APNEA TESTING USING DRAGER MEDICAL OXYGEN THERAPY SOFTWARE.

Tony Ruppert; Pulmonary Services, York Hospital, York, PA

BACKGROUND: The accepted methods to provide apneic oxygenation (AO) during brain death determination include an oxygen catheter placed at the carina or t-piece connected to the artificial airway. These methods retain associated risks (e.g., pneumothorax), use additional supplies increasing risk of procedure variance, and require disconnection of the ventilator circuit. Does oxygenation during brain death testing with mechanical ventilator software provide effective therapy without risks of traditional methods? I hypothesized that there will be no significant difference in pre-test (pre-PaO_2) and end-test PaO_2 (PaO_2 end) during apnea testing in brain death determination using Drager Medical (Telford, PA) Evita XL oxygen therapy software to provide apneic oxygenation. METHOD: IRB approval was obtained before completing a retrospective review of patients' records that were assessed for brain death using apnea study during July 2009 to May 2012. AO was provided using oxygen therapy software (v7.0) at a flow of 20 L/min with 100% oxygen after a period of pre-oxygenation of at least 15 min. Arterial blood gases (ABG) were obtained prior to apnea test. ABG was repeated at 8 min of suspended ventilation or with compromise in hemodynamics. The patient was returned to previous mode of ventilation after testing. Paired sample t tests were performed (P<.05). RESULTS: All tests confirmed apnea in brain death (N=23). No testing was terminated due to patient compromise. Paired samples t-test was conducted to compare PaO_2 pre-apnea test and at conclusion of apnea. A significant difference, P<.05, between pre-PaO_2 and PaO_2 end was found. CONCLUSION: The null hypothesis was rejected as arterial oxygen levels significantly changed statistically from pre apnea levels during brain death apnea testing. Despite significant difference in the mean PaO_2, this Drager software supplement provides the practitioner an alternative to provide apneic oxygenation without additional supplies or disconnecting the ventilator circuit. Further research should compare apnea testing oxygenation with previously published methods and the Drager software. Sponsored Research- None.

Sponsored Research - None

	Pre-apnea test	End-apnea test	*P*
PaO_2 (mm Hg)	300 ±127	252 ± 150	.007
PaO_2 range (mm Hg)	108-569	63-602	
SpO_2 (%)	98 ±.561	96 ± 3.95	.008
SpO_2 range (%)	97-99	84-99	

1667245

THE EFFECT OF MECHANICAL VENTILATION MODES ON THE DIAPHRAGM APOPTOSIS AND ULTRASTRUCTURE IN RABBITS.

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Background:Evidence reveals that controlled MV results in a swift progression of diaphragmatic atrophy and weakness.PSV mode can reduce the process of VIDD and try to use PSV mode ventilation to reduce the occurrence of VIDD. The aim of this study is to analyze the diaphragm EMGdi activity in the different modes under the same level of ventilation support, and observe the impact of diaphragm apoptosis and ultrastructure on healthy rabbits. Method: Sixteen New Zealand rabbits were randomly assigned to the control group or to receive 24 hours of CMV or A/C or PSV mode. Persistent observation the EMGdi, analyzed of the diaphragm immune histochemistry and western blot expression of Caspase-3 activity of diaphragm of each group, and observed the ultrastructure changes of the diaphragm by electron microscopy. Results:1.Three ventilation modes significantly reduce the diaphragm electrical activity under the same level of support. H / L decreased of 82.3%, 81.8%, 80.6% (p <0.01) in CMV group, A/C group and PSV group respectively. Center frequency (Fc) decreased by 43%,37.1% and 34.9%,respectively (P <0.01).2.Caspase-3 activity induced significantly by three ventilation modes,PSV mode attenuated changes in Caspase-3. CMV group Active-caspase 3 expression was strongly positive,the same as A/C mode(6.40±0.57 vs 5.98±0.41,P>0.05). The gray value of Western blot are 2.473±0.431 (p<0.01);2.202±0.213(p<0.01);1.829±1.001(p<0.05),respectively. 3.PSV mode inhibited the damage of diaphragm structure. Conclusions:The main effect of diaphragm electrical activity is the level of ventilation support. The three modes were significantly induced the expression of Caspase-3 protein,but PSV mode can reduce the diaphragm of the level of caspase-3.CMV leads to structural injury;PSV can reduce the damage of the diaphragm.

Sponsored Research - None

EMGDi: Fc and H/L ratio

Group	H/L	Fc(Hz)
Control	5.61±0.19	139.41±0.60
CMV	1.02±0.43**	79.31±0.62**
A/C	1.04±0.19**	87.22±0.65**#
PSV	1.09±0.20**	90.72±1.14**#△

Compared with the control group, low frequency components (L) of three groups increased, high frequency components (H) decreased, H / L decreased of 82.3%, 81.8%, 80.6% (p <0.01) in CMV group, A/C group and PSV group respectively. Center frequency (Fc) decreased by 43%, 37.1% and 34.9%, respectively (P <0.01). Significant statistics difference of Fc was found in multiple comparisons (CMV vs A/C, P<0.05; CMV vs PSV, P<0.05; A/C vs PSV, P<0.05).

1722602

FOUR MONTH TRIAL OF THE RAM CANNULA INTERFACED WITH A MECHANICAL VENTILATOR TO PROVIDE NONINVASIVE RESPIRATORY SUPPORT TO PREMATURE INFANTS IN A LEVEL III NICU.

Thomas Seidensticker; Respiratory Care, Rush-Copley Medical Center, Carol Stream, IL

Background: The RAM Cannula was introduced to the market as a means of providing non-invasive respiratory support to premature infants when interfaced with a mechanical ventilator. The design of the RAM Cannula allows the transmission of greater pressures to the infant's nasal passages than a standard infant oxygen cannula. The intent of the system is to provide a higher level of non-invasive respiratory support to a premature infant than current devices that provide NCPAP or nasal BiPAP. Methods: To test the efficacy of the RAM Cannula in our Level III NICU, a four month trial of the product interfaced with the Drager XL ventilator was conducted. Premature infants that required supplemental respiratory support were placed on the RAM system in place of the standard non-invasive system typically used in our unit. Settings on the ventilator were instituted and adjusted in compliance with the published recommendations of the product's manufacturer (Neotech Products). Carbon dioxide levels measured by capillary sample bloodgas analysis were monitored and recorded on each infant. Measured capillary PCO2 values within levels of acceptance by the NICU were used as an indicator of success. Results: Twenty infants with an average gestational age of 29 4/7 weeks were supported with the RAM Cannula interfaced with the Drager XL ventilator in the non-invasive mode for a total of 225 patient days. Analysis of 241 capillary blood gases drawn on these infants resulted in an average capillary PCO2 of 49.4 mmHg, with a SD of 9.5 mmHg. This capillary PCO2 average was considered an indicator of the successful application of the RAM Cannula in our NICU and supported the claims of the manufacturer as to its effectiveness. Conclusion: The RAM Cannula interfaced with a ventilator in the non-invasive mode provides an effective alternative method of applying non-invasive respiratory support to premature infants.

Sponsored Research - None

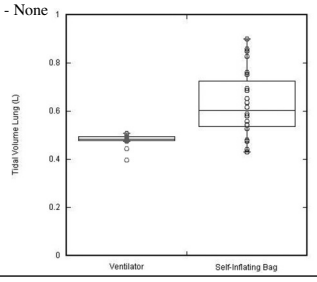
1724530

INVESTIGATION OF A NOVEL TURBINE-DRIVEN VENTILATOR FOR USE IN CARDIOPULMONARY RESUSCITATION.

Scott Allen, Lara Brewer, Derek Sakata, Erik Gillis, Nathan Pace, Joe Orr; University of Utah, Salt Lake City, UT

BACKGROUND: Past research has shown that increased respiratory rate during cardiopulmonary resuscitation is inversely correlated with systolic blood pressure. Rescuers often hyperventilate during CPR. Current American Heart Association Advanced Cardiac Life Support (ACLS) recommends a ventilation rate of 8-10 br/min once an advanced airway is established. We hypothesized that a novel, small, turbine-driven ventilator would allow rescuers to adhere more closely to ACLS guidelines. METHODS: 24 ACLS-certified healthcare professionals were paired into groups of two. Each team performed four randomized rounds of 2-minute cycles of CPR on an intubated manikin, with individuals altering between compressions and breaths. Two rounds of CPR were performed with a self-inflating bag (SIB) and two rounds were with the ventilator. The ventilator was set to deliver 8 br/min, pressure limit 22 cmH20. No coaching of volunteers was given. Respiratory rate (RR), tidal volume (Vt), peak airway pressure (PIP) and compression interruptions (hands-off time) were recorded. Teams also attempted to mask-ventilate the extubated manikin with the ventilator and the SIB. Data were analyzed with a linear mixed model and Welch two-sample t-test. RESULTS: The mean RR with the ventilator was 7.997 (standard deviation 0.103, 95% confidence interval 7.034-8.958). Mean RR with the SIB was 10.05 (SD 2.15, 95% CI 8.828-11.271). Mean ventilator Vt was 0.482 L (SD 0.022, 95% CI 0.441-0.523). Mean SIB Vt was 0.626 L (SD 0.084, 95% CI 0.568-0.685). Mean ventilator PIP was 22.15 cmH2O (SD 0.314, 95% CI 20.14-24.15). Mean SIB PIP was 31.88 cmH2O (SD 4.47, 95% CI 29.05-34.71). Mean hands-off time for ventilator and SIB were 5.25 sec (SD 2.10) and 6.41 sec (SD 1.45, 95% CI 0.431-1.902), respectively. During the mask leak trial, the mean ventilator delivered Vt was 2.65 L, of which 0.432 L entered the lungs. The mean SIB Vt delivered was 0.448 L, of which 0.262 L entered the lungs. CONCLUSIONS: When compared to a ventilator with fixed settings in a manikin model, volunteers ventilated with a self-inflating bag within ACLS guidelines. However, volunteers ventilated with increased variation, at higher tidal volumes and higher peak pressures with the SIB. Hands-off time was also significantly lower with the ventilator. In a mask leak simulation, the ventilator provided higher, more consistent tidal volumes. These findings indicate that a turbine-driven ventilator may benefit CPR.

Sponsored Research - None



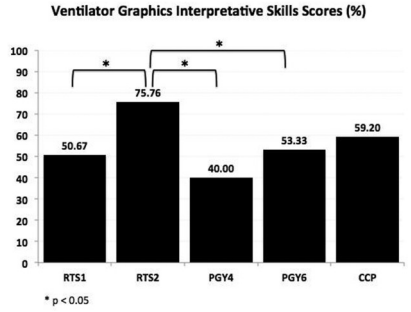
1725804

DO UNDERGRADUATE RESPIRATORY THERAPY STUDENTS HAVE BETTER VENTILATOR GRAPHICS INTERPRETATIVE SKILLS THAN CRITICAL CARE PHYSICIANS?

Ruben D. Restrepo, Juan F. Fernandez, Stephanie Levine; The University of Texas Health Science Center at San Antonio, San Antonio, TX

Background: Most respiratory therapy bachelor's degree programs teach introduction to mechanical ventilation at the end of the first academic year and formal training on ventilator graphics shortly after. While critical care physicians (CCP) do not receive formal training on ventilator graphics during their 3 years of training, they do have abundant exposure to patients undergoing mechanical ventilation. There is no documentation of how RT students (RTS) competence on ventilator graphics interpretative skills compares to those of CCP. Our goal was to evaluate basic interpretative skills in both groups. Methods: The department of respiratory care at the University of Texas Health Science Center at San Antonio conducted an evaluation of ventilator graphics interpretative skills of respiratory therapy students in their first and second year (RTS1; n=17) (RTS2; n=17); first year critical care fellows (PGY4; n= 4); third year critical care fellows (PGY6; n=3); and critical care physicians (CCP; n=5). They were all asked to meet with a faculty member at the RT department without knowing about the test. A 26-item questionnaire was designed to evaluate their ventilator graphics interpretive skills and included short answers, drawings, few clinical scenarios, and recognition of common abnormalities on the waveforms. The first item of the evaluation asked to score (1-10) their perceived knowledge of ventilator graphics before they saw the content of the questionnaire. Results: While there was a significant difference between the perceived knowledge of ventilator graphics between the RTS2 and the other two groups (RTS2 vs. CCP p=0.002; RTS2 vs. RTS1 p=0.02), scores for CCP and RTS1 were similar (p=0.312). In the questionnaire, RTS2 scored significantly higher than all other groups, except the CCP group (figure). Conclusion: During the junior and senior year, students at a bachelor's degree program gain a level of interpretative skills of ventilator graphics that is similar or better than most critical care physicians.

Sponsored Research - None



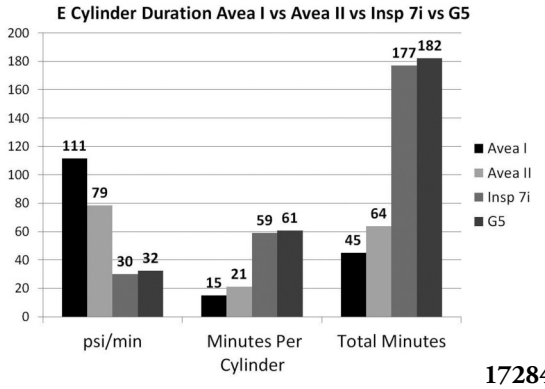
1726664

COMPARISON OF HELIOX CYLINDER GAS CONSUMPTION BETWEEN VENTILATORS.

Mark Siobal, Leo Bandian, Earl Managlindan, Kelly Ho, Nicholas Leonor; UCSF Department of Anesthesia, San Francisco General Hospital, San Francisco, CA

Background: Ventilation with Heliox is available on several ventilator platforms. The rate of heliox cylinder gas consumption is dependent on minute ventilation, the concentration of helium being delivered, and the internal function of the ventilator. We compared heliox cylinder duration using the upgraded Carefusion Avea (Avea II) and Hamilton G5, against prior measurements using the eVent Medical Inspiration 7i Ventilator and the older Carefusion Avea Ventilator (Avea I). Method: A single chamber of a Michigan Instruments Test Lung set to a compliance of 60 mL/cm H20 was used with a 7.5 mm endotracheal tube and a R50 resistor. Ventilators were connected to the test lung and set to deliver a Vt = 600mL, RR = 10/min, PEEP = 5, inspiratory flow = 60 L/min with a square wave flow pattern, minimum bias flow, and a FiHe of 70%. E-cylinders of 80/20 heliox were used for the testing. Prior to each test the cylinder pressure was recorded from the digital pressure gage of the heliox cylinder regulator. Each test was timed and ended when the ventilator alarmed for low heliox cylinder pressure. Three full E-cylinders of 80/20 heliox were tested on each ventilator. Results: Cylinder pressures varied between 1500 to 2000 psi therefore the sum of the pressures from the three cylinders varied between 5000 and 5900 psi. The sum of the run time minutes from each test ranged from 45 to 182 minutes, the average cylinder duration ranged from 15 to 61 minutes, and the average cylinder pressure drop ranged from 111 to 30 psi/min. Conclusion: Heliox gas consumption determined by cylinder pressure drop and cylinder duration is lowest for the Hamilton G5 and the eVent Inspiration 7i and highest for the Avea I and Avea II during invitro bench testing.

Sponsored Research - None



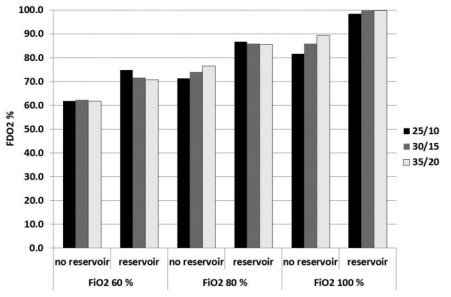
1728443

DELIVERED OXYGEN CONCENTRATION AND VENTILATOR PERFORMANCE USING A MODIFICATION TO THE METANEB CIRCUIT.

Mark Siobal, Earl Mangalindan; UCSF Department of Anesthesia, San Francisco General Hospital, San Francisco, CA

Background: Metaneb therapy can be administered inline through a ventilator circuit to deliver continuous high frequency oscillation for secretion clearance. The Metaneb uses an open circuit venturi system powered by 100% oxygen that entrains ambient air. At FiO2 above 60% dilution of the set oxygen concentration and hypoxemia can occur. We tested a modification to the Metaneb circuit with an 18 inch section of large bore aerosol tubing connected to the open end of the venturi channel. The tubing acts as a reservoir of gas leaving the circuit and prevents ambient air entrainment. We tested the effects of the modified circuit on oxygen dilution and ventilator performance. Method: A single chamber of a Michigan Instruments Test Lung set to a compliance of 20 mL/cm H20 was used with a 7.5 mm endotracheal tube. A Drager XL ventilator using the PC SIMV mode (PCV+) was connected to the test lung and set at frequencies of 15, 25, and 35 cycles/min, PIP/PEEP of 25/10, 30/15, and 35/20 cm H2O, FiO2 of 60, 80 and 100%, at an I:E ratio of 1:1. Ventilator performance in regards to the PIP, mean airway pressure, and PEEP, and the fraction of delivered oxygen (FDO2) delivered into the TTL chamber were recorded at each combination of settings with and without the circuit modification. Results: PIP, mean airway pressure, and PEEP were not affected by frequency or the use of the modified circuit. Frequency had little effect on the FDO2 at all setting combinations (average standard deviation of FDO2 = 0.7%). PIP/PEEP settings had a small effect on FDO2 (average -3.4 %, range -0.6 to -7.7 %). At FiO2 settings above 60%, oxygen dilution occurred (average -10.2 %, range -3.5 to -18.3 %) using a standard circuit. Use of the modified circuit increased FDO2 at all settings. FDO2 near 100% could be delivered at all setting combinations using the modified circuit (average 99.4%, range 98.5 to 100%) Conclusion: Use of a modified Metaneb circuit with an oxygen reservoir did not alter ventilator function and enabled delivery of oxygen concentrations up to 100% in this low compliance invitro lung model.

Sponsored Research - None



1728448

VALIDATING PERFORMANCE CHARACTERISTICS OF THE AIRON PNEUTON A PNEUMATIC TRANSPORT / MRI VEMNTILATOR.

Mark Siobal, Justin Phillips, Olivier Ngo; UCSF Department of Anesthesia, San Francisco General Hospital, San Francisco, CA

Background: The Airon pNeuton A ventilator is a pneumatically powered ventilator designed for transport and MRI compatibility. The only controls on the ventilator are for Vt, frequency, PEEP/CPAP, mode (IMV with CPAP or CPAP), pressure limit, and oxygen % (65 or 100%). This laboraory bench study examined the performance characteristics of the pNeuton A ventilator at varying IMV frequencies and Vt settings, at a PEEP/CPAP level of 10 cm H2O. Method: The pNeuton A ventilator set to IMV frequencies of 10, 15, and 20 bpm, Vt of 400, 500, 600, and 700 mL, and a continuous flow CPAP of 10 cmH2O was connected by a 7.5 ETT to a single chamber of a Michigan Instruments Test Lung with compliance settings of 20, 40, and 60 mL/cm H2O. A Ventrak 1550 respiratory mechanics monitor was used to record the actual expired Vt (Vte), frequency, Inspiratory (Tinsp) and expiratory time (Texp), I:E ratio, PIP, PEEP, and peak inspiratory flow (PIF),at each frequency, Vt, and compliance setting . During each test run after the initial Vt and frequency parameters were set, frequency was not adjusted. The test lung compliance and Vt were the only adjustments made. All testing was performed on a FiO2 setting of 100%.. Results: Average exhaled Vt was 2% to 17 % higher than targeted. Delivered Vt decreased slightly as compliance was decreased. Frequency decreased as Vt was increased (average standard deviation - 1.7, range -0.8 to – 2.3 bpm). Inspiratory time increased (range 0.7 to 1.2 seconds) as Vt increased but the change was consistent across each frequency, Vt, and compliance setting. Expiratory time decreased as frequency was increased (range 5.6 to 1.7 seconds) and decreased as Vt was increased (range 1.7 to 5.6 seconds) but was consistent at across each Vt and compliance at any frequency setting. I:E ratio decreased as Vt and frequency increased (range 1:6.6 to 1:1.9). The average PIP increased as compliance decreased. PEEP remained relatively constant at all settings. The average PIF was 36.9 ± 1.0 L/min. Conclusion: The pNeuton A pneumatic transport / MRI ventilator responded appropriately to changes in Vt and lung compliance during this invitro bench study. This data suggests that under conditions tested in this bench study, the pNeuton A ventilator would provide safe and effective ventilatory support during patient transport or MRI procedures.

Sponsored Research - None

Averages at	Compliance 60				Compliance 40				Compliance 20			
Frequencies of 10,15,20	Vt 400	Vt 500	Vt 600	Vt 700	Vt 400	Vt 500	Vt 600	Vt 700	Vt 400	Vt 500	Vt 600	Vt 700
Average Vte	466	558	671	752	463	553	665	744	448	534	641	716
Vte Percent Target	1.17	1.12	1.12	1.07	1.16	1.11	1.11	1.06	1.12	1.07	1.07	1.02
Average Tinsp	0.8	0.9	1.1	1.2	0.8	0.9	1.1	1.2	0.7	0.9	1.0	1.2
Average Texp	3.0	3.3	3.6	3.8	3.0	3.3	3.6	3.8	3.0	3.3	3.6	3.8
Average PIP	20.3	21.9	23.7	24.9	23.8	26.1	28.9	30.8	33.9	38.4	43.1	47.6
Average PEEP	10.0	10.0	10.0	10.0	10.1	10.1	10.1	10.1	10.6	10.6	10.7	10.7
Average PIF	35.0	37.2	36.6	37.9	35.5	36.9	37.5	37.2	38.4	35.6	37.5	37.4

1728454

ENGINEERING A PLATFORM DEVICE TO DELIVER BUDESONIDE NANOCLUSTER DRY POWDERS USING A MECHANICAL VENTILATOR.

Nashwa El-Gendy[1], Warangkana Pornputtapitak[1], Caitlin Uyemura[2], Parthiban Selvam[1], Joel Mermis[3], Amy O'Brien Ladner[3], Cory Berkland[1,2]; [1]Pharmaceutical Chemistry, University of Kansas, Lawrence, KS; [2]Chemical and Petroleum Engineering, University of Kansas, Lawrence, KS; [3]Medicine, Division of Pulmonary and Critical Care Medicine, University of Kansas medical center, Kansas city, KS

BACKGROUND: Clinical results for nebulized therapeutics to mechanically ventilated patients are highly variable and long dosing times are often required. Nebulized formulas suffer from 'rain-out'. A key to successful delivery is maintaining aerosol as a fine droplet or particle through ventilator tubing all the way to the distal end of tracheal tubing. An engineered budesonide NanoClusters successfully passed through endotracheal tubes whereas traditional dry powder formula failed. Here, a novel delivery system composed of dry powder inhaler (DPI) attached to a catheter was designed to efficiently deliver therapeutic formulas to mechanically ventilated patients. METHODS: Various capsule-based DPI devices were designed and fabricated by varying the mesh size and the inlet/outlet opening size. Novel designs were assessed using device air resistance measurements and aerosol impaction methods. The Bud-NC dry powder performance was studied using the novel DPI-catheter system. The DPI was fitted to catheter and explored as a unique system to bypass highly variable ventilator environment by delivering fine Bud-NC aerosol through the catheter inserted in endotracheal tube (Figure 1). Variables such as inhalation volume, ventilator flow rate, and catheter dimensions were explored. The results were accessed by one-way ANOVA followed by Tukey's Multiple Comparison Test. RESULTS: The devices' resistance was not significantly changed upon increasing the mesh size from 0.15 to 1.00 mm ($p<0.05$); however, the resistance increased when the inlet opening decreased from 2.5 to 1.5 mm. Surprisingly, the %EF (~90%) of NanoClusters delivered through these devices was not significantly different when the airflow was provided by negative pressure suggesting efficient performance of the Bud-NC powder itself. Variables were optimized to consistently deliver Bud-NC while minimizing sensitivity to ventilator settings. The DPI-catheter circumvented the humid environment of the ventilator circuit and effectively aerosolized ~65% of fine budesonide powder (particle size <5 mm). CONCLUSION: DPI-catheter system allowed placement, drug delivery and removal without disturbing the ventilator circuit. Efficient and reproducible dosing of therapeutic amounts of Bud-NC suggests clinical utility of this delivery system. The novel DPI-catheter combined with NanoCluster formulation technology has the potential to allow convenient and effective drug delivery to ventilated patients in critical care.

Sponsored Research - None

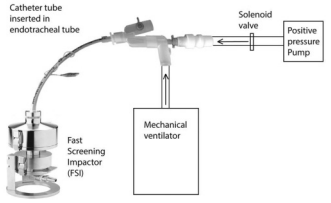


Figure 1. Schematic of the system configuration using the novel dry powder inhaler connected in parallel to the mechanical ventilation.

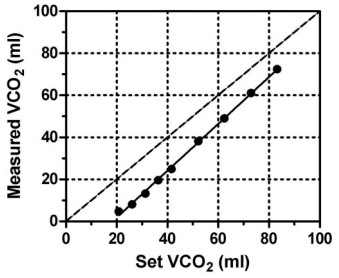
1728944

MEASUREMENT OF CARBON DIOXIDE ELIMINATION DURING HIGH-FREQUENCY JET VENTILATION: A BENCH STUDY.

Craig R. Wheeler, Craig D. Smallwood; Respiratory Care, Boston Children's Hospital, Boston, MA

BACKGROUND: High-frequency jet ventilation (HFJV) is used in tandem with a conventional ventilator (CV) in neonates and small children with respiratory failure. Due to the high frequency flow pattern, rapid rate and brief inspiratory times associated with HFJV, conventional bedside monitoring is incapable of accurately measuring changes in flow and carbon dioxide (CO_2) at the airway. The purpose of this study was to assess the feasibility and accuracy of carbon dioxide elimination (VCO_2) during HFJV, sampled at the ventilator exhaust. METHODS: A bench model was constructed using the LifePulse jet ventilator (Bunnell, Salt Lake City, UT.) in tandem with Avea ventilator (CareFusion, Yorba Linda, CA). Devices were calibrated according to manufacturer specifications before use. To simulate CO_2 production, we injected known amounts of CO_2 gas using a mass flow controller into a Quicklung Jr. test lung (IngMar, Pittsburgh, PA), which was connected to the HFJV adapter and ventilator circuit. An NM3 monitor (Philips, Andover, MA) was affixed to the CV exhaust port using a specialized adapter. Set CO_2 flow was increased incrementally from 20-80ml/min in order to simulate CO_2 production of infants and small children. Flow and CO_2 data were recorded continuously. We calculated VCO_2 offline using 1 minute averages of CO_2 and flow. This data was then compared with set CO_2 production and analyzed using Pearson correlation and linear regression. RESULTS: The Pearson correlation was R^2=0.9984 ($P<0.0001$) and Linear regression of data revealed y=1.15x -20.45 (R^2=0.9984, $P<0.0001$; see Figure). CONCLUSION: This method underestimated VCO_2, which could possibly be attributed to a leak in the circuit or technical performance of the CO_2 and flow sensor used for the measurements. Accuracy appeared to improve as set CO_2 was increased, which may suggest VCO_2 measurement is more reliable in larger children. If further testing confirms a consistent underestimation of VCO_2, a compensation factor may be used that could allow more accurate measurements. However, more studies are needed to confirm these observations and validate VCO_2 measurement during HFJV.

Sponsored Research - None



1730674

A COMPARISON OF THE ACCURACY OF DELIVERED TIDAL VOLUMES ON THE DRAGER XL AND THE SERVO-I VENTILATORS AT LOW TIDAL VOLUME SETTINGS.

Jerrold Judd; Respiratory Care, Children's Hospital Colorado, Aurora, CO

Background: When providing mechanical ventilation for neonatal patients, current literature suggests the use of a low tidal volume (Vt), lung-protective ventilation strategy. At Children's Hospital Colorado (CHCO) critical care ventilators used in the intensive care setting include the Drager XL and the Servo-i. The intent of this project was to evaluate the accuracy of delivered volumes in the very low Vt range, as would be appropriate for the mechanical ventilation of neonates. The results can potentially help in understanding the limitations of the ventilators used at CHCO. Method: Three Drager XL ventilators and three Servo-i ventilators were selected randomly from the CHCO ventilator fleet for the test. Each Drager XL was outfitted with a neo-flow sensor and a pre-use check was performed per manufacturer's recommendation in the neonatal mode. Each Servo-i was outfitted with an infant Y-sensor and a pre-use check was performed per manufacturer's recommendation in the infant mode. Volume Control mode with Auto Flow was used on the Drager XL while the Servo-i was placed in SIMV, PRVC mode. Each ventilator was connected to a calibrated BIO-TEK VT Plus Gas Flow Analyzer and volume measurements were taken at the following set tidal volumes; 3ml, 4ml, 5ml, 6ml, 7ml, 8ml, 9ml, and 10ml. Additional settings were identical for each test; respiratory rate 25, inspiratory time 0.5 sec, peep 5 and 21% FIO2. The externally analyzed Vt was compared to the set Vt and the displayed exhaled tidal volume (Vte) at each setting. Preventive maintenance is regularly performed on all ventilators by the bio-med department at CHCO per manufacturer's recommendations. Results: Across the range of tidal volumes the Drager XL delivered 110% to 137% of the set volume and displayed a Vte of 90% to 100% of the set volume. The Servo-i delivered 80% to 100% of the set volume while displaying a Vte 109% to 140% of the set volume. Conclusions: This bench test demonstrates that, among the ventilators tested, the Drager XL displays exhaled volumes equal to or less than set while external measurements show that it delivers tidal volumes greater than set. The Servo-i ventilators tested displayed exhaled volumes greater than set, but delivered volumes at or below set. This discrepancy suggests the need for further validation of the accuracy of these devices, an understanding of which may be clinically significant in the management of low tidal volume ventilation of neonates.

Sponsored Research - None

COMPARISON OF AVERAGE TIDAL VOLUMES MEASURED INTERNALLY BY VENTILATOR AND EXTERNALLY BY CALIBRATED GAS FLOW ANALYZER IN ML

Set Vt	Drager XL Internal	Drager XL External	Servo-i Internal	Servo-i External
3	2.9	3.9	3.9	2.8
4	3.8	5.2	4.5	3.6
5	4.7	6.2	5.8	4.2
6	5.6	7.5	7.0	5.0
7	6.4	8.5	8.0	5.9
8	7.4	9.6	8.9	6.9
9	8.5	10.9	9.9	8.1
10	9.4	12.2	11.5	9.0

1731203

TIDAL VOLUME AND MINUTE VOLUME DELIVERY FROM 2-ICU VENTILATORS IN VOLUME CYCLED MODE COMPARED TO 5-TRANSPORT VENTILATORS.

Paul F. Nuccio, William R. Howard, Philip Delcore; Respiratory Care, Brigham and Women's Hospital, Boston, MA

BACKGROUND: Patients on ICU ventilators are often transported from their primary care location. Our facility uses transport ventilators when outside of the ICU. We wanted to know if our ARDS net protocol using VT of 5-6 mL/kg for 50 – 85 kg patients (represented by VT 300 and 500 mL) was delivered during transport. We also wanted to know if minute ventilation (MV) from our 2-ICU ventilators in the volume cycled mode was comparable using same settings with our transport ventilators. METHODS: Two ICU ventilators were tested: Hamilton G-5, (Reno, NV), Puritan Bennett 840, (Covidien, Mansfield, MA) and compared to 5-transport ventilators: Hamilton T-1, (Reno, NV), Hamilton C-2, (Reno, NV), Newport HT-50, (Covidien, Mansfield, MA), Newport HT-70, (Covidien, Mansfield, MA) and Pulmonetic LTV 1000, (CareFusion, San Diego, CA), for VT and MV delivery. An unheated patient circuit, Airlife OY1778, (CareFusion, San Diego, CA), was used with the PB-840 and Hamilton ventilators and a single-limb unheated proprietary circuit with the other ventilators. Each ventilator passed their respective manufacturer's recommended pre-use checkout. Each ventilator was attached to an ASL 5000 breathing simulator (IngMar Medical, Ltd, Pittsburgh, PA) with the following test conditions: compliance 20, 30, and 50 ml/cm H2O, resistance 5 cm H2O/L/sec and 20 cm H2O/L/sec; VT 300 mL and 500 mL, RR 20 BPM, I:E 1:2, PEEP 5 and 10 cm H2O. Exhaled VT and MV were recorded after 40 breaths and calculated for bias or mean difference (MD) ±SD. ANOVA and paired t-tests were performed ($p \leq 0.05$). RESULTS: The Table illustrates the MD (±SD) of VT and MV. The VT MD was not statistically significant except with the PB-840 and HT-50 combination ($p = 0.001$). MV from the transport ventilators ranged from a MD (±SD) of 340 mL (177.1) less to 1670 mL (403.1 mL) higher than the ICU ventilators. CONCLUSION: VT delivery from the transport ventilators was not significantly different than the ICU ventilators with the one exception of the PB-840 and HT-50 comparison. With this combination the additional VT increases to 7-7.7 mL/kg. MV MD with this exception was also not statistically significant. However, caution may be warranted with the MV difference having potential to alter acid base and/or oxygenation during transport. The transport ventilator should be carefully chosen and adjusted to assure equivalent VT and MV that is comparable to the ICU ventilator.

Sponsored Research - None

	PB840/ T1	PB840/ C2	PB840/ HT-50	PB840/ HT-70	PB840/ LTV	G5/ T1	G5/ C2	G5/ HT-50	G5/ HT-70	G5/ LTV
VT MD mL (± SD)	37.5 ± 7.6	11.0 ± 16.0	83.5 ± 20.2	9.0 ± 3.3	19.5 ± 4.7	12.0 ± 6.6	-12.5 ± 14.9	55.5 ± 19.7	-17 ± 8.9	-7.5 ± 9.3
MV MD mL (± SD)	750 ± 151.6	220 ± 319.9	1670 ± 403.1	180 ± 65.2	390 ± 94.6	240 ± 132.8	-250 ± 297.7	1110 ± 393.9	-340 ± 177.1	-150 ± 185.4
p - value	0.36	0.77	0.001	0.83	0.65	0.88	0.78	0.23	0.69	0.88

1731570

COMPARING TIDAL VOLUME AND MINUTE VOLUME DELIVERY IN 2 ICU-VENTILATORS WITH 5-TRANSPORT VENTILATORS DURING TIME-CYCLED-PRESSURE-CONTROL MODE.

William R. Howard, Philip Delcore, Paul F. Nuccio; Respiratory Care, Brigham and Women's Hospital, Boston, MA

BACKGROUND: Often critically ill patients managed with ICU ventilators are transported away from their primary location for diagnostic testing or to return to the operating room. At our facility the standard of care has changed from providing life support with a common manual resuscitator for these events and relying instead on transport ventilators. We wanted to know if VT and minute ventilation (MV) delivered from our 2-ICU ventilators in the time-cycled pressure controlled mode and at I:E ratios of 1:2, 1:1, and 2:1 was comparable when the same settings were used with our 5-types of transport ventilators. METHODS: We implemented the following setup to replicate the conditions of clinical practice as close as possible. Two critical care ICU ventilators were tested; Hamilton G-5, (Reno, NV), Puritan Bennett 840, (Covidien, Mansfield, MA) and compared to 5-transport ventilators; Hamilton T-1, (Reno, NV), Hamilton C-2, (Reno, NV), Newport HT-50, (Covidien, Mansfield, MA), Newport HT-70, (Covidien, Mansfield, MA), and Pulmonetic LTV 1000, (CareFusion, San Diego, CA) for MV delivery. The same unheated patient circuit, Airlife OY1778, (CareFusion, San Diego, CA) was used with the PB-840 and Hamilton ventilators while a single-limb unheated proprietary circuit was used with the other 2 transport ventilators. Each ventilator passed their respective manufacturer's recommended pre-use checkout. Each ventilator was attached to an ASL 5000 breathing simulator (IngMar Medical, Ltd, Pittsburgh, PA) with test conditions for 3 levels of compliance 20, 30, and 50 ml/cm H2O, resistance 5 cm H2O/L/sec, RR 20 breaths/min, I:E 1:2, 1:1, and 2:1, target pressure 30 cm H2O, PEEP 5 cm H2O. With each test condition exhaled VT (±SD) and MV (±SD) was recorded after 40 breaths. ANOVA and paired t-tests were performed ($p \leq 0.05$). RESULTS: The Table below illustrates the mean difference (±SD) and (p – value) of VT and MV between the ICU and transport ventilators. MV delivery from the transport ventilators ranged from a MD of 262 mL less ($p = 0.001$) to 856 mL more ($p = 0.04$) than the ICU ventilators in our test configuration. CONCLUSION: Where close adherence is desirable from the perspectives of limiting VT delivery as a lung protective strategy and for MV delivery in general, the clinician must exercise caution when selecting and adjusting a transport ventilator for their stable patient when transitioning from an ICU ventilator.

Sponsored Research - None

	G5/ T1	G5/ C2	G5/ HT50	G5/ HT-70	G5/ LTV	840/ T1	840/ C2	840/ HT50	840/ HT70	840/ LTV
VT MD mL (± SD)	27.2 (22)	1.3 (25.3)	75.6 (37.4)	-10.1 (15.32)	-2.04 (12.5)	44.8 (11.8)	18.9 (16.6)	93.2 (28.1)	7.6 (5.3)	15.6 (6.5)
MV MD mL (± SD)	37.8 (234.2)	91.1 (128.5)	855.6 (1073.3)	826.7 (654.4)	828.9 (639.5)	-262.2 (245)	-208.9 (282.2)	555.6 (1033.8)	526.7 (654.4)	528.9 (505.0)
p - value	0.64	0.07	0.04	0.005	0.004	0.01	0.06	0.15	0.002	0.14

1731604

PATIENT SAFETY IN VENTILATOR CARE USING ULNAR LENGTH TO ESTIMATE PATIENT HEIGHT.

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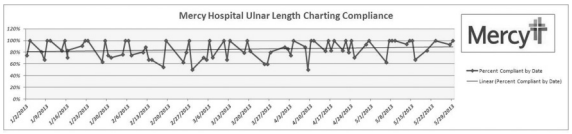
Background: Mercy Hospital Springfield implemented an electronic health record (EHR) in January thru April of 2009. One of the issues confronting Respiratory Care Practitioners is setting safe tidal volumes in mechanically ventilated patients. The EHR calculates Ideal Body Weight (IBW) when the patient height is entered. Additionally, it gives you a tidal volume range (low - 6cc/kg IBW, moderate - 8cc/kg IBW, high 10cc/kg IBW) for adult males and females based on the ideal body weight. We sought to find a method that provides a consistent and safe method for getting the patient's height for calculation of IBW. After researching the literature, we decided to use Ulnar Length for this process. Method: We found charts in the literature that allow estimation of patient height from simple measurement of Ulnar Length. This is then entered in the EHR for calculation of IBW. The Critical Care Committee approved the use of Ulnar Length in mechanically ventilated patients for the calculation of IBW. The practice is to target the low to moderate range of 6-8 cc kg/IBW. We began a Quality Excellence project to assess compliance with entering Ulnar Length with the first ventilator check documented in the ICU. The goal was set for a 90% compliance rate. We placed a simple disposable paper tape and the Ulnar Length chart with every ventilator. Daily audits were performed to assess compliance. E mails were sent to Supervisors and Co-Workers daily regarding compliance. A graph depicting our compliance percentage was posted weekly in the department. Results: We initially began collecting data in August of 2012 after the policy and procedure was initiated. The formal Quality Excellence project began in January of 2013. We reviewed charts of 974 adult patients who were intubated and mechanically ventilated. From August of 2012 till the end of May 2013 the overall compliance with entering using Ulnar Length to estimate patient height was 70%. The overall compliance for the Quality Excellence project from January 2013 till the end of May 2013 was 85%. Conclusion: Patient safety and consistency were the main goals of entering patient height in the EHR for calculation of IBW. Getting the support of the Critical Care Committee of the hospital was essential in getting the project started. Improved communication between Respiratory Care and Nursing regarding height estimation has improved the process considerably. The linear trend line shows consistent improvement over time.

Sponsored Research - None

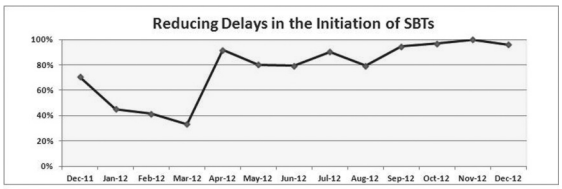


1731648

REDUCING DELAYS IN SPONTANEOUS BREATHING TRIALS AFTER A POSITIVE DAILY SCREEN.

Brent Kenney, Bill Haire, Mangus Meyer, Jim Pattinson; Mercy Hospital, Springfield, MO

Background: Evidence based guidelines using spontaneous breathing trials (SBT) for weaning and discontinuing ventilator support have existed for more than a decade. With the guidance of Critical Care Medicine we initiated a new process to automatically identify those patients who are ready to wean, and initiate SBTs. The Electronic Health Record (EHR) has made that process even easier for Respiratory Care Practitioners (RCPs). The Daily Screen (DS) is part of the EHR, and is performed every morning by RCPs in the Intensive Care Units (ICUs). If a patient passes or has a positive DS, then they are advanced to a SBT. Methods: The Daily Screen at Mercy Hospital includes Fraction of Oxygen (FIO2)



1731816

EVALUATION OF THE KNOWLEDGE OF PHARMACISTS ON THE USE OF MDI AND DPI.

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BACKGROUND: It is important for the patient to use metered dose inhalers (MDIs) and dry powder inhalers (DPIs) properly because poor or incorrect techniques may cause a reduction in drug delivery. Pharmacists are the last health care provider that the patients encounter prior to using the MDI or DPI at home. The purpose of this study was to evaluate the knowledge of pharmacists on the use of MDI and DPI. METHODS: This study was approved by the Institutional Review Board (IRB). Thirty licensed pharmacists from a convenient sample of retail pharmacies were given a survey on techniques and knowledge on the use of MDI and DPI. Each pharmacist was given 5 minutes to answer 10 multiple-choice questions. RESULTS: Most pharmacists (80%) knew that MDI devices deliver a consistent precise dose. A majority of pharmacists (88%) stated that there are few respiratory drugs available in DPI form. Fifty-six percent of the pharmacists said that the patient should wait 1 to 2 minutes before the next MDI actuation. As far as demonstrating the breathing pattern for a DPI, 48% of the pharmacists would instruct the patient to take a fast and deep breath. On the other hand, when asked to demonstrate the breathing pattern for MDI administration, 84% agreed that the patient should take a slow and deep breath. Most pharmacists (84%) were confident about the advantages of using a spacer with an MDI. When asked about the whistling sounds of a spacer, 76% agreed that the patient should slow down their breaths. Some pharmacists (24%) had never heard of the feature of a whistling sound coming from a spacer. Most pharmacists (80%) recognized the reason for the patient to rinse their mouth after the use of an inhaled corticosteroid. Sixty-four percent of the pharmacists were able to recognize the advantages to DPI over MDI. Seventy-six percent of the pharmacists concluded that patients should hold their breath to allow the deposition of the medicated aerosol. CONCLUSIONS: This study shows that most pharmacists in this study are knowledgeable on the MDI, spacer chamber, and DPI. Key points that some pharmacists did not answer correctly include the recommended time lapse before the next MDI actuation, and the proper breathing pattern for DPI. For better patient outcomes pharmacists should keep current on the knowledge and proper use of MDI and DPI.

Sponsored Research - None

1723052

THE EFFECT OF ADAPTING NEBULIZERS TO OXYGEN MASKS ON HYPOPHARYNGEAL FIO2 AND AEROSOL DELIVERY.

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BACKGROUND: Various techniques have been used to deliver aerosol treatments while a patient is receiving oxygen. We sought to determine the aerosol deposition and hypopharyngeal FiO2 (hFiO2) using four combinations of oxygen device and nebulizer. The research questions were: a) which of four techniques will result in the greatest aerosol deposition and b) what is the effect of adding a nebulizer on the hFiO2? METHODS: Part 1. Aerosol deposition on a filter was measured using four nebulizer/oxygen device techniques with the gravimetric method. Technique 1 adapted the Aeroneb nebulizer to the air/oxygen mixing tube of a 40% air entrainment mask (AEM) at 8L/minute. Technique 2 adapted the Aeroneb to the medication delivery adaptor of the Hi-OX mask at 8L/minute and a 2L/minute oxygen flow to move the aerosol into the mainstream of gas. Technique 3 adapted a small volume pneumatic nebulizer with a closed-end to the air/oxygen mixing tube of the 40% AEM at 8L/min oxygen. Technique 4 adapted a small volume nebulizer at 8L/minute to a nonrebreather mask at 10 L/minute, with a Y adapter. Three mL of saline was nebulized in all techniques. The manikin's trachea was connected to a lung simulator that simulated a spontaneously breathing adult with a tidal volume=0.5L, f=20 breaths/minute and Ti=1.0 sec. Aerosol delivery was assessed by collecting the aerosol on a dry filter then calculating the change in weight. Part 2. Following IRB approval and informed consent in normal healthy volunteers, hFiO2 measurement was made. Following anesthesia with nebulized 4% lidocaine an 8 Fr. suction catheter was inserted through the nare behind the uvula. The catheter was connected to a galvanic oxygen analyzer. The hFiO2 was measured with and without the nebulizers adapted. One way ANOVA and Tukeys hsd were used to analyze the data. RESULTS: Part 1. Technique 2 using the Hi-OX mask with the Aeroneb resulted in the largest filter weight change (260±20.5mg or 8.7%), p= 0.007 compared to the other 3 techniques. Part 2. In 8 volunteers, the lowest change in hFiO2 (0) was with technique 1. The greatest change in hFiO2 was 0.2+0.02 in technique 3. CONCLUSION: The Hi-OX mask with the Aeroneb (technique 2) had the greatest change in filter weight with a small increase (~.06) in hFiO2. If one wanted to have a system where delivering a high concentration of oxygen and an adequate fraction of the nominal dose was desired, the Hi-OX mask with the Aeroneb would be used.

Sponsored Research - None

1725015

NEBULIZER CLEANING PROCESS IN THE ADULT ACUTE CARE SETTING.

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BACKGROUND: The joint Commission has called attention to the lack of a standardized process for cleaning patient nebulizers after administration of a medication in the hospital setting. Moreover, there is scant evidence regarding effective cleaning methods. To address the issue at our facility the Respiratory Department's Safety Committee conducted a quality improvement project to identify, implement and evaluate the effectiveness of a standardized nebulizer cleaning protocol (NCP). METHOD: A quality improvement process was used to guide this project. First we reviewed manufacturers' recommendations for equipment cleaning post-nebulizer care. Next the method that was most feasible to implement based on Respiratory Therapy (RT) staff scheduling and average patient loads was selected. . The NCP selected included three steps: 1)After an aerosolized treatment has been administered, the RT rinses the nebulizer cup(s) with normal saline; 2)The RT dries the nebulizer cup by reattaching the nebulizer to the flow meter and blowing air through the cup for at least 10 seconds at a rate of 6L/min; and 3)The RT reassembles the nebulizer and places it into the patient's storage bag. Then the NCP was implemented into clinical practice. Finally to evaluate the effectiveness of the NCP, ten nebulizers used in patient care for a minimum of seven days were collected and cultures obtained to identify any flora that remained after the equipment was cleaned using the NCP. Parts of the nebulized swabbed for culture included the nebulizer cup and mouth piece. A clean nebulizer was cultured as a control. Culture results would be used to educate RT staff and reinforce use of the NCP. RESULTS: 85% of the nebulizers cultured indicated an absence of flora passed by patient mouth into nebulizer cups and the absence of foreign bacteria in nebulizer mouth pieces or cups only three cultures demonstrated positive growth; however, the growth found was a common skin contaminant, likely introduced during routine patient care. Based on these results, it was determined our NCP was effective and sanitary. CONCLUSION: The quality improvement project resulted in the adoption and implementation of a standardized NCP for in-hospital patient care. Culture results supported effectiveness of the newly adopted NCP. Creation of a standardized NCP post treatment and educating staff on the importance of implementing the NCP will help us promote the overall safety of patients and staff at our facility.

Sponsored Research - None

NEBULIZER CULTURE RESULTS

Nebulizer Letter	Mouth Piece	Neb. Cup
A	NO GROWTH	NO GROWTH
B	NO GROWTH	NO GROWTH
C	NO GROWTH	NO GROWTH
D	NO GROWTH	NO GROWTH
E	NO GROWTH	SCANT GROWTH OF COAGULASE STAPHYLOCCUS SPECIES
F	NO GROWTH	SCANT GROWTH OF COAGULASE STAPHYLOCCUSSCANT GROWTH OF BACULLUS SPECIES, NOT B. ANTHRACIS SPECIES;
G	NO GROWTH	NO GROWTH
H	NO GROWTH	NO GROWTH
I	SCANT GROWTH OF COAGULASE NEGATIVE STAPHYLOCCUS SPECIES STRAIN 1; SCANT GROWTH OF COAGULASE NEGATIVE STAPHYLOCCUS SPECIES STRAIN 2	NO GROWTH
J	NO GROWTH	NO GROWTH
K	NO GROWTH	NO GROWTH

1725033

THE IMPACT OF DIFFERENT CLOSED SUCTION CATHETER DESIGNS AND P-MDI ADAPTERS/SPACERS ON AEROSOL DELIVERY IN SIMULATED ADULT MECHANICAL VENTILATION WITH "WET" AND "DRY" EXHALATION.

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Background: Closed-suction catheters (CSC) are commonly used with pMDIs in ventilated patients receiving bronchodilator therapy with pressurized metered-dose inhalers (pMDI). Although heated/humidified circuits results in a decrease in drug delivery, none have addressed the impact of CSC with pMDI on drug delivery using "wet" and "dry" exhalation. The purpose of this study was to quantify aerosol delivery with a variety of CSC and pMDI spacers/adapters in simulated adult mechanical ventilation with and without exhaled humidity. Method: A ventilator (Vt 450mL, PEEP 5cm H2O, RR 15 bpm, peak flow 60 lpm, and bias flow 2 lpm) with and without heated humidification was attached to 3 CSC designs (T-piece, Double Swivel Elbow and the Multi Access Port), with pMDI spacers/adapters (small and large unidirectional adapters, bidirectional adapter and built in port) connected to an endotracheal tube with collecting filter and passive test lung. To simulate exhaled humidity, a heated humidifier was placed between the collection filter and distal tip of the ETT at 36°C. "Dry" experiments were performed with no "exhaled" humidification. 4 puffs of albuterol sulfate (432mg) were administered. Drug was eluted from the collecting filter and analyzed via spectrophotometer (276 nm). Each experiment was run 3 times (n=3). Results: Table shows % of dose (mean±SD) deposited distal to the ETT. Delivery efficiency of the bidirectional adapter was greatest compared to other adapters tested in this study ($p<0.05$). Aerosol deposition obtained from the combination of the T-piece CSC and the bidirectional adapter was more than the Multi-Access Port (p=0.420) and Double Swivel CSC (p=0.269). Drug delivery with "dry" exhalation exceeded "wet" exhalation values by 20-90% with the small unidirectional, large unidirectional and bidirectional adapters (p=0.013, p=0.023 and p=0.017, respectively). Conclusion: CSC, pMDI adapters/spacers, and exhalation conditions have an impact on drug delivery, during adult simulated mechanical ventilation. Aerosol delivery with "dry" exhalation will report false high values in comparison to more accurate simulated "wet" exhalation values.

Sponsored Research - The suction catheters (Kimberly-Clark) and Dual Spray pMDI adapters (Teleflex Medical) were obtained from their companies, who were not involved in the design of the study. Emory University Hospital Midtown and Georgia State University funded the study.

AIRWAY	SUCTION CATHETERS	P-MDI SPACERS/ADAPTORS			
		Uni-Small	Uni-Large	Bi-directional	Port
Wet Airway with Exhaled Humidity	Multi Access Port	2.90 ± 0.92%	7.75 ± 1.57%*	13.94 ± 2.35%**	NA
	Double Swivel	3.38 ± 1.26%	7.11 ± 1.04%*	13.09 ± 2.46%**	NA
	Adult T-Piece	1.72 ± 0.38%	8.73 ± 0.36%*	16.99 ± 3.01%**	1.30 ± 0.68%
Dry Exhaled Circuit	Double Swivel	18.82 ± 2.53%	24.07 ± 5.48%	31.65 ± 4.45%	NA

* Higher deposition than Uni-small and port, $p<0.05$

**Higher deposition than all other adapters

1726769

AEROSOLIZED ANTIFUNGAL AGENTS FOR MECHANICALLY VENTILATED PATIENTS ON NITRIC OXIDE.

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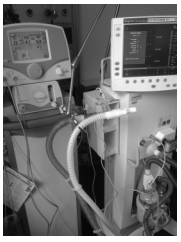
BACKGROUND: Inhaled nitric oxide (iNO) has been used for perioperative care of lung transplantation (LT). iNO may attenuate intra operative pulmonary hypertension and modulate effects of organ re-perfusion. Mechanically ventilated (MV) LT patients are at risk for post-operative Aspergillus pneumonia. Prophylaxis frequently involves aerosolized (AZ) delivery of Amphotericin B (AB). Because abrupt iNO discontinuation should be avoided, temporarily interrupting iNO to administer aerosolized AB is risky. We examined two strategies for concurrently administering iNO and aerosolized AB in intubated, mechanically ventilated adult LT patients. In the first, the INOMAX DS® (IKARIA, Clinton, NJ) (DS) was used to power a low-flow nebulizer. In the second, a vibrating mesh nebulizer was used with concurrent iNO delivery via DS. AB dose 25mg. METHODS: A DS containing a test iNO cylinder (800 ppm) was set to deliver 20 ppm via in-line injector. The DS was connected to a GE Care Station® (Madison Wis) (CS) MV. Conventional volume control settings were used. A PALL® filter (PALL Medical, East Hills, NY) was connected to the exhalation valve on the CS. The DS and CS were then connected to a test lung and MV with iNO delivery begun. Two different nebulizers (NB1 = low flow, CareFusion, San Diego CA, NB2 = vibrating mesh ANEB®, Aerogen, Galway, Ireland) were placed on the inspiratory limb of the CS circuit before the wye but after the DS sample line. Delivered tidal volumes and iNO concentrations were tested at the dry and wet sides of the in-line humidifier chamber and inspiratory circuit 6 inches from wye. RESULTS: When the NB1 was used with a 2L/min O2 source and 20ppm iNO, 1mL residual solution remained in the NB cup after 10 min and no effect on NO delivery device function or NO levels were observed. When the NB2 was used, no residual solution remained, and MV function and NO delivery were unaffected. Because NB solution delivery is more efficient with the NB2 and no additional gas flow is needed, we prefer the NB2 for concurrently delivering nebulized AB and iNO. Between 2/2006 and 5/2013 12 adult LT patients have received AZ and AB at the University of Chicago. No clogged filters, auto-PEEP, or hemodynamic instability have been noted. CONCLUSION: Both NB1 and NB2 were able to deliver nebulized solutions concurrently with iNO use. More study is needed to validate use of other MV concurrently with vibrating mesh nebulizers and iNO delivery systems.

Sponsored Research - None



1727888

IN VITRO EVALUATION THE AEROSOL DELIVERY OF JET NEBULIZER AT 3 LOCATIONS DURING MECHANICAL VENTILATION.

Hsin-Chun Liu[1], Lan-Ti Chou[2], Chung-Chi Huang[1,3]; [1]the Graduate Institute of Clinical Medical Sciences, Chang Gung University, Taoyuan, Taiwan; [2]the Department of Respiratory Therapy, Chang Gung Memorial Hospital, Taoyuan, Taiwan; [3]the Department of Thoracic Medicine, Chang Gung Memorial Hospital, Taoyuan, Taiwan

BACKGROUD: The jet nebulizer was less efficient than the other aerosol generators, but provided the highest efficiency when placed proximal to the ventilator prior to heated humidifier. The impact of position before or after the heated humidifier on aerosol drug delivery has not been established for adult mechanical ventilated patients. OBJECTIVE: To determine the influence of jet nebulizer position with heated humidified and with the heated humidifier transiently switched off during the nebulizer treatment on aerosol drug delivery in simulated and mechanically ventilated adult patients. METHOD: Salbutamol was nebulized with a jet nebulizer at 3 positions: (1) 15 cm from Y-adapter; (2) at humidifier outlet; (3) 15 cm from the ventilator, with each position (n=3) using adult lung model. The ventilator settings were VT 500 mL, RR 15 breathe/min, PEEP 5 cm H2O, peak inspiratory flow 60 L/min, and descending ramp flow pattern. The drug deposition on collecting and expiratory filters was eluted and analysis via spectrophotometry at the maxima absorbance wavelength of 276 nm. Data reported as mean ± SEM percent of total emitted dose. RESULTS: The jet nebulizer was most efficient in position 2 and 3 with both heated humidified (28.4 ± 2.76 %, 20.39 ± 1.88 %, respectively) and non-humidified (20 ± 1.06 %, 19.81 ± 2.66 %, respectively) conditions. The aerosol delivery was the highest in position 2 with heated humidified condition (p= 0.001). CONCLUSION: During the adult mechanical ventilation model, the position of jet nebulizer on the ventilator circuit impacts aerosol drug delivery.

Sponsored Research - None

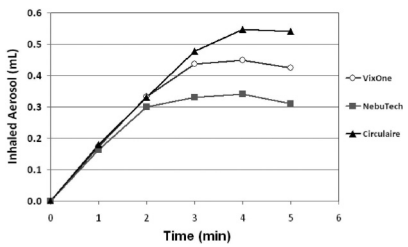
1728008

THE EFFECT OF RESERVOIR DESIGN ON INHALED AEROSOL FOR SMALL VOLUME NEBULIZERS.

John Bennett, Edward Hoisington, Robert L. Chatburn; Respiratory Institute, Cleveland Clinic, Cleveland, OH

BACKGROUND There are many small volume nebulizer designs and they all perform differently. Reservoir design is important because of its effect on inhaled aerosol. The biggest factor that affects inhaled aerosol is output aerosol. The two components of output aerosol are inhaled aerosol and wasted aerosol (Respir Care 2007;52(8):1037–1050). In particular, if one nebulizer is more efficient than another, wasted aerosol will decrease and inhaled aerosol will increase, increasing the amount of medication deposited in the patient's lungs. The purpose of this study was to compare the performance of three different types of nebulizers. We hypothesized a difference in inhaled aerosol. **METHODS** We evaluated the VixOne (Westmed) with a tube reservoir, the Circulaire (Westmed) VixOne nebulizer with a bag and valve reservoir, and the NebuTech (Salter Labs) with a built-in reservoir. Three nebulizers of each brand were tested. Breathing was simulated using an ASL 5000 (Ingmar Medical) lung simulator; sinusoidal flow pump, tidal volume 500 mL, frequency = 15/min. The nebulizers were charged with 3 mL of normal saline. Source oxygen flow was set at 9 L/min for the VixOne and 6 L/min for the NebuTech (per previous study findings for ideal flow rate (Respir Care 2012;57(10):1774). Data were collected every minute for each nebulizer. Aerosol was collected on a HEPA filter (Puritan Bennett) and inhaled aerosol was defined as the change in mass of the filter over the treatment time expressed as mL (assuming 1 g = 1 mL). Treatment time was defined as the maximum time before a negative change or no change in inhaled mass per minute. Mean inhaled mass values were compared using one way ANOVA with $P < 0.05$ indicating significance. **RESULTS** Raw data are shown in the graph. The treatment time for all three devices was 4 minutes. The Circulaire had the highest inhaled aerosol and the NebuTech had the lowest (0.55, 0.45, 0.34 mL; P = 0.006). **CONCLUSIONS** Despite similar treatment times, different nebulizer system designs delivered significantly different inhaled aerosol amounts. In this case, the major design differences were the reservoirs. In particular, the only difference between the VixOne and the Circulaire was the reservoir (tube vs bag and valve). Therefore, reservoir type has a significant effect on inhaled aerosol. However, further research is required to determine whether the differences in inhaled aerosol are associated with differences in patient outcomes.

Sponsored Research - None



1730521

AEROSOL DELIVERY WITH DIFFERENT FIO2 USING AN UNHEATED LARGE VOLUME HUMIDIFIER TO AN ADULT LUNG MODEL WITH TRACHEOSTOMY.

Arzu Ari[1], Bshayer Alhamad[1], Robert Harwood[1], Meryl Sheard[1], James Fink[1,2]; [1]Georgia State University, Atlanta, GA; [2]Independent Consultant, San Mateo, CA

Background: Successful aerosol therapy in patients with tracheostomy depends on achieving adequate drug deposition in the lungs. Attaching a nebulizer to the circuit of an unheated large volume humidifier (LVH) is a common practice during aerosol therapy. Although LVH provides different flow rates at each FiO2 level that affects aerosol deposition, its impact on medication delivery during aerosol therapy has not been well documented. Therefore, the objective of this study was to quantify aerosol deposition at different FiO2 levels used with LVH. Method: Albuterol sulfate (2.5 mg/3 mL) was delivered to an adult lung model through a tracheostomy tube of 8 mmID (Porter). A collecting filter at the level of the bronchi was connected to a breathing simulator with adult parameters (Vt 400 mL, RR 20 bpm, and I:E ratio 1:2). A jet nebulizer (Misty Max 10, Airlife) was attached to the circuit of LVH (Moore Medical) at different FiO2 levels and operated with O2 at 10 lpm. Each condition was tested in triplicate (n=3). Drug was analyzed by spectrophotometry (276 nm). Descriptive statistics, one-way analysis of variance and multiple comparisons with a Bonferonni adjustment were used for data analysis ($p<0.05$) Results: The table indicates albuterol (mean ± SD) delivered distal to the bronchi. We found an inverse relationship between FiO2 and deposition. Inhaled dose at high FiO2 was greater than lower FiO2 (p=0.003). Increasing total flow rate by 10 lpm decreased aerosol delivery up to 15%. Conclusion: Differences in total flow rates required to produce FiO2 with LVH impact aerosol drug delivery from a jet nebulizer in this simulated spontaneously breathing adult model with tracheostomy.

Sponsored Research - None

FiO2	100%	60%	45%	40%	35%
Total Flow Rate	20 lpm	30 lpm	40 lpm	50 lpm	70 lpm
Inhaled Mass	0.1511 ± 0.04	0.1275 ± 0.01	0.1133 ± 0.02	0.0968 ± 0.01	0.0823 ± 0.02
Inhaled Mass %	6.04 ± 0.17	5.10 ± 0.54	4.53 ± 1.04	3.87 ± 0.47	3.29 ± 0.58

1731043

EVALUATION OF THE CIRCULAIRE II AEROSOL DRUG DELIVERY SYSTEMS FOR MICRO-BIOLOGICAL CONTAMINATION.

Mark Grzeskowiak, Barbara McKee, Jeffrey Riker; Respiratory Care Services, Long Beach Memorial, Long Beach, CA

BACKGROUND: Small Volume Nebulizers (SVNs) are considered at risk for microbiological contamination due to their proximity to the patient's exhaled gas path and saliva. Routine use, post–treatment handling and storage practices may allow pathogens to proliferate to greater colony counts and inoculate the patient with contaminated aerosol during subsequent treatments. The Westmed Circulaire II (CII) and Circulaire II Hybrid (CII-H) are valved conserver type SVNs with two different types of aerosol reservoirs. Reservoirs substantially increase drug delivery but the condensation that forms inside them raises concerns about their potential for contamination. PURPOSE: This study was designed to determine if a valved conserver-type SVN with a reservoir would increase the potential for microbiological contamination. METHOD: Patients receiving at least 2 treatments daily had their CII and CII-H devices cultured at the end of each treatment day X 4 days. After each treatment, residual drug was poured out and the nebulizer stored in a plastic bag at the bedside. The nebulizer cup and reservoir was cultured using the BBL™ CultureSwab™ collection and transport system. Blood agar plates were inoculated with a specimen, streaked for isolation and incubated for 48 hrs. A semi-quantitative scale (rare, light, moderate or heavy) was planned to report any growth. Representative samples of each type of SVN were cultured prior to patient use to rule out contamination from the manufacturer. The study end-point was to collect 4 consecutive days of cultures (Cx's) from 10 patients each using CII and CII-H. Many patients remained on treatments for <4 days and thus had <4 cultures. RESULTS: Daily results are summarized in the table. Two cx's showed rare growth but cx's taken from those same nebulizers on a subsequent day showed no growth. Cultures from all other nebulizers and reservoirs showed no growth. CONCLUSION: Despite using minimal post-treatment practices, in 252 cultures, no significant organism growth was found in either the nebulizer or reservoir of the Circulaire II devices. The rare growth found in 3 SVNs was considered insignificant. These findings suggest that the valved conserver device may isolate the nebulizer and reservoir and protect them from contamination.

Sponsored Research - The manufacturer (Westmed) supplied samples of the Hybrid nebulizer referred to in this study.

Circulaire II (CII) with 550 mL Thin Film Reservoir Bag								
	DAY 1		DAY 2		DAY 3		DAY 4	
# of Patients	33		20		13		10	
	NEB	BAG	NEB	BAG	NEB	BAG	NEB	BAG
# of Cx's	32	32	20	20	12	12	10	10
# of + Cx's	0	0	0	0	0	0	0	0

Circulaire II Hybrid (CII-H) with 350 mL Elastomeric Reservoir Ball								
# of Patients	29		13		11		10	
	NEB	BALL	NEB	BALL	NEB	BALL	NEB	BALL
# of Cx's	19	19	13	13	10	10	10	10
# of + Cx's	2 (rare)	0	0	0	0	1 (rare)	0	0

1731043

COMPARISON OF AEROSOL DELIVERY VIA AEROGEN MICROPUMP ON THE DRY SIDE VERSUS THE WET SIDE OF THE HEATER.

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Background The current recommendation of the manufacturer of the Fisher and Paykel MR850JHU heater is to run aerosols on the dry side of the heater chamber when delivering medications through a system requiring the use of this heater. This is to avoid direct contact of the medication with the temperature probe thus reducing the efficacy of the probe and modifying how the heater works. It is unknown whether medication delivery to the patient is affected by this placement of the treatment on the dry side versus the wet side of the heater chamber. Methods Testing was performed using a closed system with the Carefusion wye and expiratory limb attached to a Fisher and Paykel RT 202 inspiratory limb connected to a LTV 1200 ventilator utilizing a BC Biomedical test lung. Each test disbursed a 3 mL of TC 99mTC DTDA as our aerosol. The Aerogen micropump was first placed in line on the dry side of the heater chamber and then in line on the wet side. All nebulizer sessions were performed over the duration of medication. All circuits were then evaluated by a Discovery NM 630 gamma camera. Results Data was analyzed from 12 sessions. The average medication delivery toward the patient when the micropump was on the dry side was 8.5% +0.012 (n=6). The average medication delivery toward the patient when the micropump was on the wet side was 9.89% +0.018 (n=6). Single factor anaylsis of variation (ANOVA) yielded a P=0.142 between the dry and wet side of the heater chamber. Conclusion When using a closed system requiring the use of a Fisher and Paykel MR850JHU heater there is no statistical significance in the delivery of aerosolized medication toward the patient when using the Aerogen Micropump at the heater whether the placement be on the dry or wet side.

Sponsored Research - None

1731110

HFA MDI ACTUATOR OBSTRUCTION.

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BACKGROUND: In 1973 it was determined that there was environmental consequence with the use of chlorofluorocarbon. In response came the Montreal Protocol, phasing out substances believed to be responsible for ozone depletion. In 2008 MDIs began transition to HFA which changed the performance. One specific concern is the apparent clogging of the inhaler. All HFA manufacturers direct the consumer to clean the plastic actuator at least every seven days. We questioned two manufactures, as to how this determination was made, with no success. If baseline doses, of 2-4 puffs Q4-Q6 hours, deliver 56-112 doses in 7 days is that the determining factor? Our in-patients could receive 112 doses in less than 3 days (8 puffs Q4). We sought to determine how many doses could be dispensed before the actuator would clog so we could define a frequency to clean the canister. METHOD: We invited Chantal Darquenne Ph.D., whose research includes the use of particles as a tool to probe different regions of the lung to study mixing mechanisms and Janelle M. Fine, B.S., hardware engineer, both from the NASA laboratory, to provide Photo Detector voltage readings, documentation and analysis of the data from each dose of an Albuterol HFA 60 dose MDI. 4 puffs were actuated into the air per normal procedure. The first 2 doses through the detector provided inconsistent readings. This was due to the 6 inch corrugated tubing used to deliver the MDI dose. This adaptor was modified to 1 inch and was held in place during each subsequent actuation. Between each 8 puffs the canister was removed then the port of the canister dried using a warm blower on slow speed, 12 inches away, to replicate drying time between treatments and then shaken. RESULTS: Each dose provided a consistent reading. As we neared the 60th actuation we expected to see a fall in the voltage. We did not. The testing continued past the 60th dose. It was not until dose 86 that the MDI had a distinct change in voltage delivery. CONCLUSIONS: No visible clogging or voltage changes occurred before 60 puffs. It is possible that with normal drying time between doses the spray could have caked on and in our testing may have cleared with each subsequent actuation. We also noted that a 60 metered dose canister may have 30% more contents. Actual voltage analysis is pending.

Sponsored Research - None

1731890

ENDOTRACHAEL TUBE OCCLUSION WITH AN IN-LINE SUCTION CATHETER - A BENCH STUDY.

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Background: The utilization of in-line suction catheters to manage secretions of mechanically ventilated patients with artifical airways in the ICU enviroment is widespread. Concern related to in-line suction catheters not being fully withdrawn is apparent. The objective of this study is to determine the effect of endotrachael tube occlusion with an in-line suction catheter on measured ventilatory parameters on a mechanically ventilated patient. Method: IRB approval was not needed for this bench study. This study was designed to collect data on the effect of entrachael tube occlusion with an inline suction catheter. For the purposes of this study a 3.0 uncuffed ETT, a 6 fr inline suction catheter, pediatric circuit and neonatal test lung were used. The 3.0 ETT was attached to a neonatal test lung model, a Certifier FA Ventilator Test System 4 (TSI) was used to measure the following ventilatory parameters: PIP,MAP,MV,iVt,eVt. These parameters were measured with the suction catheter introduced into the airway and again with the catheter withdrawn, this was repeated with three different ventilatory modes; Pressure Control, Volume Control and Pressure Regulated Volume Control. Results: See Table 1 Conclusion: Measuring ventilatory parameters with and without suction catheter occlusion showed no demonstratable differences in the following ventilator parameters, PIP,MAP,MV,iVt,eVt. Further study on the effect suction catheter occlusion has on airway resistance and ventilatory time constants may be indicated.

Sponsored Research - None

Table 1: Proximal Ventilatory Measurements - Pre and post Suction Catheter Insertion

Ventilator Mode	Measures	Suction Catheter Withdrawn		Suction Catheter Introduced	
		Servo i Parameters	TSI Parameters	Servo i Parameters	TSI Parameters
PRVC	PIP	46	45.7	48	47
PRVC	MAP	18	17.6	19	17.7
PRVC	MV	0.6	.58	0.6	.59
PRVC	iVt	24	21	24	21
PRVC	eVt	21	21	19.7	22
VOL CONTROL	PIP	46	49	56	52.5
VOL CONTROL	MAP	14	13.7	16	15.5
VOL CONTROL	MV	0.6	0.6	0.6	0.6
VOL CONTROL	iVt	23	22	23	22
VOL CONTROL	eVt	22	22	22	22
PRESS CONTROL	PIP	30	29.6	30	28
PRESS CONTROL	MAP	13	12.6	13	12.1
PRESS CONTROL	MV	0.39	0.41	0.35	0.39
PRESS CONTROL	iVt	17.1	15	15.8	14
PRESS CONTROL	eVt	14.1	15	12.5	14

1718698

ENDOTRACHEAL TUBE COLLAPSE POTENTIAL IN AN ARTIFICIAL AIRWAY MODEL.

Blake G. Hagen[1], William M. LeTourneau[2]; [1]Concordia University, Saint Paul, MN; [2]Fairview Southdale Hospital, Edina, MN

Background: In emergent and nonemergent intubations, endotracheal tube (ETT) cuffs can be hastily overinflated with air volumes exceeding the optimal pressure ranges of 20-30 cmH20. Excessive ETT cuff pressures may alter ETT integrity and collapse the cylindrical cross section of the lumen resulting in airway obstruction. Sufficient cuff pressures are required to seal the interface between the ETT cuff outer wall and the inner lumen of the trachea. The mechanics of this closure allow for positive pressure ventilation as well as preventing micro aspiration of upper airway secretions. The purpose of this study was to assess the potential for endotracheal tube collapse during excessively high cuff pressure application in an artificial airway model. Method: In vitro, artificial tracheas consist of a 20 mL syringe with a transverse cut at the zero line allowing for open ends of the barrel. The ETTs were positioned, inflated and conditioned to 37°C, delivered via high flow FiO2 (.30) at 30 liter per minute in order to mimic body temperature and pressure saturated (BTPS). We studied 6 high volume low-pressure cuffs in two sizes (internal diameters of 5.0 and 5.5). ETT cuff pressures were filled at 4 hours increments totaling a 12-hour exposure with syringe air volumes of 7, 10 and 15 mL. All three of these volumes resulted in ETT cuff pressures of 120 cmH2O and higher. Our group employed an aneroid ETT cuff monometer, which is maximally calibrated to 120 cmH20. Results: Of the 6 ETT studied, cuff pressures of >120 cmH2O did not alter the integrity of the ETT resulting in failure of the cylindrical cross section of the lumen ensuing in airway obstruction. We did find that over inflation of the ETTs of >16 mL of syringe volume would result in ETT cuff rupture and failure. Conclusion: Our interpretation of the results concluded that ETT cuff pressures >120 cmH2O and higher from syringe air volumes of 7, 10, and 15 mL did not cause structural failure of the ETT which could result in airway obstruction. Further study is needed on a variety of ETT sizes and manufactures to assess industry variability. Our group does advocate the use of ETT cuff pressure surveillance in the clinical setting for the utility of applicable ETT cuff pressures.

Sponsored Research - None

1727963

CONSCIOUS SEDATION WITH MIDAZOLAM AND DEZOCINE IN DIAGNOSTIC FLEXIBLE BRONCHOSCOPY: ALLEVIATES PATIENT DISCOMFORT AND IMPROVES SATISFACTION.

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Background: Conscious sedation for patients undergoing flexible bronchoscopy (FB) is suggested to reduce discomfort and improve satisfaction. In China, most of diagnostic FB practice involves local anesthesia only. This study aimed to assess the benefits and risks of conscious sedation with midazolam and dezocine in diagnostic FB. Methods: This prospective case control study enrolled 40 non-sedated and 40 sedated patients who underwent diagnostic FB. All received the standard upper airway preparation, while sedated patients received clinically judged increments of midazolam and dezocine for conscious sedation. Patient discomforts during FB were assessed using the verbal analogue score (VAS, 0-10 scale). Willingness to return was assessed as five scales to monitor patient satisfaction. Safety profiles throughout the procedures were also assessed. Student's T test and Chi-square with Yates' correction were used for analysis of numeric and categorical parameters, respectively. VAS was presented as the median (range) and was analyzed by Mann–Whitney U test. Statistical significance was indicated as $p < 0.05$. Results:Anterograde amnesia existed in 75.0% sedated patients. Compared to non-sedated patients, sedated ones expressed less discomfort, with lower VAS scores regarding scope insertion (4 [0-10] vs. 0 [0-4], $p < 0.001$), cough (5.5 [0-10] vs. 0 [0-4], $p < 0.001$), dyspnea (3.5 [0-10] vs. 0 [0-4], $p < 0.001$), pain (3 [0-10] vs. 0 [0-5], $p < 0.001$), and global tolerance of the procedures (5.5 [1-10] vs. 0 [0-5], $p < 0.001$). More sedated patients expressed willingness to return (90.0% vs. 30.0%, $p < 0.001$). Sedated patients had no more hypoxemic episodes during the procedure(7.5% vs. 5.0%, $p > 0.05$), which were all transient and not life-threatening. Conclusions: Conscious sedation with clinically judged midazolam and dezocine reduces discomforts, improves satisfaction, and carries no more significantly risks in patients undergoing diagnostic FB.

Sponsored Research - None

1725210

PERFORMANCE EVALUATION OF AIRWAY MEDIX CLOSED SUCTION SYSTEM COMPARED WITH A STANDARD CLOSED SUCTION SYSTEM.

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Background: The lower respiratory tract of healthy humans is normally kept sterile by natural defense mechanisms. Endotracheal intubation and mechanical ventilation, profoundly impaired these defense mechanisms. Retained mucus in the lower airways as well as biofilm buildup in the endotracheal tube must be removed by suctioning to prevent consequent complications in patients who are unable to do so independently. The Airway Medix Closed Suction System (AMCSS) and Kimberly-Clark KimVent Closed Suction System (KimVent) are devices used to aspirate liquids or semisolids from a patient's airway while intubated with an endotracheal tube. Objectives: To compare the performance, safety, and ease of use (usability) between two closed suction systems, the AMCSS and KimVent. Method: This study included 28 post cardiac surgical patients requiring mechanical ventilation. Baseline parameters, date, reason and number of suction episodes were recorded for each patient. All patients were monitored hemodynamically and respiratory before, during and after each suction episode. During suction the following parameters were monitored: Patient discomfort, Cough, Desaturation, Hypotension, Hypertension, Cardiac Arrhythmia, Bronchoconstriction and Decrease in lung compliance. Results: Patients were divided into two randomized groups for each type of closed suction system. The following parameters were analyzed: PaCO2 (mmHg), PaO2 (mmHg), Blood pressure (mmHg) and Heart Rate (bpm). There were no significant differences between the groups at baseline of any of the above parameters and between pre and post suction in both groups. In addition, mean change and SE obtained from pre suction to post suction using the AMCSS vs. the KimVent were calculated. The change between the groups was not significant for all parameters. Mean changes in Heart Rate from pre suction to post suction was smaller in the AMCSS group in comparison to the KimVent group (1±2.1 and 3.2±1.7 respectively). This may be attributed to the fact that shallow suction was performed with the AMCSS device while deep suction was performed with the KimVent device as common practice. No respiratory and hemodynamic complications related to tracheal suctioning were observed. Conclusions: AMCSS is not inferior to KimVent in respect to respiratory and/or hemodynamic complications related to tracheal suctioning.

Sponsored Research - This study was contributed by Biovo technologies.

1728053

COMPARISON OF TWO OSCILLATING POSITIVE EXPIRATORY PRESSURE DEVICES: ACAPELLA VERSUS RC CORNET.

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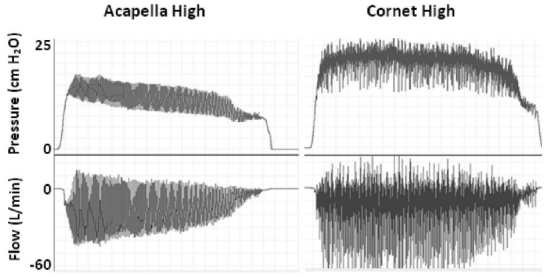
BACKGROUND: The Acapella and the RC Cornet are devices that combine oscillations and positive expiratory pressure (PEP) for secretion removal. We hypothesized that these devices would produce similar pressure and flow waveforms. **METHODS:** A Hans Rudolph, Inc. Pneumotac Amplifier series 1110 and Hamilton disposable pneumotachometer were used to measure pressures and flows. Data were recorded and analyzed with ADInstruments Inc. LabChart software. A single trained therapist preformed 3 expiratory maneuvers through each device according to the manufactures' instructions. Devices were adjusted to their lowest and highest settings. Oscillatory frequency (Hz), ΔP (cm H_2O), mean pressure (cm H_2O), and peak expiratory flows (L/min) were recorded for each breath. As the data were highly variable during a breath, minimum and maximum values for each waveform parameter were recorded. Mean values for each parameter were compared with t-tests or Mann-Whitney tests as appropriate, using $P < 0.05$ to determine significance. **RESULTS:** See illustrations below. Waveforms for high device setting only shown as representative. **CONCLUSION:** The RC Cornet produced more vigorous pressure and flow oscillations and higher PEP (mean pressure) at both low and high settings. Because these parameters contribute to the effectiveness of secretion removal, we speculate that the RC Cornet may provide better airway clearance therapy than the Acapella device. Human studies are needed to test this hypothesis.

Sponsored Research - None

	Device Setting: Low						Device Setting: High					
	Min Val			Max Val			Min Val			Max Val		
	Aca	Cor	P	Aca	Cor	P	Aca	Cor	P	Aca	Cor	P
frequency	9	7	0.020	14	48	<0.001	13	13	0.100	18	48	<0.001
Δ pressure	3	2	0.100	7	18	0.005	1	1	0.100	6	13	0.002
mean P	5	17	<0.001	10	27	<0.001	7	11	0.205	14	21	0.004
exp. flow (L/min)	27	13	<0.001	51	63	0.1	6	15	0.003	40	56	0.016



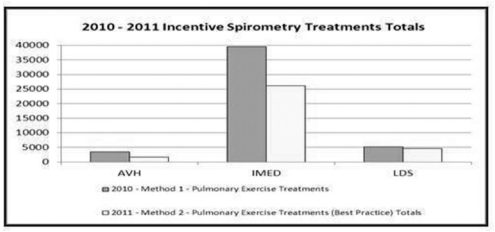
1728366

INCENTIVE SPIROMETRY (IS) BEST PRACTICE COMPARISON OF PROCEDURAL VOLUMES AFTER IMPLEMENTATION OF NEW PROTOCOL.

Carrie M. Winberg, Max Kunzler, Vrena Flint, Bill Beninati, Greg Snow, Jeff Craghead, Justin Dickerson; Respiratory Care, Intermountain Healthcare, Salt Lake City, UT

BACKGROUND Forty percent of the patients on IS method one (Self Use at 70% of predicted Inspiratory Capacity (IC) - were discharged before they reached their predicted IC. This lead to the comparison of self use targets from sister hospitals ranging from 70%, 50%, and 40% of predicted IC. Length of Stay (LOS), treatments per patient, patient days on oxygen, and ICU transfers were compared between hospitals. Lack of statistical difference in this comparison lead to Method 2 being implemented in the Urban Central Region (UCR). This method moved patients to self use at 1/3 of their predicted IC. Presented below are data findings from UCR hospitals showing a significant decrease in IS treatments in the UCR using method 2 with improved outcomes Method 1 IS Protocol Across Six Intermountain Hospitals Self Use at 70% of predicted IC Intermountain Medical Center (IMC), Alta View (AV), LDS, and Logan Self Use at 50% of predicted – McKay Self Use at 40% of predicted – Utah Valley Method 1 Results There was no statistical difference in LOS in hours, days on O2, percentages of patients transferred or admitted to the ICU. There was statistical differences in the number of treatments per patient. McKay had a statistically higher number of treatments than any of the other facilities Method 2 IS Protocol Urban Central Region - (AV, IMC, LDS) > 1/3 of predicted IC - Self Use Sticker – If patient falls below 1/3, RT to reassess <1/3 of predicted IC Level 1: Start Resistance Device QID Level 2: Start CPAP – 5- 8 cm H20 BID, keep SpO2 > 90% (Level 2 requires additional physician order.) Method 2 Results – 2010 - 2011 There was a decrease in LOS from 5.12 to 4.54 days, treatments per patient 3.83 - 1.91, days on IS reduced from 2.51 to 1.45, and average total charges were decreased by 13%. Conclusion – Method 2 resulted in a reduction in patient cost, LOS, and improved autonomy of the Respiratory Therapists. Early appropriate patient intervention improved communication with our physicians and nurses. Method 2 moved us toward a Shared Accountability Organization Model and lead us to the implementation of our present RT Evaluate and Treat Protocol. After determining the time series was not serially correlated, a negative binomial regression model was employed to measure the change in pre/post number of treatments. The reduction in treatments was statistically significant ($p < 0.001$).

Sponsored Research - None



1729400

CLINICAL STAFF CONFIDENCE IN PROVIDING CARE AND MANAGEMENT OF PATIENTS WITH A TRACHEOSTOMY.

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Background: At our facility, care and management of patients with a tracheostomy involves multiple disciplines. Registered Nurses (RNs) perform tracheostomy site assessment and routine site care. Respiratory Therapists (RTs) change/clean the inner cannula, maintain emergency equipment at the patient's bedside, and administer aerosol therapy. An interdisciplinary pathway dictates ventilator management. However, after an informal conversation among RTs and RNs, it was noted that not all clinical staff felt confident in their knowledge of overall management of patients with a tracheostomy. Members of the Respiratory Therapy Safety Committee created a study to assess the current level of confidence among clinical staff. Methods: A cross-sectional, descriptive design study was conducted. Potential participants were inpatient clinical staff. Potential participants were informed of the study survey via invitation by email and an announcement on the hospital's internal website. The survey contained 28 items evaluating clinical staff confidence in assessing, caring for, and managing a patient with a tracheostomy from time of insertion until decannulation. Other items assessed clinical staff's tracheostomy-specific education and the need for a dedicated tracheostomy team and tracheostomy management protocols. Data were collected for one month and analyzed using simple descriptive statistics in Microsoft® Excel 2010 to yield percentages. Results: A total of 142 clinical staff completed the survey. Respondents included RNs (80.6%), RTs (18.6%), and physicians (0.7%). Over half (50.8%) reported being less than "mostly sure" in their overall comfort level in caring for patients with a tracheostomy. Nearly two-thirds (64.8%) were less than "mostly sure" that safe care was being provided for patients with a tracheostomy. Over half (55%) felt the development of a dedicated tracheostomy team was of "high importance" and would benefit patients, staff, and the hospital. Most respondents (84%) thought development of a tracheostomy management protocol was of "high importance." Conclusion: Survey results supported the creation of a multi-disciplinary process improvement team at our facility to standardize practices related to care of patients with a tracheostomy. Within this project, the needs of the patient and clinical staff will be addressed and solutions developed in collaboration with clinical staff to ensure effective, consistent, and safe care.

Sponsored Research - None

1729292

SECRETION MOBILIZATION BEST PRACTICE COMPARISON AFTER IMPLEMENTATION OF NEW PROTOCOL.

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BACKGROUND There were several adjuncts of therapy at our hospital being used for secretion mobilization in non-intubated patients, e.g. Acapella, Flutter, IPV, Chest Physical Therapy, and High Frequency Oscillator Vest. Without a protocol process in place, there was a lack of consistency and standard of care. A more expensive or more invasive method may have been ordered than was required. A patient needing help with secretion mobilization, was not ordered at all. With the implementation of our non-intubated secretion mobilization protocol, including a standard approach and criteria, we felt that the patients would be treated more appropriately. Method 1 Physician Orders Secretion Mobilization or Therapist May Request it if They Think it is Indicated. The physician determined or the therapist occasionally requested secretion mobilization adjunct or therapy used for each individual patient. Method 1 Results The adjunct used for each patient was different depending on which physician ordered it or which Respiratory Therapist requested it. Sometimes the patients were not receiving the most appropriate, least invasive modality required. Method 2 – Initiated March 2011 Secretion Mobilization Protocol Comprehensive Patient Assessment Check for one or more assessment findings to meet criteria. Home Regime Arm and Non Home Regime Arm Level 1 – RT/patient can self administer - Resistance Device, Vibratory Device, SVN/Hypertonic Saline Level 2 – Therapist must have a physicians order to administer – Vest, CPT, IPV, Assisted Cough Techniques Method 2 Results – 2010 - 2011 More patients were treated for Secretion Mobilization. Those patients treated required less treatments. Average Respiratory cost per case decreased, while Average < 30 Day Respiratory Readmission rate remained flat. Conclusion – Method 2 moved us toward a standard process model . Doing the "right" thing as indicated, performing comprehensive patient assessment, moving patients through the protocol with least invasive adjuncts of therapy, decreased treatments needed, decreased cost, and Average < 30 Day Respiratory Readmission Rate remained flat. After transforming variable respiratory costs data to achieve distributional normality, we evaluated such costs before and after implementing changes to the secretion mobilization process. The result was a 7% reduction in variable respiratory cost per patient. This result was statistically significant ($p = 0.032$).

Sponsored Research - None

1729406

POSITIONING AND VERIFICATION OF NEUTRAL HEAD POSITION: DOES IT FAVORABLY IMPACT ENDOTRACHEAL TUBE REPOSITIONING?

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Intro/Background: Endotracheal tubes (ETTs) are frequently repositioned based on the radiograph (X-ray) view of tube position. Head position can change the viewed location of the ETT in relationship to the carina. However, this information is often not available at the time of X-ray review, which contributes to un-necessary repositioning and can increase the risk of unplanned extubation. This study was designed to evaluate how the verification of neutral head position impacts the number of times ETTs are repositioned. Method: This study was a two stage quality assurance review that took place in the Pediatric Cardio-Thoracic Unit and evaluated all intubated patients over a three month period of time. Stage I involved a retrospective review, comparing the number of times ETTs were repositioned to the number of X-rays taken. Preparation for stage II included the education of respiratory and nursing staff regarding the relationship between head position and X-ray results. During stage II staff were asked to position patients for every X-ray and record compliance on a bedside data collection sheet. At the end of Stage II the ratio of ETT repositions to the number of X-rays taken, was again reviewed. Results: For both stages data was collected on patient weight, ETT size, length of vent days, number of X-rays and number of times ETTs were repositioned. Data for stage I was collected over 91 days, from January through March of 2012 and included 123 patients. During this stage the ratio of ETT repositions to X-rays was 114/1194; 10% of the X-rays reviewed resulted in ETT repositioning. Data for stage II was collected over 87 days from September through November of 2012 and included 123 patients. During this stage the ratio of ETT repositions to X-rays was 130/1107; 12% of the X-rays reviewed resulted in ETT repositioning. Observations: In secondary review of the results, discordance between staff recording and X-ray view of neutral head position was noted. It was also observed that neutral head position was maintained only during preparation for X-rays and not incorporated into routine patient care. Conclusions: Positioning patients and verification of neutral head position did not decrease the number of times ETTs were repositioned Next Steps: Further education of staff regarding "neutral" head position and its importance and benefit is required

Sponsored Research - None

1731042

ESTIMATING NATIVE ENDOTRACHEAL TUBE CUFF PRESSURE IN AN ARTIFICIAL PILOT BALLOON MODEL.

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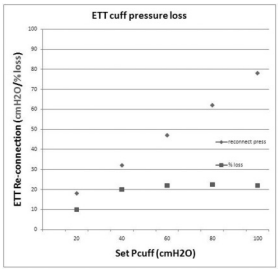
Background: The clinical consequence of monitoring and maintaining endotracheal tube cuff pressures (Pcuff) has a strong reliance on the accuracy of the measurements and the understanding of pilot balloon mechanics. Clinicians have noted the difference in measured Pcuff from the initial setting to subsequent checks. The purpose of this study was to assess how and when the pressure changed in the endotracheal tube (ETT) cuff and to determine a native Pcuff after re-connecting to the pilot balloon. Methods: The artificial pilot balloon model consisted of a syringe fixed at a volume of 10 mL connected to a multiple port stopcock manifold that allowed for two pilot balloons to be simultaneously connected and monitored. One pilot balloon was used for continuous pressure monitoring while the second was used for connection and disconnection purposes. The pilot balloons had been separated from various endotracheal and tracheostomy tubes to represent several manufactures of ETTs and pilot balloons. The pilot balloons were then connected to the manifold using a pilot balloon repair kit and injection site adapter. A series of initial pressures was set at 20, 40, 60, 80 and 100 cmH2O. After the initial pressure was set, the cuff pressure monometer was disconnected and the resulting native cuff pressure was recorded and then the cuff monometer was reconnected to the pilot balloon and the resulting pressure was recorded. Results: The resulting native Pcuff after initial disconnection did not drop more than 2 cmH2O from any of the starting Pcuff settings. The subsequent Pcuff after re-connection showed an evident loss of pressure. The pressures were recorded and the data was plotted. The relationship between the two variables was liner so a slope-intercept strait line equation format was used (y=mx+b). The resulting line equation was: y=1.34x-4, with y = the native Pcuff prior to a re-connection of a pressure monometer and x= the Pcuff measured on re-connection of a cuff monometer. Pcuff loss in relation to the set Pcuff is shown on figure 1. Conclusion: As a result of these findings it is determined that Pcuff loss does not occur during initial disconnection of a pressure monometer but a noticeable loss will occur on cuff pressure monometer re-connection and the native cuff pressure can be estimated from the re-connection pressure using the equation; y=1.34x-4.

Sponsored Research - None



1731290

EFFECTS OF COUGH WITH HIGH FREQUENCY CHEST WALL OSCILLATION (HFCWO) FOR AIRWAY CLEARANCE.

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Background:HFCWO is commonly used for airway clearance, and effective for moving airway secretions from peripheral airway. We already reported that effects of mucus clearance on the differences of rheological property, driving pressure and frequency during HFCWO in AARC Congress 2010. However the effect of cough mucus clearance on the rheological property, driving pressure during HFCWO is not clear. The purpose of this study is to clarify differences of airway clearance efficacy in mechanically assisted cough by HFCWO. Method: 20 normal subjects participated in this study. Mucus stimulants (MS) were prepared using thickener 1, 2, 3 and 4% and the pressure controls of SmartVestTM were driven 30, 40, 50 and 60 on the frequency 13Hz synchronized with cough. MS rheological studied were measured frequency-dependency and stress-dependency using rheometer. They were coughed into the internal diameter of 10mm, 1-meter-long tube through a mask during SmartVestTM. We measured migration length of each MS, Peak Couth Flow (PCF), PEmax and effortless breathing. We also analyzed flow, pressure and volume using HFCWO by flow analyzer. Results: The higher setting pressure controls droved, the more PCF and PEmax increased except of 60 ($p<0.05$). In the rheology of MS, the lower viscoelasticity of 1% MS had, the longer migration length moved ($p<0.05$). However, the migration length did not increase in the higher viscoelasticity of MS in spite of high driving pressure. The driving pressure 40 and 50 were most increased by comparison with 30 and 60($p<0.05$). The subjects were not tolerable on 60.(Table 1) Conclusions The cough synchronized with driving pressure 40 and 50 using HFCWO(SmartVestTM) is effective for mucus clearance.

Sponsored Research - None

Table 1 The migration length (cm) of each mucus stimulants (MS) on each driving pressure

	pressure (-)	pressure30	pressure40	pressure50	pressure60
MS1%	27.99±9.83	30.74±12.09	32.53±12.73	31.57±14.27	29.34±11.35
MS2%	20.55±9.18	22.12±9.47	22.64±10.80	23.27±10.08	22.2±10.83
MS3%	15.34±5.82	17.15±6.74	18.05±7.35	17.83±6.53	16.70±6.75
MS4%	13.26±5.21	14.26±5.96	14.19±5.90	15.50±7.59	14.48±5.67

1731371

THE EFFECT OF CONDENSATION ON CUFF PRESSURE.

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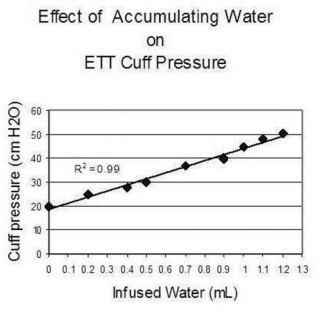
BACKGROUND: Maintaining artificial airway cuff pressure (CP) between 20 and 30 cm H2O is recommended as preventative strategies against micro-aspiration and tracheal damage. For decades the majority of artificial airway air-filled cuffs that we use have been made of polyvinyl chloride and more recently polyurethane materials. There are no published reports documenting the amount or the period of time that condensation collects in these cuffs. According to the manufacturer, the Microcuff endotracheal tube (ETT), (Kimberly Clark, Irving, TX), which uses a polyurethane cuff acknowledges that more condensation accumulates than with the standard PVC cuff. What is unknown and the purpose of this study is whether the accumulation of condensation in the cuff has the potential for impacting patient care by altering baseline CP. METHODS: An 18G needle was inserted into the cuff of a 8.0 Microcuff ETT, sealed with epoxy cement, and placed in a water bath to test for the absence of air leaks. Aerosol tubing representing an artificial airway was intubated with the ETT and the cuff was inflated to 20 cm H2O. Sterile water representing condensation was infused into the cuff with a CME America Bodyguard 575 infusion pump, (CME America, Golden, CO), at a rate of 2 mL/hour while CP was continuously monitored with a certified Puritan Bennett PTS-2000 analyzer (Covidien, Mansfield, MA). The data were recorded, analyzed, and reported by Pearson correlation coefficient. RESULTS: The Pearson correlation of adding water to the ETT cuff was high; R2 = 0.99. At 15 minutes CP reached 30 cm H2O (50% increase) with the addition of 0.5 mL of water infused into the cuff. CP was 40 cm H2O (100% increase) at 27 minutes with 0.9 mL infused and 50 cm H2O (152% increase) at 37 minutes after 1.2 mL was infused. CONCLUSIONS: Condensation that is allowed to collect in the cuff of the artificial airway has a linear correlation with CP. CP will increase to undesirable levels unless intervention is taken to either withdraw the condensate or intervene to lower CP.

Sponsored Research - None



1731427

CAN A COMMERCIALLY AVAILABLE DEVICE RESTORE THE FLOW RESISTIVE PROPERTIES OF AN ENDOTRACHEAL TUBE TO PRE-USE CONDITIONS?

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Background: Airway resistance (RAW) is one of two main impedances to ventilation and correlates with increased work of breathing. Endotracheal tubes (ETT) are a significant component that contributes to total RAW. Medical literature highlights that biofilm accumulations within the lumen of an ETT may impede flow and possibly result in failure of liberation from mechanical ventilation. Clinical management for obstructed ETT may include the need for changing the tube. However, a new device with FDA approval for extracting biofilm from within ETT may obviate the need for tube replacement. Our bench model evaluates the ability of this device to restore the flow resistive properties of ETT to pristine conditions. Purpose: To evaluate the impact of significant increases in RAW on spontaneous tidal volume and determine the effectiveness of Rescue Cath in returning ETT to pristine conditions. Methods: The bench model includes an ASL-5000 medical test lung (Ingmar, Pittsburgh, PA.) and upper airway template to ensure consistent ETT curvature. We evaluated three pristine ETT of each size (7.0, 7.5, 8.0 mm ID) to serve as controls. The test lung was configured to mimic a 70 kg ideal body weight patient with the following settings: Pmus for Vt=350 mL, f=29 b/min, I:E ratio 1:3, Ti=0.5, VE=10.5 L/min, for each size pristine ETT. Used ETT were evaluated against size matched control ETT within one hour of patient extubation. A CO2SMO monitor (Novametrics, Wallingford, PA.) was placed at the proximal end of each ETT to measure Vt of both control and used ETT. Following Vt assessment on used ETT a Rescue Cath (Omneotech, Tavernier, FL.) was used according to manufacturer specifications for biofilm removal. Vt was reassessed following Rescue Cath employment. Results: Vt was significantly reduced in all used ETT relative to controls, $p<0.001$. Employment of the Rescue Cath increased Vt post cleaning compared to uncleaned, used ETT, $p<0.05$. The Rescue Cath did not return any ETT to pristine conditions, $p<0.001$. Conclusion: Biofilm formation within all used ETT resulted in statistically significant reductions of spontaneous Vt. Rescue Cath cleaning increased Vt 80% of the time. The Rescue Cath did not return Vt to pre-use condition with any ETT evaluated. Clinical Implications: Rescue Cath use may improve flow resistive properties of used ETT. Further investigation is required to determine the appropriate assessment technique to identify clinical need for ETT cleaning.

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UTILIZATION OF A TRACHEOSTOMY DECANNULATION PROTOCOL.

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Background: Patients with long term tracheostomies have increased risk for infection, scar tissue development and unplanned decannulation that can put the patient in jeopardy. Reducing the amount of time the tracheostomy is being utilized by the patient can significantly decrease the incidence of all these issues and also improve the outcome of the patient's long term recovery. Baylor Specialty Hospital implemented a Tracheostomy Decannulation Protocol to reduce the amount of time the patient had a tracheostomy, to reduce their overall length of stay, reducing cost and most important improve the patient's quality of life and restore normal airway activity. Method: The Tracheostomy Decannulation protocol was developed by the Cardiopulmonary Council at Baylor Health Care System. The protocol was implemented with approval from our Medical Executive Committee and under the direction of the Medical Director for the Cardiopulmonary Department. Tracheostomy patients were tracked weekly to determine if the protocol was being utilized appropriately, progress of the patients and to ensure there were no unplanned occurrences. Each patient, family member and multidisciplinary team member was educated on the protocol. Results: Tracheostomy days were reduced from 25.58 days to 10.58 days during the fiscal year utilizing the Tracheostomy Decannulation Protocol. The net cost saving per patient was $10,278.00 resulting in a total year end savings of $1,253,916.00. There were no negative outcomes reported during this time period. Patient discharge disposition was improved to maintain their expected number of days and placement post discharge. Conclusion: Implementing a Tracheostomy Decannulation Protocol improved our ability to care for our patients and work through the process of planned decannulations. Standardizing the process allowed for better communication with patients and their families on expectations. The cost savings seen created a positive result with leadership and the fact there were no negative outcomes recorded. Tracheostomy Decannulation Protocols are an effective way to provide care to long term tracheostomy patients and ensure positive outcomes.

Sponsored Research - None **1731846**

NONINVASIVE VENTILATION (NIV) UTILIZATION IN AN ACADEMIC EMERGENCY DEPARTMENT (ED).

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Background: Noninvasive ventilation (NIV) is a valuable therapeutic modality for subjects presenting to the emergency department (ED) with acute respiratory failure due to chronic obstructive pulmonary disease or cardiogenic pulmonary edema. NIV is increasingly being used for acute respiratory failure caused by other disease entities. The purpose of this report is to analyze NIV utilization in our academic medical center ED. Methods: Subjects were identified through an IRB approved electronic records search of patients who received NIV in the ED between January 1, 2010 and June 30, 2012. Data tracked included: NIV used as life support (defined as "respiratory compromise would occur if NIV is removed"), indication for NIV and endotracheal intubation (ETI) requirement. Subjects were grouped into six month intervals for analysis. Results: Eight hundred and ninety-seven subjects (mean age 65 years) were included. There was a trend towards increasing use of NIV over the study period (in chronological order: 159, 173, 187, 172 and 206 patients receiving NIV for each 6 month interval). 77% of NIV usage was considered life support. Conclusion: The use of NIV in our ED increased during the time period evaluated. The majority of NIV use in the ED was considered life support. Interestingly, intubation rates were remarkably similar among patient groups.

Sponsored Research - None

	Number	Life Support	Non-Life Support	Intubation (% non DNI)
All Patients	897	689 (77%)	208 (23%)	13%
Accepted Indications	626 (70%)	446 (71%)	180 (29%)	12%
COPD	200 (22%)	145 (73%)	55 (27%)	12%
CHF	204 (23%)	158 (77%)	46 (23%)	8%
COPD&CHF	165 (18%)	124 (75%)	41 (25%)	13%
Immunocompromised/Neuromuscular Weakness	8 (0.9%)	6 (75%)	2 (25%)	67%
Obstructive Sleep Apnea	49 (5.5%)	13 (27%)	36 (73%)	8%
Other Indications				
Asthma	44 (5 %)	43 (98%)	1 (2%)	7%
Other diseases	227 (25%)	200 (88%)	27 (12%)	15%

1731883

EXTUBATION OUTCOMES FOR PATIENTS RECIEVING MORE THAN ONE SPONTANEOUS BREATHING TRIAL (SBT) PER DAY.

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BACKGROUND: At our facility we have implemented daily spontaneous breathing trials (SBT) on all candidates each day at the beginning of dayshift. Some patients are not extubated after the daily SBT, but 8 to 16 hours later continue to meet criteria to initiate an SBT on evening or night shift. Evidence based literature guides that SBT's should only be done once per day and patients should rest 24 hours between SBTs*. We wanted to determine if performing a second SBT would result safe extubations for patients who were not extubated after the first SBT of the day. METHOD: In November 2012, a multidisciplinary group formed to look at liberation practice and revised the current standard to increase around the clock surveillance for patients who meet criteria for SBT (and may be ready for extubation). The new standards allowed our respiratory staff to perform multiple daily SBTs, as long as the patient continued to meet SBT criteria. Staff and physicians were educated on these new standards for liberation from mechanical ventilation. The new practice was implemented in the fall of 2012 in five ICU's, Cardiac ICU (CVCCC), Medical ICU (MICU), Neuro ICU (NCCC), Surgical ICU (SCCC) and Med/Surg ICU (WICU). RESULTS: Patients received multiple SBTs in one day 454 times between November 2012 and May 2013. Two hundred twenty five were extubated (50% resulted in extubation). Re-intubation was required after 17 of those 225 extubations (8% re-intubation rate). Four hundred forty one times, there were 2 SBT's in a 24 hour period. Thirteen times there were 3 SBTs in a 24 hour period. All 13, who had 3 SBTs in a 24 hour period, were extubated. One re-intubation was required of those who received 3 SBTs in a 24 hour period (8% re-intubation rate). See table for breakdown between ICU's. Our hospital's overall typical range for re-intubation is 4% to 8%. CONCLUSIONS: 1) Allowing multiple SBTs per day resulted in extubations that did not occur on the first SBT of the day. 2) It is safe to undergo multiple SBTs daily since re-intubation rates were within recommended range (5% to 15%*) in each of the ICU populations. *Evidence-Based Guidelines for Weaning and Discontinuing Ventilatory Support. Chest 2001; 120:375S–395S

Sponsored Research - None

Extubation Data For Patients Receiving More Than One Daily SBT

Unit	Extubations	Re-Intubations	Re-Intubation Rate (%)
MICU	88	6	7%
SCCC	51	3	6%
CVCCC	41	3	7%
WICU	32	3	9%
NCCC	13	2	15%

1732186

RAPID PROCESS IMPROVEMENT TO INCREASE SURVEILLANCE FOR PATIENTS READY FOR EXTUBATION AROUND THE CLOCK.

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BACKGROUND: At our facility we have been successful in completing spontaneous breathing trials (SBT) on all candidates each day at the beginning of dayshift. We had noticed that some patients begin to meet SBT criteria after dayshift. Those patient may either get an SBT during evening shift, night shift or wait until the next day for an SBT. Waiting until day causes a delay until extubation. We wanted to determine if increasing surveillance on the off-shifts would safely and more quickly liberate patients from mechanical ventilation and reduce time in the ICU. METHOD: In November 2012, a multidisciplinary group formed to look at liberation practice. We revised our liberation procedure to intentionally seek out patients who are ready for a spontaneous breathing trial and possible extubation any time around the clock. Staff and physicians were educated on this new surveillance which would initiate SBTs on evening and night shift if indicated. Patients passing the SBTs would be extubated throughout the evening or night shift. This new practice was implemented in Medical ICU (MICU) and Surgical ICU (SCCC) in December 2012. All mechanically ventilated patients who were extubated were included in the data of this project. All mechanically ventilated patients that required tracheostomy were excluded from the data in this project. RESULTS: See the table for results. PRE-PERIOD in MICU was June 2012 - September 2012. PRE-PERIOD in SCCC was July 2012 - November 2012. POST-PERIOD for both ICUs were December 2012 - May 2013. MICU had 182 extubations in the PRE-PERIOD and 311 in the POST-PERIOD. SCCC had 204 extubations in the PRE-PERIOD and 299 in the POST PERIOD. The percentage of extubations on off-shifts increased significantly for both ICUs. CONCLUSIONS: 1) Patients who come into meeting SBT criteria during evening or night shift can be safely extubated without increasing re-intubation rate. 2) Surveillance around the clock for SBT candidates can significantly increase the percentage of extubations performed on evening and night shift. 3) Initiating SBTs that result in extubations on evening and night shift contributed to a reduction in ventilator time and ICU time.

Sponsored Research - None

Initiation Of Increased Off-Shift Extubation

	PRE-PERIOD	POST-PERIOD
MICU - Off Shift Extubation Rate (%)	22%	37% (p<0.05)
MICU - Re-Intubation Rate (%)	7%	5% (p=0.22)
MICU - Ventilator Days	3.7	3.3 (p=0.46)
MICU - ICU Days	6.6	5.6 (p=0.14)
SCCC - Off Shift Extubation Rate (%)	23%	33% (p<0.05)
SCCC - Re-Intubation Rate (%)	2%	3% (p=0.51)
SCCC - Ventilator Days	2.8	2.3 (p=0.35)
SCCC - ICU Days	4.4	4.0 (p=0.41)

173040

THE USE OF NON-INVASIVE VENTILATION (NIV) IN THE POST ANESTHESIA CARE UNIT (PACU) IN AN ACADEMIC MEDICAL CENTER.

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Background: NIV can be a valuable support therapy in the Post Anesthesia Care Unit (PACU). At the same time NIV can have a significant impact on Respiratory Care Services (RCS) since they are the ones that most often provide this service. This review evaluates NIV utilization in the PACU at Duke Hospital. Methods: All patients who received NIV in the PACU between 01/01/2010 and 7/23/12 were identified through a search of RCS electronic records following an IRB approved protocol. Data tracked included: indication, home unit availability, life support vs. non-life support use (NIV is classified as life support if the patient would suffer harm if NIV was removed) and need for re-intubation. Results: One hundred forty-five patients received NIV in the PACU over the 31 month period. Forty-eight (33%) were classified as life support and 97 (67%) non-life support NIV. RCS owned equipment was used in 97% of cases. The indications for NIV are summarized in the table below. Fifty-seven (39%) patients had the indication documented as OSA. Of those 57 patients, 19(33%) lacked a preadmission diagnosis of OSA. For six month intervals starting January 1, 2010 and ending June 30, 2012 the number of subjects receiving NIV in the PACU were: 20, 25, 44, 25, and 28, respectively. Nine (6%) patients required re-intubation, 136 (92%) were discharged and 3 (2%) were DNR patients who expired without further intervention. (insert table) Conclusion: Noninvasive ventilation is provided for a broad range of patient acuity in the PACU. This review suggests RCS support from an advanced practitioner is required in the PACU. Respiratory Care departments should consider the PACU in resource procurement and clinician development.

Sponsored Research - None

	Obstructive Sleep Apnea	Respiratory Distress	Facilitate Ventilator Weaning	Hypercarbia	Chronic Respiratory Insufficiency	Other
All Patients n=145	57 (39%)	32 (22%)	27 (19%)	12 (8%)	6 (4%)	11 (8%)
Life support n=48	5 (10%)	24 (50%)	7 (15%)	7 (15%)	0 (0%)	5 (10%)
Non-Life Support n=97	52 (54%)	8 (8%)	20 (21%)	5 (5%)	6 (6%)	6 (6%)

1732064

ACCURACY OF EXHALED TIDAL VOLUME (MEASURED AND ESTIMATED) OF TWO SUBACUTE/HOME CARE VENTILATORS IN A SIMULATED NEONATE/INFANT MODEL.

Gerald Moody, Andre Finley; Children's Medical Center, Dallas, TX

BACKGROUND: In our institution, when transitioning ventilator dependent patients to home care ventilators we commonly place patients in PC-SIMV mode using tidal volumes (VT) as a parameter for setting pressures. There has been some question as to the accuracy of exhaled VT readings, especially on smaller patients (around 5 kg) when using a passive circuit with no proximal flow sensor at the patient airway. We conducted tests of two brands of subacute/home care ventilators used in our hospital to determine accuracy of exhaled VT readings with passive circuits and active circuits with proximal flow sensors. We hypothesized there would be no difference in accuracy between the LTV 1200 (Carefusion, Yorba Linda, CA) and the Trilogy 202 (Phillips Healthcare, Andover, MA) when using each manufacturers' proprietary active circuits with proximal flow sensors; there would be a difference in VT accuracy when using the Trilogy 202's passive circuit. METHODS: The Trilogy 202 and LTV 1200 were tested with their active circuits. Each vent/circuit configuration was attached to a test lung (Ingmar ASL 5000) using the neonate/apneic model with a C: 7 mL/cmH2O and R: 10 cm H2O/L/s. 10 Vent breaths were read for each configuration and compared to the ASL 5000 readings at 3 different pressure levels using the following settings: PC-SIMV mode, PIP of (12,15 & 20 cmH2O), PEEP 5 cmH20, RR 25 breaths/min, Ti .5, rise of 1 on Trilogy rise of 3 on LTV, leak compensation "on", all configurations were tested with no leaks. RESULTS: Table 1 shows results for each vent/circuit configuration. The LTV 1200 was the most accurate, followed by the Trilogy with active circuit. As hypothesized the Trilogy with the passive circuit was least accurate, but provided the most consistent VT's as measured by the ASL 5000. The Trilogy with passive circuit also delivered less VT's compared to each active circuit configuration. Conclusion: Based on these data the LTV 1200 displayed the most accurate VT readings and may be the best choice for ventilating patients whom VT is of greater concern. We were also surprised by the large variance in measured VT between the passive and active circuits and caution should be applied when placing patients on different vent/circuit combinations with the same settings.

Sponsored Research - None

Table 1: Results

PIP 12	+/- SD	Mean	Vt (% error)	PIP 15	+/- SD	Mean	Vt (% error)	PIP 20	+/- SD	Mean	Vt (% error)
Trilogy Passive circuit	12.19	50.2	+ 28%	Trilogy Passive circuit	11.61	74.3	+ 25%	Trilogy Passive circuit	10.8	111	+ 19%
ASL 5000	2.11	36		ASL 5000	2.69	55.9		ASL 5000	2.27	89.6	
Trilogy Active circuit	11.65	80.8	+ 11%	Trilogy Active circuit	8.95	101	+ 10%	Trilogy Active circuit	0.67	139	+ 9%
ASL 5000	13.86	72		ASL 5000	10.01	91		ASL 5000	0.42	126	
LTV 1200	13.16	47.5	+ 3%	LTV 1200	14.01	107	+ 5%	LTV 1200	23	157	+ 5%
ASL 5000	12.70	45.9		ASL 5000	11.83	101		ASL 5000	16.1	148	

173225

A 5-YEAR FOLLOW UP AFTER APPLICATION OF NON-INVASIVE VENTILATOR SUPPORT IN PATIENTS WITH NEUROMUSCULAR DISEASE.

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Background Non-invasive positive pressure ventilation(NIPPV) is known to have more benefits over invasive positive pressure ventilation (IPPV) in assisting ventilatory failure for patients with neuromuscular diseases (NMD).The purpose of this study was to investigate the 5 years outcome of NIPPV application in different NMD groups. Method Among the 627 patients with ventilator-failure who were successfully managed with NIPPV, 104 NMD patients who had been followed up more than 5 yrs after NIPPV application between March 2001 and May 2013 became candidates in our study. The mechanical ventilator application state and any transitions during the 5 yrs were surveyed through their medical records. All patients were categorized into four groups based on the clinical manifestation : Amyotrophic lateral sclerosis (ALS) (Group 1), Spinal muscular atrophy(SMA) combined with congenital myopathy (Group 2, according to their similar clinical manifestation), and Duchenne muscular dystrophy(DMD) (Group 3) and other NMDs (Group 4). Result Twenty three (22.1%) patients among 104 had successfully switchedto NIPPV from intubation or tracheostomy status. Survival rate in each group was 53.3% in Group 1 (8 out of 15), 91.7% in Group 2 (11 out of 12), 96.0% in Group 3 (48 out of 50) and 96.3% in Group 4(26 out of 27). Five-year maintenance rate of NIPPV was 33.3% in Group 1, 91.7% in Group 2, 96.0% in Group 3, and 85.2% in Group 4. Group 1 had the longest application time in a day after 5 years (23.71±1.07 hours) whereas Group 2 had the shortest(8.83±1.34 hours). Conclusion DMD patients had the highest maintenance rate of NIPPV. Even in ALS, who mostly suffer from bulbar symptoms, 1/3 could maintain NIPPV successfully after 5 years. Ventilatory failure can be successfully managed for a long time by NIPPV even in progressive NMD patients who need daily ventilatory support.

Sponsored Research - None

	Group 1 ALS (n=15)	Group 2 SMA & Congenital myopathy (n=12)	Group 3 DMD (n=50)	Other (n=27)	Total (n=104)
5 year survival(%)	8 (53.33%)	11 (91.67%)	48 (96.00%)	26 (96.30%)	96 (92.31%)
Maintenance of NIPPV after 5 yearss (%)	5* (33.33%)	11 (91.67%)	48 (96.00%)	23+ (85.19%)	90 (86.54%)
NIPPV applying time at initial	10.67 ±6.13	9.33 ±4.62	10.06 ±5.27	7.41 ±2.55	7.41 ±2.55
NIPPV applying time after 5 years	23.71 ±1.07	8.83 ±1.34	15.47 ±6.94	12.31 ±6.69	15.01 ±7.20
Applying time variance (per year)	8.04 ±10.44	-0.11 ±0.74	1.16 ±1.54	1.05 ±4.94	1.93 ±4.68

*3 out of 15 ALS patients performed tracheostomy before 5 year follow up period, and 7 expired + 2 out of 27 other neuromuscular diseasepatients performed tracheostomy, 1 weaned off ventilator, and 1expired.

1733040

EFFECT OF INCREASING PATIENT EFFORT SIMULATED WITH AN ELECTRONIC TEST LUNG ON TIDAL VOLUME DURING A SPONTANEOUS BREATHING TRIAL WITH AUTOMATIC TUBE COMPENSATION.

Lonny R. Niejadlik, Kortnee Fleming, Lonny Ashworth; Respiratory Care, Boise State University, Boise, ID

Background: Automatic Tube Compensation (ATC) has been shown to assist patients' ventilation during spontaneous breathing trials (SBT); however, the level of support offered by this feature in different ventilators has not been determined. This bench study aimed to determine how the ATC on the CareFusion Avea (AAC), Covidien PB 840 (TC), and the Dräger Evita XL (ATC) each affect tidal volumes at various inspiratory demand levels. Methods: After calibrating each ventilator and the lung simulator, the Avea, Evita XL, and the PB 840 were joined with the Hans Rudolph 1101 Electronic Lung Simulator (HR 1101) using the same large bore circuit and a Teleflex Isis HVT 7.0 and 7.5 and a Rusch 8.0 ETT. The HR 1101 was setup to mimic a 'normal' pulmonary system: Resistance 10 cm H2O/L/s; Compliance 40 mL/cm H2O; Rate 20/minute; Inspiratory time Percent 30; Load Effort NORMAL; Maximum Volume 3000 mL. The HR 1101 amplitude or 'patient effort' was set at 5, 10, 20, 30, and 40 cm H2O with each ETT and with each ventilator with ATC off and then on. The Evita XL was assessed with ATC at 80% and 100%. Each ventilator was placed in CPAP, Pressure Support 0 cm H2O and PEEP 5 cm H2O. After allowing for stabilization, video recordings of the HR 1101 displayed values were made at each combination of settings. While reviewing the video playback, data for six consecutive breaths were recorded and averaged. Results: Using the 7.5 ETT as a median value, the Avea's AAC resulted in minimal changes in the delivered tidal volume, with the largest percentage being 5.56% at Amplitude of 5 garnering an 8 mL change per breath. In contrast, the Evita XL at 100% ATC resulted in a 51.34% increase in delivered tidal volume, delivering an additional 487.25 mL per breath at the maximal Amplitude of 40. Overall, the use of ATC increases delivered tidal volume by 2.92% on the Avea, 12.1% on the PB 840, 11.96% on the Evita XL at 80% and 24.96% on the Evita XL at 100%. Conclusion: While a patient is undergoing an SBT, s/he may be receiving more support than initially thought or desired. ATC results in an increased tidal volume and a presumed reduction in work of breathing. Currently, the level of support to be used during an SBT is being questioned by other authors and it has now been shown that airway resistance may increase after extubation, rather than decrease. Therefore, the use of ATC, designed to reduce the work of breathing of the ETT, needs to be carefully considered during an SBT.

Sponsored Research - None

1732354

EFFECTS OF HAMILTON G5 FLOW SENSOR ON AEROSOL DELIVERY.

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INTRODUCTION: The Hamilton G-5 ventilator flow sensor is placed between the patient and the ventilator wye. AARC Open Forum Abstract 1435808 from 2012 tested aerosol delivery with this flow sensor in place but with a Servo-i ventilator. The flow sensor connected to the patient circuit wye demonstrated to have an unfavorable effect. Based on this Abstract, we had concerns that the flow sensor might reduce the amount of aerosol delivery and evaluated it with the G5 ventilator that it was designed for. METHODS: A Hamilton G-5 ventilator (Hamilton Co., Reno, NV) was connected to an ASL-5000 breathing simulator with the Hamilton flow sensor placed at the ventilator wye per manufacturer's instruction. The ventilator settings were S-CMV mode, VT 500 ml, RR 20, PEEP 5 cm H2O, I:E 1:2. Two Hudson disposable filters, (Teleflex Medical, Research Triangle Park, NC) were placed between the wye and the test lung. The filter closest to the wye was weighed before each test. An Aerogen nebulizer, (Aerogen, Galway, Ireland), was placed in-line on the inspiratory limb of the patient circuit, 6 inches from the ventilator wye and the nebulizer cup was filled with 6mL of sterile. The G5 Aeroneb nebulizer setting was adjusted so that aerosolization occurred during both the inspiration and expiration phases of each breath. After 30 minutes, or 600 breaths, the filter closest to the circuit wye was weighed again. The flow sensor was removed and the process repeated with new filters. Each series of tests was repeated 5 times. The mean difference (MD) in the weight (± SD) of the filters was calculated and compared using one-way analysis of variance (ANOVA). RESULTS: Comparing aerosol delivery with the flow sensor installed to when it was not installed, the MD in filter weight gain was 0.029 g (± 0.10). The MD in the weights of the filters was not statistically different, ($p = 0.24$). CONCLUSION: This bench study demonstrates that the G5 flow sensor did not have a significant effect on impeding aerosol delivery.

Sponsored Research - None

1733227

PORTABLE VENTILATORS AT ALTITUDE.

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Background: Aeromedical transport of critically injured war fighters may require transport via rotary wing and fixed wing aircraft at altitudes above the normal cabin altitude of 8,000 feet. Previous bench studies have shown that some portable ventilators do not compensate for changes in barometric pressure and can cause dangerous increases in delivered tidal volume (VT). We evaluated the performance of three portable ventilators in an altitude chamber. Methods: We evaluated the Impact 731, CareFusion Revel, and Hamilton T1 at sea level and barometric pressures of 565 mm Hg, 412 mm Hg, and 321 mm Hg, simulating altitudes of 8,000, 16,000, and 22,000 feet in an altitude chamber. Each ventilator was attached to a test lung with a pneumotachograph between the test lung and the ventilator circuit and measurements of (VT) ranging from 50 mL to 750 mL, timing, flow, and airway pressure with and without the use of PEEP were recorded with each breath. Lung compliance and airway resistance were altered with each VT/respiratory rate combination to determine the effect on delivered VT. Results: The T1 and Revel delivered VT > 10% of set VT at settings ≥ 250 mL. The VT overshoot with the T1 was observed at all volumes at an altitude of 22,000 ft and also with 250 mL VT setting at 8,000 and 16,000 ft. The range of overshoot was 11-34% of set VT. The delivered VT overshoot range was 15-31% higher than the set VT and was seen only at an altitude of 22,000 ft with the Revel . The 731 did not deliver any VT > 10% of the set VT at any altitude. The figure below shows delivered VT at a set Vt of 500 mL and 0 PEEP. Additionally, at an altitude of 22,000 ft and VT setting of 500 mL and PEEP of 20 cm H2O, and an altitude 16,000 and 22,000 ft with a VT setting of 750 mL and PEEP of 20 cm H2O, the T1 displayed a pressure limit alarm despite the set alarm being 10 – 20 cm H2O higher. Delivered VT was 11-41% less than set VT in these instances. Conclusions: The Impact 731 was the only ventilator tested that compensated for all increases in altitude. Some of the VT overshoot seen with the T1 at the 250 mL setting can be attributed to the ventilator's use of dual control mode with lung compliance of 100 ml/cm H2O. The lowest peak pressure allowed with this mode (5 cm H2O above PEEP) produced VT greater than set VT. Clinicians must be aware of these alterations in VT during aeromedical transport.

Sponsored Research - This study was funded by the United States Air Force 711th HPW.

1733332

OCCULT BIOLOGICAL CONTAMINATION OF DRAEGER NEONATAL FLOW SENSORS.

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INTRODUCTION: A new fleet of mechanical ventilators (Draeger Infinity VN500 and V500)) were recently introduced at our hospital. We began to receive anecdotal reports of failures of reprocessed neonatal flow sensors. These reusable sensors were cleaned according to manufacturer's recommendations. We sought to examine our reprocessing system in hopes of determining why these sensors were failing. METHODS: We examined a freshly reprocessed sensor under a microscope, finding visible accumulation of what looked like dried, hardened secretions inside the sensor housing on the heated wire nearest the patient connection. This was not visible with the naked eye. This led us to suspend use of reprocessed sensors and examine our cleaning methods. We continued to gather new sensors after their first use and reprocess them and then examine them under low power magnification. We recorded date tested, number of sensors with and without accumulated debris. In addition, those sensors that had evidence of contamination were tested for function on a ventilator. Contaminated sensors were sent to an analytical lab to determine the composition of this contamination. We also tested 20 unused, new sensors to see if this build-up was present on new sensors. On April 8th we began storing sensors in water after use and continued to periodically examined reprocessed sensors. RESULTS: No debris was found on the new unused sensors. Scanning electron microcopy and Fourier transformed infrared spectroscopy revealed that the built-up debris was collagen related biological material. Table one lists our inspection results. Initially, we had a 19% contamination rate. Of those that were contaminated, 90% failed. After introduction of the new process, the contamination rate fell to 3% and then to 0%. DISCUSSION: Collagen is a major component of connective tissue and is part of airway structure. Thus we concluded that the contamination was dried on exhaled micro-debris from the airways. This contamination may be widespread in the neonatal community since it is not visible with the naked eye. Soaking these sensors in water after use appears to eliminate this phenomenon, most likely by keeping the built up secretions moist so that they can be removed by the cleaning process.

Sponsored Research - None

Results

Date	Number Examine	Number Soiled	Number Failed
22-Feb	8	3	3
27-Feb	7	0	0
13-Mar	39	6	4
3-Apr	47	10	9
Sub-Total	101	19	16
15-Apr	97	3	0
29-May	19	0	0

1733396

PROPHYLACTIC CPAP APPLICATION IN POST EXTUBATION CARDIOTHORACIC OPEN HEART PATIENTS.

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BACKGROUND: Virginia Mason Medical Center is a 300 bed teaching hospital in Seattle Washington. Our Respiratory Therapy (RT) Department was approached by the Cardiothoracic Surgical Service (CTS) who presented us with the research article; CHEST 2009; 135:1252-1259; titled: "Prophylactic Nasal Continuous Positive Airway Pressure Following Cardiac Surgery Protects From Postoperative Pulmonary Complications". Based on this research we implemented the application of CPAP on our post extubation open heart patients. METHOD: The Chest paper was presented to the RT Staff along with instructions to place post extubation open heart patients on CPAP of 10cwp via nasal mask (preferred per the Chest article) along with the autonomy to use any mask interface needed, an auto-adjust CPAP unit, or to terminate the CPAP if the patient is not able to tolerate it or the patient subsequently needs BiPAP instead. Nov 1st was the designated start date with data collected four months before (Pre) and after (Post) this start date. We then compared the Pre (n=109) and Post (n=108) data; specifically, we looked at Average CCU length of stay (CCU LoSavg), CCU readmission (CCU ReAdmis), post op pneumonia (POPneu), Re-intubation (Re-int), and Hospital length of stay (HLoS). We also analyzed the CPAP data that was collected during the four month Post start date; specifically, we looked at CPAP device used, type of mask interface, and CPAP pressure. We then compared these data results to determine efficacy of the prophylactic CPAP and the best practice for CPAP application. RESULTS: CCU LoSavg: Pre;63.79hrs/Post;52.80hrs, HLoS: Pre; 7.2 days/Post; 6.6 days, CCU ReAdmis: Pre; 9/Post; 4 (-4.6%), POPneu: Pre; 8/Post; 7 (-0.8%), Re-int: Pre;7/Post;4 (-2.7%). Regarding the CPAP use during the four month data collection period, 16.2% of the patients were placed on standard CPAP, 64.9% on Auto-adjusting CPAP, and 15.3% on BiPAP. 3.6% did not go on any positive pressure post extubation. Of the patients on auto-adjusting CPAP the pressure range needed was 5.7cwp to18.7cwp with a Mean of 13.5cwp. CONCLUSIONS: Our data results demonstrated an improvement in all category comparisons. Of particular note is the CPAP pressure needs recorded on the auto-adjusting CPAP units. The Chest article used a set pressure of 10cwp; however, our study results call into question the adequacy of a set pressure and would suggest that the use of an auto-adjusting CPAP unit to be a better choice.

Sponsored Research - None

1733445

THE IMPACT OF CLINICAL TRIALS: A SURVEY ON THE USE OF HFOV.

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Background: High Frequency Oscillatory Ventilation (HFOV) is used primarily in patients with refractory hypoxemia. The purpose of this survey is to examine HFOV practice across various institutions following the publication of the OSCILLATE3 and OSCAR4 studies in the New England Journal of Medicine on February 28, 2013. Methods: The authors developed a survey instrument on HFOV use that was approved by the IRB and sent via email to 200 Respiratory Therapists. Only 1 participant per institution was allowed. Results: The response rate was 44% with 53% of the hospitals represented having more than 500 beds. Facility types represented were 43.68% academic centers, 26.44% community hospitals, 29.89% academic/community hospitals, and 26.44% tertiary care centers. The results are depicted in table 1 as changes of practices due to the publication of the OSCILLATE and OSCAR studies. 25% reported that the studies had changed their current practice with 27% noting an increase in low tidal volume strategies. Individual sites reported HFOV use in patients per year as 49.21% (0-10pts), 19.05% (10-20pts), 15.87% (20-30pts), 7.94% (30-40pts), 6.35% (40-50pts), 1.59% (more than 50 pts). In the opinion of those surveyed, 3.08% believe the utilization of HFOV in their institution will increase, 33.85% expect a decrease, and 63.08% think utilization will stay the same due to the OSCILLATE and OSCAR trial results. Conclusions: Survey results suggest that the OSCILLATE and OSCAR trials may have impacted the use of HFOV to some extent. There also appears to be a concurrent increase in the use of APRV, ECMO and prone positioning. 3. Ferguson ND, Cook DJ, Guyatt GH, et al. High-frequency oscillation in early acute respiratory distress syndrome. N Engl J Med 2013;368:795-805. 4. Young D, Lamb SE, Shah S, et al. High-frequency oscillation for acute respiratory distress syndrome.N Engl J Med 2013;368:806-13.

Sponsored Research - None

Table 1. Clinical practice changes post OSCILLATE/OSCAR

	HFOV	APRV	iNO	Prone	ECMO
Increased	1.61%	10%	4.69%	7.69%	9.84%
Unchanged	75.81%	86.67%	87.50%	90.77%	88.52%
Decreased	22.58%	3.33%	7.81%	1.54%	1.64%

1733483

CHARACTERISTICS OF DELIVERED TIDAL VOLUMES DURING NASAL CANNULA IMV: A BENCH STUDY IN AN INFANT MODEL.

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Introduction: The use of Nasal Cannula IMV is a growing and innovative approach to providing NIPPV in the infant population. The pressure levels transmitted through different nasal cannula interfaces applied during CPAP, NIPPV and HHFNC have been studied extensively, however, there is very little data on how effective these pressures are in supplementing ventilation non-invasively and what size tidal volumes are generated. We performed a bench evaluation in an infant model to determine what tidal volumes are potentially delivered using two common types of interfaces applied in Nasal Cannula IMV. Methodology: A Servo-i ventilator was setup with an infant ventilator circuit and calibrated according to manufacturer standards. The ventilator was then connected to a Michigan Instruments Infant Test Lung using the test Nasal Cannulas. (Pediatric Fisher & Paykel, and RAM cannulas) An appropriate size ETT adaptor connected each nasal prong to a wye and three-way stop cock which was adjusted to vary the percent leak in the system. A pressure differential pneumotach (NICO) was placed proximal to the infant test lung to measure tidal volumes. Measurements were obtained on the following range of ventilator settings which each type of nasal cannula interface: Noninvasive Pressure Control; RR 30 BPM; PIP of 30, 25, 20, and 15 cmH20; PEEP 5 cmH20; FiO2 0.30; Rise Time of 1, 3, and 9; and I- time 0.6 seconds. The infant test lung had a compliance of 0.02 L/cmH20. Leaks were tested at 10%, 30%, and 50%. Results: The average tidal volume delivered through the RAM Cannula across the varying leak and rise time conditions was 24.94 mL. The average tidal volume delivered through the Fisher & Paykel Cannula was 17.10 mL. The RAM Cannula consistently delivered higher tidal volumes when compared to the Fisher & Paykel Cannula. This was statistically significant. (Paired t-test, $p < .05$) The RAM Cannula was more effective in delivering tidal volumes as the percent leak was increased. (See table) Conclusion: The RAM Cannula and Pediatric Fisher & Paykel Cannula are able to potentially deliver effective tidal volumes during Nasal Cannula IMV in the infant model. The RAM Cannula is potentially more effective in delivering tidal volumes as the percent system leak increases.

Sponsored Research - None

Average Tidal Volumes Delivered

	10% Leak	30% Leak	50% Leak
Fisher & Paykel	23.8 ml	16.4 ml	11.1 ml
RAM Cannula	28.7 ml	24.9 ml	21.3 ml
% Diff	17%	34%	48%

1733606

OBESITY AFFECTS WORK OF BREATHING DURING SPONTANEOUS BREATHING TRIALS USING PROPORTIONAL ASSIST VENTILATION.

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Introduction: The epidemic of obesity is a national healthcare concern. While extensive research has been done on the co morbidities associated with obesity, little research has been done to analyze the effect body habitus has on liberation from mechanical ventilation in the setting of trauma. Obese patients have been shown to have an inherent decrease in cardiopulmonary reserve and thoraco-abdominal compliance. How body habitus influences spontaneous respiration during mechanical ventilation is yet to be fully explored. This study seeks to identify aspects of respiratory mechanics that may be influenced by obesity. Methods: This is an IRB-approved retrospective study examining intubated adult patients in a Trauma Intensive Care Unit. A total of 51 patients and 56 spontaneous breathing trials (SBT's) were monitored and ventilation parameters were recorded. Patients were categorized into two groups based on their Body Mass Index (BMI) as either obese or non-obese, >/= 30kg/m2 or < 30 kg/m2 (WHO definition). Patients underwent SBT's using the PAV+ setting on Covidien PB 840 ventilators. Ventilation parameters were collected and analyzed using student's t-test while the correlation between BMI and work of breathing (WOB) was analyzed using a linear regression model and Pearson's coefficient (GraphPad Prism statistical software). Results: Following 56 trials, 30 patients were successfully liberated from mechanical ventilation. In our cohort, obesity did not appear to impact likelihood of successful liberation from the ventilator. There was also no difference in the respiratory mechanics of obese patients versus the non-obese (see Table). There was, however, a strong association between work of breathing (WOB) and body habitus. Not only did obese patients have a significantly higher average WOB, there appears to be a linear correlation between BMI and WOB ($p=0.01$, 95% CI 0.06725 to0.5413,R-squared=0.1). Conclusion: Our results show that conventional monitoring indices among patients considered for extubation undergoing SBT's do not vary significantly based on BMI. Interestingly, however, the measured WOB using PAV+ may be a more sensitive measure of intrinsic cofactors that may influence ventilator management and outcomes. These results warrant further investigation into the role of WOB as an indicator for intrinsic respiratory function.

Sponsored Research - None

Parameter	Obese (N=16)	Non-Obese (N=34)	P Value
RSBI	39.19 +/- 2.2	36.84 +/- 3	0.532
Minute Ventilation	12.6 +/- 1.5	9.9 +/- 0.4	0.088
Compliance	70.47 +/- 7.6	80.3 +/- 4.8	0.282
Resistance	6.14 +/- 0.6	6.18 +/- 0.7	0.959
P100	3.45 +/- 0.8	2.45 +/- 0.3	0.250
WOB	1.07 +/- 0.1	0.82 +/- 0.05	0.044*

1733656

EFFECT OF INCREASING AMPLITUDE USING AN ELECTRONIC LUNG SIMULATOR ON TIDAL VOLUME AND PEAK INSPIRATORY PRESSURE DURING ADAPTIVE PRESSURE CONTROL.

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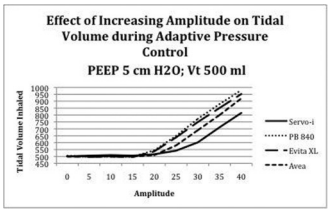
BACKGROUND Many current ICU ventilators offer Adaptive Pressure Control, automatically adjusting peak inspiratory pressure levels between breaths while targeting a desired tidal volume. The purpose of this study was to study the effects of increased amplitude using an electronic lung simulator, simulating an increased patient inspiratory effort, on both tidal volume and peak inspiratory pressure. METHOD Four ICU ventilators were evaluated: Covidien PB 840, CareFusion Avea, Maquet Servo-i, and Drager Evita XL. The Hans Rudolph HR 1101 Electronic Lung Simulator, used to mimic changes in patient effort, was set at the following values: Resistance 18 cm H20/L/sec; Compliance 30 mL/cm H20; Respiratory Rate 15 breaths/minute; Amplitude 0 – 40 cm H20; Effort Slope 20; % Inhale 20; Target Volume 3000 mL. Ventilator Settings: Mode PB 840 VC+; Avea PRVC; Servo-i PRVC; Drager XL CMV with AutoFlow On. Each ventilator was set at the following parameters: VT 500 mL; Respiratory Rate 12/minute; Inspiratory Time 0.7 seconds; PEEP 5 cm H2O. Each ventilator was set for a default pressure slope and set to allow triggering with minimal effort, ensuring that there were no missed triggers and no auto-triggering. Data were gathered after the ventilators were allowed to stabilize at an Amplitude of 0 cm H2O. Then Amplitude was increased in increments of 5 cm H2O up to 40 cm H2O. Tidal volume and PIP displayed on the HR1101, as well as the Vti, Vte, and PIP displayed on the ventilators, were noted at each change in Amplitude. RESULTS As Amplitude was increased, the PIP decreased; however the lowest PIP varied, as the following shows: PB 840 10 cm H2O; Avea 8 cm H2O; Servo-i 6 cm H2O; Drager XL 10 cm H2O. The tidal volume increased well above the set tidal volume, as displayed in the graph below. CONCLUSION Each of the ventilators studied showed dramatic increases in Vti as Amplitude increased. The PB 840 showed the largest increase in Vti while the Servo-i displayed the smallest increase in Vti. Also of interest was the variation among the ventilators pertaining to the lowest peak inspiratory pressure.

Sponsored Research - None



1733639

THE USE OF INHALED ISOFLURANE FOR TREATING SEVERE REFRACTORY STATUS ASTHMATICUS: A CASE STUDY.

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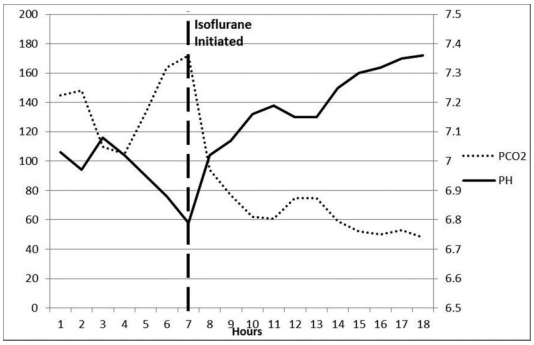
Introduction: Isoflurane is a potent inhalational anesthetic which is commonly used for the induction and maintenance of general anesthesia. This report examines the effectiveness of administering isoflurane for treating severe refractory status asthmaticus. Method: For the purpose of this case study, arterial blood gases with the primary focus on pH and pCO2 were used to assess the effectiveness of isoflurane therapy. Case Summary: A 3 year old male with a primary history of asthma was intubated and transferred to a tertiary care center after presenting with severe respiratory distress; non-responsive to conventional therapies. A venous blood gas obtained upon arrival to the Pediatric Intensive Care Unit showed a severe respiratory acidosis with a pH 6.78 and pCO2 191 mmHg. The patient received continuous albuterol, terbutaline, aminophylline, subcutaneous epinephrine, magnesium and methylprednisolone. Due to continued deterioration of the patient's status and subsequent critical value arterial bood gases, inhaled isoflurane was instituted using an anesthesia machine, and continuous albuterol was discontinued. An arterial blood gas was obtained at the initiation of Isoflurane, indicating a profound respiratory acidosis with a pH 6.79 and pCO2 172 mmHg. After one hour of Isoflurane therapy, the patient's blood gas showed marked improvement with a pH 7.02 and pCO2 94 mmHg. Over the next 48 hours arterial blood gases continued to normalize and the patient was weaned off Isoflurane. Discussion: Severe Status Asthmaticus has been shown to be difficult to manage with conventional therapies. This case shows the efficacy of Isoflurane as a bronchodilator in severe refractory status asthmaticus, as evident by the rapid and significant improvement in pH and pCO2. When using Isoflurane, the lowest possible dose should be used to minimize hypotension due to direct vasodilation and myocardial depression.

Sponsored Research - None



ABG results pre and post isoflurane administration.

171838

CHALLENGES IN VENTILATING AN INFANT WITH ASPHYXIATING THORACIC DYSTROPHY.

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Introduction: A 5 month old female with asphyxiating thoracic dystrophy (ATD)/Jeune syndrome was admitted to our institution for increased work of breathing and chronic respiratory insufficiency. **Case Summary:** The patient was diagnosed with ATD early in life with classic clinical signs including a narrow chest and with short ribs. Genetic testing confirmed mutations consistent with ATD. She had been on supplemental oxygen (O_2) at ¼ LPM via nasal cannula (NC), and on admission had mild to moderate respiratory distress requiring ½-1 LPM O_2 via NC. Capillary blood gas (CBG) showed a pH-7.40, pCO_2-51, and HCO_3^--31.6. On day 2, CBG worsened (pH-7.36, PCO_2-55, HCO_3^--31.1), and CPAP was initiated (4 cmH_2O) via mask with ¼ LPM O_2. Due to her petite size, fitting the mask was problematic. Different headgears were tried to achieve a proper seal. Day 3 CBG worsened (pH-7.31, PCO_2-63, HCO_3^--31.7) despite CPAP. On day 4, BiPAP was started with pressures of 8/4 cmH_2O. On day 6, due to asynchrony with BiPAP and worsening CBGs (pH-7.30, PCO_2-65, HCO_3^--32.0), she was placed on a Trilogy ventilator (ST mode, rate-20, pressures 12/4 cmH_2O, and T_i-0.4). CBG did not improve. Since trials of different modalities did not improve CO_2levels, NIV attempts were stopped. On day 9, her CBG improved (pH-7.39, PCO_2-51, HCO_3^--30.9). She was discharged home on O_2 via NC. Two months later, a vertical expandable prosthetic titanium rib (VEPTR) was placed on the right side. She was discharged home on Auto CPAP (4-8 cmH_2O) via nasal pillows. Follow-up CBG showed pH-7.41, PCO_2-52, HCO_3^--32.8. **Discussion:** ATD is an autosomal recessive disorder occurring in 1/100,000–130,000 live births. Clinical signs include dwarfism, short ribs and limbs, narrow thorax, and lung hypoplasia (LH). LH, due to a restricted thoracic cage, is the major cause of death in infancy. For patients surviving infancy, the thorax tends to revert to normal with improving respiratory function suggesting the lungs have normal growth potential. VEPTR can increase thoracic volume and allow lung growth, providing for efficient ventilation and oxygenation. However, until these infants undergo VETPR, they need respiratory support. A challenging aspect in this case was implementation of NIV due to problems with a proper interface. Headgear was adapted by tailoring the straps for a proper seal. Knowledge of chronic respiratory insufficiency, available devices, and interfaces were essential in implementing NIV on this infant.

Sponsored Research - None

174850

RARE AIRWAY ANOMOLY ASSOCIATED WITH JARCHO-LEVIN SYNDROME: A CASE PRESENTATION.

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INTRODUCTION: Jarcho-Levin Syndrome (JLS) is a rare genetic disorder associated with malformation of the ribs and vertebral column. Paradoxical respirations due to lung herniation through missing or malformed ribs, and chest wall instability contribute to respiratory insufficiency. We describe a case of JLS with an unusual airway anomaly. **CASE SUMMARY:** A 3,680 gram, male infant born at 40.2 weeks gestation presented with a short trunk, short neck, and crab-like appearance of the rib cage. APGAR scores were 3, 4 and 4 at 1, 3 and 5 minutes respectively. The patient was orally intubated with a 3.5mm uncuffed endotracheal tube and transferred to the NICU for nutritional and mechanical ventilatory support. Chest radiograph revealed scoliosis, with missing and fused ribs bilaterally. At three months of age, a 3.5 (34 mm length) cuffed tracheostomy tube was surgically placed to facilitate mechanical ventilatory support secondary to chronic respiratory failure. Repeated episodes of profound respiratory distress required manipulation of the tracheostomy tube during manual ventilation and sedation to maintain a heart rate and blood pressure within normal limits and SpO_2 of 90- 92%. A series of bronchoscopies were performed to assess and treat the airway anomalies, Table 1. The patient stabilized after the third interventional bronchoscopy on the following ventilator settings: 80 mL (exhaled V_T 8mL/kg) IMV 24 (total rate 35) per minute), PEEP 11 cm H_2O, PS 25 cm H_2O (exhaled V_T 17 mL/kg), F_IO_2 between 0.28-0.30, and an T_I of 0.8 sec. PS was weaned to16 cm H_2O (exhaled V_T 8mL/kg) and F_IO_2 to 0.21 prior to discharge. SpO_2 of 96 and $ETCO_2$ of 45 mm HG were realized. Genetic testing confirmed JLS. The infant was transitioned home for ventilatory support and plans made to correct rib and spinal deformities when the child was close to a year in age. **DISCUSSION:** Although JLS is well described, a dearth of information is available describing associated airway abnormalities. Airway malformations, such as tracheal shelving should be suspected when respiratory distress persists in the presence of an artificial airway. Bronchoscopy is useful for initial diagnosis, periodic evaluations of airway anomalies and need for tracheostomy tube length adjustments.

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Table 1. Results of serial bronchoscopies

Bronchoscopy	Findings	Action
Initial	Congenital narrowing of the lower trachea Mild bilateral bronchiomalacia of the left and right mainstem bronchi. Thoracic dysplasia. The tip of the tracheostomy tube was positioned in the upper aspect of a shelf in the posterior trachea.	Placement of an extended length 3.5 (40 mm length) cuffed tracheostomy tube was then placed to bypass the tracheal shelf.
Day 7	Significant granulation tissue was found at the distal end of the 3.5 (40 mm length) cuffed tracheostomy tube obstructing 3/4 of the tracheal opening.	Placement of an extended length, 3.5 mm (54 mm length), cuffed tracheostomy tube was placed, to bypass the obstruction.
Day 9	Ulceration in the posterior wall of the trachea with edema at the tip of the , 3.5 mm (54 mm length), cuffed tracheostomy tube.	Placement of an extended length 3.5 (40 mm length) cuffed tracheostomy tube.

1723203

ECMO AND INDEPENDENT LUNG VENTILATION IN AN ADOLESCENT MALE POST ALL-TERRAIN VEHICLE ACCIDENT.

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Introduction: Pediatric patients who are involved in all-terrain vehicle (ATV) accidents can challenge the medical team due to the significant trauma involved. This case illustrates the course of a previously healthy 16 year old male who sustained severe chest trauma following an ATV accident. **Case Summary:** The patient sustained multiple injuries in an ATV accident. Injuries resulting from blunt force chest trauma included multiple fractures of ribs, scapula, sternum, C1–T6 spinous processes and multiple pneumothoraces. He also had traumatic brain injury with frontal arachnoid hemorrhage. He was intubated on scene and bilateral chest tubes were placed. Due to profound hypoxia and hypercarbia, he was ventilated in PRVC mode (Rate–22, Vt–350 ml, PEEP–5, F_IO_2–1.0). A challenging aspect of this case was treating the development of a bronchopleural fistula (BPF). The BPF created a significant air leak and refractory pneumothorax on the left. BPF as a result of blunt trauma to the chest is associated with high morbidity and mortality. The BPF markedly decreased the effectiveness of mechanical ventilation. Air flow through the BPF needed to be limited to promote healing. On day 5, a Combitube was placed to occlude the left lung and initiate independent lung ventilation (ILV) to the right lung. Inhaled nitric oxide was started at 20 ppm. He was maintained in this mode of ventilation until day 8 when oxygenation status deteriorated. He was placed on high frequency oscillatory ventilation briefly, but due to persistent hypoxemia was transitioned to VV ECMO support. He remained on ECMO for 14 days, during which the left lung was slowly and progressively ventilated with increasing volumes and pressures. On day 20 he was transitioned to conventional ventilation. On day 30 he received a tracheostomy and was weaned off the ventilator on day 39. He transitioned to rehabilitation services for his brain injury and discharged on day 63. **Discussion:** This study illustrates three important points. First, ATV accidents are associated with significant mortality and severe morbidity. Nationally, 317 deaths and ~ 115,000 hospital visits were noted in 2010. The Arkansas age-adjusted rate of 1.5/100,000 is twice as high as the national rate (0.72/100,000). Second, BPF can be successfully treated using ILV, and allowing the injured lung to heal using minimal pressures and volumes. Third, aggressive support including ECMO can lead to survival in cases of significant chest trauma.

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1725553

IT WAS NOT ASTHMA!!

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Introduction: A 6 year old female was admitted to our facility with a 6 week history of wheezing and coughing that did not respond to bronchodilators, steroids, and antibiotics. **Case Summary:** A previously healthy 6 year old female was evaluated by her Primary Care Physician 6 weeks prior to admission for wheezing and coughing episodes. Pulse oximetry and chest x-ray were normal. Albuterol was initiated with partial relief. Later she became febrile with a dry cough and antibiotics and inhaled steroids were started with partial improvement. Three days prior to presentation at our facility, she started vomiting, had a loose cough, and was again febrile. On the day of admission she presented to the ER with significant respiratory distress, audible wheezing and hypoxemia. In the hospital she was started on continuous albuterol. Due to persistent respiratory distress, IV steroids were started. A chest x-ray showed increased bibasilar infiltration and small fluid collection on the left side. Differential diagnoses included atypical pneumonia, foreign body aspiration, and sudden onset asthma. A flexible bronchoscopy (BRO) revealed an intra-tracheal mass which obstructed 90% of the airway. A CT of chest and neck confirmed the location of the mass and partial debridement and debulking was performed during rigid BRO. The mass was diagnosed as an inflammatory myofibroblastic tumor (IMT). Despite several rigid BROs performed over the following months, the tumor has not been completely resected. **Discussion:** Although rare, IMT is the most common benign primary pulmonary tumor seen in children and comprises less than 1% of all surgically resected lung lesions. In this case, the tumor was growing at the carina, partially obstructing the trachea, and left and right mainstem bronchi which made this a difficult area to completely resect the tumor due to growth into the bifurcation. Until the tumor is completely removed, IMT may continue to grow back with further surgical intervention required. This case illustrates two important points. First, alternative diagnosis should be considered in patients that have atypical presentation/response to therapy because wheezing does not always mean asthma. Second, successful resolution of airway obstruction will only occur when IMT is totally removed.

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1727786

A CASE STUDY: USE OF NAVA IN AN ASYNCHRONOUS PATIENT WITH COPD.

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Introduction: Good patient-ventilator synchrony unloads respiratory muscles and improves gas exchange.1 Neurally Adjusted Ventilatory Assist (NAVA) uses electrical activity of the diaphragm to trigger and cycle the ventilator and is unaffected by the most common causes associated with patient-ventilator asynchrony, auto-peep and leaks.2 Our goal for this patient was to improve patient-ventilator synchrony. Case Summary: A 65 year old female with COPD on Volume Assist Control (A/C), rate 14, tidal volume 400 cc, FiO2 .30, peep 4 cm H2O, sensitivity -1 cm H2O. She was changed from pressure sensitivity to flow sensitivity due to double triggering presumably caused by insensitivity of the ventilator to patient effort due to airway mechanics. The presence of auto-peep was noted on the graphics display. An Electrical Activity of the Diaphragm (EDI) catheter was inserted to monitor the patient's respiratory efforts. We overlaid the EDI tracing over the pressure tracing and noted asynchrony with several missed breaths. The patient was changed to Pressure Support Ventilation (PSV) 10 and continued monitoring showed ongoing missed breaths. The PSV level was increased to 15 and although synchrony slightly improved the tracing indicated a time delay in the delivery of the PSV breaths. The patient was switched to Neurally Adjusted Ventilatory Assist (NAVA) mode. A NAVA level of 2.0 produced a similar tidal volume, minute ventilation and peak pressure as PSV. The EDI tracing and pressure scalar on NAVA revealed an immediate change indicative of total patient/ventilator synchrony with no missed or delayed breaths. Observation of the patient demonstrated an obvious increase in patient comfort and decrease in respiratory effort. Discussion: The presence of auto-peep in patients with COPD confounds ventilator responsiveness leading to patient-ventilator asynchrony and an increased work of breathing. Despite the presence of auto-peep in this patient, we were able to maintain ventilator responsiveness and synchrony during NAVA mode allowing us to accomplish our stated goal. Resources 1. Epstein SK. Optimizing patient-ventilator synchrony. Semin Respir Crit Care Med. 2001;22(2):137-152 2. Branson RD, Johannignman JA. Innovations in mechanical ventilation. Resp Care. July 2009 Vol. 54 No 7 (933-947)

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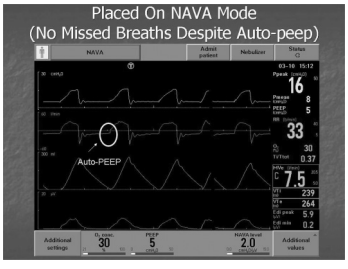

1731013

PULMONARY INTERSTITIAL GLYCOGENOSIS ASSOCIATED WITH RESPIRATORY INSUFFICIENCY.

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Introduction: We report a common presentation of a child with respiratory distress that represents an uncommon etiology that must be considered in the differential diagnosis of these patients. **Case Summary:** The child is an 8 month old female delivered full term by C-section due to failure to progress. She presented on the 4th day of life with tachypnea, nasal flaring, possible reflux and aspiration pneumonia. The child transferred to our facility at day 10 of life due to lack of improvement. She received intravenous antibiotics and heated high flow nasal cannula (2.5 LPM, F_IO_2–0.3). Chest x-ray (CXR) revealed bilateral hyperinflation with diffuse lung markings. An Echocardiogram showed pulmonary hypertension. Bronchoscopy with supraglottoplasty was performed with no improvement in symptoms. Swallow study was unremarkable. Respiratory viral panels and sweat chloride test were negative. Blood, urine and CSF cultures were also negative. Chest CT revealed a ground glass appearance consistent with chronic interstitial lung disease, and thoracopic lung biopsy was performed which confirmed the presence of pulmonary interstitial glycogenosis (PIG). Chromosome microassay revealed a deletion of 22q.11.2 (associated with DiGeorge Syndrome) and 15q.11.2 (associated with learning disabilities). She experienced respiratory failure, was intubated, and placed on mechanical ventilation via Servo-i in PRVC mode (rate–30, Vt– 24 ml, PEEP–8 cmH_2O, and F_IO_2–0.4). Three extubation attempts failed and a tracheostomy was performed. Pulse steroid therapy was initiated and she continues to be ventilated. **Discussion:** PIG is a rare form of infantile interstitial lung disease. Neonates generally appear normal in presentation and have a normal CXR at birth. They begin to experience respiratory distress within the first week of life. PIG is diagnosed histologically via the presence of particulate glycogen in the interstitium of the lung. This is thought to be the result of a maturation deficit within interstitial cells. PIG is generally considered to be a non-fatal disease process with a favorable prognosis; although outcome is dependent on the type of lung abnormalities associated with the disease. This case illustrates three important points. First, due to the rarity, diagnosing PIG is difficult. Second, severe pulmonary decompensation can accompany this disease process. Third, PIG should be considered in the differential diagnosis in a patient presenting with these symptoms.

Sponsored Research - None

1727797

UNILATERAL PULMONARY AGENESIS: A CASE REPORT.

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Introduction: Pulmonary agenesis is a rare congenital anomaly of unknown etiology with complete absence of the bronchus, pulmonary parenchyma, and blood vessels beyond the carina. We report a case of unilateral pulmonary agenesis in a 37-week term newborn. **Case Summary:** A male infant (wt. = 2410g) was born via spontaneous vaginal delivery. Pregnancy was complicated by intrauterine growth restriction and positive group beta streptococcus screen. Apgars were 7 and 8. He had tachypnea, retractions, and cyanosis and received oxygen (O_2) by face mask and then nasal CPAP. Chest radiograph (CXR) revealed normal right lung with complete collapse of the left. Chest CT noted left lung collapse and inability to identify the left mainstem bronchus. Stable on 3 LPM nasal cannula at .50 F_IO_2, he was transferred to our facility for evaluation. Admission respiratory rate (RR) was 48-80. Breath sounds were clear on the right but absent on the left. CXR revealed a well-aerated right lung with complete opacification of the left hemithorax, mediastinal shift to the left, and rib crowding on the left. Echocardiogram showed no pulmonary venous return or pulmonary artery on the left and a small ventricular septal defect. Chest CT confirmed pulmonary agenesis of the left lung. Cervical spine radiograph showed abnormal spinal fusion and thoracic rib anomalies. Head ultrasound, brain MRI, and chromosomal studies were normal. He weaned to room air, maintained a RR less than 60, and was discharged on hospital day 34. **Discussion:** During the 4th week of gestation the primitive lung forms from the foregut. Pulmonary agenesis occurs when the lung bud or a bronchial bud fails to develop. There is neither gender nor right or left side predominance. Clinical presentation and severity range from respiratory distress at birth to incidental diagnosis in asymptomatic children and adults. Recurrent respiratory tract infections are the most common complication. Diagnosis is confirmed with CT scan or MRI. Diaphragmatic, renal, extrapulmonary sequestration and cardiac defects are generally associated. Prognosis depends upon the severity of associated anomalies and health of the developed lung. Although unilateral pulmonary agenesis is a rare condition, it warrants consideration in all infants with CXR findings of persistent homogenous density in a hemithorax and ipsilateral shift of the heart and mediastinum.

Sponsored Research - None

1731543

ACTIVE-ASSISTED DEEP BREATHING - FROM INTENSIVE CARE TO HOME CARE - A NOVEL APPROACH IN RESPIRATORY CARE FOR PATIENTS WITH NEUROMUSCULAR DISORDERS.

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1.Introduction: Active-assisted deep breathing [AA-DB] is a new approach for lung volume recruitment in patients with neuromuscular disorders [NMD]. It is based on classic deep breathing [DB], widely recognized to improve tidal volume [Webber & Pryor 1993] and facilitate secretion removal [Menkes & Britt 1980]. This new approach uses positive pressure from a ventilator or BiPAP to assist the child's active effort to take a deep breath. This case report describes the use of AA-DB for a critically ill child whose condition precluded the use of the ATS 2004 recommended techniques of manually assisted cough [AC] and mechanical in-exsufflation [MI-E]. 2.Case summary: AB is a 15-year-old male with Centronuclear myopathy and repeated admissions for respiratory distress. Home nocturnal BiPAP and secretion clearance with percussion, vibration [P&V] and assisted coughing [AC] were started in 2000. Bag and mask breath-stacking was added in 2002 and changed to MI-E in 2005. His left lung has been collapsed since 2006. His PFTs were unrecordable. Past intubations were for elective surgery; a few hours in 2000, 2 days in 2011. In September 2012 he performed his home MI-E routine. Shortly after arriving at school he went into cardiorespiratory arrest requiring CPR. He was taken by ambulance to hospital. He required intubation and a chest tube for tension pneumothorax. After transfer to PICU, a CT scan done for continued instability revealed a grade 4 liver laceration and multiple pneumatoceles. MI-E was contraindicated because of his pneumothorax; AC was contraindicated because of his liver laceration. He was treated with suctioning and AA-DB on the ventilator for 2 weeks, plus 4 weeks on BiPAP [BiPAP-AA-DB]. This approach provided good secretion clearance and facilitated weaning from ventilator through to nocturnal BiPAP. He was discharged in mid-October with a BiPAP-AA-DB home program, target volume 350ml, plus P&V and AC as required, and no MI-E. In December he returned for a procedure. His target volume increased to 400ml. In January he returned with increased secretions. By following the original home BiPAP-AA-DB plan, secretions resolved within 2 days. His target volume increased to 500ml. 3.Discussion: This new approach helped this young man clear secretions both on the ventilator and BiPAP while the more recognized techniques were contraindicated. AA-DB has replaced MI-E in his home-care routine with a demonstrable improvement in his performance over time.

Sponsored Research - None

1732540

ANAPHYLACTOID SYNDROME OF PREGNANCY - USUALLY A CATASTROPHIC COMPLICATION FOR MOTHER AND INFANT.

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INTRODUCTION: First reported in 1921 by Meyer followed by the first recorded death and description in 1941 by Steiner and Lushbaugh, this exceedingly rare complication presented in our Labor and Delivery Unit. This syndrome has also been called Amniotic Fluid Embolus which can be misleading because occlusion is not as common as the severe vasoconstriction of the pulmonary vessels. There are many components in the amniotic fluid both in solution and suspension. The products in solution include surfactant, endothelin, leukotriene C4 and D4, IL1, TNFα, thromboxane A2, prostaglandins, and other products of anaphylaxis. The components in suspension, which may occlude the vessels, include lanugo hair, vernix caseosa, fetal squamous cells, finger/ toe nails and meconium. The former products may be responsible for the major effect of anaphylaxis and multi system involvement and the latter may be responsible for mechanical obstruction and cardiogenic shock. Maternal death usually occurs from cardiac arrest, coagulopathy and hemorrhage, or the complications of critical illness including ARDS. CASE SUMMARY: A 28 year old mother of three was delivering twins. After the delivery of the first twin the mother went into sudden and complete myocardial and pulmonary collapse. Cardiopulmonary resuscitation was started immediately but she responded poorly to our efforts. Within the first few minutes the patient was started on a balloon pump to assist in restoring circulatory function. The resuscitation effort for the mother continued for four hours. Hypothermia protocol was initiated and supportive care was provided including mechanical ventilation and hemodialysis. The patient immediately went into DIC and started hemorrhaging. DISCUSSION: Since the exact pathophysiology is still unknown a focused intense literature search lead to use of nitric oxide as a response to the anaphylactic reaction occurring in the pulmonary vessels. The primary function of the lung was supported with mechanical ventilation and the secondary function of the lung, meaning vascular tone and hemostasis, was supported by replacing the nitric oxide which in this state of crisis the pulmonary vessels could no longer provide. In this case, it is believed that the early use of nitric oxide, acting in a Xigris-like resetting of homeostasis, helped restore balance to the secondary function of the pulmonary vascular system. The patient was discharged to rehabilitation and both babies are in good health.

Sponsored Research - None

1733126

CASE REPORT: WHOLE LUNG LAVAGE IN A 52 YEAR OLD MALE WITH PULMONARY ALVEOLAR PROTEINOSIS.

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Pulmonary Alveolar Proteinosis (PAP) is a rare (approximately 0.37 per 100,000 population) but potentially treatable disease, evidenced by impaired surfactant metabolism that leads to accumulation in the alveoli of granular phospholipoproteinaceous material rich in surfactant protein and esosinophilic debris. In many cases, the cause of the PAP is unknown; the majority is usually due to autoimmune disease. This disorder is generally seen in men more than women, in ages 30-50. Patients present with abnormal chest films; PFT will show restrictive defect with abnormal diffusion, and decreased oxygenation. Definitive diagnosis requires lung biopsy. The slow progression of this disorder usually delays diagnosis by months or years. Mild cases of PAP can be treated conservatively with a systemic treatment of GM-CSF. More severe forms of this disease are treated with Whole Lung Lavage (WLL) usually in combination with systemic GM-CSF between episodes of lavage. Case Summary: The patient is a 52 year old diagnosed with PAP via open lung biopsy that came to us for WLL on 5 occasions to date (11/2010 thru 12/2011). The patient was initially intubated conventionally, then switched to a Robertshaw Right or Left Endobronchial tube, depending on which lung was to be lavaged. Placement of the double-lumen tube was confirmed/adjusted by use of video fiber-optic bronchoscopy (FOB). ETCO2 was used to monitor ventilation, and ventilator adjustment via the "dry" lung. Lavage was performed with 5-8 liters (total volume during procedure) of warmed saline, delivered by large bore irrigation tubing into the FOB adapter. The patient position was manipulated via Roto-rest bed, and percussive CPT was performed. Drainage of the lung was performed passively by gravity. The procedure repeated until the drainage obtained was clear. Volumes of the delivered and recovered fluid were recorded. The first occasion of the WLL elicited acute pulmonary edema of the opposite (dry) lung, but was resolved with administration of diuretic. The next session (3 months later) yielded better results and toleration of the procedure; it was noted that the patients recovery stay in the hospital was considerably shorter after each procedure (8 days decreased to 3 days); except for the initial treatment admission, the patient was able to be discharged without the use of supplemental oxygen, and improved exercise tolerance.

Sponsored Research - None

1732737

TRIAL OF A STANDARD GUIDELINE TO MANAGE VENTILATION MASK RELATED PRESSURE SORE.

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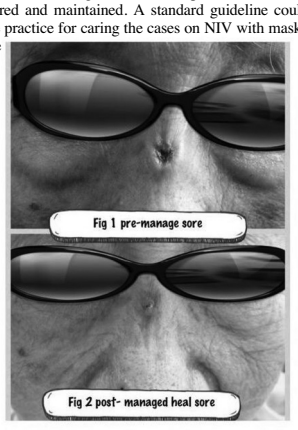
1. Introduction Patients with chronic respiratory failure may need long-term non-invasive ventilation (NIV) via a ventilation mask. The factors leading to failure of NIV included mask related skin lesion ranged from 10 to 20%. We report a trial of nursing standard guideline for skin care and lesion related to ventilation mask. There was no such guideline to our knowledge among public hospitals in Hong Kong. 2. Case Summary A 93 years old lady was referred to our nursing specialty service for management of mask related skin lesion. She had history of bronchiectasis and three times of hypercapnia in the past six months. She had started long-term NIV via nasal mask with good compliance since February 2013. The skin lesion developed in the middle of March 2013 but was reported to Respiratory consultant one month later during her regular medical follow up. On physical examination, the lady had a 5 x 6 mm stage 3 ulcer with little amount of yellowish discharge on the nasal dorsum (Fig. 1). The case was cared according to standard guideline. Patient's grand-daughter was reinforced and empowered to implement the care at home, included skin care, change & management of mask, proper application of artificial dressing, pain score assessment, wound care and QD dressing with normal saline and monitored with photo picture and phone follow-up. The skin lesion healed one week later (Fig. 2) 3. Discussion Skin problems related to ventilation mask are common complication, which could significantly lead to failure of NIV. Proper mask choice and fitting can ensure minimal air-leak and patient discomfort and thus optimize patient tolerance on NIV. The skin problems could be identified early and managed promptly with adequate healthcare support and, patient and carer education. The aim of the standard guideline was expected that the skin integrity related to the ventilation mask was restored and maintained. A standard guideline could guide nurses, enhance compliance and standardize practice for caring the cases on NIV with mask related skin problems.

Sponsored Research - None



1733136

EPISODIC HYPOTENSION ASSOCIATED WITH 1.0 FIO2 DELIVERY DURING SEPSIS AND ARDS.

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Introduction: There are multiple and complex pathophysiological processes underlying hemodynamic instability in sepsis, including the excessive production and pathological effects of nitric oxide. Here we present an unusually pronounced demonstration of a common central pathological aspect of vasomotor instability in sepsis: hyperoxia-induced, excessive nitric oxide production with consequent acute hypotension. Case Summary: We present the case of a 78-year-old male with subacute osteomyelitis complicated by sepsis and repeated episodes of acute severe hypotension associated with exposure to inhaled hyperoxia. The patient had a history of recent trauma complicated by vertebral osteomyelitis, and was admitted to the hospital for thoracic laminectomy and spinal decompression surgery as part of his osteomyelitis management. His spinal operation was notable for a severe hypotensive cardiac arrest at the end of the surgery and subsequent development of ARDS. His ICU course was notable for initial marked hemodynamic instability while on high FIO2 for treatment of ARDS. Oxygenation improved on a lung protective ventilation protocol, and hemodynamic instability also improved with cessation of his vasopressor drug requirement, although he continued to have laboratory evidence of an active inflammatory state. With the ARDS improving, the patient was repeatedly observed to have acute hypotensive events associated with delivery of 100% oxygen for tracheal suctioning and other patient care events. Each acute hypotensive event was also noted to correct back to his baseline blood pressure within 5 minutes of decreasing FIO2 back to baseline (< 0.60). As the osteomyelitis and inflammatory state improved, the acute hypotensive events associated with high FIO2 resolved. Discussion: This case demonstrates an unusual clinical circumstance of repeated pronounced episodes of hypotension after exposure to hyperoxia occurring in the setting of active sepsis. The mechanisms for these hypotensive episodes include the possible contribution of acute pathological overproduction of nitric oxide with acute vasomotor effects. We concluded that the best approach to avoiding the hypotension associated with high FIO2 was to limit the circumstances where the patient was exposed to oxygen concentrations greater than 50 percent.

Sponsored Research - None

1734007

RARE PRESENTATION OF A TRACHEAL ESOPHAGEAL FISTULA: A CASE REPORT.

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INTRODUCTION: Tracheal Esophageal Fistula (TEF) is an airway anomaly seen commonly in neonates and infants. There are five different commonly described subtypes of TEF. Esophageal Atresia (EA) can also be associated with the presence of a TEF. We report findings of an abnormal subtype of TEF with an associated EA. **CASE SUMMARY:** We describe a case of an 1840 gm. male born at 33 weeks gestation. Upon presentation the infant was cyanotic, apneic. requiring resuscitation in the delivery room, which included intubation and ventilatory support. Two aliquots of Curosurf were administered and mechanical ventilation initiated with PCV in PC mode PC of 10 cm H_2O (V_T 10 mL/kg), PEEP 5 cm H_2O, F_IO_2 0.30. and a T_I of 0.4 sec. Although airway management included frequent suctioning, thick airway secretions contributed to precipitous decompensation, an occluded endotracheal tube and the need to re-intubate. Inability to pass a nasogastic tube and a chest radiograph showing a gastric air bubble led to the suspicion of an EA with TEF. An esophogram only confirmed the diagnosis of EA, Figure 1. The TEF, discovered during surgical repair of the EA, was located at the apex of the chest near the base of the neck. A pouch of the proximal esophagus was positioned on top of the fistula, obscuring its view. After the fistula, EA and tear in the proximal esophagus were repaired, two chest tubes were placed, one for drainage and the other for a pneumothorax. Postoperatively, on two separate occasions, billious fluid found in the chest tube prompted re-evaluation, recognition of anastomotic leaks requiring surgical repair. Ventilatory assistance was required for 24 days and supplemental oxygen an additional 20 days. The patient was discharged home on day 54 of post-uterine life. **DISCUSSION:** This case reported an unusual representation of TEF in which medical management and the surgical course were unpredictable. Anastomotic leaks are an uncommon early complication of surgical repair, occurring in up to 17% of patients, which can reoccur and complicate the post-operative course. Early recognition of leaks and prompt surgical intervention can minimize the potential for recurrent TEF, aspiration and respiratory failure.

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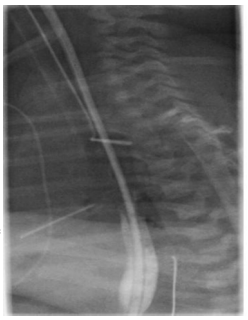

Figure 1. Esophogram showing the tip of teh nasogastric tube in the blind pouch of the esophagus.

1722829

TRACHEOPATHIA OSTEOCHONDROPLASTICA.

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Introduction: Tracheopathia osteochondroplastica (TO) is a rare tracheal disease consisting of gravel like nodules of bone and hyaline cartilage in the trachea. A small number of patients present with a persistent cough otherwise patients with TO are asymptomatic. Case Summary: A 91 year old Caucasian male with a chief complaint of persistent cough, shortness of breath and hemoptysis underwent bronchoscopy. Pertinent medical history includes a thirty-five pack year smoking history, arthritis, hypertension, COPD and diabetes. This 91 year-old male was extremely healthy and active. Cat scan of the chest revealed thickening of the tracheal wall and multiple nodules. Bronchoscopic examination revealed severe narrowing below the vocal cords secondary to multiple nodules of various sizes. Biopsy results revealed normal ciliated epithelial tissue with chondroblasts present in the hyaline cartilage and laminar bone containing osteoblasts forming the hardened nodules. Discussion: TO was first documented in 1857 as "ossific deposits on the larynx, trachea and bronchi" and since then approximately 300 cases have been reported. Symptoms associated with TO include a productive or non-productive cough, hemoptysis, dyspnea, dryness of the throat, wheezing and recurrent pulmonary infections. Stridor and rhonchi can occur with severe obstruction. A difficult intubation may lead to the discovery of TO. Fiberoptic bronchoscopy is considered the best method to diagnose TO due to the unique characteristics of the lesions (See figure below). Bronchoscopic tissue histology identifies the presence of cartilaginous and osseous nodules in the submucosa and confirms the diagnosis. TO mainly effects patients over the age of fifty and affects both genders equally. Prognosis depends on the severity of the nodules and recurrent pulmonary infections which can be life-threatening. There is no specific treatment unless significant airway narrowing occurs. In such cases laser therapy, nodule removal and tracheostomy have been employed to relieve the obstruction.

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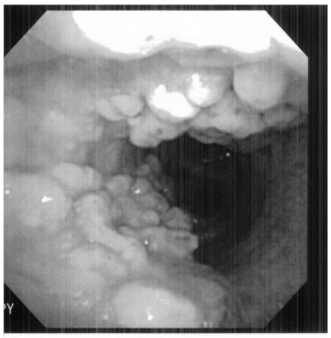

1734045

EARLY EXPERIENCE WITH A RESPIRATORY THERAPIST DRIVEN TRACHEOSTOMY TUBE MANAGEMENT PROTOCOL.

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Background: Tracheostomy tubes are used for prolonged mechanical ventilation and airway protection. As a patient's condition improves a standardized weaning process facilitates removal of tracheostomy tubes. This process is often directed by physicians or by a multidisciplinary care group (ie. trach team). In 2007, Harborview Medical Center implemented a respiratory therapist driven protocol to manage the process for tracheostomy tube decannulation. We performed a retrospective chart review to determine if our tracheostomy management protocol (TMP) was associated with a shorter time to decannulation. Methods: To assess the impact of the TMP we conducted a pre-TMP/ post-TMP electronic medical database query for patients who had tracheostomy documentation. 200 patients in the pre-TMP period and 200 in the post-TMP period were reviewed. Patients were excluded from analysis if they were not ordered for the TMP in the post-TMP period or were admitted with an existing tracheostomy tube. We recorded patient demographics, days to first cuff deflation attempt, days to successful cuff deflation, days to first trach tube change, and days from initial tracheostomy tube placement to decannulation. Data is represented as mean ± sd, independent samples t-test were used to determine differences. Results: A total of 242 patients (Pre= 110, Post=132) were analyzed. Ages ranged from 16-93, mean 52 ± 19.3, 72.7% were male. There were no significant differences in the following measures: days to first cuff deflation attempt (14.7 days vs. 13.1 days), days to successful cuff deflation (14.9 days vs. 15.8 days), days to first trach change (10.9 days vs. 10.8 days), and days from initial tracheostomy tube to decannulation (25.5 days vs. 26.5 days.) Conclusion: The respiratory therapist driven tracheostomy tube protocol was as effective as the multidisciplinary trach team approach in directing the tracheostomy tube weaning process. Further research is needed further explore the efficacy of a respiratory therapist driven trach management protocol in terms of outcomes and cost-savings.

Sponsored Research - None

1731876

AN IN VITRO EVALUATION OF ENDOTRACHEAL TUBE CUFF LEAK AND SUCTION PERFORMANCE USING A BIO-REALISTIC MODEL.

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Background Endotracheal tube (ETT) performance is commonly evaluated using PVC tube, which does not reflect realistic airway anatomy. We developed a bio-realistic model of an adult mouth, throat and trachea to study the performance of commercially available ETTs. Methods A biomechanical model was developed from anatomical data and rapid prototyped in a flexible material to match previously reported distention data. This model was intubated using different ETTs (KIMVENT Microcuff, TaperGuard, Sheridan HVT (SHVT), TaperGuard Evac and ISIS/HVT) and attached to a mechanical ventilator. Integrity of cuff seal was determined by return tidal volume (rVTE) and leak of simulant secretions at cuff pressures ranging 5 to 25 and PEEP from 0 to 15 cmH_2O. Suction efficiency by low flow continuous suction versus intermittent high flow was measured with the model in supine and lateral positions on a 30° elevation. Results Leakage: Leak in all ETTs decreased as PEEP increased. Only at cuff pressure = 5 and PEEP = 0, KIMVENT Microcuff and TaperGuard had lower leak ($p=0.028$ and $p = 0.026$ vs SHVT respectively). At the lowest cuff pressure to sustain 80% tidal volume with PEEP = 5 and 15, rVTE and simulant leak were significantly better in the Microcuff and TaperGuard ETTs. Suction: Low continuous suction was less efficient in aspirating secretions than higher intermittent suction for all ETT designs. The ISIS/HVT aspirated simulant more quickly at 15 and 20 mmHg continuous pressures ($p=0.05$, $p=0.002$) in the lateral position compared to the TaperGuard Evac. There was no significant difference between the ISIS/HVT and TaperGuard Evac's suction performance during intermittent suction; however, greater trachea occlusion from airway movement was noted with the ISIS/HVT. Conclusion Higher PEEP allows lower cuff pressure without compromising the cuff seal. The KIMVENT Microcuff and TaperGuard had a better seal only at the lowest tested cuff pressure. This model demonstrated no leak at cuff pressures of 10-15 cmH_2O, lower than current clinical cuff pressures. The ISIS/HVT was more effective in suctioning secretions; however, it is also more prone to occlusion. Using 15-20 mmHg continuous pressure with a patient in a lateral position appears best for aspirating airway secretions while reducing risk of membrane occlusion.

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1732412

ESOPAHAGEAL INTUBATION OF A PATIENT IN THE FIELD CORRECTED IN THE EMERGENCY ROOM WITH SUCCESSFUL OUTCOME.

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INTRODUCTION: Airway management is of critical importance in all Respiratory/ Cardiac arrests. It is all the more challenging to place an artificial airway (intubation) in the field (other than hospital setting) where there is limited resources. Proper placement of ET tube and verification of the ET tube placement makes a big difference between life and death. Without proper placement of the ET tube, all resucitation attempts would be futile. CASE SUMMARY: 69 yr old male witth unknown PMH was found at work in V-Fib arrest by co-workers. Patient was down for about 20 minutes. EMS placed an artificial airway at site; started CPR and patient was immediately transferred to our Medical Center, which is a Level I Trauma Center. In the ER, in the trauma room, as per our routine protocol, we rechecked the ET tube placement, while continuing high quality chest compressions. EMS had reported that it was a difficult intubation as patient was obese and was in cardiac arrest at the time of intubation. ET tube was found to be misplaced in the esophagus. With the help of a glyoscope and with help of highly trained ER team, patient was successfully re-intubated in the trachea; ET tube palcement was confirmed by bilateral breath sounds, EtCO2 and by chest radiograph shortly afterwards. With high quality CPR and ACLS algorithm, patient was succesfully resucitated to Normal Sinus Rhythm (NSR). Patient was transferred to ICU for further management and was placed on 'arctic sun'. After successful reintubation and ventilation, patient's ABGs were: 7.39/ 30/ 155 on 40% FIO2 with HCO3 at 18 and BE - 5.7. After 5 days, patient was weaned off the ventilator although patient suffered some hypoxic brain injury. DISCUSSION: The case study presents the pramount importance of checking the ET tube placement immediately after intubation by bilateral breath sounds, use of capnography; and rechecking the tube placement as soon as the patient arrives at the hospital, where there is availability of advanced techniques and more skilled personnels. And, never assume that the ET tube is always in the right place. While in the ER, the ABC of Airway management must be always followed without exceptions. Otherwise lives could be lost and all efforts of resucitation would be in vain.

Sponsored Research - None

Airway Management Protocols in the Field vs ED

Bilateral Breath sounds	ETCO2/ Capnography	SPO2
Present	Positive	> 90%
Reconfirmed in ED	Reconfirmed in ED	Reconfirmed for > 90% in ED

Verification of ET Tube placement - a must

1732532

REDUCING UNPLANNED EXTUBATIONS IN A QUATERNARY NEONATAL INTENSIVE CARE UNIT: IS IT AS EASY AS COMMUNICATING WITH EACH OTHER?

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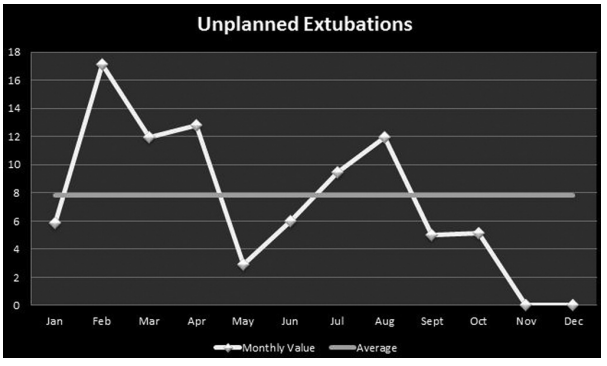
Background: Unplanned extubations (UEs) have been linked to increased risk for trauma, increased risk of VAP, and increased VLOS. At Children's Hospital Colorado (CHCO), we identified that our unplanned extubation rate was over 9 events per 1000 ventilator days averaged throughout 2011. Method: A multidisciplinary team was developed to identify mechanisms that contribute to the UEs in our unit. The team included participants from nursing, respiratory therapy, physicians, nurse practitioners, and unlicensed clinical assistants. In Q1, 2012 we worked to develop an efficient audit tool to help us identify the causes. We also engaged all clinical disciplines to help decrease the rates of UEs in the unit. At the end of Q2, we further refined the audit tool and implemented the daily use of the tool at every bedside in our unit. Results: What we learned was that the use of the audit tool in March and throughout third quarter reduced our UEs below half of our baseline level. In March, the use was not as widespread as we refined the tool yet our UEs decreased to less than 4 per 1000 ventilator days. This process was not continued through second quarter as we worked to further refine the tool. In third and fourth quarter, the tool was consistently used on every bedside. Without any further change, our UEs decreased to a quarterly average of less than 1.5 per 1000 ventilator days. Additionally, we experienced 102 days without an unplanned extubation. Conclusions: Simply using a formalized tool which increased communication has helped us to reduce our UEs by greater than 50%. The continued use of such a tool and multidisciplinary engagement may demonstrate sustained improvement. Additional follow-up and study is still warranted.

Sponsored Research - None



1732535

EVALUATION OF THE HAMILTON MEDICAL INTELLICUFF VERSUS MANUALLY SETTING ETT CUFF PRESSURES DURING SIMULATED MECHANICAL VENTILATION.

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Introduction: Endotracheal tube cuff pressure is increasingly recognized as an important factor in patient care, with both high and low pressures associated with potential complications. The ability to maintain cuff pressure at a target is critical for optimal ventilation and patient care. The practice of manually adjusting cuff pressures with a manometer on regular intervals is problematic. The IntelliCuff system, incorporated in the G5 ventilator (Hamilton Medical, Bonaduz, Switzerland), was developed as a potential solution, but there is limited literature evaluating its use and effectiveness. The goal of this study was to evaluate the IntelliCuff against the manual technique for maintaining desired cuff pressures during simulated mechanical ventilation. Methods: A standard 8.0 mm internal diameter endotracheal tube (ETT) (Mallinckrodt, Hazelwood, MO) with a trachea model and test lung (Michigan Instruments, Grand Rapids, MI) was used to simulate a patient mechanically ventilated with a G5 with IntelliCuff. During each 10-minute run, the ETT cuff was inflated manually or by the IntelliCuff prior to the initiation of ventilation. The cuff pressure was continuously logged with a transducer and data acquisition software (WinDaq, Akron, OH). Two cuff pressures (20, 30 cmH2O), two positive end-expiratory pressures (PEEP) (10, 20 cmH2O), and two peak inspiratory pressures (PP) (30, 40 cmH2O) were evaluated. Results: The average cuff pressure rose significantly above the initial set pressure for all scenarios once ventilation began (25.3±5.33 vs. 31.2±4.12 cmH2O, p<.01). The magnitude of the baseline pressure change was closely correlated with PEEP (correlation coefficient: r=.79, p<.01). When set manually, the baseline pressure remained elevated at the end of the run (start 25.2±5.2 vs. end 28.9±4.7 cmH2O, p=.01), but was not elevated with the IntelliCuff (25.4±5.8 vs. 24.8±5.7 cmH2O, p=.26). The cuff pressure increased from the baseline pressure with each inspiration, reaching maximum pressures that were correlated with the PP (r=.65 p<.01). Conclusions: PEEP and PP values significantly affect ETT cuff pressure during ventilation. When set manually, cuff pressure always exceeds the initial set pressure, while the IntelliCuff adjusts it back to the desired value. It is important for clinicians to recognize the discrepancies between set and actual values. The IntelliCuff might be a useful tool for mitigating this issue.

Sponsored Research - None

1733185

VALIDATION OF FEASIBILITY AND FUNCTIONALITY OF A VIDEO-LARYNGOSCOPE EQUIPPED WITH VENTILATION FEATURE.

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Background: Effective ventilation and oxygenation is critical for patients with apnea. However, to achieve this goal is challenging for anesthesia care providers and emergency medical personnel as difficult mask ventilation and difficult intubation frequently occur. The aim of this study was to determine if a video-laryngoscope equipped with a ventilation feature can establish effective ventilation prior to endotracheal intubation. Methods: The study was conducted on an intubation mannequin with its trachea connected to a model lung with compliance set at 50 (Normal model) and 20 ml/cm H2O (ARDS model) and airway resistance 5 cm H2O/L/s. Ventilation was established by mounting a "ventilation tube" (inner diameter: ID 7 mm, 50 cm length with the distal 5 cm ID 3.5 mm) at the tip of the blade of video-laryngoscope positioned proximal to the vocal cords. To evaluate gastric distension, the mannequin's esophagus was connected to a 20 cm H2O PEEP valve and balloon. Three different views of the vocal cords (Position 1: vocal codes fully visualized, Position 2: partial vocal cord visualization, and Position 3: only epiglottis visualized) were tested for ventilation. Three devices were used for ventilation, ICU ventilator (ICU vent), manual resuscitation bag (Bag), and Jet ventilator (JET). The ICU vent was operated in pressure control peak inspiratory pressure 70 cm H2O. The JET was operated at 14.5 psi. Bag ventilation was provided at 80 to 120 cm H2O. Effective ventilation was considered a tidal volume (VT) above anatomical dead space (>150 ml). Results: The JET generated the largest VT with the normal model (JET: 538±15 ml, ICU vent: 225±8 ml, Bag: 372±100 ml, respectively, $p < 0.001$) and ARDS model (JET: 197±7 ml, ICU vent: 83±7 ml, Bag: 169±58 ml, respectively, $p < 0.001$) in Position 1. Smaller VT was generated in position 2 than Position 1 with each ventilation method (JET: 367±173 ml vs. 87±64 ml, ICU vent: 154±72 ml vs. 15±16 ml, Bag: 271±131 ml vs. 21±23 ml, $p < 0.001$). In position 3, none of the ventilation methods could generate a VT (0 ml). Gastric distension was not observed in any position or ventilation device. Conclusions: The video-laryngoscope with a ventilation feature provides effective ventilation with each ventilation approach in the normal mechanics model provided the vocal cords can be visualized. JET and Bag achieved effective ventilation even with the ARDS model. Further clinical study is needed to validate the findings of this study.

Sponsored Research - None

1733228

THE ROLE OF ACOUSTIC REFLECTOMETRY IN EVALUATION OF ENDOTRACHEAL TUBE PATENCY: AN "IN-VITRO" COMPARISON OF ASSESSMENT TECHNIQUES USED TO EVALUATE AIRWAY RESISTANCE CAUSED BY ENDOTRACHEAL TUBE BIOFILM FORMATION.

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Background: Airways resistance (RAW) is a major impedance to ventilation. RAW values ≥15 cm H2O/L/sec in intubated patients is associated with significant increases in patient's flow resistive work of breathing (WOBR). Biofilm (BF) in endotracheal tubes (ETT) is one cause of increased RAW. Our objective was two-fold: to identify the incidence of increased WOBR and compare two available methods for quantitating RAW against an ultrasound device to determine airway patency (AP). Our bench model evaluated ETT obstructions using RAW and AP measurements to establish the airway assessment technique most useful in detecting clinically significant increased WOBR caused by BF within ETT. Methods: A bench model was created with an ASL-5000 test lung (Ingmar Medical) and a template for consistent ETT curvature. Bench model setup: f 29 b/m, muscle pressure (Pmus) fixed to produce a 350 mL VT with each control ETT. ETT control group: (3) ETT of each size 7.0, 7.5, 8.0 mm ID were evaluated to determine average RAW ±SD. Experimental group: extubated ETT were obtained from ICU patients. Measurements of VT, RAW (manual calculation CO2SMO, Novametrix), RAW (electronic calculation Drager E-4), and AP (SonarMed) were obtained within one hour of extubation. RAW calculations used flows: 30, 60, and 90 L/min. Results: Manual calculation of RAW showed statically significant increases in all used ETT, defined as > mean + 3* SD of control ETT. There was statically significant decreases in ETT diameter, defined as > mean + 3* SD of the next smaller size ETT. Electronic calculation of RAW had statically significant increases in RAW, but showed no decrease in ETT diameter. AP revealed 0% ETT obstructions in all tubes tested. VT measurements showed statistically significant decreases in inspired VT. Conclusion: Our data show statically significant increases in RAW in all used ETT. Clinically significant decreases in VT were not observed despite statistically significant VT decreases in all ETT assessed. The SonarMed did not identify any change in the AP of used verses control ETT possibly due to the accuracy of the device (±15%). Clinical Implications: RAW calculations may be the best early indicator of BF formation, but does not clinically correlate with objective liberation assessment parameters such as VT. Further investigation is required to determine if AP provides a better assessment tool to identify clinically significant VT decreases.

Sponsored Research - This presentation was supported by the Delaware INBRE program, with grants from the National Center for Research Resources-NCRR (5P20RR016472-12) and the National Institute of General Medical Sciences-NIGMS (8 P20 GM103446-12) from the National Institutes of Health.

Flow Rate (L/m)	RAW Increase (> mean + 3 X SD)	Diameter Decrease (> mean + 3 X SD) of 7.5 ETT
30 Manual	63%	25%
60 Manual	88%	63%
90 Manual	88%	50%
30 Electronic	80%	0%
60 Electronic	60%	0%
90 Electronic	60%	0%

Table 1: Demonstrates the difference in RAW assessed between manual and electronic measurements in 8.0 mm ID ETT at flow rates of 30, 60, & 90 L/min

1733254

MEASURED EXPIRATORY RESISTANCE OF THE BLUE AND GREEN ACAPELLA DEVICES AS SETTING IS INCREASED FROM 1–5; AMPLITUDE 20, 30, 40.

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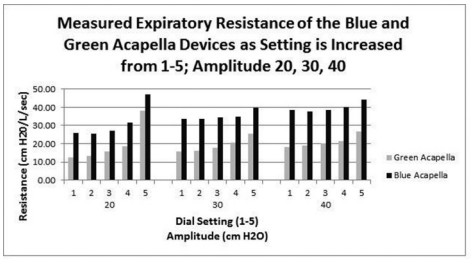
Background: After reviewing the literature on both high flow and low flow Acapella devices, it was determined that most researchers evaluated only three frequency dial settings. Due to this gap, we chose to determine the expiratory resistance at each frequency dial setting for both high flow and low flow Acapella devices, as patient effort (amplitude) is increased on an electronic lung simulator. Hypothesis: 1) As the frequency dial setting is increased on the Acapella, the expiratory resistance will increase, and 2) as the patient effort (amplitude) is increased, the expiratory resistance will increase. Methods: Each Acapella device was attached, separately, via a female-to-female adapter to the Hans Rudolph 1101 Electronic Lung Simulator. HR 1101 settings: Resistance 5 cm H2O/L/sec, Compliance 50 mL/cm H2O, Respiratory Rate 20/minute, Amplitude 10, 20, 30 and 40 cm H2O (to simulate patient effort), Percent Inhale 30 %, Targeted Volume 3000 mL, Load Effort Normal. Initially, amplitude was set at 10 cm H2O and the Acapella was set at the lowest setting. After allowing for stabilization, Peak Pressure and Peak Expiratory Flowrates were recorded for 20 consecutive breaths. The Acapella dial was then increased to the next setting; pressure and flowrates were recorded again as previously described. This process was continued until reaching the highest Acapella setting. Next, data was gathered at amplitudes of 20, 30 and 40 cm H2O, following the same procedure as stated for amplitude of 10 cm H2O. Resistance was calculated as (P1-P2)/Flow. P1 = averaged peak pressure for 20 breaths; P2 = 0 (ambient pressure); Flow = averaged Peak Expiratory Flowrate for 20 breaths. Results: The expiratory resistance increased as the frequency dial setting was increased and the expiratory resistance increased as amplitude increased. At an amplitude of 20 cm H2O, the expiratory resistance increased from 25.83 to 47.02 cm H2O/L/sec on the blue Acapella and from 12.56 to 38.24 cm H2O/L/sec on the green Acapella device as the frequency dial setting was increased from 1-5 (Figure 1). Conclusion: The expiratory resistance increased as the frequency dial setting increased from 1 to 5 on both Acapella devices. The expiratory resistance increased as the amplitude increased at 10, 20, 30 and 40 cm H2O, on both devices, confirming our hypothesis.

Sponsored Research - None



1733517

INITIAL EXPERIENCE WITH AN AIRWAY MANAGEMENT CATHETER TO CLEAR PARTIAL ENDOTRACHEAL TUBE OBSTRUCTIONS.

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BACKGROUND: Even with active humidification, occlusion of the endotracheal tube (ETT) can occur. New airway management catheters claim to remove occlusions, restoring patency. Bronchoscopy and re-intubation are options for ETT occlusion which introduce risk and cost. We wanted to examine and report our experience on the effectiveness of an airway management catheter after one year of use. METHODS: We initiated the use of the CAM Rescue Cath, Omneotech, Tavernier FL (RC) in April 2012 as part of a new product evaluation. It was used when partial ETT occlusion was suspected. Signs of a partial occlusion included: high airway resistance, difficulty passing suction catheter, flattened flow graphics. RESULTS: Thirteen patients had the RC used on them for suspected partial ETT occlusion, out of about 3200 ventilated adults at our hospital between April 2012 and April 2013. All patients having the RC used were on heated humidification and 92% of them had significant secretions documented with suctioning. 62% of the patients were detected by difficulty passing a standard suction catheter. 62% of the patients also had flattened flow graphics. Three patients (23%) had no secretions yielded during the RC use. Ten patients (77%) had large amounts of thick secretions removed from the ETT with RC use. Seven (54%) of the patients were on PSV at the time of RC use. Average ventilation values before and after the RC use for PSV patients were as follows: PSV level before 15.4 cmH20, after 13.4 cmH20. Spontaneous Rate before 23.4, after 18.4. Spontaneous Vt before 508 ml, after 670 ml. Five patients failed an SBT before RC use due to respiratory rate and increased work of breathing. All 5 that had failed an SBT, passed the next SBT less than 24 hours later. Two of those patients were extubated, 3 continued ventilation for mental status issues. CONCLUSIONS: 1) Partial ETT occlusion appears to be an infrequent occurrence, but other cases may be undetected. 2) Failure to pass the suction catheter and abnormal flow graphics were the most common signs that RC was needed. 3) The majority (77%) of patients had large amounts of secretions removed from the ETT with RC use. 4) Ventilation parameters improved for patients on PSV, as well as performance of SBT's which may enable extubation in patients that would appear to be failing the SBT prior to RC use. The Rescue Cath appears to be a beneficial airway adjunct for appropriate patients.

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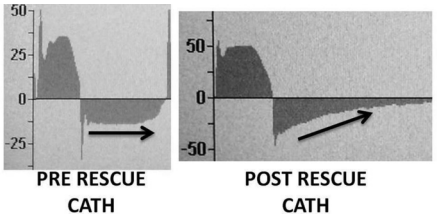

Pre and Post Rescue Cath: Flow graphics changes after ETT patency is restored.

1733763

IN-VITRO EVALUATION OF TWO DIFFERENT NEONATAL ENDOTRACHEAL TUBE SECURING DEVICES ON IMPOSED WORK OF BREATHING.

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Background: Spontaneous breathing trials are becoming a standard of care across all age groups, including premature neonates. Imposed work of breathing (WOBI) can cause iatrogenic liberation failure. Equipment manufacturers do not report the impact of their securing devices on WOBI. Purpose: To evaulate the impact of two neonatal endotracheal tube (ETT) securing devices on WOBI using a bench model to simulate a spontaneously breathing neonate. Methods: A bench model was created with an ASL-5000 test lung (Ingmar Medical). Bench model setup: f 25b/m, muscle pressure 5 cm H2O, compliance 3.3 mL/cm H2O, airway resistance 14.5 cm H2O/L/sec. We evaluated three of each size ETT, 2.5 mm and 3.0 mm ID (Mallinkrodt). We secured each ETT into a rubber stoper to create a leak free seal at the test lung interface. Consistent ETT curvature was maintained when testing each ETT. The control condition utilized no securing device. We evaluated two neonatal ETT holders, (Neo-fit, and NeoBar) to determine if the devices caused an increase in WOBI, relative to controls. Three different securing devices from each manufacturer were used in the treatment group. Adhesive tape was used to secure each ETT to the NeoBar. The Neo-fit incorporates a "metal and Velcro" retaining strap. For consistency, the same technique and clinician secured each tube. VT was measured using a differential pressure transducer (CO2SMO) postioned at the proximal end of each ETT. Results: The average VT for control ETT were 8.3 (±0.03) mL for the 2.5 ETT and 9.4 (±0.02) mL for the 3.0 ETT. Average VT with NeoBar was 8.1 (±0.01) mL for the 2.5 ETT and 9.2 (±0.02) mL for the 3.0 ETT. Average VT when ETT were secured via Neo-fit was 8.0 (±0.02) mL for the 2.5 ETT and 9.2 (±0.02) mL for the 3.0 ETT. Conclusion: Compared to control ETT, both the NeoBar and Neo-fit devices caused a statistically significant decrease in VT for both the 2.5 and 3.0 ETT, $p < 0.01$. When comparing the NeoBar to the Neo-fit, the Neo-fit produced a statistically significant decrease in VT with the 2.5 ETT, $P < 0.01$, but did not impact VT with the 3.0 ETT, $p > 0.05$. Clinical Implications: Despite statistically significant decreases in VT when using either securing device, our results demonstrate no clinically significant difference between control VT, and securing device VT regardless of ETT size. We suggset that manufacturers of ETT securing devices consider reporting the impact of their device on WOBI in product literature.

Sponsored Research - None

1733982

THE EFFECT OF IMPOSED WORK OF BREATHING ON SPONTANEOUS BREATHING TRIAL RESULTS AND BEDSIDE DECISION MAKING IN AN IN-VITRO ADULT MODEL OF SPONTANEOUS BREATHING.

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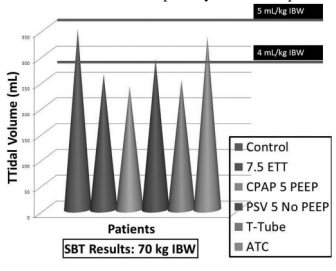
Abstract body: Background: Evidence based literature (EBL) suggests that there are multiple acceptable techniques that can be used for performing spontaneous breathing trials (SBT) in intubated mechanically ventilated patients to assess preparedness for liberation. The purpose of this study was to evaluate four strategies for assessing SBT in a lung model configured to breathe with borderline acceptable SBT parameters and their impact on imposed work of breathing (WOBI) and bedside decision making with regard to liberation. Methods: We configured an ASL-5000 test lung (Ingmar Medical) to mimic a 70 kg adult male with borderline acceptable SBT parameters as evaluated using our institutions SBT protocol. Configuration: f 29 b/m., muscle pressure 14.85 cm H20 to produce a VT average of 350 mL, compliance 40 mL/cm H2O when ventilating with no ETT. Our protocol considers a VT of 4 mL/kg PBW as the minimum acceptable VT for passing an SBT. Our model was set to breath at 5 mL/kg PBW. We assessed the effect of four common bedside interventions on our model to determine if the WOBI from these interventions would drop the VT below the protocol minimum, thereby creating a failed SBT decision. The interventions were: intubation with a 7.5 mm ID ETT, CPAP 5 cm H2O, PSV 5 cm H2O with no PEEP, T-tube, and ATC set at 100% support. Results: Two of the four interventions caused the VT to drop below 4 mL/kg and would have changed the bedside decsion from a successful to an unsuccessful SBT. These interventions included: CPAP 5 cm H2O, and unsuported T-tube breathing. If either PSV with 5 cm H2O PEEP or ATC set at 100% support had been used for the SBT, the bedside decision would not be affected and the decision to liberate would be retained. Conclusion: EBL indicates that the four ventilation approaches we evaluated for conducting an SBT should produce comparable decsion outcomes. Our model suggests that there may be a subset of patients in whom the SBT technique may alter WOBI and thus, clinical decision making. Clinical Implications: Based upon our results, the approach employed for conducting an SBT may change bedside decision making in patient populations who have limited ability to increase their muscular effort to breathe when faced with WOBI from respiratory care techniques and equipment.

Sponsored Research - None



1734076

MINIMIZING ENDOTRACHEAL TUBE CUFF LEAK.

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Background Aspiration of subglottic secretions has been reported as a significant contributor to the development of VAP. Published reports illustrate how folds develop in the ET tube cuff when it is inflated in a confined space (the human trachea). It is presumed that these folds would allow for the passage/aspiration of subglottic secretions. The cuff's sealing power was reportedly improved when coated with a water-souble, sterile lubricant. The bench test in that paper was only conducted for one hour and in a non-humidified environment. Patients are rarely intubated for less than one hour so this study was undertaken to evaluate the sealing potential of a lubricated cuff over a longer period and in a humidified environment. Method To confirm that folds do develop, a Coviden Low Contour tube was placed inside a 10-inch length of clear, plastic tubing (ID 18mm). A manometer was used to inflate the cuff to 25 cmH20. Three ml of red food coloring was introduced over the top of the cuff and within 3 seconds, the liquid found its way down the folds and onto the counter surface. The process was repeated after applying approximately 3 ml of a sterile, water soluble lubricant to the outside of the cuff. The endotracheal tube and the plastic tubing were placed in a 3L container. A humid environment was created using a Fisher-Paykel 850 humidifier set to the "invasive" mode, (approximately 37 degrees, 96% RH). Large bore tubing and a Philips/Respironics BiPAP Auto set at + 5 cmH2O, delivered the humidity to the container. Movement of the red liquid past the cuff was documented with daily photographs. Results Red liquid did not pass the tubes cuff until day 9. Conclusions The application of water soluble lubricant completely stopped the flow of red liquid past the cuff. A "zero" leak rate was also reported in endotracheal tubes costing $45-60. The type used here cost < $2 but sealed as well with minor modification. Additional studies are needed to confirm the benefits of this strategy in patients.

Sponsored research-none
Sponsored Research - None

1624031

OBJECTS IN GLIDESCOPE® ARE CLOSER THAN THEY APPREAR.

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Background: Endotracheal intubation is not without complications, among the most serious of these being misplacement of the endotracheal tube (ETT). A number of devices, including GlideScope® Video Laryngoscope (GVL) is used to aid in intubation. Current evidence indicates a potential loss of depth perception associated with GVL. With conventional direct laryngoscopy (DL), the hands, devise, and targets are all in a "real-world" line of sight, and simple hand-to-eye coordination is required. With GLV the intubator often perceives the spatial position of the visualization to be closer or further because of virtual/real overlay. The goal of this study was to compare initial endotracheal tube placement via chest x-ray of GVL to DL in normal and difficult adult airways. Method: This was a retrospective case series of 113 critically ill adult patients requiring intubation either with DL or GVL. A standardized chart review was performed along with final radiology attending readings of post-intubation chest x-ray to assess initial ETT placement. The optimal placement was established as 2-4 cm above the carina. The comparison between the groups was made with the Fisher Exact Test for continuous and categorical variables, respectively. Statistical significance was established at $p < 0.05$. Results: Of the 113 patients (n=90) were intubated via direct laryngoscopy and (n=23) were intubated via GVL. There was no statistical difference in cm above the carina (p=.77). The average ETT depth for DL was 2.8 cm above the carina, compared to 2.1 cm for GVL. There was, however, a statistical difference in endobronchial intubations (p=.04) with 2 occurrences from DL and 5 from GVL. Conclusion: Adequate initial endotracheal tube placement was established by both DL and GVL. There was a slight difference in initial ETT placement but it was not considered statistically significant. There was a higher incidence in endobronchial intubations with the GVL. It is unknown whether this can be attributed to a loss of depth perception by the healthcare provider. Further research is needed. Sponsored Research – None

Sponsored Research - None

1715809

EVALUATION OF RESPIRATORY OUTCOMES IN PRETERM INFANTS RECEIVING NASAL CONTINUOUS POSITIVE AIRWAY PRESSURE (NCPAP) VERSUS SURFACTANT AND MECHANICAL VENTILATION DURING TRANSPORT.

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Background: The initial respiratory treatment for premature infants is trending toward nCPAP but this therapy sometimes fails requiring surfactant plus mechanical ventilation. The aim of this study was to identify variables such as time between birth and transport arrival, a specific gestational age group, early surfactant administration, referral interventions, or the use of nCPAP, to predict the level of respiratory support required at 72 hours after admission to the NICU. Methods: This was a retrospective review during the period 2006 to 2011. Data was collected regarding respiratory interventions provided by referral hospitals, the neonatal transport team, and the Neonatal Intensive Care Unit (NICU) for premature newborn infants less than 33-weeks gestational age (GA) transported less than 24 hours after birth to a Level III-C NICU. A unique variable of time between birth and transport arrival was added to the multivariate regression model. Multiple logistic regression was utilized to evaluate the primary outcome of level of respiratory support at 72 hours after admission. The same analysis model was used to evaluate presence of bronchopulmonary dysplasia (BPD). Results: The multiple logistic regression analysis demonstrated that higher level of respiratory support at admission, gestational age, and birth year were significant predictors for higher level of respiratory support at 72 hours. The secondary analysis revealed that birth year and gestational age are significant predictors for the presence of BPD at 36 weeks post-menstrual age (PMA). Conclusions: This study confirmed that gestational age, birth year, and high levels of respiratory support such as positive pressure ventilation in the first hours of life are strong predictors for higher levels of respiratory support at 72 hours. Time to transport arrival was not a factor. The transport team trended toward utilizing nCPAP more often over the period 2006 – 2011.

Sponsored Research - None

1709216

A NOVEL DELIVERY METHOD FOR MEDICATION IN A PEDIATRIC PATIENT WITH RESPIRATORY DISTRESS FROM PULMONARY ALVEOLAR PROTEINOSIS (PAP).

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Background: Autoimmune PAP is associated with increased autoantibodies that degrade the body's ability to use granulocyte-macrophage colony-stimulating factor (GM-CSF) which normally rids the body of excessive surfactant. This excessive surfactant within the alveoli interferes with gas exchange and leads patients into Respiratory Distress. Leukine, also known as GM-CSF, functions to stimulate this response. Following a failed Stem Cell Transplant, our 9-year-old patient became a challenge during his GM-CSF treatments due to his increased flow demands and his lack of tolerance at being removed from positive pressure. A novel delivery method for GM-CSF was needed to meet these demands. Case Summary: The patient was maintained on a BiPAP with AVAPS settings of RR 20, TV 300, 0.8 iTime, PEEP +16, 70%FiO2, Max PIP 30, Min PIP 13. During a discussion with the medical team, concerns arose with loss of medication from the expiratory port during delivery via BiPAP. Our first attempt at this therapy with conventional nebulizers inline with a flow inflating bag to maintain PEEP resulted in failure. It was observed that the patient's inspiratory flow demands exceeded 15 liters per minute causing complete deflation of the resuscitation bag with each breath. He complained of not being able to breathe. Vital signs became unstable, and treatments were stopped before the medication was finished. A vibrating mesh nebulizer was affixed to the tee portion of a filtered nebulizer. Flow was controlled for the patient with a high-flow flow meter, set at 30 liters per minute, attached behind the vibrating mesh nebulizer. A PEEP valve was used to help maintain positive pressure while a resuscitation mask was used on the patient end of the device to maintain a closed system. Discussion: With this novel delivery method our objectives were met. The patient's flow and pressure demands were supported with minimal loss of medication during delivery. He was able to receive his GM-CSF without increased respiratory distress using these adaptations to the vibrating mesh nebulizer.

Sponsored Research - None

	BiPAP	Flow inflating bag	Sargramostim neb setup
HR	94	90	127**
RR	23	40	25
SpO2	100	99	100
FiO2	70	70	70
Patient Tolerance	* No complaints of air hunger. * Mild subcostal retractions noted	* Complaints of air hunger and not being able to breathe. * Retractions, RR and WOB increased.	* No complaints of air hunger. * Mild subcostal retractions noted. ** Other factors led to a higher HR with this treatment.

1713014

ACHIEVING EFFECTIVE MASK FIT IN PEDIATRIC PATIENTS.

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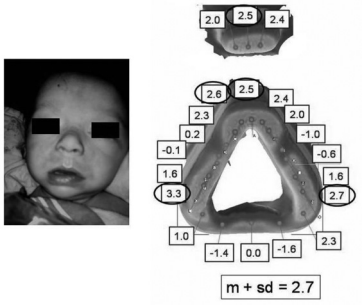
Background: Pediatric patients are at risk for pressure ulcers (PUs) due to immature skin, compromised perfusion, fluid retention, moisture, and medical devices. The mechanical stress of applied pressure results in cycles of ischemia-reperfusion, but damage occurs after a single cycle with only two hours of ischemia. Over 60% of injuries, e.g., erythema and PUs (stages I, II, III, deep tissue injury), are due to medical devices including NIV masks. Importantly, proper face mask fit is difficult in this fragile population. Poor fit creates localized areas of pressure and leaks at the patient facemask interface. Leaks often result in complications with NIV delivery equipment or impact intended pressure being delivered to the patient. Clinicians may further tighten the mask to achieve a seal. Fewer interface options are available to rotate interfaces and offset pressure, e.g., bridge of the nose. We evaluated mask fit and the effect on early skin tissue damage in pediatric patients. Method: The IRB approved the research. Parents provided written informed consent (n = 8). Three dimensional face scans and a variety of NIV masks were obtained using the portable Artec 3D scanner. Color images were taken and visual skin damage assessed. Face and mask scans were aligned using the 3dMD Vultus software and distances measured along the contact surface. Positive values indicate distance into the face while negative numbers indicate non contact. The standard deviation (sd) represents "goodness of fit". Values greater than the mean + 1sd are regions pf greatest pressure. Results: Six masks were fitted to the patient scans. Significant fit differences were found for two commonly used masks ($p < 0.05$). Mask 1 and Mask 2 differed for distance from left cheek (4.3 vs. 11.5mm), distance from right cheek (4.6 vs. 11.7), sd (2.7 vs. 5.5) and m+1sd (2.6 vs. 9.3). The proportion of the contact area above m+1sd ranged from 4-25%. The figure shows a subject who developed skin erythema where predicted by this analysis. Conclusion: This method of fitting is currently being utilized by clinicians to select masks from available options, to identify the potential areas of increased tissue pressure and to prevent skin injury and their complication. Improvement of mask fit is an important priority for improving respiratory outcomes.

Sponsored Research - Some funding for this project from Medline



1729006

EVALUATION OF IMPLEMENTATION OF STANDARDIZED RT SKIN MANAGEMENT DURING NON-INVASIVE VENTILATION IN A CHILDREN'S HOSPITAL.

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Introduction: With an increase in the amount of pediatric patients utilizing non-invasive ventilation (NIV), preventing and treating device related pressure ulcers (PU's) remains high on organizational patient safety goals to prevent serious harm. This effort often requires a multidisciplinary patient care approach to include trained staff with knowledge of highly technical equipment, ability to select appropriate NIV interfaces, and understanding of complexities of the skin. The RT Department at CCHMC supported a team of five bedside RT's to be a part of a RCIC (Rapid Cycle Improvement Collaborative) team. The main objective of this project was to standardize the care of pediatric patients across multiple patient care units and prevent pediatric pressure ulcers from NIV devices. Secondary goals included getting RT's more involved in skin assessment and early detection of PU's. The initial SMART Goal developed by the team was to increase the percent of RT Compliance with the new NIV Care standards in the Pediatric Intensive Care Unit (PICU), from 0-50% by September 2012. Methods: An RT care standard was developed and implemented for all patients on NIV in PICU to begin the initial test of change. The care standard included guidelines for interface rotation, daily interface cleaning, patient skin care, when to apply a barrier. A form documenting frequency and compliance with the standards was placed at each patient bedside. Compliance with the bundle was monitored weekly by the RCIC team and data was placed into a run chart in excel to document progress. A total of eight new interventions were introduced over the time frame of July 2012 to February 2013. Implementation of each of the interventions required focused team work to identify problems, identify and analyze process failures, and brainstorm root causes to overcome barriers to success. Results: See run chart below for compliance information with care standards. Conclusion: The team achieved the initial smart goal of reaching 50% compliance with NIV care standards in PICU by September 2012, and have been successfully been able to spread care standards to CICU. Next steps for the project include correlating care standard compliance with number of PU's and getting the care standards placed into Respiratory Care flow sheet in the electronic medical record. This will serve as an additional intervention with ability to prompt RT's to follow care standards during the documentation process.

Sponsored Research - None

1723417

RESPIRATORY MECHANICS WITH A RAM CANNULA IN A SPONTANEOUSLY BREATHING LUNG MODEL.

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Introduction: When the RAM cannula (RAM) entered into the clinical setting the utilization methods began to vary. The aim of this study is to define some of the devices limitation, and determine best practice. Method: Each sized RAM was connected to a calibrated/device checked Dragger Evita, but not affixed to the lung interface. This was done to determine maximum unimpeded flows through the RAM at the varied CPAP pressures. The 3 RAM sizes had interfaces specific to each, so that the cannula prong would occluded 72-80% of the interface port holes. Each sized RAM was then affixed to the breathing lung model using their interface with and without Cannulaide. The breathing lung model was set to appropriate tidal volumes and inspiratory times in accordance of each sized RAM. The RAM ventilator was started at 4 cm CPAP, and then adjusted upward 1 cm at a time until reaching 14 cm CPAP after the RAM had been affixed to the lung model with and without Cannulaide. Flows through the RAM, and the pressure within the lung model were recorded (see tables 1, 2, 3). Results: The flows achieved through the unimpeded RAM were high considering low driving pressures. The various cannula flows when affixed to the breathing lung interface demonstrated little differences in flow when compared with the unimpeded, although the Newborn and Infant cannula flows seemed dampened at the larger CPAP pressures. Without Cannulaide, minimal CPAP was observed within the lung model (< 3 cm). When Cannulaide was applied, measured CPAP was nearly equal to what was set on the ventilator in static state. The measured flows were significantly decreased in both static and activated breathing. When the breathing lung model was active, significant pressure changes were observed within the lung when the Cannulaide was applied. Conclusion: We found that the RAM is able to administer quiet high flows at low driving pressures. The Ram cannula is only able to delivers minimal CPAP when used alone. When Cannulaide is applied, set CPAP's can be achieved, but increased work of breathing is demonstrated by the positive and negative defection in pressure from the base CPAP during active breaths.

Sponsored Research - None

1723890

IMPLEMENTATION OF BEST PRACTICE STRATEGIES TO DECREASE UNPLANNED EXTUBATIONS IN THE NEONATE.

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Background: Unplanned extubations (UEX) are a serious and potentially life-threatening event for a neonate. UEX leads to emergent, less-controlled endotracheal re-intubations.Repeated intubations increase the risk of ventilator associated pneumonia, tracheal injury, and may prolong length of stay. A number of factors increase the risk of UEX's. These include lack of adequate sedation; type of tube stabilization used, and lack of vigilance by staff. Method: A prospective cohort quality study was designed to consider the impact of modifying these factors and implementing a sequence of best practice strategies. Three leading factors were defined: stabilization of endotracheal tube (ETT), sedation for intubated patients, and personnel at the bedside. Strategies were developed to address these factors: 1) A six month trial of three different stabilization techniques; 2) Sedation guideline implemented, for patients who self extubated and required re-intubation within 48hrs (scheduled sedation, 1mcg/Kg Fentanyl Q4, 1 mcg/kg Fentanyl q2 hrs PRN); 3) Intubated patients required two personnel at the bedside during care or procedures. Patients requiring intubation from February 2010 to present were included in this 5 year quality study. A tracking tool was developed and data collected included: patient data were protocols followed, circumstances and personnel present for UEX and level of sedation. Results: Baseline data indicated an UEX rate of 4.5/100 ventilator days. Following the implementation of three standards of care practice changes we saw the following decrease in the UEX rate: 1) Standardized Taping to 2.4/100 ventilator days; 2) Standard sedation to 1.7/100 ventilator days; 3) Adequate personnel at the bedside to 0.4/100 ventilator days. Conclusion: UEX's continued to occur despite the implementation of standardized taping. It was determined that lack of sedation and the absence of adequate number of personnel at bedside during procedures and care time contributed to UEX's. After the implementation of sedation guidelines and standardizing personnel at the bedside during procedures, we experienced an additional decrease in the UEX's rate. Care time, procedures, and sedation are coordinated by nursing and respiratory therapy Qshift. We continue to evaluate and track UEX's as part of our ongoing quality initiatives.

Sponsored Research - None

1725984

THE EFFECT OF INCREASING NAVA LEVELS ON PEAK PRESSURES AND ELECTRICAL ACTIVITY OF THE DIAPHRAGM IN PREMATURE NEONATES.

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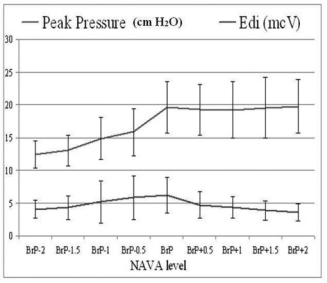
Background: Neurally adjusted ventilator assist (NAVA) uses electrical activity of the diaphragm (Edi) to provide patient-directed ventilatory support. The NAVA level determines the proportional amount of ventilatory support. Adult and animal studies suggest that subjects can control the delivered pressure through neural feedback despite changes in NAVA level. Systematically increasing NAVA level initially increases peak pressure (PP) while maintaining a constant Edi until a breakpoint (BrP) is reached and the lung is adequately unloaded. Further increases in NAVA level reduce the Edi, while the PP plateaus. The BrP has never been studied in neonates, so the research question is: do premature neonates have comparable intact neural feedback systems allowing them to have a BrP? We hypothesized that the BrP is not present in neonates on NAVA. **Methods:** IRB approval and parental consent were obtained. NAVA level was increased by 0.5 mcV/cm H_2O every 3 minutes from 0.5 to 4.0 mcV/cm H_2O. PP, Edi, mean blood pressure, heart rate, respiratory rate, oxygen saturation and F_IO_2 were recorded. Statistics: For PP, non-linear regression with constraints placed so that the slope of the first phase ascent could not be greater than the slope of the second phase plateau. The BrP was determined by the intersection of the 2 lines. The data from the trials were combined by averaging the BrP and change in NAVA level above and below the BrP. Linear regression was done to determine differences in the other variables. **Results:** 60 studies were performed. PP increased until the BrP was reached and then remained unchanged. Edi decreased after the BrP was reached (Fig 1). All other variables remained unchanged. **Conclusions:** The hypothesis was rejected. Neonates demonstrated a BrP. This suggests that neonates have intact neural feedback mechanisms that may protect lungs from over distention with NAVA ventilation.

Sponsored Research - None



1725854

COMPARISON OF COMPLICATIONS BETWEEN CUFFED AND UNCUFFED ENDOTRACHEAL TUBES IN THE CARDIAC NEONATAL POPULATION LESS THAN 5KG.

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Background: In 2010, the use of the Kimberly Clark Microcuff began being used in some of the patients requiring heart surgery in the Sibley Heart Center CICU. A literature search resulted in limited information on the use of cuffed endotracheal in the pediatric population and no studies specifically looked at the Microcuff endotracheal tubes for clinical use in neonates. Therefore, a retrospective review was done to evaluate the complications associated with the use of the Microcuff endotracheal tube in neonatal cardiac surgical patients. Methods: A chart review was conducted on neonates between 2-5kg who had heart surgery and returned to the CICU post-operatively between January 1, 2011 and August 31, 2011. The use of the Microcuff varied due to physician discretion; therefore comparisons were made between a convenience sample of patients with cuffed and uncuffed endotracheal tubes. Complications were defined as need for re-intubation, use of systemic steroids post extubation, use of racemic epinephrine and Heliox. All analyses were conducted using SAS 9.2 (Cary, NC). Because some patients had multiple intubations within a hospitalization, repeated measures generalized linear models were used to assess the relationship between type of intubation tube and several clinical outcomes. Results: The data consisted of 252 intubations from 181 patients. The median (range) number of intubations per patient was 1.0 (1 - 6) and the median duration of intubation for each patient was 2 days (0 – 38 days). Ninety-four (37%) of the intubations were performed using a Microcuff tube. Twenty-two percent of the patients with Microcuff tube required reintubation for respiratory complications as compared to 16% with the uncuffed. Please refer to the Table1. Overall, patients with cuffed airways had more complications than patients with un-cuffed airways; however this difference was not statistically significant ($p = 0.287$). Due to the very small number of observed complications, individual rates were not compared between groups. No significant differences between any of the clinical outcomes were found between intubation groups. Conclusion: Compared to uncuffed airways, patients with cuffed airways had higher rates of complications and durations of intubation; but this difference was not statistically significant. These findings suggest more research is needed regarding the complication rate of the Microcuff in the neonatal patient population.

Sponsored Research - None

1726572

STANDARDIZING A METHOD FOR SAFELY AND EFFECTIVELY PREDICTING SUCCESSFUL EXTUBATION IN NEONATES.

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BACKGROUND: Extubating neonates before they are ready results in re-intubations which causes additional trauma to the airway. Studies have also shown that having to re-intubate will actually prolong mechanical ventilation. Therefore, the NICU Respiratory Care Work developed an "Extubation Readiness Protocol". The goal of this protocol is to consistently use specific criteria as indicators for successful extubation (defined as remaining extubated for 72 hours). The protocol designers conducted an interdisciplinary poll (MD's, RRT's, RN, NP's) to determine criteria that caregivers most commonly evaluated prior to extubation. Five final criteria were selected. The primary criteria are the Minimal Ventilator Settings (MVS): Respiratory Rate 10-15, Positive Airway Pressure - 20, Vt of 4-6 ml/kg if in volume ventilation, FiO2 - 40% or less, PEEP - 6 or less and PS of 3-6 (duration of at least 4 hours). Four additional criteria are reviewed once MVS is achieved (ABG, Vital Signs, Physical Assessment, Sedation). METHOD: Respiratory Therapy screens every intubated neonate twice a day to identify the ones that meet the MVS criteria. The remaining criteria are evaluated during patient rounds. A tool was designed for the Respiratory Care and nursing staff to fill out upon extubation. The data collected is compiled monthly. RESULTS: After six months of data collection we reviewed 116 extubations that met the MVS criteria. Successful Extubations - 100, Unsuccessful Extubations - 16, Total - 116 Positive Predictive Value = 100/116 = 86% CONCLUSION: If the neonate meets the MVS criteria, he/she has an 86% chance of remaining successfully extubated. We are now evaluating adding a Spontaneous Breathing Trial as part of the Extubation Readiness Protocol.

Sponsored Research - None

1726638

THE IMPACT OF AN RT DEVELOPING SKILLS TO PERFORM QUANTITATIVE ANALYSIS OF VENTILATION IN A PEDIATRIC LONG TERM TRANSITIONAL CARE UNIT.

Carolyn McHendry, Dan Benscoter, Justin Brockbank, Thomas Cahill, Cynthia White; Cincinnati Children's Hospital, Cincinnati, OH

Background: Preliminary data from a recent cohort study at our institution showed that chronically ventilated patients may benefit from using a consistent quantitative approach to ventilator management compared to standard changes based on point in time measurements. Patient parameters can be continuously measured via a CO2/flow sensor (NM3, Phillips Respironics, Carlsbad, CA) placed at the patient's airway. The information is downloaded into an excel spreadsheet and graphed to show what percentage of time the patient spent in the target range for each ventilator parameter. Targets are pre determined by the patient care team based on baseline data for each patient with focus on ETCO2, VTe/kg, PIP, and leak percent. We hypothesized that training a Respiratory Therapist (RT) to develop skills to performing quantitative analysis may be value added for patient care and may allow RT's more input into optimal ventilation strategies with faster turn-around time. Method: To test our hypothesis, an RT was trained to perform quantitative analysis in our 18 bed transitional care unit (TCC). A survey was sent to Pulmonary Attendings, Fellows, and Nurse Practitioners on the unit to capture their perceptions of the benefits of an RT developing these skills. The survey also assessed perceived value of the quantified approach itself and how this approach could potentially evolve into the transition of patients from hospital to home in the future. Results: The response rate was 87%. One hundred percent the respondents thought the NM3 data added value to managing ventilated patients. Having an RT develop the skill to graph the NM3 data had 93% of the respondents who said this skill would benefit chronically ventilated pediatric patients. The information that was most valuable to the physicians and nurse practitioners was the leak% and VTe/kg at 92%. Eighty - five percent reported that the NM3 is a value added skill for respiratory therapists to learn in the future. Eighty -five percent of the respondents also thought the NM3 would be beneficial in the home care setting in order to manage patients with quantitative data verses one moment in time. Conclusion: Based on the responses of the survey, having the NM3 data added value to managing chronically ventilated pediatric patients. Having an RT who is able to graph the data is a desirable skill for the future. From the data that was interpreted with the NM3, leak percent and VTe/kg was considered the most valuable.

Sponsored Research - None

1727800

THE USE OF THE ASL 5000 TO VALIDATE PEDIATRIC AND NEONATAL NORMAL AND DISEASE STATE LUNG MODELS.

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INTRODUCTION: There is a need for neonatal and pediatric models to test equipment in a simulated setting. A dearth of information exists using simulation to construct and validate models based upon the pulmonary mechanics in health and with lung pathophysiology. The purpose of this study was to validate neonatal/pediatric models for a neonate, infant with severe bronchopulmonary dysplasia (BPD), pediatric patient without lung disease and pediatric patient with neuromuscular disease. **METHODS:** The ASL 5000 (Ingmar Medical, Pittsburgh, Pennsylvania) was used to construct and validate models of pulmonary mechanics for an infant and pediatric patient with normal lung function (healthy controls) and two disease states, BPD and neuromuscular disease. A literature search was conducted to determine the lung model settings for the aforementioned normal and disease states. PubMed and CINAHL databases were used to search for human, English language, age of neonate to 18 years of age, simulation, biological models, respiratory mechanics, BPD, neuromuscular, mechanical ventilation, medical education, respiratory insufficiency, airways resistance. Using this method, the search returned a total of 186 results, of which 15 were used. Tidal Volume (V_T), Inspiratory time (T_I), respiratory rate (RR), resistance and compliance were gleaned from the literature to construct each model. Esophogeal pressure was used to derrive muscle pressure (P_{MUS}). Active breathing was simulated by adjusting (P_{MUS}) on the ASL 5000 to produce the target tidal volume of 7 mL/kg. Each model was individually scripted and tested. Data were collected for a one minute period, and the procedure repeated three times for each model. V_T, RR, and T_I obtained from the ASL5000 were compared to data abstracted from the literature by repeated measures. Statistical significance was established at $p < 0.05$. **RESULTS:** Data are found in Table 1. **CONCLUSIONS:** Statistically significant differences in V_T and T_I were noted between data in the literature and the measured values from the ASL 5000. Although the differences reached statistical significance, these differences were not clinically relevant. Differences in V_T were within the error specifications of the ASL 5000.

Sponsored Research - None

1728096

LABORATORY INVESTIGATION OF 4 PORTABLE VENTILATORS USING PEDIATRIC AND INFANT LUNG MODELS.

Amy Grant[2], Amanda Dexter[2,3], Scott Grey[4], Teresa A. Volsko[1]; [1]Respiratory Care and Transport, Akron Children's Hospital, Akron, OH; [2]College of Health Sciences, Rush University, Chicago, IL; [3]Department of Respiratory Care, Rush University, Chicago, IL; [4]College of Public Health, Kent State University, Kent, OH

BACKGROUND: Portable ventilators are used for long term ventilation of infants and children with chronic respiratory and neuromuscular disease. The purpose of this study was to compare 4 portable ventilators, Puritan Bennett PB540, CareFusion LTV 1200, GE I-Vent, and Philips Respironics Trilogy 202 in terms of triggering, delivered tidal volume (V_T), respiratory rate (RR), inspiratory time (T_I) and PEEP accuracy, and presence of autoPEEP with normal pulmonary mechanics, and with load (weak effort, high resistance, low lung compliance). **METHODS:** The Ingmar Medical ASL 5000 was used to simulate the pulmonary mechanics of 4 validated active lung models. Normal pediatric and infant models served as the controls. Bronchopulmonary dysplasia and neuromuscular disease models served as load conditions. Volume control IMV to ventilate the pediatric neuromuscular and normal models. Peak flow was adjusted to obtain desired T_I. Pressure-control IMV was used to ventilate the BPD and infant models. The ventilator settings and model characteristics are displayed in Table 1. Data were collected for a one minute period. The iterations were repeated three times for every model. Set V_T, RR, PEEP and T_I were compared to measured values. Data for V_T, RR and set PEEP were analyzed using modified ANOVA F test followed by modified t-tests. Statistical significance was established at $p < 0.05$. Mean values for T_I and autoPEEP were reported. **RESULTS:** Triggering performance varied among devices. Autotriggering was present with the PB 540 with the infant and BPD models. AutoPEEP was present with each ventilator for every model. Results for V_T, RR and set PEEP stability as well as quantification of autoPEEP are shown in Table 1. **CONCLUSIONS:** Although manufacturers continue to improve the performance of portable ventilators problems exist. V_T delivery across a range of settings on all the ventilators we tested was outside of the ± 10% ASTM International standard of the set volume for all models except for the infant. A majority of ventilators had T_I outside of the ± 10%ASTM International standard of the set inspiratory time. None of the devices was clearly superior to the others in all aspects of our evaluation.

Sponsored Research - None

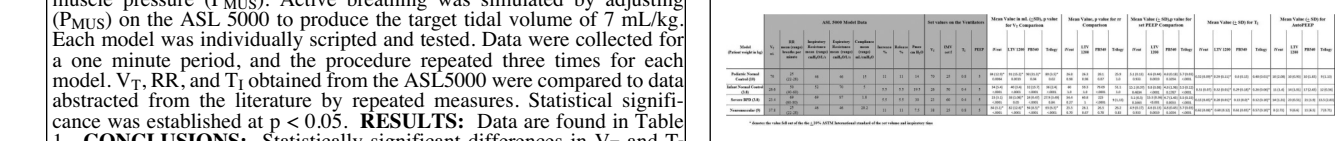


Table 1

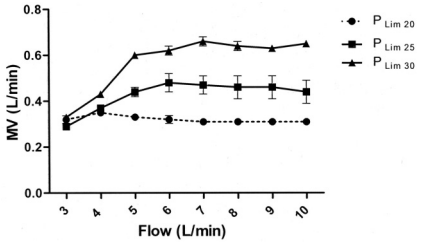
1728110

EVALUATION OF AN INCREASE IN FLOW VERSUS PRESSURE LIMIT IN A TIME CYCLED PRESSURE LIMITED TRANSPORT VENTILATOR.

Karen M. Muirhead[1], Kristin E. Smith[1], Thomas H. Shaffer[1,2], Yan Zhu[1,2], Tim Cox[1]; [1]Respiratory Care, Alfred I. duPont Hospital for Children, Wilmington, DE; [2]Nemours Research Lung Center, Wilmington, DE

Background: In the NICU, patients on mechanical ventilation are closely monitored and their ventilator settings optimized for comfort and acceptable gas exchange. However, during transport, this ability is limited, leaving the clinician with very little feedback for initial set up and continued evaluation. When presented with a patient with increased WOB during transport, the two relevant parameters that can increase respiratory support are flow and pressure limit (P_{Lim}). We wanted to determine the impact of increasing flow versus P_{Lim} on respiratory support parameters and how easily this relationship can be modeled for the transport setting. **Method:** An MVP 10 ventilator was attached via a 3.0 ID ETT to a Michigan test lung set at a compliance of 0.001 L/cmH_2O. A Philips NM3 monitor sidestream adapter was placed between the ETT and the patient wye. The MVP 10 was set at T_I = 0.4 s, T_E = 1.4 s and a PEEP of 5 cmH_2O. We recorded three values for all parameters at liter flows from 3L to 10L/min at P_{Lim} of 20, 25, and 30 cmH_2O. Mean values and ANOVA results for respiratory parameters as a function of flow and P_{Lim} are presented. **Results:** Our model demonstrated a saturation point for each P_{Lim} at which any further increase in flow beyond this point provided no further increase in support. Vt, MV, and peak flow all demonstrated a significant relationship with flow and P_{Lim} ($p<0.001$). See Figure for MV results. **Conclusion:** In a transport setting with limited monitoring, the choice to increase flow or P_{Lim} depends on the ability of the clinician to determine if flow to the patient has stopped, which occurs when the set point is reached. The observed plateau points suggest that there is less benefit when increasing flow at lower P_{Lim}. Considering the starting flows frequently used (e.g. 6-8 L/min), the point of plateau may have already been reached at initial settings. We found it extremely difficult to determine whether this point was reached over the majority of the flows tested by using only the ventilator manometer; however, this determination was much easier using the graphics available from an independent monitor. Based on test model results, we recommend that an independent monitor be used at the least for initial transition to the transport ventilator. This would not only provide the clinician with delivered volumes and pressures, but would help determine which changes might be most beneficial clinically.

Sponsored Research - None



1728258

DECREASING THE INFANT MORTALITY RATE IN GUYANA, SOUTH AMERICA: THE INTERNATIONAL TRAINING OF A NICU NURSE.

Stacy L. Hubbard; Respiratory, Nationwide Children's Hospital, Columbus, OH

Background: Guyana is a low middle income, English-speaking country in South America. The UN's Millennium Development Goals shows that neonatal mortality is approximately a third of all the childhood mortality rates in Guyana. Method: In March of 2012, a 24 bed Level 2 NICU was opened at GPHC. With this NICU opening at GPHC, in May 2012, a Neonatal Nursing Certification Program was initiated in conjunction with providing technology and specialized skills in order to determine if this will have an impact on the neonatal mortality rate. The nurses admitted into this program went through a 2 month didactic training sessions via Skype with various Nationwide Children's (NCH) employees, 1 month of hands on training at Georgetown Public Hospital Corporation (GPHC), an 8 month "internship" with weekly Skype sessions between GPHC and their preceptors at NCH, 2 weeks of hands on training at NCH, and a final 2 weeks training at GPHC to wrap up any questions, receive ventilators and the subsequent training of the nurses to run them, and assess the knowledge gained by these nurses throughout this program. Results: In 2011, 19.3% of all the infant births at GPHC were admitted to the NICU. From January to August of 2011 the infant mortality rate at GPHC was 14.2%. In the year after the neonatal program was initiated, from September 2011 to August 2012, the infant mortality rate dropped to 7.7%. This data excludes infants less than 26 weeks and under 800 grams. Conclusions: This data shows a substantial drop in the neonatal mortality rate after the introduction of the new technology and various training programs the nurses have undergone. With the expansion of this program to GPHC and the 4 other regional hospitals in Georgetown, which accounts for 83% of all deliveries in Guyana, this program has a very high potential to improve on the infant mortality rate in Guyana.

Sponsored Research - None

1728500

SURVEY OF PROTOCOL USE AND EXPERIENCE AMONG CHILDREN'S HOSPITALS.

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BACKGROUND: Protocol use has been reported to reduce practice variability, improve adherence to evidence-based interventions and improve clinical, process and financial outcomes. Although a plethora of data is available supporting protocol use in adult acute care, little information is available with respect to their use in neonatal and pediatrics. The purpose of this study is to quantify the use of protocols and describe the implementation barriers experienced by children's hospitals. **METHODS:** An electronic survey was distributed to respiratory care department directors from 40 children's hospitals who are members of Children's Hospital Association. The survey was confidential and consent implied. There were 21 closed-ended questions and one open-ended question that gathered organizational and departmental demographic information, protocol prevalence, type(s) used and implementation barriers. Data were entered into Excel for analysis, and descriptive statistics used to report outcomes. **RESULTS:** A 52.5% survey response rate was realized. Most hospitals were described as free-standing (76.2%), urban (81%) with a staff of 50 to 100 full-time equivalents (66.7%) and medical school affiliation (90.5%). The number of licensed beds from participating organizations ranged from 150 – 532 (Mean 291, ± SD 84). An average daily census of 217.7 (± SD 75.2) patients was reported. A majority of participants reported current protocol use (71%), with 78.6% of which reported 1- 5 different protocols were in place. Most (91.7%) have protocols for bronchodilator use, half (50%) for mechanical ventilation management, and oxygen therapy, one quarter (25%) for bronchial hygiene and patient assessment and 8.3% for hyperinflation therapy. Protocols were only routinely ordered by 42.9% of the medical staff mostly due to a perceived loss of control in the treatment provided to their patients if protocols were implemented and lack of awareness regarding the clinical and economic benefits of implementing protocols. Although protocol use was supported by nursing, administration and respiratory care managers, 65% reported lack of support by the medical staff as a barrier to protocol implementation. **CONCLUSIONS:** A wide variety of protocols are used in pediatric specialty hospitals. The majority of these hospitals report the implementation of protocols and note physician ordering practices limit their use.

Sponsored Research - None

1728720

EVALUATION OF IMPLEMENTATION OF BREATH STACKING THERAPY INTO CLINICAL PRACTICE IN A CHILDREN'S HOSPITAL.

Cynthia C. White, Edward Conway, Susan Allgeier, Joseph Westrich, Thomas J. Cahill, Erin Shaughnessy, Hemant Sawnani; Respiratory Care Division, Cincinnati Children's Hospital Medical Center, Cincinnati, OH

Introduction: Breath stacking (BS), a technique that utilizes a one way valve to promote sustained inflation, has been previously described in the literature in normal healthy adults, post op adult patients, and patients with Duchenne's Muscular Dystrophy. The modality has not well been described in the pediatric population and is not commonly used in clinical practice. Despite this, It is an attractive modality for patients with neurologic impairment or those who are heavily sedated and unable to coordinate the effort required for other techniques. In January 2013 we implemented BS in our institution as a technique to recruit lung volume and facilitate cough. We hypothesized that BS would be a safe and effective tool to utilize in postoperative pediatric patients who are at high risk for developing atelectasis. Method: BS was introduced into a single acute care unit in a large tertiary children's hospital as part of a quality improvement project. A one way valve connected an anesthesia mask or mouthpiece with a disposable pressure manometer to monitor pressures. An arrow on the one way valve ensured the valve was correctly oriented to improve safety. Retrospective data was collected from the Electronic Medical Record (EMR), from all patients who received BS. Variables collected were age, history of lung disease, history of neurologic impairment, time on O2, PIP, tolerance of technique, and whether or not the patient developed any complications (i.e.pneumothorax, pneumonia, ICU transfer). Results: Thirty -nine patients received BS as a part of a small test of change at our institution from January 2013 to May 2013. Mean patient age was 10.72 y/o (+/- 5.72). 23% had underlying neurologic impairment. None of the patients who received the therapy had any complications and all patients were able to perform the therapy despite various level of consciousness. Measured PIP during ranged from 8-35 cmH20 with mean PIP 14.72 (+/- 3.62), and was only 35 cmH20 in situation where patient was coughing. 23% of the patients were previously diagnosed with lung disease and 74% of the patients remained on O2 4 hours or less. Conclusion: BS appears to be a safe and effective modality to facilitate lung recruitment and airway clearance in the pediatric population and can be used with or without coordinated effort. Further research is needed to evaluate the therapy in specific patient populations and compare outcomes data to other commonly used modalities.

Sponsored Research - None

1728787

NON-INVASIVE TRENDING OF CO2 IN NEONATES REQUIRING LOW-FLOW OXYGEN THERAPY: COMPARISON OF ETCO2 TO PCCO2.

David Kissin, John Dziodzio; Pulmonary & Critical Care Medicine, Maine Medical Center, Portland, ME

Background. Monitoring of CO2 by capillary blood gas (CBG) is the standard of care at the Maine Medical Center's (MMC) Neonatal Intensive Care Unit (NICU) to follow ventilation in neonates with bronchopulmonary dysplasia (BPD). The proposal was to compare the CO2 measurement obtained by CBG and end-tidal CO2 (ETCO2) to ascertain if ETCO2 trending could eliminate or reduce the need for serial CBGs. Methods. We concurrently monitor ETCO2 via nasal cannula when drawing CBG to assess adequate correlation. Patients studied were non-ventilated neonates on supplemental oxygen via low flow nasal cannula. We used the Oridion® (Bedford, MA) nasal cannula to deliver the prescribed supplemental oxygen the patient required prior to the study and also to detect ETCO2 during the study period. ETCO2 was sampled prior to, during, and after the blood draw for each subject. Results. We collected complete sets of data from 18 subjects. Data from the prior, draw, and post-draw samples were evaluated separately. The mean difference in CO2 between techniques ("bias") was 8.81 Torr with standard deviation ("precision") 5.87. The mean capillary value was 56.9 and the 95% confidence interval was 36.5 to 59.6, representing a range of error from -35.8% to +4.7% of reading. This wide interval is well beyond the scope of clinical usefulness. Across these three cohorts, Student's T scores were around 7.4 (P<0.0001), affirming statistically significant differences between the two techniques. Conclusions. Due to a limited sample size and variability in capillary blood gas sampling techniques, the hypothesis that CO2 measured by end-tidal capnography would correlate to CO2 by CBG sampling could not be established clinically. Further evaluation is needed with a larger sample size and preferably comparing ETCO2 to blood sampled from invasive lines.

Sponsored Research - None

1728855

EFFECTS OF PNEUMONIA ON CLINICAL OUTCOMES IN BURNED CHILDREN WITH INHALATION INJURY.

Ronald Mlcak[1,2], Oscar E. Suman[2,1], David N. Herndon[2,1]; [1]Shriners Hospitals for Children-Galveston, Galveston, TX; [2]The University of Texas Medical Branch, Galveston, TX

Introduction: Inhalation injury continues to represent a major source of morbidity and mortality. Inhalation injury predisposes the burn patient to pneumonia. Pneumonia has been shown to increase mortality by 40-60%. The aim of the present study was to evaluate the incidence, morbidity, and mortality of pneumonia among a large group of pediatric burn patients with inhalation injury. Methods: Seven hundred sixty nine pediatric burn patients with inhalation injury were retrospectively studied. Patients were randomized into two groups; pneumonia (n=150) vs. no-pneumonia (n=619). Outcome variables included demographics, length of stay (LOS), length of ventilation (LOV), incidence of acute respiratory distress syndrome (ARDS), and mortality. Data are reported as mean ± SD. Significance was accepted at p<0.05. Results: The overall incidence of pneumonia was 19.5%. Age was similar in both groups. The % TBSA burn in the pneumonia group was 62 ± 23 vs. 48 ± 25 in patients without (p<0.05). The LOS for patients with pneumonia was 39 ± 37 days vs. 31 ± 29 days for those without (p<0.05). The average length of ventilation in patients with pneumonia was 14 ± 18 days vs. 5 ± 11 days for those without (p<0.05). The ARDS rate for patients with pneumonia was 38% vs. 4% for those without (p<0.05). The mortality rate for patients with pneumonia was 43% vs. 7% for those without (p<0.05). Conclusion: The presence of pneumonia in pediatric burn patients with inhalation injury significantly increases the LOS, LOV, incidence of ARDS and mortality. Therapeutic priorities should be aimed at prevention, early detection and aggressive treatment.

Sponsored Research - None

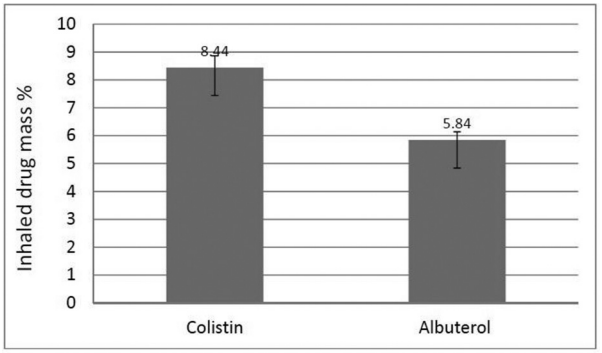
1728871

COMPARISON OF AEROSOLIZED ALBULTEROL AND COLISTIN DELIVERY VIA MECHANICAL VENTILATION.

Hui-Ling Lin[1], James B. Fink[2,3], Arzu Ari[2], Robert J. Harwood[2]; [1]Respiratory Therapy, Chang Gung University, Taoyuan, Taiwan; [2]Division of Respiratory Therapy, Georgia State University, Atlanta, GA; [3]Independent Consultant, San Mateo, CA

Background: Aerosol delivery through mechanical ventilators has been used to administer various mediations, such as bronchodilators, mucolytics, and antibiotics. The efficiency of aerosol delivery through the mechanical ventilator may be affected by various factors and has been investigated extensively in vitro studies with albuterol. Objective: The objective of this study was to compare the delivery of albuterol and colistin under the same nebulizer and mechanical ventilator settings in a bench study. Methods: A teaching manikin was intubated with an 8.0 mm tracheostomy tube, with both bronchi connected to a Y-adaptor and collecting filter. A ventilator (7200, Puritan Bennett) delivered adults settings with volume control ventilation (tidal volume 450 mL, respiratory rate 20 breath/min, inspiratory-expiratory ratio 1:2), through a heated humidifier (Fisher & Paykel) set at 37 °C. Albuterol sulfate (2.5 mg/3mL) and 3 mL colistin (668mcg/mL) were nebulized by a jet nebulizer (MistyNeb, Carefusion Corp) powered by 8 L/min of compressed air placed proximal to the simulated patient in the inspiratory limb of the ventilator circuit (n = 5). Drug on the filter was eluted and analyzed with spectrophotometry (Thermo Fisher Scientific) at 276 and 190 nm, and expressed as mean percent of loaded dose delivered. Independent t- test was used for statistical analysis ($p < 0.05$). Results: Figure shows the percent of drug dose (mean ± SD) deposited on the filter. Deposition with Colistin was higher than albuterol (8.44±0.97 vs. 5.84±0.64, $p = 0.001$). Conclusion: In this in vitro study of aerosol delivery during adult ventilation, the same jet nebulizer deposition of colistin was > 20% more than albuterol.

Sponsored Research - None



Comparison of percent of inhaled dose (mean ±SD) with two drugs

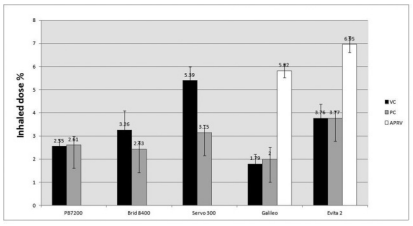
1731356

INFLUENCE OF METERED-DOSE INHALER DELIVERY USING DIFFERENT MECHANICAL VENTILATORS.

Hui-Ling Lin[1], James B. Fink[2,3]; [1]Respiratory Therapy, Chang Gung University, Taoyuan, Taiwan; [2]Division of Respiratory Therapy, Georgia State University, Atlanta, GA; [3]Independent Consultant, San Mateo, CA

Background: The efficiency of aerosol delivery through mechanical ventilators may be affected by various factors such as type of ventilator and mode of ventilation. Objective: The objective of this study was to compare MDI delivery under the same settings in three modesl of ventilationwith 5 different ventilators in a bench study. Methods: A 7.5 mm endotracheal tube was connected to a collecting filter and test lung (Michigan Instruments Inc). Five ventilators (Puritan Bennett 7200, Bird 8400 STi, Servo 300, Drager Evita 2, and Hamilton Galileo Gold with a heated humidifier (Fisher & Paykel) set at 37 °C were used to deliver adult settings in three modes: Volume control ventilation (VC; tidal volume 600 mL, respiratory rate 15 breath/min, inspiratory time 1 second), pressure control ventilation (PC; inspiratory pressure 20 cmH2O, respiratory rate 15 breath/min, inspiratory time 1 second), and airway pressure release ventilation (APRV; Phigh 20 cmH2O, Plow 5 cmH2O, Thigh 3 s, Tlow 0.8 s) . Eight actuations of Albuterol sulfate from an HFA MDI (Ventolin, 100mcg/actuation, GlaxoSmithKline Inc) were given through an AeroVent (Trudell Medical) placed proximal to the Y in the inspiratory limb of the ventilator circuit (n = 5). Drug on the filter was eluted and analyzed with spectrophotometry (Thermo Fisher Scientific) at 246 nm. One-way ANOVA with Scheffee post hoc test and independent t- test were used for statistical analysis ($p < 0.05$). Results: Figure shows percent of emitted dose (mean ± SD) deposited. Under volume control ventilation, delivery was greatest with Servo 300 and lowest with Galileo ventilator (5.79±0.31vs. 1.79±0.43, $p = 0.001$). MDI delivery during pressure control was higher than volume control with the Servo 300 ($p = 0.001$), but similar with other vents. Deposition was greatest with APRV mode ($p = 0.003$). Conclusion: In this in vitro study of aerosol delivery during adult ventilator, MDI delivery was greater with APRV than other modes of ventilation tested, and was lowest with Galileo ventilator than other ventilator tested.

Sponsored Research - None



Comparison of percent of inhaled dose (mean±SD) with 5 ventilators

1731364

EVALUATION OF ENVIRONMENTAL EXPOSURE OF AMIKACIN INHALE (PULMONARY DRUG DELIVERY SYSTEM WITH AMIKACIN INHALATION SOLUTION.

Richard D. Branson[1], Kevin Corkery[2], Nani Kadrichu[2], Robert Bacci[3]; [1]Surgery, University of Cincinnati, Cincinnati, OH; [2]Novartis Pharmaceuticals, San Carlos, CA; [3]Nektar Therapeutics, San Francisco, CA

Background: Amikacin Inhale, an integrated drug–device combination, is being co-developed by Bayer HealthCare and Nektar to treat Gram-negative pneumonia in intubated and mechanically ventilated patients. Inhaled antibiotics are proposed as adjunctive therapy for the treatment of mechanically ventilated patients with pneumonia to increase local drug concentration and reduce systemic complications. Environmental exposure and attendant consequences may be of concern. Amikacin Inhale comprises a specially formulated Amikacin Inhalation Solution and a Pulmonary Drug Delivery System (PDDS). This study was designed to evaluate occupational exposure to airborne amikacin using the on-vent and hand-held (HH) configurations of the PDDS using an in vitro lung model. Method: Amikacin Inhalation Solution (BAY41-6551/NKTR-061) (dose 400 mg; 3.2 mL of 125 mg/mL) was delivered via a vibrating mesh nebulizer (PDDS) in two configurations, on-vent in an in vitro lung model and HH delivery inside a laboratory hood (four 60-minute simulations for each configuration). Air samples were collected at three likely points of aerosol emission, and at two fixed locations within the laboratory. Sampling was performed before and after simulation using open-face three-piece 25-mm polypropylene cassettes containing Teflon® filters. Air samples (n=73) were analyzed for amikacin using high-performance liquid chromatography with UV absorbance detection. The proposed Nektar occupational exposure limit for amikacin sulphate has been determined as 400 µg/m3, with exposures of ≤ 200 µg/m3 considered acceptable. Results: Detection thresholds in air ranged from < 33 µg/m3 to < 45 µg/m3 during on-vent and < 77 µg/m3 to < 123 µg/m3 for the HH configurations in 'normal' operation mode. Daily baseline air samples obtained from the three likely points of aerosol emission failed to detect measurable levels of amikacin within the testing area. During simulation periods, there were no detectable concentrations of amikacin in any sample collected, including workplace air near the testing room exit and entrance. Conclusions: During simulated amikacin administration, potential occupational exposure to amikacin from Amikacin Inhale is very low. When used as directed, respiratory protective equipment is not required for Amikacin Inhale. Additional studies using ventilators without internal expiratory filters should be evaluated.

Sponsored Research - Work was performed in the Nektar aerosol laboratory. Samples were analyzed by an independent contractor. I (branson) had full access to the data from the independent contractor. The data herein are based on that data.

1732260

IMPACT OF A NOVEL VIBRATING MESH NEBULIZER ON VENTILATOR FUNCTION: A BENCH TRIAL.

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Introduction: The e-flow nebulizer is a novel vibrating mesh aerosol generating device currently under development. The unique design of the eflow creates the potential for interfering with the normal operation of a mechanical ventilator. We conducted a bench test to determine whether or not the eflow nebulizer would interfere with normal operations of a mechanical ventilator. Methods: We tested five current ventilator models: Carefusion Avea, Hamiltion G5, Maquet Servo-I, PB 840, and Draeger C500. An ASL 5000 was configured to simulate three lung conditions: normal lung (c:50, r:5), obstructed lung (c:50, r: 20), and injured lung (c:20, r:5). Each ventilator was outfitted with a F & P MR 850 humidifier. A thermometer was connected at the wye to assess impact on airway temperature. Each ventilator was tested with A/C, SIMV, PC, and PS. Settings for each mode were appropriate to simulate a 80kg male and were the same across all ventilators. Each condition was tested with and without the nebulizer inline and in triplicate. Impact of the nebulizer on ventilator function was determined by number of ventilator alarms activations, delivered VT, changes in Peak pressures, leak, time to trigger, oxygen delivery, PEEP, and airway temperature. Data is represented as mean ± sd; student's t-test was used to determine differences. Results: a total of 360 conditions were run (n=360). The e-flow vibrating nebulizer resulted in small changes in delivered VT in all conditions (460.83 ± 84 mL vs. 473.94 ± 99 mL, $p < 0.00$) and similar results between volume targeted and pressure targeted modes. Airway temperature was lower at the patient wye(34.0 °± 1.2 vs 36.5° ± 1.6, $p < 0.05$) and time to trigger was shorter (35.55 ms ± 45 vs. 247.63 ms ± 701, $p < 0.05$). No changes were seen in peak pressures (31.43 cmH2O ± 12 vs. 31.14 cmH2O ± 12), leak, oxygen delivery (305.12 vol% ± 26 vs. 309.91 vol% ± 26), and PEEP (10.09 cmH2O ± 4.96 vs. 10.14 cmH2O ± 5.14). Only two alarm conditions occurred during the testing, both unrelated to the e-flow. Conclusion: Although some changes were statistically significant, no clinically significant alterations to ventilator operations were detected.

Sponsored Research - Cardeas Pharmaceutical sponsored this research.

1732358

COMPARISON OF AEROSOL DRUG DELIVERY TO A NASO-PHARYNGEAL REPLICA VIA TWO VALVED HOLDING CHAMBERS (VHC) WITH FACEMASK VIA NEXT GENERATION CASCADE IMPACTOR.

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BACKGROUND: In vitro assessments of VHC performance are primarily designed to characterize aerosol formulations during product development and to ensure consistent product quality, rather than predict how the device will perform when used by a patient. In vivo, delivery is influenced by numerous factors, including device design, patient interface, patient compliance and airway anatomy. The use of casts of anatomical throats provides a means of reproducing the clinical situation more accurately. We report a laboratory-based comparison of aerosol drug delivery between two VHCs using a cascade impactor and a replica infant face and naso-pharyngeal airway developed from computed tomography (CT) scans. METHODS: A Next Generation Impactor (NGI) was used to evaluate the fine particle mass < 5.4 mm of fluticasone propionate (FP; 110 µg/actuation GSK) that exited the carinal region of the model following inhalation via either anti-static AeroChamber Plus® VHC with Flow-Vu® IFI/infant mask (AC-Plus, TMI) or OptiChamber® Diamond® VHC/LiteTouch® small-mask (OD, Philips) (n=3 devices/group). To simulate better the clinical situation the USP inlet of the NGI was replaced with a CT replica of a naso-pharyngeal airway of a 7 month old infant (ADAM-III, Trudell Medical International (TMI)), reducing the operating flowrate to 15 LPM. FP was recovered from the face and airway of the model, as well as the collection plates of the NGI at the exit of the model, VHC, facemask and pMDI. Delivered mass of FP (DMFP) was quantified by HPLC. RESULTS: DMFP <5.4mm collected from the NGI (mean±S.D.) was not significantly different between the AC-plus (22.2±2.9mg) and OD (15.4±2.8mg) (unpaired t-test, p=0.062). The percentage of medication delivered to the model was greater than 97% indicating that any mass delivered past the carinal region of the model is indeed 'respirable', and potentially of therapeutic benefit. CONCLUSIONS: There were no notable differences in fine particle mass between the AC-plus and Optichamber Diamond; however, additional testing looking at the absolute mass of drug delivered to a spontaneously breathing lung model is necessary.

Sponsored Research - This study was funded by Monaghan Medical

1733892

COMPARISON OF AEROSOL DRUG DELIVERY TO A NASO-PHARYNGEAL REPLICA VIA TWO VALVED HOLDING CHAMBERS (VHC) WITH FACEMASK VIA BREATH SIMULATION.

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BACKGROUND: In order to improve patient compliance, the use of charge dissipative materials in VHC construction is becoming the standard of care. A facemask is required as the interface between patient and VHC for young children who cannot breathe through a mouthpiece. Recent studies have emphasized that a well-fitting facemask is critical for optimal drug delivery. We report a laboratory-based comparison of aerosol drug delivery between two 'antistatic' VHCs under simulated breathing conditions, using a realistic infant face-upper airway model (ADAM-III, Trudell Medical International (TMI)).METHODS: Delivery of fluticasone propionate (FP; 44 µg/actuation GSK) as evaluated via anti-static AeroChamber Plus® VHC with Flow-Vu® IFI/infant mask (AC-Plus, TMI) and OptiChamber® Diamond® VHC/LiteTouch® small-mask (OD, Philips) (n=5 devices/group). Tidal-breathing (tidal-volume (Vt)= 155-mL, duty-cycle=33%, rate= 25-breaths/min) was simulated with an Ingmar ASL 500 test lung. Each facemask was applied to the face with the same clinically-appropriate force (1.6 kg). FP was recovered from the pMDI mouthpiece, VHC, facemask, face and airway of the model as well as the filter at the carinal exit of the model airway (equivalent to lung dose). Delivered mass of FP (DMFP) was quantified by HPLC.RESULTS: DMFP (mean±SD.) was significantly greater from AC-plus (11.6±1.4mg) than OD (7.2±1.4mg) (unpaired t-test, p=0.002). This difference was largely due to the FP lost on the facemask of the OD facemask (8.8±0.9mg) compared to that of the AC-plus (4.3±0.3 mg). CONCLUSIONS: While other factors such as facemask dead volume and device design are important factors in device performances, decreased aerosol delivery from the OD is explicable in terms of leakage between facemask and face, or choice of anti static materials, supported by higher deposition in its facemask. Clinicians should be aware that each VHC-pMDI combination is unique.

Sponsored Research - This study was funded by Monaghan Medical

1733899

MANAGEMENT OF SEVERE HYPERKALEMIA WITH HIGH DOSE OF ALBUTEROL SULFATE NEBULIZED OVER ONE HOUR.

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INTRODUCTION: Hyperkalemia is one of the few potentially lethal electrolyte imbalances. Prompt diagnosis and immediate treatment can save lives. This Case Study is based on successful treatment of a patient with severe hyperkalemia with high dose of albuterol sulfate nebulized over one hour. CASE SUMMARY: 61 yr old male with history of CAD; CABG and HTN was admitted with hyperkalemia through ED with EKG changes. At the time of admission, patient's sodium (Na) was 131 and potassium (K) was 7.4. Patient was admitted to Coronary Care Unit for treatment and observation. One hr after admission, Na was 135 and K was still 7.1 with chest discomfort and EKG changes. Pt was ordered for high dose Albuterol sulfate treatment for 1 hr. After one hr of high dose albuterol nebulizer treatment, patient's electrolytes were repeated with Na at135 and K dropped down to 5.6 and potassium level further dropped down to 5.4 after 4 hrs, which is within normal limits. DISCUSSION: Hyperkalemia is commmon in hospitalized patients due to many reasons. The ratio of extracellular to intercellular potassium concentration largely determines the cell membrane resting electrical potential, which in turn, regulates the function of excitable tissues as in cardiac, skeletal muscle and nerves. High K depolarizes the cell membrane, slows ventricular conduction, and decreases the duration of the action potential. Normal therapy for acute hyperkalemia is directed at preventing its electrophysiologic effects on myocardium. There are few methods of elimination of high K. Treatment options include insulin therapy, which in turn can cause hypoglycemia and may take 4- 6 hrs; diuretuc therapy with Furosemide, Bumetanide and sodium bicarbonate may take 2- 3 hrs and can cause volume depletion. Elimination or redistribution of K by high dose albuterol may take 30 min. to 2 hrs; this also has complications such as tachycardia (not always the case); however, the response to albuterol is inconsistent. The case study presents a treatment option and an appreciation of the use of a catecholamine, a beta- 2 agonist, albuterol, to treat hyperkalemia. Albuterol is normally used for bronchodilation for patients with COPD, Asthma, etc. We used high dose albuterol (20 mg), nebulized using a 'MiniHEART High-Flo' continuous Nebulizer by Westmed at 8lpm for 1 hr with the reported outcome. Patient's K was within normal limits within two hrs; was asymptomatic after 8 hrs and was discharged home the following day.

Sponsored Research - None

Hyperkalemia and Albuterol Treatment

Time	In ED	In CCU	1 hr after TX	2 hrs after TX
Potassium Level	7.4	7.1	5.6	5.4

Hyperkalemia treated successfully with beta agonist (Albuterol Sulfate)

1732365

EVALUATION OF A BLEED-IN NITRIC OXIDE DELIVERY METHOD DURING AN MRI.

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BACKGROUND: Magnetic resonance imaging (MRI) suites require the use of non magnetic medical equipment including ventilators during testing. Patients may require inhaled nitric oxide (iNO) use during MRI. The available equipment for iNO delivery: iNO Max DS ir (Ikaria, Hampton, NJ) does not meet MRI compatibility requirements and must remain outside the MRI suite during testing. The purpose of this study was to determine if the iNO Max DS ir adequately delivers measurable iNO to the patient during MRI. METHODS: A MRI compatible ventilator, GE iVent 201 (GE Healthcare, Waukesha, WI), was set to pressure control ventilation (PCV) at a respiratory rate 20bpm, PIP 25cmH2O, pressure support 5cmH2O and FiO2 100%. The iNO Max DS ir injector module was placed in the inspiratory limb of the circuit and set at 20ppm. For baseline measurements, a 10ft sample line was placed proximal to the patient in the inspiratory limb. Measured iNO samples were taken with the injector module out of line using 1 and 2 liters per minute of nitric oxide bled in from the iNO Max DS ir blender. iNO was added into the inspiratory limb of the ventilator circuit using a bleed-in method through a pressure line adaptor and 35 feet of oxygen tubing connected to the iNO blender at the ventilator outlet. The iNO was sampled at the inspiratory limb using 40 feet of sample tubing. The iNO (ppm), NO2 (ppm) and peak flows (liters/min) were measured using the injector module and the bleed -in method on the inspiratory limb. RESULTS: There was no statistically significant difference in measured iNO using either route of iNO delivery to the ventilator circuit (p<0.0001). Mean values and standard deviations for iNO, NO2 and peak flow are displayed in the table below. CONCLUSION: The iNO Max DS ir delivers desired iNO effectively using a bleed -in method when placed outside of the MRI suite. Changing peak flows may affect the amount of iNO required to achieve desired iNO concentration.

Sponsored Research - None

iNO Mode of Delivery	iNO (ppm) mean (StDev)	NO2 (ppm) mean (StDev)	Peak Flow (lpm) mean (StDev)
Injector Module	23.47 (0.68)	0.12 (0.06)	31.00 (0.00)
80ppm setting 1lpm bleed-in	23.20 (1.27)	0.28 (0.04)	31.37 (0.49)
80ppm setting 2lpm bleed-in	28.30 (0.95)	0.40 (0.06)	31.60 (0.50)
40ppm setting 2lpm bleed in	23.13 (0.63)	0.29 (0.03)	31.37 (0.38)

1732642

EFFECT OF VENTILATOR MODE ON AEROSOL DELIVERY.

John W. Newhart, Chantal J. Darquenne, Janelle M. Fine, Garner G. Faulkner, Tyler C. McCleery, Ted Vallejos; Respiratory Care, UC San Diego Med Ctr, San Diego, CA

Background: As more dose critical drugs are being aerosolized into mechanical ventilator circuits at our institution we set out to determine the effect certain modes of ventilation may have on aerosol delivered to the patient. We compared the amount of aerosol delivered in volume targeted pressure control (VTPC) to an unconventional mode of ventilation, airway pressure release ventilation (APRV). Methods: We utilized a Draeger XL ventilator with an F&P 850 heated wire circuit in conjunction with an Aerogen vibrating mesh nebulizer. We placed the nebulizer into the inspiratory port of the "Y" and measured the amount of aerosol reaching the cuff end of an ETT using an in-line photometer placed between the ETT and a rubber test lung that allowed for cycling of the ventilator. A differential pressure flow sensor recorded Vt. The amount of aerosol reaching the test lung on inspiration was expressed as A.U. (arbitrary units). This number is directly related to the reflection of light due to the combined surface area of the aerosol flowing through the photometer. APRV is often characterized in literature as prolonged inspiratory times (T high) with very brief periods of expiration (T low). For APRV we set the ventilator to a T high of 4.3 sec and T low at 0.7 sec. For VTPC we used RR 12, Vt 500ml, Ti 1.2 sec. The amount of aerosol reaching the test lung was expressed as amount delivered/ml of inspired air. Results: 615 ± 23 a.u./ml (mean ± SD) was delivered during each inspiration to the test lung in VTPC while 140 ± 7 a.u/ml was delivered in APRV. Conclusion: The difference in aerosol reaching the end of the ETT (i.e. the patient's airway) was approximately four times greater in VTPC than APRV. Simply by changing the mode on a ventilator one can drastically alter the amount of an aerosolized drug to a patient. Therapists need to be vigilant for changes in patient's condition when changing modes on a mechanical ventilator while giving aerosol. Our results suggest consideration should be given to appropriate dosing when utilizing certain ventilator modes such as APRV.

Sponsored Research - None

1733460

EFFECT OF NEBULIZER PLACEMENT ON AEROSOL DELIVERY EFFICIENCY IN A MECHANICALLY VENTILATED INFANT MODEL.

Justin Hotz, Al Tostado, Edward Guerrero, Leo Langga, Maria Salazar; Children's Hospital Los Angeles, Los Angeles, CA

Introduction: There are a few studies that look at the relationship between medication nebulizer placement within a pediatric and adult ventilator circuit and its relationship to optimal aerosol delivery; however, there are very few studies that look at this phenomenon in the infant model. The pediatric and adult model suggests that aerosolized medications can be delivered more efficiently when placed on the pre-humidifier location. We seek to study the effect of nebulizer placement in an infant model to more effectively optimize nebulizer positioning in this patient population. Methods: An Avea ventilator was setup with an infant ventilator circuit and calibrated according to manufacturer standards with a heated concha humidifier. The ventilator was connected to a Michigan Instruments Infant Test Lung using a 3.5 mm endotracheal tube. A filter was placed between the test lung and the endotracheal tube to capture the aerosolized solution. The ventilator was set to the following settings: Assist Control / Time Cycled-Pressure Control; RR 32 BPM; PIP 18 cmH20; PEEP 5 cmH20; FiO2 0.30; I- time 0.4 seconds; and Bias-flow of 2 LPM. The infant test lung had a compliance of 0.02 L/cmH20 and a resistance of 20 cmH20/ L/second. An Aeroneb nebulizer was tested in two different positions within the ventilator circuit. Position one was with the nebulizer placed proximally to the ventilator wye. Position two was on the "dry side" at the humidifier inlet. Each position was tested by nebulizing 3 mLs of normal saline and comparing the "dry" weight of the filters to the "wet" weight after each nebulization. The Aeroneb nebulizers were also weighed before and after each nebulization to determine the amount of nebulized solution. Each test was performed three times. Results: Measurements were expressed as a nominal dose percent which is the change in filter weight divided by the total weight of the nebulized solution. Position one delivered a nominal dose of 1.94 ± 0.25 percent. Position two delivered a nominal dose of 1.06 ± 0.25 percent. The difference was statistically significant. (Paired t-test $p < .05$) Conclusion: In an infant ventilator model, aerosol delivery appears to be more efficient when the nebulizer is placed proximally to the patient wye. More studies need to be done to evaluate the relationship of varying bias flow, proximity to the patient wye, and tidal volume, to the efficiency of aerosol delivery.

Sponsored Research - None

1733566

THE EFFECT OF NEBULIZER PLACEMENT IN THE VENTILATOR CIRCUIT ON AEROSOL DELIVERY.

John W. Newhart, Chantal J. Darquenne, Janelle M. Fine, Garner Faulkner, Ted Vallejos, Tyler McCleery; Respiratory Care, UC San Diego Med Ctr, San Diego, CA

Background: As more dose critical drugs are being aerosolized to patients on mechanical ventilation at our institution we set out to determine the most effective location of the nebulizer within the ventilator circuit. Methods: We utilized a Draeger XL ventilator, with an F&P 850 heated wire circuit, using an MR 290 chamber, in conjunction with an Aerogen vibrating mesh nebulizer. Ventilator settings were volume targeted pressure control, RR 12 Vt 500, Ti 1.2 Peep5. We placed the nebulizer at the common port of the patient Y connector (A), inspiratory side of the patient Y connector (B), outlet of the humidifier (C) and inlet of the humidifier (D). We measured the amount of aerosol delivered to the cuff end of an ETT using an in-line photometer placed between the EET and a rubber test lung that allowed for cycling of the ventilator. The amount of aerosol was expressed in A.U. (arbitrary units). This number is directly related to the reflection of light due to the combined surface area of the aerosol flowing through the photometer. Results: The results are expressed as amount delivered/ml of inspired air. Location (A) 663 +10 a.u./ml (mean + SD), (B) 615 + 23, (C) 65 +/-8, (D) 38 +/-4. Discussion: The results indicate nearly ten times as much aerosol was delivered when the nebulizer was attached to either the inspiratory or common port of the Y vs. the inlet or outlet of the humidifier chamber. There are many variables that effect aerosol delivery, specifically when in-line during mechanical ventilation. For instance this ventilator does not have any bias flow so these results may not have any correlation to one that does. The Aerogen nebulizer does not add any additional flow to the ventilator circuit but a jet nebulizer does and this may cause different results. Conclusions: This study, and others strongly suggest that clinicians using dose sensitive medications need to be aware of these variables Additional studies will be performed to better identify the various influences on aerosol delivery when administered to patients on mechanical ventilation.

Sponsored Research - None

1733948

THE INTEREST OF UTAH RESPIRATORY THERAPISTS AND RESPIRATORY THERAPY STUDENTS IN PURSUING AN ONLINE MASTERS OF SCIENCE IN RESPIRATORY THERAPY DEGREE.

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The rapidly advancing respiratory therapy profession is driving respiratory therapists to complete bachelor degrees and to move toward graduate degrees. In order to determine the viability of a Master of Science in Respiratory Therapy in Utah, a survey was created to poll respiratory therapists and students. Method: A multiple-choice survey was e-mailed to all Respiratory Therapy (RT) department managers in acute care hospitals and RT students within the state of Utah. Managers were encouraged to forward the voluntary survey to their employees. The survey was also sent to approximately 80 RT students. Results: This survey examined the responses of a broad population (n136) of RTs and RT students. It considered gender (female 56%, male 44%), age, current degree (60% bachelor degree), years of experience (40% >10 years), current credential (72% RRT), current advanced credential(s) (NPS 75%), and desire to pursue a Masters degree or higher (84%). The survey examined motivation for pursuing an advanced degree (personal goal 75%, advanced clinical development 67%, job requirement for advancement 37%) and areas outside RT that subjects have considered (Physician Assistant 57%, health administration 50%, education 39%, business 28%, Perfusionist 25% and Pharm-D 7%). The survey examined how likely subjects would be to pursue an online Master of Science in Respiratory Therapy (MSRT) (very likely 34%, somewhat likely 34%) and how soon they would apply to a MSRT program (within 1 year 26%, within 2 years 43%). Subjects were asked which track within an MSRT they would pursue (education 37%, research 17%, or health administration 46%) and which two specialty credentials they would select within an MSRT (NPS 69%, ACCS 58%, CPFT/RPFT 25%, AEC 22%, and RSDS/RPSGT 21%). Conclusion: The survey data clearly outlines Utah RTs' desire to pursue graduate level degrees (84%). Approx. 69% of RTs surveyed state they would start an MSRT program within 1-2 years The data reveals RTs' desire to earn advanced credentials, specifically in neonatal/pediatric and adult critical care. An MSRT would provide an avenue for RTs to advanced clinical education and develop skills in research, higher education and health administration. Several who were unlikely to pursue an MSRT stated it was due to already having a graduate degree outside the RT field. Without the availability of MSRT programs, we stand to lose RTs to other professions that offer graduate degrees.

Sponsored Research - None

1712048

A NEEDS ASSESSMENT OF TOBACCO USE AMONG LGBT (LESBIAN, GAY, BISEXUAL, TRANSGENDER) YOUNG ADULTS IN COLUMBUS, OH.

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BACKGROUND: According to the Centers for Disease Control and Prevention (CDC), tobacco use among the LGBT community is significantly higher than it is in the general population. Despite this, there has been no tobacco cessation program designed to meet the needs of this community. The purpose of this study was to conduct a needs assessment about tobacco use in the young adult LGBT community in Columbus, OH. METHODS: We conducted four focus groups and collected 20 individual surveys from current and former LGBT smokers, ages 18-26. Questions were reviewed by a panel of experts to ensure content validity. Researchers analyzed the responses individually and identified common themes. RESULTS: Participants included 12 males and 21 females; 14 current smokers and 19 former smokers. Ninety-four percent of respondents smoked less than one pack of cigarettes per week. Twenty-one respondents (64%) have tried to quit—95% of those individuals were able to quit "cold turkey". About half were unaware that the LGBT community uses tobacco at a higher rate; 95% were unaware that the community has been targeted by tobacco companies. Seventy-nine percent reported that they believed the LGBT community to be more tolerant of tobacco use. Most reported that they smoked to relieve stress and/or in social situations. While the majority believed there is a need for an LGBT-specific tobacco cessation program, only 64% would use such a program. CONCLUSIONS: Although the number of tobacco users in the LGBT community is higher, individuals smoke less compared to the general population. While participants believed that they smoke for the same reasons as heterosexuals, those reasons are exacerbated in the LGBT community. Respondents stated that the tobacco cessation program should be facilitated by former smokers from the LGBT community, offered and marketed in LGBT-friendly spaces, and include a component on stress management. Subjects reported that the main barrier to implementation of such a program would be participation because LGBT smokers believe that they are less addicted and are able to quit on their own.

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172301

PERCEPTIONS OF CARDIORESPIRATORY CARE STUDENTS ON THEIR CLINICAL PRECEPTORS.

Tomasina Burrelli, David Chang; University of South Alabama, Mobile, AL

BACKGROUND: Clinical preceptors are assigned to students in clinical settings to facilitate application of concepts learned in class to real life situations. Part of being a preceptor is to show the student what it is like to be a respiratory therapist. However, sometimes conflicts can arise between the students and preceptors. The purpose of this study was to evaluate the perceptions of the students on their clinical preceptors. METHODS: IRB approval was obtained from the university and clinical affiliates. A 10-item questionnaire was constructed, validated and used to conduct the survey (Table 1). The confidential survey was handed out to the junior and senior students in a cardiorespiratory care program at a state university. A descriptive evaluation was done to interpret the data. RESULTS: Twenty junior and 17 senior students completed the survey. Some major findings of the study were described below. All 37 students attended at least three different hospitals for their clinical rotations. Thirteen (76%) senior students confirmed that they had overheard a preceptor verbalize that having a student and a large workload is a hassle. Sixteen (94%) senior students heard their preceptor expressed that they do not wish to have a student accompanying them during rounds. Fourteen (70%) junior students were dropped off with another preceptor on more than one occasion. Twenty junior and senior students (54%) stated one particular hospital as the clinical site that they do not wish to return to because of their preceptors' attitude on students. Nine (53%) senior students did not enjoy their clinical experiences because of some preceptors. CONCLUSIONS: Based on the perceptions of the students who completed the survey, the overall experiences of the students in clinical are positive. However, some preceptors openly verbalized that they did not want to have students around them. These preceptors did not show a positive role model and professional behavior by verbalizing their negative feelings on the preceptor/student working relationship. This shortcoming was most problematic in one particular hospital.The program faculty and department directors and supervisors should perform an in-depth evaluation of the clinical preceptor program. By having better communication and expectations among the clinical staff and the educational program, the preceptor/ student relationship may be improved.

Sponsored Research - None

Table 1

1. How many semesters have you had clinical rotations as a RT student at USA? (write in)
2. How many different hospitals have you been to for your clinical rotation? (0-2/3-5/6-8/9+)
3. The preceptor verbalizes that trying to teach students with a large workload can be a hassle. (strongly agree/agree/neutral/disagree/strongly disagree)
4. Have you ever heard your preceptor tell another person that he/she does not wish to have a student? (Yes/No)
5. The preceptor treats you fairly and listens to and respects your opinion (strongly agree/agree/neutral/disagree/strongly disagree)
6. How long have you had to wait for your preceptor to come get you to start rounds? (I did not have to wait/ 30min/30min-1hr/1hr-1hr 30min/1hr 30 min+)
7. On how many occasions has your preceptor dropped you off with another preceptor? (Never/1-2 times/2-3 times/more than 3 times)
8. List the hospitals that you prefer not to return to because of the behavior of the preceptors (Write in comment below)
9. What can be done to improve the preceptor/ student relationship? (Write in comments below)
10. I enjoy attending all of my clinical rotations because of my preceptors (strongly agree/agree/neutral/disagree/strongly disagree)

1722975

FEATURES OF RT TEXTBOOKS THAT FACILITATE STUDENT USAGE AND LEARNING.

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BACKGROUND: Textbook selection plays a crucial role in the learning success of students. The purpose of this study is to evaluate the opinions of junior and senior RT students on the features found in the required textbooks. METHODS: This study was approved by the Institutional Review Board. A 10-item survey (Table 1) was developed to evaluate the opinions of RT students on the features and usage of the required textbooks in the curriculum. The written survey was completed by 36 junior and senior RT students. Nineteen juniors and 17 seniors were allotted 5 minutes to complete the survey. RESULTS: From a list of required RT textbooks (not shown in abstract), 14 students stated that using the required textbooks for a course contributed to receiving a good grade in the course (question 5). When the students were asked about the useful study aids in the textbooks (question 6), 26 indicated that review questions were the most useful. When questioned about the price of the required textbooks and the influence it had on the decision to not buy the book (question 8), 15 responded that the price of a book was a major factor when electing to not buy it. For question 9, 31 students stated that definition of key terms was the most important quality of a useful textbook, review questions gained 26 responses, with diagrams/figures and good readability/writing quality earned 24 responses each. CONCLUSIONS: This study shows that some features of a textbook contribute to textbook usage by students. The key elements that make up a useful textbook are review questions, definition of key terms, diagrams, and readability/ writing quality. When selecting a textbook for a course, the cost of the book should be considered because it can be a major factor for students when choosing to buy the book or not.

Sponsored Research - None

1723025

EFFECTS OF AN INTERPROFESSIONAL SIMULATION ACTIVITY TO IMPROVE STUDENTS' PERCEPTIONS OF OTHER HEALTHCARE PROFESSIONS.

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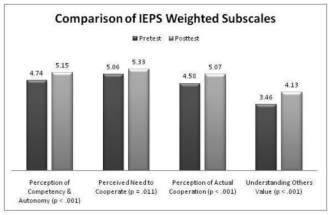
Background: Healthcare professionals have historically been educated by members of their own profession within a curriculum that reinforces discipline-specific strengths. This differentiation has contributed to students having little interaction with other professionals until after they have entered the workforce and consequently little formal education in collaboration or integration. The purpose of this mixed-method study was to evaluate the impact of an interprofessional (IP) collaborative activity on student's perceptions of the others discipline. Method: The sample consisted of students from two programs, nursing (n=40) and respiratory therapy (n=33). Students were prepared prior to the IP activity on the content and psychomotor aspects of their individual competencies. Mannequins of moderate fidelity were used to enable each participant to perform discipline specific procedures during the course of a trauma simulation. After viewing an introductory video, participants were instructed to assist and educate the other member during the critical components of the scenario on their respective procedures. A modified Interdisciplinary Education Perception Scale (IEPS) was administered one week prior to and after the simulation activity. The IEPS uses four subscales to assess individual's perception of competency and autonomy, perceived need for cooperation, perception of cooperation, and understanding others value. Pre- and post-test scores on the IEPS sub-scales were analyzed with univariate, repeated measures two-way Analysis of Variance (ANOVA). Main effects for profession and time (2x2), as well as interactions, were tested on each sub-scale. In addition, a qualitative content analysis based on the open-ended questionnaire was performed on all subjects. Results: There was a significant change in all four subset scores following the IP activity when investigating the main effect of time ($p < .05$). Neither effect of profession or interaction within any of the four subscales reached statistical significance. Qualitative analysis of participant questionnaires supported the quantitative findings. Conclusions: This study demonstrated an effective method to increase students' perceptions of attributes found in effective clinical teams. Healthcare educators should incorporate structured, interprofessional (IP) simulation activities within their curricular programs to improve competency, cooperation, and value placed on other professions.

Sponsored Research - None



1727821

PEER ASSISTED LEARNING IN ANATOMY & PHYSIOLOGY II LABORATOTRY: AN ULTRAHYBRID DESIGN USING HEALTH PROFESSIONS STUDENTS.

George A. Steer[1,5], Michael L. Slaughter[1], Kimberly A. Whiter[2], Chase R. Poulsen[3], Elliot D. Carhart[4]; [1]Biomedical Science, Jefferson College of Health Sciences, Roanoke, VA; [2]Medical Laboratory Science, Jefferson College of Health Sciences, Roanoke, VA; [3]Respiratory Therapy, Jefferson College of Health Sciences, Roanoke, VA; [4]Emergency Services, Jefferson College of Health Sciences, Roanoke, VA; [5]Basic Science, Virginia Tech Carilion School of Medicine, Roanoke, VA

Background: Student attrition in basic sciences ranges from 40-70%. Peer Assisted Learning (PAL) has been utilized to improve performance. All three types of PAL; a) same-level equal status, b) same-level unequal status and, c) cross-level, require significant tutor preparation. Concerns with PAL in undergraduate anatomy and physiology (A&P) are tutor performance, miscommunication and erroneous information. We evaluated the pilot use of a novel hybrid PAL activity where cross level tutors from health professional programs facilitate A&P II laboratories. Method: An Allied Heath professor and student tutors delivered discipline-specific content during four standard laboratories. Emergency Services - ECG & BP, Medical Laboratory Science - blood typing and urinalysis and Respiratory Therapy - lung volumes. Four sections participated; a control group (n= 96), with a professor to student ratio of 1 to 12-20 had standard content delivery and an intervention group, PAL (n=62) with a 1:4 tutor to student ratio and two professors. After each session both groups voluntarily completed a seven question survey (6 pt Likert), to assess their perception of the laboratoies' effectiveness. Group responses were combined for analysis. Results: T-tests revealed a difference ($p<0.05$) between groups on questions (SQ) 1, 2, and 7: 1) This exercise was beneficial to my understanding of the material, 2) I received an appropriate amount of individualized attention to learn the material and, 7) Rate the pre-laboratory assignments with respect to the usefulness for understanding the material. Students approached a significant difference in recognizing which profession performed the procedure ($p=.071$) and the exercises' application to their future clinical practice ($p=.095$). Conclusions: We developed and assessed a novel cross-discipline, cross-level PAL, for A&P II lab exercises. These exercises indentify the profession and clinical application of the activity, introduce interprofessionalism, and upgrade two sessions from lecture to active learning; lung volumes and ECG. Discipline specific tutors reduce the instructor to student ratio and may improve overall comprehension while minimizing miscommunication and delivery of erroneous information. The associated pre-laboratory assignments may enhance learning. Limitations; population and class size. Assumptions; equality of professors, students and delivered content.

Sponsored Research - None

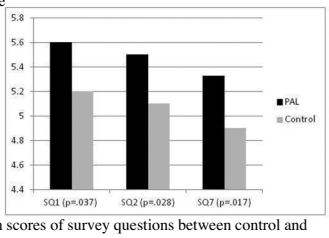


Fig 1. Comparison of mean scores of survey questions between control and intervention (PAL) groups.

1727838

THE IMPACT OF INCREASING ENTRY-LEVEL RESPIRATORY CARE EDUCATION STANDARDS ON THE SOCIO-ECONOMIC DIVERSITY OF POTENTIAL APPLICANTS.

Xuan Nguyen; Respiratory Care, Rush University, Chicago, IL

Abstract 1. Background: Transitioning from an associate degree to a baccalaureate degree for respiratory therapists has been suggested as a new entry-level educational standard. One potential risk for this change is that socio-economic variables may limit the diversity of potential applicants for entry-level education. 2. Methods: This study is a secondary analysis of data collected from the 2009 AARC Respiratory Therapist Human Resource Survey. Relationships among socio-economic variables and choice of entry-level education between associate and baccalaureate degrees were explored. The chi square test was used to test for differences in nominal data, the t-test for scale variables, and Spearman's rho for correlation with interval data. An alpha = 0.05 was used for all tests. 3. Results: There were no differences in gender, race, desire to pursue a higher academic degree, number of additional health care credentials, numbers of life support credentials, wages, delivering respiratory care by protocol, and job satisfaction between therapists with entry-level associate and baccalaureate degrees. There were significantly higher percentages of advanced academic degrees, RRT credentials, NBRC specialty credentials, and leadership roles for therapists with baccalaureate entry-level degrees. 4.Conclusion: Increasing the entry-level educational standard to a baccalaureate degree for respiratory therapy would not create a socio-economic disadvantage and decrease the diversity of the work force.

Sponsored Research - None

1728989

INTERPROFESSIONAL EDUCATION: THE ATTITUDES OF RESPIRATORY CARE, NURSING AND CLINICAL LABORATORY SCIENCES STUDENTS TO SHARED LEARNING AT PRINCE SULTAN MILITARY COLLEGE OF HEALTH SCIENCES IN DHAHRAN, SAUDI ARABIA.

Ibrahim A. ALBalawi, Musallam A. Al Nasser, Mohammed D. AlAhmari; RC, PSMCHS, Dhahran, Saudi Arabia

Background: Interprofessional education (IPE) intends to improve training and communication among health professions, and to provide effective patient-centered collaborative care. Currently, the frequency and scope of IPE is increasing in different medical schools worldwide. In Saudi Arabia, there is no evidence that IPE has been applied. This study aimed to determine the attitudes of respiratory care (RC), nursing and clinical laboratory sciences (CLS) students during the last academic semester toward IPE using Readiness for Interprofessional Learning Scale (RIPLS) questionnaire. Method: Sixty-seven students (25 from RC; 14 nursing; 28 CLS) were recruited in this study. All surveyed students never exposed to IPE or professional experience. The questionnaire consisted of 3 subscales with a total of 19 items to assess the readiness of students in an interactive engagement with other students and shared learning. The 3 subscales include teamwork & collaboration, professional identity and roles & responsibilities. The total RIPLS scores were ranged from 19 to 95. All respondents were instructed on all RIPLS measured concepts. Data were analyzed using GraphPad Prism 5 software. A one-way analysis of variance (ANOVA) with post hoc Bonferroni test was done to determine differences between the groups. A p-value 0.05 was considered statistically significant. Results: Sixty-seven students (49% male & 51% female) with the age mean [22.24 ± 0.89]. The response rate was 100% [37% RC; 21% nursing; 42% CLS]. The overall scores ranged from 66.9 to 74.6. CLS scored the highest with 74.6 (79%); 71.4 (75%) RC; and 66.9 (70%) nursing. ANOVA revealed highly significant difference among the three groups' mean score for overall attitudes, Table 1. A post hoc Bonferroni analysis showed the overall RIPLS scores were statistically higher in CLS compared to nursing [ANOVA p= 0.009]. Conclusions: Our results showed that students are ready for IPE. Further work need to be conducted on other health disciplines from other schools nationally to assess interprofessional educational readiness.

Sponsored Research - None

Table 1. RIPLS scores by professional disciplines.

	Possible min.& max. score	Nursing M (SD)	RC M (SD)	CLS M (SD)	One-way ANOVA P-value
Subscales					
Teamwork and collaboration	9-45	38.14 (2.28)	38.42 (3.85)	39.07 (3.76)	0.25
Professional identity	7-35	21.64 (1.73)	23.63 (2.90)	25.07 (3.76)	0.005
Roles and responsibilities	3-15	7.07 (1.14)	9.37 (2.16)	10.5 (2.58)	0.001
Overall	19-95	66.86 (3.8)	71.42 (5.09)	74.64 (7.47)	0.009

A post hoc Bonferroni comparison indicated that the overall RIPLS scores of CLS were statistically higher than nursing [ANOVA p= 0.009].

1729195

HIGH-FIDELITY AND LOW-FIDELITY SIMULATION: DOES FIDELITY EFFECT THE SELF-EFFICACY AND LEARNING OUTCOMES OF ASSOCIATE DEGREE-SEEKING RESPIRATORY CARE AND NURSING STUDENTS?

Luster Fowler; Ivy Tech Community College, Indianapolis, IN

BACKGROUND: Healthcare practitioner training programs have historically focused practitioner training efforts on discipline-specific programming and curricula. This study examined the use of interprofessional high-fidelity versus low-fidelity simulation and examined potential differences in self-efficacy and learning outcomes of participants. METHOD: A quasi-experimental, non-equivalent groups, between-groups construction design was utilized in this study. The intervention was the type of simulation provided to the participants. Assessment of pre-intervention and post-intervention self-efficacy and learning outcomes was performed utilizing Analysis of Covariance (ANCOVA) methods that examined students by treatment group (High or Low-Fidelity) and by specific course of study (Respiratory Care or Nursing student). A convenience sample of 75 students participated in this study, and included nursing students (n = 36) and respiratory care students (n = 39). Participants were divided into two groups: a high-fidelity group (n = 52) and a low-fidelity group (n = 23). Student participants within low-fidelity and high-fidelity groups were prompted to engage in patient care scenarios which consisted of the patient following conditions: (a) hypoxia, (b) tachypnea and/or apnea, (c) dyspnea and/or respiratory distress, and (d) oxygen desaturation. RESULTS: Differences in self-efficacy between the high-and low-fidelity groups were not significant on pre-assessment or post-assessment, p = .529 and p = .246. Differences between nursing and respiratory care students were not significant on pre-assessment or post- assessment, p = .079 and p = .779 respectively. Differences in perceived learning outcomes between the high-and low-fidelity groups were not significant on pre-assessment or post-assessment, p = .747 and p = .219. Differences between nursing and respiratory care students were not significant on pre or post-assessment, p = .408 and p = .611 respectively. CONCLUSIONS: The results of this study provides valuable insight regarding the current and future use of high- and low-fidelity manikin-based simulation within academic institutions offering nursing or allied health training programs at the associate degree level of study. Additional study should consider the incorporation of higher levels of collaboration and critical thinking using more challenging patient care scenarios in order to evaluate self-efficacy and learning outcomes.

Sponsored Research - None

Comparison of Pre and Post Means of Self-Efficacy by Student Type

Pre and Post Self-Efficacy	Nursing or Respiratory Student	N	Mean	SD
Pre Self-Efficacy	Respiratory Student	36	71.472	11.680
	Nursing Student	39	61.307	15.449
Post Self-Efficacy	Respiratory Student	36	79.250	11.532
	Nursing Student	39	69.717	14.812

1729419

A STATE-WIDE SURVEY OF RESPIRATORY THERAPIST SUPPORT FOR BACCALAUREATE ENTRY-LEVEL EDUCATIONAL STANDARDS.

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Background: In order to qualify for reimbursement under proposed changes to the Medicare part "B" program, a Respiratory Therapist must have the "registered" credential and hold a bachelor's degree, similar to the requirements for other health professions recognized by the federal government.[1] Because of potential licensure changes needed with increased educational requirements, the North Carolina Respiratory Care Board (NCRCB) conducted a state-wide survey of licensed Respiratory Care practitioners to determine staff therapist support for future increases in educational standards. The purpose of this survey was to quantify practitioner support for increasing educational standards to the baccalaureate level. **Methods**: A voluntary, anonymous, electronic survey was developed and sent state-wide to 4,526 active, licensed Respiratory Therapists in North Carolina. The survey focused on the current and projected job description requirements, salary changes, organizational recognition and support such as scholarships and tuition reimbursement, promotion options, and staff support for the baccalaureate degree as entry-level to the profession. **Results**: A total of 968 (n= 968) licensed Respiratory Care practitioners completed the survey, for a state-wide 21 % response rate. Reported responses are summarized in the table below. Key findings included: (1) Good practitioner support (n = 754, 78%) for increasing the number of baccalaureate degree programs in the state. (2) A significant percentage (n = 563, 58%) of hospitals/foundations providing available scholarships/organizational grants for continuing education by Respiratory Therapists. (3) No expected increase in salary (n = 821, 85%) for staff who complete an advanced degree. (4) Many staff with a current Associate's degree who would consider enrolling in a baccalaureate degree program (n = 532, 55%) . **Conclusions**: This study has identified significant Respiratory Care practitioner support for increasing the number of baccalaureate educational programs in the state. The study also identified good support for increasing the entry-level educational standards for Respiratory Therapists in the future. The results of this research will be used as the basis for baccalaureate program and consortium proposals to various universities in the state.

Sponsored Research - None

References:
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1730989

IMPROVING DISCHARGE EFFICENCY AND EFFECTIVENESS FOR ASTHMA PATIENTS THROUGH EARLIER INITIATION OF DISCHARGE EDUCATION.

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Background: Our current asthma discharge process was to provide the patient and family education within 90 minutes of the patient being discharged. This process contributed to delays in discharge, patient and family dissatisfaction, post-discharge care failures, and avoidable readmissions. As part of a national discharge collaborative the respiratory care department focused on earlier initiation of asthma education while attempting to improving outcomes, maintaining patient safety, ensuring effectiveness and efficiency, as well as, ongoing sustainability. Method: A multidisciplinary team of inpatient physicians, process improvement specialists, nurses, respiratory therapists (RT's), resident liaisons, case managers, clinical informatics and social workers collaborated on hospital wide processes to improve discharge process for asthma patients. The respiratory care department's efforts focused on earlier initiation of asthma education through: establishing an expectation around asthma education beginning at the time of admission; and ensuring consistency in the education being provided through a departmental wide asthma education competency. Utilization of a Pediatric Asthma Score (PAS), documented by the RT, within the Electronic Medical Record (EMR) guided the entire multidisciplinary team in determining the medical status of an asthma patient; and triggered best practice alerts (BPA) in the EMR prompting the RT to initiate a predetermined process. The first BPA alerted the RT to complete the asthma action plan and finalize discharge education. The second BPA notified the RT to place medication relabeling orders and send the patients' asthma medication(s) to pharmacy. Results: Baseline data was collected from October to December of 2011 and final data from June to August of 2012. The median time from medically ready to physical discharged decreased from 4.5 hours to 3 hours; patient and family satisfaction (institutional survey) with the overall discharge process improved from 56.1% to 73% of excellent; identified discharge related care failures decreased from 24.7% to 9.1%; and low readmission rates maintained at <1%. . Conclusion: The asthma discharge collaborative and earlier initiation of discharge education was proven to be successful through establishing clear expectations around when education was to be provided, consistency of education provided through competencies, and utilization of functions within the EMR to prompt processes.

Sponsored Research - None

1731580

EFFECTIVENESS OF DRY POWDER INHALER (DPI) PATIENT EDUCATIONAL HANDOUTS ON CORRECTING DEVICE USE IN CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD) PATIENT POPULATION AND THEIR ABILITY TO GENERATE ADEQUATE PEAK INSPIRATORY FLOW RATES (PIFR) TO PROPERLY USE THE DEVICE.

Archana B. Patel[1], David L. Vines[1], Brian Stein[2], Ellen A. Becker[1]; [1]Respiratory Care, Rush University, Chicago, IL; [2]Rush University Medical Center, Chicago, IL

BACKGROUND: The American College of Chest Physicians (ACCP) created handouts with pictures and written instructions that demonstrate how to use different medication inhaler devices, however, the effectiveness of these handouts in correcting patient technique has not been studied. This pilot study tested the effectiveness of these handouts on improving dry powder inhaler (DPI) technique in patients with COPD and the ability of COPD patients to generate the minimum peak inspiratory flow rate (PIFR) required for medication delivery. METHODS: This pilot study recruited 37 study participants from a metropolitan pulmonary function lab and outpatient clinic. Study participants were asked to demonstrate inhaler technique and were graded based on a checklist made from the ACCP handouts with 9 total points for Advair and 10 points for Spiriva. Pre-intervention post-intervention difference was evaluated to assess the effectiveness of the ACCP handouts using a paired t-test at alpha = 0.05. All study participants also performed three PIFR maneuvers using the In-check DIAL™ to evaluated their ability to generate minimum PIFRs for drug delivery. RESULTS: The 28 study participants were grouped by device. There were differences in pre-post mean scores for patients diagnosed with COPD using Advair (pre-intervention mean 6.79 + 1.19, n=14, post-intervention mean 7.71 + 0.91 n = 14) and Spiriva (pre-intervention mean 6.07 + 1.93, n=13, post-intervention mean 7.38 + 1.33 n = 13). These increases in mean score after the intervention with the ACCP handout were statistically significant for Advair (paired t13 =3.789, p=0.002) and Spiriva (paired t12 = 3.423, p=0.005). For both Advair and Spiriva, 100% (n=27) of study participants were able to generate the minimum PIFR necessary for medication delivery. CONCLUSION: The ACCP handouts alone without any verbal instructions significantly improved inhaler technique in the COPD population. Although the sample is limited, all patients enrolled were able to generate the minimum PIFR needed for drug delivery as stated by the inhaler manufacturer.

Sponsored Research - None

1731606

UTILIZATION OF A LECTURE SERIES TO ENHANCE DEPARTMENTAL EDUCATION INITIATIVES.

Matthew Trojanowski, Courtney Cesar, Kathryn Mattare; The Johns Hopkins Hospital, Baltimore, MD

BACKGROUND: Promoting education among respiratory care practitioners is critical to a department's success. Respiratory Care Services at The Johns Hopkins Hospital is currently facilitating a 16 part lecture series, of which 6 have been held. The goal of the lecture series is to promote education and skill advancement among staff members. Staff selected 16 topics through completion of an electronic survey. In addition, staff members also provided time frames that were most conducive for participating in the lectures. For the 6 lectures completed thus far, lecturers have included physicians, respiratory therapists, and nurses. Staff members are required to attend a minimum of 25% of the lectures. In addition to having the ability to attend the lectures in person, lectures are also offered via webcast. The goal of our present study was to evaluate the success of the lecture series thus far. METHODS: A 6 item, anonymous survey (Google Docs) was sent to evaluate the first 6 lectures. The survey required participants to specify the number of lectures attended in person and via webcast (Questions 1 -2). Questions 3 – 5 used a Likert scale (1 = strongly disagree, 5 = strongly agree) to evaluate the success of the initiative. The final question evaluated the value of webcasting. The survey was sent to all staff members (n = 68) and a 61.76% (n = 42) response rate was achieved. RESULTS: Results for questions 1 - 5 are summarized in table 1. Question 6 asked participants if they felt the webcasting option enabled them to attend lectures they would otherwise be unable to attend in person. 29 of the 42 (69.05%) participants said they agreed; only 1 (2.38%) disagreed, and the remaining 12 (28.57%) attended all lectures in person. CONCLUSION: The results strongly indicate that the development of an educational lecture series had a positive impact on the department and contributed to skill enhancement and knowledge development among practitioners. In addition, the data suggests that webcasting the lectures increased overall attendance. Staff input and the use of technology greatly contributed to the success of our initiative. The success of the lecture series will require continued validation through staff feedback.

Sponsored Research - None

Summary of Data for Questions 1 - 5

	Mean	Median	Min	Max	Mode
# of lectures attended in person	1.95	2.00	0.00	4.00	1.00
# of lectures attended via webcast	1.33	1.00	0.00	5.00	0.00
Total # of lectures attended	3.29	3.00	0.00	6.00	3.00
I feel the lecture series is a positive initiative for the department	4.69	5.00	3.00	5.00	5.00
The lecture series increased my knowledge-base and has helped me in the clinical setting	4.31	4.50	1.00	5.00	5.00
The lecture series increased the emphasis on education within the department	4.60	5.00	3.00	5.00	5.00

1731652

NEEDS ASSESSMENT FOR TRACHEOSTOMY CURRICULAR RESOURCES.

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BACKGROUND: Respiratory therapy educators were surveyed to gather data on current curricular content regarding tracheostomy related issues in order to identify potential new curricular resources that could be developed. METHOD: An electronic survey comprised of a 10 item rating inventory to determine the most effective practices regarding tracheostomy curriculum was developed using Jotform Pro. The survey focused on didactic coverage of tracheostomy airway management, use of various curricular resources, interaction with resources available outside the classroom, and use of cooperative curricular exercises. The survey and cover letter were forwarded electronically to a primary faculty member at all Associate, Bachelor and Master level programs identified by the Commission on Accreditation for Respiratory Care. The survey was emailed three times with responder email addresses removed prior to each successive attempt, for a total of 396 surveys administered. Survey responses were compiled and analysis performed to provide response percentages and graphs for visual representation. RESULTS: 196 responses were returned for a response rate of 49.49%. A majority of responders rated tracheostomy devices, suctioning and site care of highest importance, with more than two instructional hours of tracheostomy airway management content provided more typically within a non-specific course. Demonstration models were indicated as the most valuable instructional resource, and webinar presentations of short segments of specific topics including clinical case presentations were indicated as the preferred web resource. The predominately chosen devices for student access to web media were smart phones and computers in the classroom and home. A majority of responders indicated the use of web-based media would best serve as an out of class resource, with electronic pre and post testing and webinar attendance rated as important interaction. A majority of responders indicated the use of grand rounds during clinical rotations as the most common form of collaborative interaction. CONCLUSION: Web-based media concerning tracheostomy airway management is an educational resource to be developed, in the professional judgment of the researcher, to enhance respiratory therapy curriculum.

Sponsored Research - None

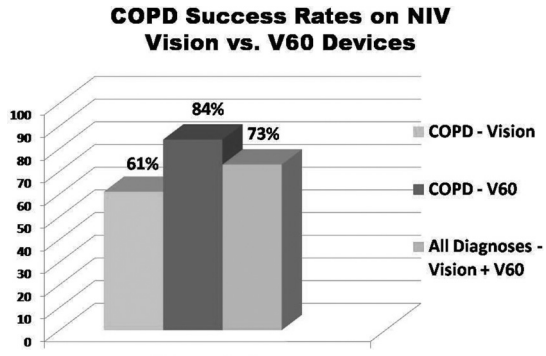
1731713

A COMPARISON OF VISION VS. V60 NIV OUTCOMES DATA FOR COPD PATIENTS – ONE HOSPITAL'S EXPERIENCE.

Diane Brenessel; The Queen's Medical Center, Honolulu, HI

Diane Brenessel, Carol Agard, Catherine Young, Respiratory Care Services; The Queen's Medical Center, Honolulu, HI BACKGROUND: Noninvasive ventilation (NIV) interventions are tracked utilizing a form which includes the reason for the NIV intervention and the outcome. NIV success is defined by stabilizing and averting endotracheal intubation for patients in respiratory distress and patients must remain stable for a minimum of 48 hours post NIV utilization. Respironics V60 devices were added to the NIV fleet on April 1st, 2012 METHODS: Separate tracking forms were created for Respironics Vision and V60 noninvasive ventilators, utilizing the same data points to compare the outcomes. The two devices were retrospectively compared with regard to their overall success rates and their success rates with specific diagnoses. Both devices were utilized with the same NIV Policy and Protocol, and RCP availability. RESULTS: From 4/1/12 to 3/31/13, a total of 473 NIV interventions were recorded. Use of the Vision device (n=192) resulted in an overall success rate of 69% compared to an overall success rate of 76% with the V60 device (n=280), with a combined overall NIV success rate of 73%. An acute exacerbation of COPD was the indication for NIV in 18% of the patients (n=85), and analysis of this subgroup indicated that success rates with the Vision device were lower than success rates with the V60 device (61% v. 84%). CONCLUSIONS: Although use of the Vision device led to success rates higher than the national benchmark for NIV, patients stabilized with the V60 device had an even higher success rate, especially in the COPD subgroup. This difference may be attributed to improved patient triggering with the V60 device when air-trapping is present, allowing for improved synchrony and decreased work of breathing. While further investigation is warranted, our findings suggest that the technological advancements of the V60 device may have a positive impact on patient outcomes.

Sponsored Research - None



1733657

TRACKING, TRAJECTORY, AND TRIGGERING INTENSIVE CARE UNIT VENTILATOR DATA.

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Background: Historically, tracking, trending and triggering of alerts from bedside physiologic and mechanical ventilation parameters was only obtainable from the bedside monitor or ventilator's user interface. This fixed display of information limited its utility. Advancements in physiologic monitoring and ventilation technology have provided the capability to stream information in a digital format. This has enabled the coupling of high frequency physiologic and ventilation data sampling for real-time display and interaction. Described herein is a program designed for real-time capture, storage, and analysis of data from these two sources that is under development. Method: The Tracking, Trajectory, and Triggering tool (T3) was developed by the Intensive Care Units at Boston Children's Hospital in collaboration with a software development partner, Arcadia Solutions. The objective was to enable the continuous evaluation and storage of physiologic and mechanical ventilation monitoring data within the ICU. A browser-based application designed to leverage real-time patient data by presenting complex information in a user-friendly interface was developed and implemented. A rollout was executed starting with physiologic monitoring in 2010. Mechanical ventilation parameters were added to the T3 platform in 2013, with future plans to integrate the data stream from additional biomedical devices. Results: To date, six mechanically ventilated patients (ages 5-13 years) have been successfully monitored. Figure 1 is a de-identified snapshot of the resulting output of the T3 user interface. T3 deploys four graphing canvases that are capable of displaying as many as four individual measures simultaneously per canvas. The user may drag and drop any combination of parameters on the canvas from currently measured values. Four targets can be established for each of the measured parameters. As these thresholds are met or exceeded, a visual alert is created. Conclusion: T3 is the result of an ongoing project to support clinicians caring for complex pediatric patients through enhanced visualization of the patient's physiologic data stream. As demonstrated here, a time series representation of the patient's ventilator parameter trajectory, and whether the measures remain within clinician-set target ranges, can be readily viewed in context with other continuous physiologic measures. Going forward, T3 may serve as a platform on which future analytics will be built.

Sponsored Research - None

1733781

APRV UTILIZATION AND CLINICAL MANAGEMENT STRATEGIES: A SURVEY OF CLINICAL PRACTICE.

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Background: Airway-pressure release ventilation (APRV) is a ventilator mode used primarily in patients with ALI or ARDS to improve oxygenation. The purpose of this survey is to examine current APRV utilization and clinical management strategies among a wide range of institutions. Methods: A survey instrument on APRV use was developed by the authors and approved by the IRB. The survey was sent via email to 200 Respiratory Therapists (RT's) (maximum of 1 per hospital) in the United States, Canada, Saudi Arabia, and United Arab Emirates. Results: The response rate was 44%. APRV was utilized in 85% of hospitals with 54% utilizing APRV on 20 or more patients per year. 44% of respondents were from academic centers, 27% community hospitals, 51% level 1 trauma centers and 53% had more than 500 beds. 40% of centers utilized APRV as a transitional mode to HFOV and/or ECMO. APRV was managed by RT driven protocol for 51% of respondents. 93% allowed spontaneous breathing. 52% set PEEP (P-Low) at 0 cm H2O, while 39% used variable PEEP levels. 40% did not have a standard I:E ratio during APRV. Patient populations, indications and Vt targets are summarized in the table below. Conclusion: In the institutions surveyed, APRV appears to be a widely used mode of mechanical ventilation, especially in the adult patient population. Overall clinical management of APRV, however, seems to vary. However, the majority of the institutions attempt to incorporate lung protective Vt's while using APRV. Further evaluation of clinical outcomes in patients receiving APRV is warranted.

Sponsored Research - None

APRV use by patient population		Vt Target	%
Adults	96%	6 ml/kg	34%
Pediatrics	19%	6-8 ml/kg	35%
Neonates	6%	8-12 ml/kg	4%
APRV Indications		No Target Vt	26%
ARDS/ALI	76%		
Burns	19%		
Trauma	54%		
Other	19%		

1733969

COMPARISON OF PREDICTED ANATOMIC DEADSPACE AND MEASURED DEADSPACE DURING MECHANICAL VENTILATION USING THE DRAGER EVITA INFINITY V500®

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Background Anatomic deadspace affects alveolar ventilation, especially when patients are ventilated with low tidal volume strategy. It is well known that anatomic deadspace can be predicted to be 1 mL per pound of ideal body weight. It is also estimated that the anatomic deadspace is reduced by 50% due to endotracheal intubation. Anatomic deadspace can be measured with volume-based capnography using the Fowler Method. Some modern mechanical ventilators utilize volume-based capnography to estimate deadspace. Method Predicted anatomic deadspace and measured anatomic deadspace using volume-based capnography in a mechanical ventilator (Drager Evita Infinity V500®) were compared in 30 intubated patients (19 male, 11 female) in ICU. Results The mean and standard deviation for the predicted anatomic deadspace were 64.7 ± 9.5 mL and the measured anatomic deadspace were 68.4 ± 15.8 mL (p=0.75). The mean difference between the predicted and measured anatomic deadspace is -3.6 mL (95% confidence interval -9.7 to -2.5). Conclusion The predicted anatomic deadspace is similar to the measured anatomic deadspace when using the Drager Evita Infinity V500®. This value may be an important consideration, especially when ventilating patients with low tidal volume strategy.

Sponsored Research - None

1703742

PERFORMANCE OF THE TXP IN A HYPOBARIC ENVIRONMENT.

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Background: Aeromedical transport of the critically ill/injured patient necessitates mechanical ventilation that is predictable and accurate. Lung protective strategies suggest that delivered pressure and tidal volume (VT) measurements are reasonably assessable. An inability to monitor these parameters potentially subjects patients to unsafe ventilatory practices. We evaluated the TXP (Percussionaire) device in an effort to demonstrate its performance characteristics in response to changes in simulated altitude. Methods: The TXP (Percussionaire) was connected to a test lung with volume, pressure, flow and timing measurements acquired with a pneumotachograph and data analysis software. It was set to deliver 500 ml at a compliance of 30 ml/cmH20 and a resistance of 5 cmH20/L/sec at sea level. Initial TXP settings were maintained throughout testing with adjustments in compliance and resistance at sea level, 8,000, 16,000, and 22,000 feet simulated altitudes being the only variables. Modifications in compliance and resistance of 10/30 ml/cmH20 and 5/20 cmH20/L/sec respectively were performed. Data was recorded for a minimum of 1 minute after stabilization at each altitude. Results: Tidal volume measurements of the TXP increased from 164 ml at sea level to 527 ml at 22,000 feet at a compliance of 10 ml/cmH20 and resistance of 5 cmH20/L/sec, 155 ml to 539 ml at 10 ml/cmH20 and resistance of 20 cmH20/L/sec, 506 ml to 1462 ml at a compliance of 30 ml/cmH20 and resistance of 5 cmH20/L/sec, and 324 ml to 1346 at 30 ml/cmH20 and resistance of 20 cmH20/L/sec (Figure 1). These changes are likely due to gas density and dynamics at the different altitudes. Resultant data illustrated effects of altitude in a potential military transport environment. Conclusion: Aeromedical transport of critically ill and injured casualties necessitates equipment that performs accurately in a hypobaric setting. The changes in gas dynamics at varying altitudes may affect the performance characteristics of ventilation devices calibrated for use at sea level. Clinicians must be aware of this to appreciate the probable impact in their management of mechanically ventilated patients.

Sponsored Research - Study was funded by US Air Force.

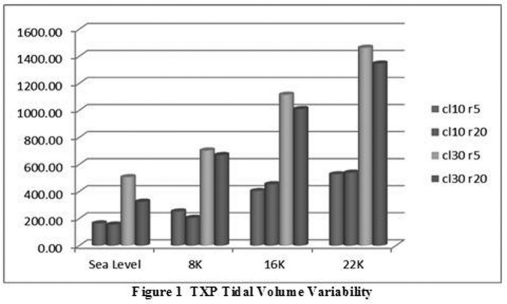

Figure 1 TXP Tidal Volume Variability

1734048

ADAPTIVE SUPPORT VENTILATION REDUCES THE NUMBER OF VENTILATOR CHANGES FROM INITIATION TO LIBERATION.

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The role of mechanical ventilation is to improve gas exchange and reduce the patient's work of breathing. Unfortunately prolonged ventilation is associated with many negative sequelae. It is imperative that than once clinical stability is achieve that the goal of ventilatory liberation is facilitated. Adaptive Support Ventilation (ASV) is a novel mode of ventilation that provides a closed loop assessment of mechanically ventilated patients. The mode will adjust delivered tidal volume and set respiratory rate based on feedback physiological data and patient interaction. If the patient starts breathing spontaneously, the mode adjusts from time-cycle ventilation to flow-cycled ventilation and may wean the patient without clinician interaction. This automatic weaning may decrease ventilator duration and facilitate ventilatory liberation. Also the number of ventilator adjustments until ventilatory liberation will be reduced. The goal of our study was to retrospectively review patients that were placed on ASV with historical cohorts whom were placed on either CMV or SIMV time-cycle ventilation to determine if there were less clinician ventilator adjustments until liberation when placed on ASV. Over an eighteen month period we reviewed patients who were placed on the ASV and then match those patients with patients who were placed on either CMV or SIMV time-cycle ventilation during the same time frame in our surgical ICU. Cohorts were match by age, BMI, ventilatory duration, and surgical diagnosis. During that time period one hundred patients were placed on the ASV mode. We examined the number of clinician interventions until liberation. We did the same for the matched cohort group. The mean number of ASV interventions was 3.4 compared to the Cohort group which was 6.2 until liberation. (Table 1). Based on our data ASV reduced the number of interventions required to facilitate ventilator liberation. This maybe very helpful in high clinical workloads and when staffing ratios are low. A large clinical study needs to be conducted to determine this effect on patient outcomes, ICU length of stay, and mortality.

Sponsored Research - None

Table 1

	Interventions	Age	BMI	Abdominal Surgery	Thoracic Surgery	VLS
ASV Group	3.4	62.6	32.1	72%	28%	5.1 Days
Cohort Group	6.2	63.8	29.9	69.6%	30.4%	5.6 Days

1688034

APPLICATION OF ECLS & LUNG RECRUITMENT VIA HFPV & BRONCHOSCOPY.

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Introduction: Extracorporeal life support (ECLS) is the use of mechanical devices to temporarily support heart and/or lung function by providing prolonged tissue oxygen delivery in patients with respiratory and/or cardiac failure. High Frequency Percussive Ventilation (HFPV) allows for progressive stepwise inflation of the lung to a set peak pressure, and passive exhalation to a predetermined lower pressure. HFPV has continuous pneumatic oscillations, which allow for mobilization of retained airway secretions. **Methods:** After May 2011, all of the children in the Pediatric Intensive Care Unit on ECLS received HFPV and therapeutic bronchoscopies as an adjunct to pulmonary toilet and we compared the HFPV cohort (n~12) to the cohort immediately preceding standardization of HFPV and bronchoscopies (n~22). Results: Oxygenation Index (OI) pre ECLS were comparable with the OIs on the HFPV group being 52 and the OIs on the Pre-HFPV group being 53. The Mean Airway Pressures (MAP) on ECLS were also comparable: HFPV group MAP was 14.5 while the Pre-HFPV group was 14. ECLS free days at day 30 & day 60 were improved with the HFPV group and there was a notable difference in the patients that developed air-leak while on ECLS: 2 patients developed air-leak on the HFPV group (17%) and 7 patients developed air-leak on the Pre-HFPV group (32%). **Discussion:** Aggressive pulmonary toilet with HFPV and therapeutic bronchoscopies reduces time on extracorporeal support and HFPV can be applied with minimum complications while on ECLS.

Sponsored Research - None

1734892

THE EXPLORATION OF PLANNED EXTUBATION OF A SOUTHERN MEDICAL CENTER IN TAIWAN.

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Background: Planned extubation (PE) requires appropriate timing and supportive care in order to avoid reintubation (re-intubation within 72 hours). The aim of this study was to exhibit the current status of PE, included duration of ventilation, ICU (intensive care unit) and hospital length of stay, hospital cost and prognosis. Method: From 1 Jan, 2010 to 31 Oct, 2010, a retrospective review of all adult patients (>18 years old) on mechanical ventilation with an endotracheal tube admitted to the ICUs of Chi-Mei Medical Center in Taiwan were reviewed. The ventilated patients were divided into three groups: ease-to-wean, difficult-to-wean and prolonged weaning. Results:There were 2532 patients intubated with mechanical ventilator, and 1353 patients fulfilled the inclusion criteria of PE (53.4%). The rate of successful extubation accounted for 96.1% (1300/1353) and a mortality of 7.4% (100/1353). The ease-to-wean group accounted for 77.9 % of PE patients with a mortality of 5.6%; the difficult-to-wean was 13.8% of all with a mortality of 10.2%; there were 8.2% of all in the prolonged weaning group with a mortality of 19.8%. The rate of successful extubation was 96.3%, 93.6%, and 92.7% respectively. Compared with the other two groups, the ease-to-wean group was apparently younger, and APACHEII and TISS score were also lower. Furthermore, the ease-to-wean group was shorter in the ventilator days, ICU and hospital stays. The first group had a significant lower hospital cost and a hospital mortality. Conclusions: In our study, PE exhibited a higher rate of successful extubation and a lower rate of mortality. The severity score in the ease-to-wean group was significantly lower than others (difficult-to-wean and prolonged weaning). The ease-to-wean group also had a better prognosis, as shorter in the ventilator duration, ICU stay and hospital stay and lower in hospital cost and mortality. We wished to maintain the high quality of planned extubation in order to reduce the unnecessary costs and the possible harm to patients. Keyword: panned extubation, respiratory failure, mechanical ventilation. intensive care unit, prognosis.

Sponsored Research - None

1687053

ACUTE LUNG INJURY CAUSED BY HIGH TIDAL VOLUME—THE EXPERIENCE FROM RAT ANIMAL MODEL.

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Background: To establish the animal model of two-hit model by ventilator induced lung injury after pneumonia, which is not rarely seen in clinical practice. Methods: Male Sprague-Dawley rats (300 – 400 g) were aerosolised 24 hours after intratracheal challenge with LPS (Escherichia coli O55:B5) as a first hit to induce systemic inflammation. They were then randomized to receive mechanical ventilation (Servo 300 ventilator, Siemens, Sweden) as a second hit, with a high tidal volume of 22 mL/kg and zero positive end-expiratory pressure (high volume group, HV), or a low tidal volume of 6 mL/kg with positive end-expiratory pressure of 5 cm H2O (low volume group, LV), with a fraction of inspired oxygen (FiO2) of 40 % during the experimental period. There were 4 groups (n=8~10 in each group): HV, HV+LPS, LV and LV+LPS. The following data were collected: hemodynamic data, blood gases, lung lavarge cell differentiation, lung edema (as wet/dry ratio), lung compliance and serum and lung cytokines. Results: After 4-hours ventilator use, each groups had a similar hemodynamic status (mean arterial pressure and heart rate) and pH, PaCO2, HCO3. The HV+LPS group had a lower arterial O2 and lung compliance, deteriorated lung edema and higher lavarge cells and neutrophils as compared with the other groups Conclusions: Inadequate ventilator setting may cause severe lung injury complicated after LPS induced pneumonia, as evidenced in worse lung compliance, oxygenation, inflammatory cell and lung edema. The clinician should be cautious about the possible injury caused by inappropriate ventilator setting in clinical relevant condition.

Sponsored Research - None

1675128

TITLE: EFFICACY OF RECRUITMENT MANOEUVRE WITH OR WITHOUT ANTIDERECRUITMENT STRATEGY IN ARDS PATIENTS: A PROSPECTIVE STUDY.

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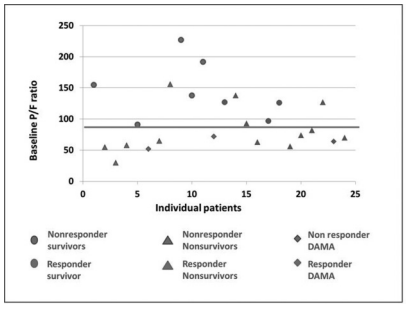
Background: In acute respiratory distress syndrome (ARDS), adequate positive end-expiratory pressure (PEEP) may recruit collapsed alveoli and reduce repetitive opening and closing that causes shear stress. Recruitment manoeuvre (RM) opens up collapsed segments of the lung in many patients with ARDS whereas some patients do not respond to RM. In the responders, the collapse may reappear once the RM is complete and the patient is returned to his pre-RM PEEP level. Oxygenation benefit achieved by the RM may be partially lost soon after the RM. The level of PEEP, i.e., an antiderecruitment strategy in mechanical ventilatory support, could be important in preserving the effect of the ARM. Objective: To evaluate the outcome of setting the PEEP using decrement PEEP titration after an alveolar recruitment manoeuvre and its effects on the clinical outcome in patients with ARDS. Methods: Twenty four patients with early ARDS were assigned in this study. Initially recruitment manoeuvre was given using pressure control ventilation to determine the responders or non-responders. Responders were randomly assigned to 'antiderecruitment RM' (ADRM) group and 'only RM' group. The 'antiderecruitment RM' group received RM using volume control ventilation and optimal PEEP was set after RM using decremental PEEP titration method. The 'only RM' group patient was put on baseline ventilator settings after manoeuvre. Results: Out of the total 24 patients, 12 showed an improvement in oxygenation (P/F) in response to the initial recruitment manoeuvre by more than 20% from baseline. When the change in P/F ratio was correlated with survival, it suggests that a P/F ratio < 90 at admission (baseline) is associated with mortality. Conclusion: Only half of the patients with ARDS respond to recruitment manoeuvres with an improvement in oxygenation. In most responders, the improvement is sustained irrespective of whether RM only or ADRM was used.

Sponsored Research - None



1689589

COMPARISON OF PRESSURE SUPPORT AND PROPORTIONAL ASSIST VENTILATION PLUS FOR WEANING FROM MECHANICAL VENTILATION IN CRITICALLY ILL PATIENTS.

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Background: Pressure support ventilation (PSV) is widely used for weaning patients from mechanical ventilation in ICU. In PSV chances of oversupport and patient-ventilator dysynchrony is commonly noticed in patients. Proportional assist ventilation (PAV) is a weaning mode which has shown to improve these problems faced with PSV. But the complexity in setting up the mode for ventilation has declined the usage of this mode. A modified software update of PAV called Proportional assist ventilation plus (PAV+) has been introduced. PAV+ has simplified the mode and the complication with respect to PAV has been rectified. Objective: To compare length of weaning (in hours) on ventilator (840, Puritan BennettTM, California), using Pressure support ventilation (PSV) and Proportional AssistTM Ventilation Plus (PAV+). Methods: 23 adult patients who were invasively ventilated via an endotracheal tube were included in the study after successfully completing SBT criteria. Patients on ventilator only for airway protection, neuromuscular disease, COPD were excluded. All included patients were randomized into 2 groups; PSV (n=10) mode group and PAV+ (n=13) mode group after passing 30 minutes of PSV trial. Both modes were continued unless the patients met predefined criteria either for switching to previous mandatory modes (failure criteria) or for breathing without ventilator assistance. An extubation failure was assessed within 48 hours to determine failure of weaning mode. Results: An Independent t-test was used for comparing means. Mean Age was 47.19±16.67. Length of weaning (in hrs) which is the primary outcome was 3.5 (median) for both PAV & PSV. In PAV+ median in ABG were, H+-39.35, PaCO2-36, P/F ratio-341 and for respiratory mechanics mean±SD were PIP-13.58±6.72, MAP-8.9±2.62. PSV median in ABG were H+- 36.34, PaCO2-37, P/F ratio-332.44 and for respiratory mechanics mean±SD were PIP-14.4±2.36, MAP-9.2±1.49.ICU Discharge (in days) was median of 9.5 and 10 in PAV+ & PSV respectively. Discussion: There was no statistical significance present. But clinically the duration of ICU stay was reduced in comparison.

Sponsored Research - None

1699574

A BENCH STUDY COMPARISON OF LITER FLOWS AND TARGETED POSITIVE END EXPIRATORY PRESSURE LEVELS WHEN UTILIZING A FLOW-INFLATING RESUSCITATION BAG.

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Background: Two common resuscitation bags used to provide manual ventilatory support are self-inflating and flow-inflating bags; both can incorporate PEEP. An abundance of evidence exists surrounding the use of PEEP in self-inflating bags. However, little evidence exists that provide recommendations on the liter flows needed to achieve a targeted PEEP level when using a flow-inflating resuscitation bag. This study has been designed to test the varying liter flows needed to achieve target PEEP levels with a flow-inflating resuscitation bag. We hypothesized that there's a difference in the ability to hold a targeted PEEP level using a flow-inflating resuscitation bag in an infant lung model with variable low to high range flow settings. Method: 5 RRT's with varying experience, were solicited to operate the flow-inflating bags (Mercury Medical) using a lung model (IngMar Medical). Each volunteer tested three 0.5 liter flow-inflating bags with integrated pressure manometers at varying liter flows (3, 5, 8, 10 L/m) and PEEP levels (5, 8, 10, 15 cmH2O); sequential order was used for liter flows and PEEP levels. RRT's were asked to bag at a RR of 20 and target PIP's of 20-25cmH2O. The NM3 (Phillips Respironics) recorded breath-by-breath data. Oxygen liter flows were measured for accuracy using the PTS 2000 (Puritan Bennet). The impact the bagger had on maintaining the targeted PEEP level was also noted. Statistical analysis was done using SPSS V21.0; descriptive statistics were used to calculate mean and standard deviation per variable. A two-way ANOVA was performed, followed by a Bonferroni post-hoc analysis. Significance was set at .01. Results: (See Graph) Set flow does not directly impact the ability to hold PEEP ($p=.35$); there's differences in the relationship between measured PEEP, flow, bagger, and bag at every level ($p<.01$). Set PEEP is different than measured PEEP at every flow level ($p<.01$). Measured PEEP was impacted by both bagger and bag variability at every level ($p<.01$). Visually, baggers had to manipulate each bag and pressure manometer valve to obtain the desired PEEP levels for all liter flows. Conclusion: This study's results demonstrate that set liter flow does not impact the ability to hold a targeted PEEP level when using a flow-inflating resuscitation bag; individuals using the bag do impact how the targeted PEEP level is achieved. Additionally, the higher the set PEEP level, the greater variability in the actual PEEP level delivered.

Sponsored Research - None

1733997

RATE OF PRESSURE ULCER DEVELOPMENT ASSOCIATED WITH NON-INVASIVE VENTILATION: OPPORTUNITY FOR IMPROVEMENT.

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Background/Objectives: Barnes-Jewish Hospital ICU pressure ulcer (PU) work group identified an issue with PU's of the nasal bridge related to the nasal-oral non-invasive ventilation (NIV) masks. During a two-month chart review in 2011, 11% of ICU patients developed a Stage I or higher PU. This data was obtained from chart review only; therefore, the rate could potentially be higher with direct observation. The PU rate benchmark set by the National Database for Nursing Quality Indicators is 4%. The objective of this study was to describe the actual Stage I and higher PU rates associated with NIV. Methods: Initially respiratory therapists and nurses were educated on proper fitting and application of NIV masks. Education focused on allowable leak to ensure adequate flow for ventilation including prevention of unnecessary tightening of the mask straps to minimize pressure under the mask. Patients in 5 ICU's with orders for NIV were screened for study eligibility. A skin assessment at initiation of NIV was completed. Members of the research team assessed the patient's skin daily under the mask for pressure related injury. Nurses were asked to complete the assessment each evening and to coordinate with respiratory therapy if any skin issues developed. Patients were followed the entire time of NIV usage in the ICU if worn at least 60% of the time. One hundred patients were followed. If a Stage I or higher PU was identified the patient was switched to an alternate full face NIV mask. In phase II of the study, another 100 patients will be started on the full face mask and followed for PU development. Results: 100 patients using the nasal-oral mask were enrolled between May-September 2012. Mean wear time was 25 hours, range 0.75 – 116 hours, with mask wearing adherence 92%. The mean age was 62; 51 patients were females; 75 were Caucasian white and 25 Black. Twenty percent of patients developed a PU. Sixteen patients developed a Stage I and 4 patients developed a Stage II. No deep tissue injury or Stage III or IV ulcers were identified. All PU's healed prior to discharge from the ICU. Conclusions: PU rates associated with NIV masks are significantly higher than the national benchmark. Phase II with an alternate mask will provide useful information to compare rates between the two masks and examine factors which may be associated with PU development such as patient age and wear time.

Sponsored Research - None

1721954

DISCHARGE TIME OUT FOR CARE COORDINATION.

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Problem Statement: A disjointed method for coordination of patient care was identified, causing an inconsistent, incomplete approach to discharge preparedness, interruptions in continuum of care and lack of collaboration among caregivers. These issues contributed to: patients gong home without needed RT DME and RT and patient dissatisfaction due to last minute calls for home O2 qualification. Project Description: Key stakeholders identified gaps and opportunities. A care coordination checklist was developed. The checklist enabled a multidisciplinary team to focus on patients' needs while planning for discharge. RT and other ancillary services, made a commitment to collaborate with nursing and care management in daily rounds, promote discussion on length of stay, patient needs and readiness for departure. Results: Significant decrease in length of time from discharge order to patient departure,developed standardized procedure and tool for discharge, HCAHPS scores for discharge communication increased from the 50th to the 90th percentile, improved communication and collaboration among caregivers, consistent use of the SBAR format for the RTs, accountability of RT within the disciplinary team for patient care interventions, changed perception of RTs away from "aerosol jockeys" to therapists, showing our value in respiratory care patient assessment and evaluation, proactive identification of RT discharge needs which decreased evening, weekend and last minute DME qualification and set up Conclusion: The success of the pilot has reached all levels of the hospital and enterprise leadership. Recognition and has further melded the collaboration of the disciplines involved. The team continues to serve as an example and resource for the other hospital units rolling out the same process. Physician and patient and family engagement are avenues the team would like to pursue next. In addition, monitoring and coordinating care across the continuum into the community are other areas where this process can help build support and better patient experiences and reduce readmissions.

Sponsored Research - None

Outcomes Time Out for Care Coordination

	Pre-Pilot 9/15-10/16/2012	Pilot Month	Post Pilot Month 1	Post Pilot Jan '13	Post Pilot Feb '13	Post Pilot Mar '13
Average Time (in hours) between discharge order and Patient departure	11.73	7.37	5.48	5.75	7.32	6.85
submitted post 5:30pm13.3%	40%	38%	37%	12.7%	12.5%	13.3%

1721057

A NURSE-LED CARING PROGRAM "REDUCE" FOR COPD PATIENTS WITH HF SYMPTOMS IN HONG KONG.

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Background: Chronic Obstructive Pulmonary Disease (COPD) and Heart Failure (HF) are highly prevalent coexisted diseases in aging population. About one third of elderly with HF have coexistent COPD and one fifth with COPD have coexistent HF [1]. Respiratory and cardiovascular diseases ranked the first two mortality rate and hospitalization among all diseases in HK, UK and globe [2]. Both diseases cause great burden to the health care system. In order to provide systematic and proactive care for these patients, a caring program has been launched since 2010 in a Respiratory division of an acute district hospital in Hong Kong. Aim: To evaluate the effectiveness of nurse-led caring program for elderly with coexisted COPD and HF symptoms. Method: This nurse-led caring program was introduced to patients with coexisted diseases from January 2010 to December 2012. Fifty-nine participants' mean scores of healthcare utilization are being reviewed retrospectively three month before and after the implementation of the program. Paired-Samples T-Test of SPSS Version 16.0 was used in the analysis. The key components of the "REDUCE" approach are as follows: R —- Registry of patients' clinical information facilitates Risk stratification. E —- Evidence-based protocols and guidelines enhance decision making. D —- Dialing of 24-hour hotline and telephone follow-up gain mutual support. U —- Use of respiratory nurse clinic and respite care. C —- Custom-made care plan. E —- Empowerment and Education. Results: Total 59 COPD patients with HF symptoms out of 423 cases were being scrutinized for their healthcare utilization three months before and after joining the service. Almost all of them are male with the mean age of 78.22+/-6.55. It was statistically significant reduction in emergency department attendance by 22.85% from 5.12 to 3.95 times ($p<0.014$), the average number of unplanned admission by 32.69% from 1.56 to 1.05 ($p<0.002$) and the length of stay by 36.58% from 5.03 to 3.19 days ($p<0.032$). Conclusions: COPD and HF are predominant coexisted diseases causing huge impact to the healthcare system. This nurse-led caring program plays an essential role in relieving the burden to the patients especially in reducing their health care utilization.

Sponsored Research - None

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1728501

NOT MY JOB? NOT ANYMORE. HOW ONE HEALTHCARE SYSTEM'S RESPIRATORY CARE DEPARTMENT CONTRIBUTED TO IMPROVING HOSPITAL CONSUMER ASSESSMENT OF HEALTHCARE PROVIDERS AND SYSTEMS (HCAHPS) SCORES FOR THE PAIN MANAGEMENT DOMAIN.

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BACKGROUND: With the changing healthcare environment, multidisciplinary teamwork is paramount to providing the best patient care experience to improve Quality Outcomes and maximize reimbursement. To that end, Respiratory Care Practitioners must realize that participation in activities outside of their primary responsibility zone is essential in meeting this need. We hypothesized that by asking patients about their level of pain prior to administering respiratory therapy, we could provide an avenue of early intervention to pain management and thus improve the patient's perception that staff did everything they could to help with their pain. We hypothesized that this would contribute to improved HCAHPS scores for the Pain Management Domain. METHOD: Three Hospitals of the Baylor Healthcare System collaborated with nursing to create pilot programs on previously selected nursing units that incorporated using respiratory therapists asking the patient about their pain prior to administering care. If the pain level on a scale of 1-10, with 10 being the highest level of pain, was 5 or greater, the respiratory therapist would call the nurse into the room at that time to address the pain in front of the patient. Press Ganey was used to track HCAHPS scores for the Pain Management questions. We evaluated scores specifically for the following HCAHPS question: " During your hospital stay, how often did the hospital staff do everything they could to help you with your pain?" RESULTS: See table for main results. CONCLUSION: Overall HCAHPS Pain Management Domain scores increased. Each hospital also reported an increased trend in scores for the specific question of " During your hospital stay, how often did the hospital staff do everything they could to help you with your pain?" . Opportunities exist to extrapolate this model to the remaining hospitals in the system and to include additional HCAHPS Domains.

Sponsored Research - None

1725638

AN EARLY AMBULATION TIME & MOTION STUDY IN HIGH ACUITY PATIENTS: PRE, DURING AND POST TIME VARIABLES: 1 OF 5.

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Background: Intermountain Healthcare Corporation (IH) owns & operates 22 acute-care hospitals in the intermountain west. IH selected a goal for early ambulation (EA) of high acuity &/or ventilated patients in the adult Intensive Care Units (ICU) enterprise-wide. Respiratory Care Service (RCS) leaders were solicited to assist. Preliminary outcomes from 1 hospital reported EA pts were able to discharge from the hospital directly home rather than to an intermediate care facility & then home. Thirty minutes were previously assigned for RCS to perform EA. To determine more accurate human, equipment, supply & time resource requirements, a multi-disciplinary team of RT/Nursing representatives conducted an EA time & motion study using the AARC's Uniform Reporting Manual as a guide. Method: Two adult ICUs were surveyed. Five patients were randomly selected for inclusion. Time elements were segmented into pre-, during & post-ambulation periods. One surveyor reviewed patient medical records for motion elements while time elements were monitored by 2 additional surveyors. Using an i-Phone® stopwatch, 2 surveyors observed EA segmented times & recorded the actual time in minutes:seconds. Results: Outcomes are reported in Table One. Conclusion: RCS previously received 30 min/pt to perform EA. The observed range of actual time for the procedure was 24.3-52.1 min. (average of 38.3 min). Time to perform a chart check or team planning for EA was not observed/included. The consensus of the team was 50 minutes should be given for a single episode of EA. The study n was small; however, actual average EA time was longer than the 30 min/pt previously allotted. More research should be performed before conclusions can be drawn. We initially thought to include only intubated/trached pts on mechanical ventilation; however, upon further analysis, we included pts on heated, high flow nasal cannuals (HHFNC). Pts 1 & 4 were on HHFNC. Total resource requirements should be considered in light of the unit's total number of pts eligible for EA, initial vs subsequent EA event, number of laps, overall expected workload & unplanned events. Accurate documentation of the time required for EA must be included if pts are to be safely ambulated & actual required resources are to be reported accurately. Leaders are meeting to determine revision of the time allotted for this procedure as a result of this survey. ®Registered trademark of Apple, In

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Table One: Pre-, During and Post-EA Time Variables

Patient # #	Pre-Ambulation Time Min:Sec	During Ambulation Time Min:Sec	Post Ambulation Time Min:Sec	Total Time Min:Sec
Patient #1	10:16	7:03	14:06	31:25
Patient #2	13:10	4:50	8:04	26:04
Patient #3	21:28	15:33	15:44	52:05
Patient #4	7:25	7:22	9:45	24;32
Patient #5	9:33	5:02	11:31	26:06
Total Time Min:Sec	61:12	39:10	58:29	191:37
Average Time Min:Sec	12:22	7:82	12:06	38:28

*Surveyros did not observe pre-ambulation team coordinaton
**Surveyors did not observe pre-ambulation team coordination or RT patient assessment
πSurveyors did not observe RT patient assessment

1728716

AN EARLY AMBULATION (EA) TIME AND MOTION STUDY IN HIGH ACUITY PATIENTS: PATIENT DEMOGRAPHICS, LINES/TUBING, EQUIPMENT/SUPPLIES AND TIME REQUIREMENTS: 4 OF 5.

Kimberly J. Bennion[1], Scott Daniel[2,1], Danny Probst[1], Nancy Nelson[1], Steven Abplanalp[1]; [1]Corporate Respiratory Care, Intermountain Healthcare, Salt Lake City, UT; [2]Respiratory Care, Dixie Regional Medical Center, St. George, UT

. Background: Intermountain Healthcare Corporation (IH) owns & operates 22 acute-care hospitals in the intermountain west. IH selected a goal for early ambulation (EA) of high acuity &/or ventilated patients in the adult Intensive Care Units (ICU) across the corporation. Corporate Respiratory Care Service (RCS) leaders were solicited to assist. Preliminary outcomes from 1 hospital reported EA patients (pts) were able to discharge directly home from the hospital rather than to an intermediate care facility & then home. Thirty minutes were previously assigned for RCS to perform EA. To determine more accurate human, equipment, supply & time resource requirements, a multi-disciplinary team of RT & Nursing conducted an EA time & motion study using the AARC's Uniform Reporting Manual as a guide. Method: Two adult ICUs were surveyed within IH. Five patients were randomly selected for inclusion. Time elements were segmented into pre-, during & post-ambulation periods. One surveyor reviewed the pt medical records for motion elements while time elements were monitored by 2 additional surveyors. Using an i-Phone® stopwatch, 2 surveyors observed EA segment times & recorded the actual time in minutes & seconds. Results: Outcomes are reported in Table One. Conclusion: The observed range & average of actual time for the procedure was 24.3-52.1 min. & 38.3 min. respectively. Time to perform chart checks or team ambulation planning were not observed/included. The consensus of the team was 50 minutes should be given for a single episode of EA. The study n was small; however, the average time for EA was longer than the 30 min/pt previously allotted. There appears to be some association between the number of equipment/supply requirements on EA total/average time requirements. Further study is needed before conclusions can be drawn. Total resource requirements should be considered in light of the unit's total number of high acuity pts, initial vs subsequent EA event, number of laps, overall expected workload & unplanned events. Accurate documentation of the time required for EA must be included if patients are to be ambulated safely & actual required resources are to be reported accurately. Leaders are meeting to determine a revision of the time allotted for this procedure as a result of this survey. ®Registered trademark of Apple, Inc

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1728993

AN EARLY AMBULATION (EA) TIME AND MOTION STUDY IN HIGH ACUITY PATIENTS: PATIENT DEMOGRAPHICS, EA AREA SCORE, STAFF REQUIREMENTS AND TIME VARIABLES: 5 OF 5.

Kimberly J. Bennion[1], Scott Daniel[2,1], Danny Probst[1], Nancy Nelson[1], Steve Abplanalp[1]; [1]Corporate Respiratory Care, Intermountain Healthcare, Salt Lake City, UT; [2]Respiratory Care, Dixie Regional Medical Center, St. George, UT

Background: Intermountain Healthcare Corporation (IH) owns & operates 22 acute-care hospitals in the intermountain west. IH selected a goal for early ambulation (EA) of high acuity/ventilated patients in the adult Intensive Care Units (ICU) across the corporation. Corporate Respiratory Care Service (RCS) leaders were solicited to assist. Preliminary outcomes from 1 hospital reported EA patients (pts) were able to discharge from hospital directly to home rather than to an intermediate care facility & then home. Thirty minutes were previously assigned for RCS to perform EA. To determine more accurate human, equipment, supply & time resource requirements, a multi-disciplinary team of RT/Nursing representatives conducted an EA time & motion study using the AARC's Uniform Reporting Manual as a guide. Method: Two adult ICUs were surveyed within IM. Five patients were randomly selected for inclusion. Time elements were segmented into pre-, during & post-ambulation periods. One surveyor reviewed the pt medical records for motion elements while time elements were monitored by 2 additional surveyors. Using an i-Phone® stopwatch, 2 surveyors observed EA segment times & recorded the actual time in minutes & seconds. Results: Outcomes are reported in Table One. Conclusion: RCS previously received 30 min/pt to perform ambulation in this subset of ICU pts. The observed range & average times for the procedure were 24.3-52.1 min. & 38.3 min. respectively. Time to perform chart checks or team ambulatory planning were not observed/included. The consensus of the team was 50 minutes should be given for a single episode of EA. The study n was small; however, the average time for EA was longer than the 30 min/pt previously allotted. There does not appear to be an association between the number of staff/family required during EA and total/average time requirements. Further study is needed before conclusions can be drawn. Total resource requirements should be considered in light of the unit's total number of high acuity pts, initial vs subsequent EA event, number of laps, overall expected workload & unplanned events. Accurate documentation of the time required for EA must be included if patients are to be ambulated safely & actual required resources are to be reported accurately. Leaders are meeting to determinea revision of the time allotted for this procedure as a result of this survey. ®Registered trademark of Apple, Inc

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1729053

A STATE-WIDE SURVEY OF MANAGEMENT SUPPORT FOR INCREASING RESPIRATORY THERAPIST EDUCATIONAL STANDARDS.

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Background: In order to expand services, achieve new competencies, and adopt new roles such as Patient Educator, Disease Manager, and Pulmonary Navigator; the AARC has recommended increasing future educational standards for Respiratory Therapists. [1] Because of potential licensure changes needed to coincide with increased educational requirements, the North Carolina Respiratory Care Board (NCRCB) conducted a statewide survey of Directors/ Managers of Respiratory Care Departments regarding future changes in credentialing and educational standards. The purpose of this survey was to quantify support from Respiratory Care department managers for increasing educational standards for Respiratory Therapists in the future. **Methods:** A voluntary, anonymous, electronic survey was developed and sent state-wide to all Directors/Managers of Respiratory Care departments throughout North Carolina (n=136). The survey focused on the current and projected job description requirements, salary changes, recognition, and organizational support for increased educational standards for the baccalaureate degree as entry level to the profession. **Results:** A total of 34 (n=34) licensed Directors/Managers of Respiratory Care departments completed the survey, for a statewide 25 % response rate. Reported responses are summarized in the table, which follows this abstract. Key findings included (1) strong management support (n = 28, 82%) for increasing future educational standards, (2) a high percentage (n =29, 85%) of hospitals/foundations providing available scholarships/organizational grants for continuing education for Respiratory Therapists, and (3) Some degree (n = 16, 47%) of current clinical ladder implementation to provide incentives for advanced degree completion. **Conclusions:** This study has identified substantial state-wide management support for increasing educational standards for Respiratory Therapists in the future. Although institutional resources exist to support current staff continuing their education, this study has also identified the need to pursue clinical ladder implementation as an incentive for existing staff to further their education; since salary increases were not projected for current staff who choose to obtain an advanced degree.

Sponsored Research - None

1. American Association for Respiratory Care. Development of Baccalaureate and Graduate Degrees in Respiratory Care: A White Paper from the AARC Steering Committee of the Coalition for Baccalaureate and Graduate Respiratory Therapy Education. AARC Website, www.AARC.org

1729588

VALIDATION OF RELATIVE VALUE UNIT METRICS FOR AN 800 BED RESPIRATORY CARE DEPARTMENT.

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Background: The American Association for Respiratory Care has recommended that Relative Value Units (RVU's) be utilized as the metric to accurately determine staffing resources required for cost- effective and safe provision of services.[1] This topic is important since the Centers for Medicare and Medicaid (CMS), require adequate staffing levels for safe delivery of Respiratory Care services.[2] The purpose of this study was to validate the metrics used to determine staffing levels and productivity in an 800 bed, acute care hospital by comparing actual, measured RVU's to the national time standards published by the AARC in the Uniform Reporting Manual (URM). **Methods**: We retrospectively analyzed the top 13 procedures which constituted 95% of the work performed by the department staff in one fiscal year (fy 2011). The actual time required for completion of each procedure was recorded by staff from the time that an order was received to the time at which all documentation was completed. The mean and standard deviation for the measured hospital RVU's were calculated and compared to the mean RVU in the AARC URM. The variance between the hospital RVU and the AARC URM RVU was determined for each procedure. **Results**: Comparative data between our hospital and national standards are shown in the table, which follows this abstract. Of the 13 high-volume procedures analyzed, the hospital RVU's were less than the national time standards for 8/13 procedures = 61%; hospital RVU's were within 2 minutes of the URM RVU values for 3/13 procedures = 23%; and hospital RVU time exceeded those in the AARC URM manual for 2/13 procedures = 15% of annual workload. **Conclusions**: This study has demonstrated an objective method to validate and update the metrics used for calculation of staffing levels and productivity for Respiratory Care services in an 800 bed hospital. Since metrics provide important time standard data to drive crucial decisions such as staffing levels, productivity, and comparative expense reporting between hospitals; it is recommended that Relative Value Units be periodically validated by comparison to national time standards in the AARC Uniform Reporting Manual to ensure cost-effective and safe staffing levels.

Sponsored Research - None

References:

1. AARC White Paper. Best Practices in Respiratory Care Productivity and Staffing. Adopted July, 2012. www.AARC.org.

2. 42 C.F.R. § 482.57 Condition of Participation: Respiratory Care Services.

1732425

RESPIRATORY CARE SERVICE (RCS) DEMOGRAPHIC SURVEY OF 18 CORPORATE ACUTE CARE HOSPITALS IN UTAH AND IDAHO STUDYING RCS GAPS FOR STRATEGIC PLANNING: 4 OF 4.

Kimberly J. Bennion[1], Scott Daniel[2,1], Connie Hatch[3,1], Steve Abplanalp[1]; [1]Corporate Respiratory Care, Intermountain Healthcare, Salt Lake City, UT; [2]Respiratory Care Services, Dixie Regional Medical Center, St. George, UT; [3]Respiratory Care Services, Sanpete Hospital, Mount Pleasant, UT

Background: After a detailed review of the AARC's 2015 and Beyond consortium & reports, Intermountain Healthcare Corporation (IH) Respiratory Care Service (RCS) leadership sought to determine a number of factors regarding RT demographics across the corporation to include but not be limited to RT: education level, credentials, traditional & non-traditional RT services offered, medical director specialty, trauma/nursery levels & professional memberships. The corporation owns & operates 22 acute-care hospitals in the intermountain west divided into 6 regions across Utah & Idaho. Eighteen (82%) of the hospitals utilize RCS provided by established RT departments. Facilities range from major trauma centers to community & rural/critical access hospitals. Method: The corporate RCS Quality Assurance Manager, a trauma center RCS manager & rural RT staff/polysomnography staff member performed site visits at each hospital utilizing RCS. A survey guiding document & survey tool via an Excel ® spreadsheet were utilized to define scope of the survey. Surveyors met face-to-face with RT directors/managers to discuss the questions on the survey tool. Time was also allotted for "think tank" discussions. Of the 18 facilities with RT departments, 432 RTs are employed. Results: RCS high-level gaps & recommendations are reported in Table One. Conclusion: Accurate RCS demographic data is paramount in making strategic planning decisions. An Executive Summary with recommendations from the survey has been distributed to the corporation's Executive Leadership. Recommendations are under discussion at the time of the writing of this abstract. The RCS Standards Committee is actively working on corrective actions to close gaps. As a result of our study, the Utah Society for Respiratory Care is in the process of conducting this same survey throughout Utah. Additional outcomes are reported in separate abstracts.

Sponsored Research - None

Table One: RCS Key Gaps and Recommendations

Gap	Recommendations
Policies, Procedures & Guidelines (PPGs) -4 (22%) report no specific RCS PPGs -No central RCS PPG storage	-Corporate RCS PPGs under development -Corporate to create RCS PPG repository
RCS Productivity -Productivity models not standardized -No trakcing of non-revenue generating time -0(0%) facilities report using pt acuity in staffing decision support	-Develop staffing model to include pt acuity -Pilot for tracking non-revenue generating time
EmployeeOrientation Education -New RT employee orientation & annual education not standardized -No new RCS Director/Manager training	-RCS Corporate Clinical Educator -Standardized new RCS employee orientation & annual skills training -Develop new RCS Director/Manager training
RCS Staff Education -190 (45%) of RTs have AS degrees -3 (17%) of facilities require no annual CRCEs	-Determine strategic plan to move AS RTs to BS degrees -BS as mandatory requirement on ledership job descriptions -Each facility to require 6 CRCEs/year as per AARC guidelines

1730510

CREATING A TRACKING SYSTEM FOR CLINICAL LADDER COMPETENCIES AND ACTIVITIES.

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BACKGROUND: In 2008, the clinical ladder program that was formally in place within the Respiratory Care Department at UCSD Medical Center did not enter renegotiations for the new union contract because RCPs did not find value in the program. This was due to poor record keeping, which consisted of numerous errors, inconsistencies, and failure to track current activities. The department continued to build programs requiring new skills and extra effort by staff. By 2012, RCPs felt they deserved recognition/reward for going above and beyond expectations. To encourage therapists to grow, Respiratory Care found it desirable to reinstitute the clinical ladder. We needed to find an effective mechanism to track activities and competencies for all RCPs across both sites and prevent the issues that occurred in 2008. METHODS: It was essential the new tracking system be transparent to the RCPs, easy for management to maintain and did not utilize numerous hours and resources to oversee. Options were discussed in meetings including the use of a software program. It was agreed upon to evaluate the capabilities of Schedule Anywhere as a tracking tool. RCPs were required to provide all documents needed for proof of degrees and certifications. This was inclusive of bachelor/master degree certificates, NBRC Advanced Credentialing, and any type of specialty certification. The data was entered into Schedule Anywhere and a profile was created on each therapist. Schedule Anywhere was programed to track each clinical ladder activity. This included serving as a relief team leader, precepting, participation in clinics, research, partners and leadership, performance improvement, community outreach and advanced practices (pediatrics and diagnostic bronchoscopies). RESULTS: Reports for certifications and activities completed throughout the year can be generated instantly. The software program allows 100% transparency for staff and management to view clinical ladder activities, certifications and compliance from any smart phone or PC. It is a tracking system that is cost effective and decreases overhead to manage with minimal effort to maintain. CONCLUSIONS: Clinical ladders are an effective way to recognize and reward achievement; however to be successful you must have an effective tracking mechanism that is 100% accurate. Use of this web based real-time tool accessible 24/7 proved to be an effective tool to manage competency tracking for both RC staff and leadership.

Sponsored Research - None

1731848

THE PDCA CYCLE: AN OPTIMAL QUALITY IMPROVEMENT (QI) TOOL IN RESPIRATORY CARE - THE UAE EXPERIENCE.

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INTRODUCTION: The PDCA Cycle is a checklist of the four stages which you must go through to get from "problem-faced" to "problem-solved". The 4 stages are Plan–Do–Check–Act is also known as the Deming Cycle. OBJECTIVE: To demonstrate how the PDCA Cycle can be an optimal QI tool in respiratory care in finding solutions to some of the most common respiratory-related patient care problems. METHOD: The PDCA Cycle was used as the QI tool as mandated by the Quality Department in the Respiratory Therapy Departments of two tertiary hospitals in the UAE. Using the Key Performance Indicators in each RT Department, five problem areas were identified. The QI projects were done for a period of 6-12 months. Random checks and audits were done by the RT Department's QI Link RTs at Al Ain Hospital and Tawam Hospital on a bi-monthly basis involving a significant number of patients. An approved Patient Record Closed Review Form with the standard documentation requirements was used as a primary tool to collect data and statistics. The Five PDCA Projects: 1. Prevention of medication errors in bronchodilators administration in the ICU. 2. Prevention or reduction of NCPAP-related pressure sores on the nares of the newborn babies in NICU. 3. Prevention or reduction of post-extubation stridor in the ICU. 4. Reduction of waiting time for sleep study in the Sleep Laboratory. 5. Effectiveness of structured teaching program on the proper use of MDI & DPI. RESULTS: 1. Identifying the most common causes of medication errors in the administration of bronchodilators in the ICU using the KPI helped reduced this incidence. 2. Regular and scheduled monitoring of NCPAP-related pressure sores on the nares of the newborn resulted in significant reduction. 3. An almost zero incidence of post-extubation stridor in the ICU was achieved because of regular and consistent monitoring of the ETT cuff pressure. 4. Reducing waiting time for sleep studies has resulted in the significant increase of patient census in the Sleep Lab. 5. Identifying the different factors that might contribute to the poor compliance and improper use of MDI and DPI has helped in the effectiveness of the structured teaching program. CONCLUSION: As a result of these five studies, the PDCA Cycle has been proven to be a very effective and optimal QI tool in respiratory care at two hospitals in the UAE and is therefore highly recommended to be a standard QI tool in any RT Department.

Sponsored Research - None

1731710

A COMPARISON OF ACUITY WITH THE UTILIZATION OF SELECTED INPATIENT RESPIRATORY CARE RESOURCES OVER 7 DAYS FOR PEDIATRIC PATIENTS REQUIRING MECHANICAL VENTILATION.

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Background Meeting staffing needs without wasting resources can be a complex task for respiratory care departments (RCD) providing services in pediatric units. Departments must utilize some system for prospectively determining respiratory care workload (RCW) requirements and adjusting workforce up or down to meet those needs. Where information is available to aid in planning for known workloads, much less validated, prognosticative data exists to establish an estimation of the workload and its momentum. Understanding this predicament, acuity is postulated as a potential factor for predicting RCW. Methods The PRISM-III score was selected as a validated measure of pediatric acuity. RCW was quantified utilizing definitions and time allocations derived from the 2004 American Association for Respiratory Care's Uniform Reporting Manual. In this retrospective, stratified, observational cohort study, 25 pediatric ICU patients, ranging in age from neonate to adolescent and with a need for mechanical ventilation (MV), were studied for up to 7 days. PRISM-III scores were calculated near the time of initiation of MV and select respiratory care procedural events were tallied for the duration of the study period. For each subject, the PRISM-III score was compared to the total number of procedures, total time of procedures, along with commensurate categorical measures. Acuity scores were analyzed for correlation to RCW variations using Spearman's Rho test. Results In nearly all comparisons, the correlations between PRISM-III score and the values representing RCW appeared to be weak or very weak with statistical significance (SS) approaching acceptability. One single exception, Ventilator Settings Adjustments, showed a moderate degree of direct agreement with good SS. Conclusion In this study, retrospectively collected PRISM-III scores showed weak correlations to measures related to RCW during a limited period of in-patient care with SS approaching acceptability. The study failed to validate the PRISM-III measure of acuity as an independent predictor of a patient's need for RCD resources.

Sponsored Research - None

Value	PRISM III to Procedure Count. n: 25 (all)	PRISM III to Procedure Time Total. n: 25 (all)
All Procedures	Correlation: 0.380 Sig (2-tailed): 0.061	Correlation: 0.382 Sig (2-tailed): 0.060
Blood gas acquisition and analysis	Correlation: 0.390 Sig (2-tailed): 0.054	Correlation: 0.385 Sig (2-tailed): 0.057
Patient/Ventilator System Set-up and Assessment	Correlation: 0.377 Sig (2-tailed): 0.063	Correlation: 0.382 Sig (2-tailed): 0.059
Ventilator Setting Adjustments	Correlation: 0.420 Sig (2-tailed): 0.037	Correlation: 0.409 Sig (2-tailed): 0.042
Bronchial Hygiene Procedures	Correlation: 0.069 Sig (2-tailed): 0.744	Correlation: 0.065 Sig (2-tailed): 0.757
Aerosolized Medication Delivery	Correlation: 0.078 Sig (2-tailed): 0.712	Correlation: 0.065 Sig (2-tailed): 0.757

1702036

BREAKING THE 30% SURVIVAL RATE WINDOW: IMPACT OF THE 2010 AMERICAN HEART ASSOCIATION GUIDELINES ON IN-HOSPITAL CARDIAC ARREST SURVIVAL WITH FAVORABLE NEUROLOGICAL FUNCTION.

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Background: In 2005 AHA Guidelines were implemented and emphasized the key changes related to cardiac arrest treatments related to chest compression rate, depth, ventilation:compression frequency, impedance threshold device (ITD) use, defibrillation sequence, and rotation of CPR personnel. We prospectively demonstrated that hospital discharge rates increased from 17% to 28%. We report now on a prospective assessment of the impact of the 2010 AHA Guidelines changes with a goal to improve survival for all patients in-hospital cardiac arrest to >30%. Our therapists play a vital role in the prompt initiation and assurance of High-Performance (HP-) CPR, partnering with our nurses and physicians in all resuscitation efforts. We have increased the utilization of clinical hypothermia over the past 36 months and are realizing the synergistic effects of this comprehensive approach. Methods: In a medium size (571 bed) hospital we reemphasized importance of our 2005 Guideline changes noted above and implemented additional key 2010 recommendations including: chest compression first before ventilation, emphasis on continuous chest compression as much as possible, delivery of compressions at 100 compressions/minute and at a depth of 2", a 'pit crew' approach, and new Advanced Life Support algorithms. Results: Overall return of spontaneous circulation rates and hospital discharge rates increased from 58% and 28% prior to 2010 to 76.7% and 30.1% since implementing new guidelines, respectively. Survival to hospital discharge rates with a cerebral performance category score of <3 consistent with favorable neurological function was 74.7% from 2010-2012. Conclusions: Building upon the successes achieved by implementing the key AHA 2005 CPR Guidelines, and adoption of the additional 2010 recommendations increased overall survival rates to 30.1%. These findings demonstrate the enormous clinical benefits associated with focusing on provider engagement in effective delivery of CPR including delivery of consistent chest compressions, full chest wall recoil, minimal interruptions, ITD use, and the overall 'pit crew' approach.

Sponsored Research - None

1734066

EFFECTS OF A PNEUMONIA PATHWAY ON HOSPITAL READMISSON RATES.

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Background: There are inconsistencies in treating inpatients with community acquired pneumonia (CAP) and providing adequate post discharge follow-up contributing to significant hospital re-admission rates and increased healthcare costs. Will the use of a pneumonia pathway decrease hospital re-admissions and healthcare costs? Our null hypothesis for this study was that the use of a pneumonia care pathway will have no significant effect on hospital readmission rates. Methods: Over a two year period, we followed 386 patients with a diagnosis of CAP for readmission. In 2011, we followed 150 patients who were not ordered the pathway. In 2012, 236 patients were ordered the pathway and followed. Patients met criteria for the pathway if they had a diagnosis of CAP and were 18 years and older. The pneumonia pathway started on presentation to the emergency room and ended thirty days following discharge. While in the hospital, patients received education about pneumonia from respiratory, nursing, and pharmacy. Prior to the discharge, a respiratory therapist (RT) met with each patient to schedule a follow up doctor's appointment. At this time, the patient was instructed on the proper use of an MDI and an MDI spacer. If applicable, the RT offered smoking cessation counseling. Patients received calls from an RT at days two and seven following discharge. The Respiratory Therapy Department continued to follow patients for 30-days to monitor hospital readmission for pneumonia. Data was analyzed using the Chi-Square Test on SPSS 20.0 for Windows (Chicago, IL, USA). Alpha was set at 0.05. Results: We rejected our null hypothesis because the p value was calculated to be < 0.001. $C2(1)=24.770$, p=<0.001. The use of a pneumonia pathway significantly reduces hospital readmissions and healthcare costs. Conclusion: Following a pneumonia care pathway significantly reduces re-admissions and healthcare costs due to the interdisciplinary participation while the patient is hospitalized. The post discharge phone calls and patient compliance with physician follow-up visits after hospital discharge was vital to further reducing re-admissions.

Sponsored Research - None

1708628

EFFECTS OF ALCOHOL WIPE AND FOAM DISINFECTANT ON MICROBES THAT HARBOR ON STETHOSCOPES.

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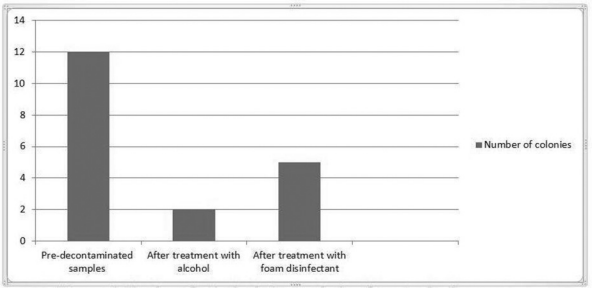
BACKGROUND: Pathogens can be transmitted from patient to patient via contaminated medical devices that are used on multiple patients. Because stethoscopes are one of the most commonly used devices in the hospital, they could carry and transmit pathogenic microbes to patients. The purpose of this study was to assess and evaluate the effectiveness of alcohol wipe and foam disinfectant in decontaminating the diaphragm of stethoscopes in a clinical setting. METHODS: The IRB approval for this study was not required because the study did not involve human subjects. Fourteen stethoscopes owned by respiratory therapists were used in this study. All 14 stethoscopes received a pre-decontamination culture swab using standard procedures. Seven of the 14 stethoscopes were decontaminated by alcohol wipe (70% isopropyl alcohol) and the other 7 by foam disinfectant (62.5% isopropyl alcohol). Following decontamination by alcohol and foam disinfectant, all 14 stethoscopes received post-decontamination culture swab. All samples were inoculated onto blood agar plates and incubated for 48 hours in a carbon dioxide rich environment created by controlled burning candles. The result of this study was analyzed by the t-test. The microbes found on the agar plates were identified by gross examination. RESULTS: The total bacterial colony counts were as follows (Figure 1): pre-decontamination (12), after using alcohol wipe (2), and after using foam disinfectant (5). The total bacterial colony counts by the type of microbes were: Staphylococcus (5), Alpha haemophilus (5), and Mud fungi (2). Microbial colonies were reduced by 71% (5 of 7) with alcohol wipe. With foam disinfectant, the colony count was reduced by 29% (2 of 7). Mud fungi were eliminated by use of alcohol wipe but not by foam disinfectant. The t-test did not show significant difference between alcohol and foam disinfectant at the $p > 0.05$ level. CONCLUSIONS: The results show that foam disinfectant with 62.5% isopropyl alcohol may be used to decontaminate the diaphragm of stethoscopes. Its effectiveness in eliminating Mud fungi is not as effective as 70% isopropyl alcohol. The results also suggest that stethoscopes should be decontaminated as often as feasible, preferably before and after each patient use. A larger sample size from multiple hospitals should be done to validate the results.

Sponsored Research - None



Number of colonies before and after decontamination

1717623

PARENTAL KNOWLEDGE IMPROVED AFTER OPEN AIRWAYS FOR SCHOOLS PROGRAM.

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BACKGROUND: A variety of asthma self-management programs exist. The Open Airways for Schools (OAS) program from the American Lung Association is among them. Within the program are sessions for children and for their caregivers (Asthma 101). We presented an OAS program in two local elementary schools. We hypothesized that as a result of caregiver education that there would be a decrease in the number of work days lost for caregivers due to asthma exacerbation, a decrease in school absenteeism, increased caregiver knowledge of asthma control, triggers, exacerbations, and proper use of medications. METHODS: With IRB approval, caregivers were surveyed using an 8 question survey before the asthma 101 class. Then, the one-hour caregiver class was presented. One month after the class, a post-class questionnaire (the same 8 questions) was administered by phone. Pre and post-class data analyses included descriptive statistics and a paired t-test on the number of correct responses to a test of asthma knowledge. RESULTS: Thirty-three children attended the OAS program, while 8 caregivers consented to participate. The percent improvement in burden and knowledge were: 43% in work days lost, 57% in school days lost, 88% in access to an action plan, and 100% in asthma knowledge. There was a significant difference between parental knowledge before and after having participated in the Asthma 101 education class ($p<.05$). CONCLUSION: These results show an improvement in medication use, access to an asthma action plan, lost work and school days, and caregiver asthma knowledge. The OAS Asthma 101 program may help reduce the overall burden of asthma in schools when caregivers are more knowledgeable.

Sponsored Research - None

1724975

IMPROVED ASTHMA OUTCOMES IN ELEMENTARY SCHOOL STUDENTS FOLLOWING THE OPEN AIRWAYS FOR SCHOOLS PROGRAM.

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Background: Several asthma-self management education programs exist. The Open Airways for Schools (OAS) is such a program from the American Lung Association (ALA) for elementary school children. To prepare for this program, new facilitators attended sessions both in-person and online. We hypothesized that following this OAS presentation, participants would have improved asthma knowledge and self-management skills. Methods: Facilitators were prepared by the ALA and the protocol was approved by the University of South Alabama Institutional Review Board. The Saraland, Alabama school system agreed to host the project. The school nurses recruited students diagnosed with asthma to attend the program. Before the program, students were asked to complete a standard ALA questionnaire, as well as answer questions designed by the researchers to measure asthma knowledge, self-management skills, self-efficacy of asthma medication use, number of unplanned school nurse office visits, and ability to perform peak flow monitoring. Following the program, students completed the questionnaires a second time and demonstrated peak flow monitoring skill. Descriptive statistics, a two-tailed paired t-test and McNemar's test were used to compare the pretest and posttest scores, as applicable. A $p < 0.05$ was considered significant. Results: Twenty-nine students ages 8-11 in grades 3-5 with physician diagnosed asthma participated. The self-efficacy of asthma medication use was increased (3 questions: 0%, 13%, and 16%). Unplanned school nurse visits decreased one month post program ($p<.05$). Students who had been using PEF monitoring prior to the program demonstrated improved peak flow technique ($p<.05$). There was an improvement in ability to identify asthma triggers at home and school ($p<.05$). Conclusion: As a result of the ALA OAS program in two elementary schools, participant's asthma knowledge, medication self-efficacy, peak flow technique and identification of asthma triggers improved, while the number of unplanned school nurse visits decreased.

Sponsored Research - None

1725001

CHRONIC OBSTRUCTIVE PULMONARY DISEASE EDUCATION AND TRAINING BY RESPIRATORY CARE PRACTITIONERS DECREASES HEALTHCARE UTILIZATION AND IMPROVES PATIENT OUTCOMES.

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Background: Hospital admissions and readmissions to the UC Davis Medical Center (UCDMC) for Acute Exacerbation of Chronic Obstructive Pulmonary Disease (AECOPD) have increased since 2009 and represent an unrecognized problem and opportunity for multidisciplinary chronic disease management. In fiscal year (FY) 2011, average length of stay (LOS) for AECOPD was 7.57 days; bounce back rate (patients readmitted less than 30 days after discharge) was 16%. The UC Davis COPD Case Management Team, part of the Reversible Obstructive Airway Disease (ROAD) Program, was instituted to simplify patient education and streamline access to primary and subspecialty services for individuals and their families living with COPD. Methods: The COPD Case Management Team led by seven RCPs under the supervision of a pulmonologist, provided inpatient COPD education utilizing a written ROAD Action Plan which included an individualized medication plan in accordance with the Global Initiative of Chronic Obstructive Lung Disease (GOLD) guidelines. Education sessions included anatomy and physiology of the respiratory system, inhalation device use, controlled breathing techniques, return demonstration, referral services and medication reconciliation. Between March 2012 and February 2013, the COPD Case Management Team treated 70 patients: 41 (55%) were women, 34 (45%) were men; ages ranged from 46 to 88 years; 36% had very severe COPD, 44% had severe COPD, 17% had moderate COPD, and 4% had mild COPD. Results: Average LOS for AECOPD was reduced by 1.9 days to 5.7 days from FY 2011 after implementation of COPD Case Managers. Projected cost savings was $6,511 per admission. Bounce back rate was reduced from 16% in FY 2011 to 5% with projected cost savings of $481,814 during study period. Conclusions: The important role RCP COPD Case Managers play in educating and training COPD patients is validated in this viable case management model for improving the quality of COPD care while achieving significant economical savings through patient education, and improvement in healthcare navigation and utilization.

Sponsored Research - None

1702388

NOCTURNAL DESATURATION AS AN INDICATIVE FEATURE OF STABLE COPD PATIENTS A PROSPECTIVE OPEN-LABEL OBSERVATIONAL STUDY.

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Diverse COPD manifestations reject performing broad-based treatment and challenge respiratory physicians to search significant disease features, other than the degree of pulmonary function deterioration, which represent distinct COPD phenotypes and facilitate personalized approaches to stable COPD patients. Apparently, determinative, or phenotyping, COPD features should be based on precise and easy-to-perform bedside tests. The aim of our study was to determine whether nocturnal desaturation, which, when presents, presumably impairs COPD course, is valid for the disease phenotyping. We conducted an overnight pulseoximetry screening in 62 stable COPD patients and determined patients with persistent nocturnal desaturation with TSpO2≤88% >5 min as desaturators (n=32). COPD patients with overnight normoxemia were identified as non-desaturators (n=30). All patients completed pulmonary function tests and underwent daytime rest ABG analysis. Group characteristics are specified in Table 1. Stable COPD patients with nocturnal desaturation (n=32) presented more severe functional deterioration when compared to non-desaturators (n=30) (FEV1, % = 23.4±7.9 vs. 33.9±17.4; FEV1/FVC = 0.38±0.14 vs. 0.52±0.21, p<0.05). In daytime ABG analysis desaturators showed more prominent hypoxemia (pO2, mm Hg = 60.5±20.9 vs. 74.9±15.6, p<0.05) and hypercapnia (pCO2, mm Hg = 51.3±12.5 vs. 39.7±4.9, p<0.05). During follow-up period, in stable COPD patients nocturnal desaturation was associated with higher exacerbation rate within a 6-month time frame (2.21 vs. 1.17 exacerbations per patient) and shorter time to a subsequent exacerbation assessed by Kaplan-Meier test (p<0.05; see Table 1). Nocturnal desaturation in stable COPD patients is associated with more pronounced pulmonary function deterioration and blood gas exchange impairment, as well as higher exacerbation rate and more frequent exacerbations, when compared to patients with normal overnight saturation level. This suggests nocturnal desaturation for a distinct COPD phenotype criterion.

Sponsored Research - None

Table 1: group characteristics

	Desaturators	Non-desaturators
N	32	30
Sex: male/female	28/4	26/4
Age, mean+-SD	63.6+-9.7	63.0+-7.4
FEV1, %, mean+-SD	23.4+-7.9	33.9+-17.4
FEV1/FVC, mean+-SD	0.38+-0.14	0.52+-0.21
pCO2, mm Hg, mean+-SD	51.3+-12.5	39.7+-4.9
pO2, mm Hg, mean+-SD	60.5+-20.9	74.9+-15.6
Exacerbation rate, 6 mo period, per patient	2.21	1.17

1731977

EFFECTIVENESS OF ASTHMA EDUCATION IN GRADES K-6.

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BACKGROUND: Asthma management programs can be provided in schools where a learning environment already exists. The literature suggests that well developed asthma educational programs can improve understanding and management of this disease. These programs have the potential to help improve quality of life for children with asthma through decreased number and severity of asthma exacerbations. We evaluated elementary school children who participated in Akron Children's Hospital Community Outreach Education and Support Center's (COESC) Asthma Education Program. The asthma education content and pre- and post-test instrument provided in the program complied with the guidelines established by the National Heart, Lung, and Blood Institute's National Asthma Education and Prevention Program. We hypothesized that children who participated in Akron Children's Hospital COESC Asthma Education Program would show significant improvement in their knowledge of asthma management and prevention. METHODS: This is a retrospective study which evaluated children's knowledge of asthma management and prevention before and after completion of the Akron Children's Hospital COESC Asthma Education Program using an instrument developed by asthma educators at this institution. The children attended six sessions over six weeks which covered the following topics: understanding asthma, symptoms and early warning signs, asthma triggers, medicines, prevention, and living with asthma at school and at home. Data were analyzed using PASW Statistics for Windows, Version 18 (Chicago: SPSS, Inc). A paired samples t-test was used to assess differences between pre- and post-test scores. An alpha of .05 was selected to indicate statistical significance. RESULTS: Thirty-one students, in grades one through six, participated in the program and completed the pre- and post-test. The mean pre-test score was 5.90 (sd=1.375), and the mean post-test score was 7.74 (sd=1.21). A significant increase from pre-test to post-test was found t (30) = -6.42, p<.001). CONCLUSIONS: Results indicated that participants' test scores significantly improved after completion of the Akron Children's Hospital COESC Asthma Education Program. This program enhanced participants' knowledge of asthma management and prevention. The researchers suggest that on-going evaluation of this program continue and recommend that the program be expanded to include additional private and/or public school systems.

Sponsored Research - None

1730958

EFFECTIVENESS OF A CHRONIC PULMONARY DISEASE CLINIC ON EMERGENCY DEPARTMENT AND INPATIENT ADMISSION RATES.

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Background: Chronic Obstructive Pulmonary Disease (COPD) accounts for an average of 1800 patient admissions to our facilities per year with an average of $7.6 million in charges. In order to prevent COPD admissions, University of Colorado Health-Memorial Hospital in Colorado Springs, Colorado created the Chronic Pulmonary Disease Management Program. The main patient population of the clinic is our under insured/uninsured patients. The program consists of four parts: initial consult and evaluation, continual care management in collaboration with their Primary Care Physician (PCP), medication management, and follow-up. Method: In order to determine the true effectiveness of this program on COPD admission rates, admission data was collected 1 year prior to the initial clinic visit. The admission data was then sorted by primary diagnosis code. Non-pulmonary diagnoses were excluded from the data. Inpatient and ED visits one year pre-initial clinic visit were then compared to inpatient and ED visits one year post clinic for patients seen between Jan 2010 to Jan 2012. Results: 380 patients were reviewed. Total inpatient stays prior to Clinic were 73. Total inpatient stays post clinic were 36. This represents a 51% reduction in inpatient visits (p=.0003). Total ED visits prior to clinic were 166. Total ED visits post clinic were 73. This represents a 56% reduction in ED visits (p=<0.0001). These reductions account for approximately $513,342 in patient charges. Conclusions: The initiation of a Chronic Pulmonary Disease Management Clinic to manage patients with COPD significantly decreased the incidence of inpatient and emergency room visits. While there is expense incurred in running this clinic, our results show a significant decrease in hospital visits improving care for this patient population. With the anticipated changes from CMS regarding COPD readmissions, clinics such as ours may help to prevent or decrease readmission penalties.

Sponsored Research - None

1732925

A NURSE-LED COPD PROGRAM IN HONG KONG.

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Background Chronic obstructive pulmonary disease (COPD) caused huge impact to healthcare system. COPD was ranked second as a respiratory cause of hospitalization (14.6%) and inpatient bed-days (20.5%) in Hong Kong in 2005. In order to provide structured and proactive care for the COPD patients, a Nurse-initiated COPD program has been piloted since 2010 in Respiratory division of a district hospital in Hong Kong. Objectives To establish a program to proactively and systemically care patients with COPD To retrospectively review the effectiveness of the program Method The key components of the program were as follows: Clinical information There was a "patient registry" with updated clinical information facilitating risk stratification and healthcare planning. Individualized care plan (ICP) The ICP empowered COPD patients to care themselves in the community with adequate healthcare support. Evidence-based guideline The protocol guideline was developed with reference to local hospital guidelines and best available evidence such as Global initiative of Obstructive Lung Disease. Respiratory Nurse Clinic The accredited Respiratory nurse clinic provided service of holistic and disease specific assessment, individualized care plan, nursing intervention and evaluation. 24-hour hotline 24-hour hotline improved health access, continuity of care and timely management. Multi-disciplinary approach Multi-disciplinary approach could integrate and optimize care for patients with chronic diseases. Result The first 300 COPD patients with mean age of 74.98+7.47 were analyzed for their healthcare utilization and dyspnoea score for three months before and after being recruited to the program. It was statistically significant reduction in the mean of emergency department attendance by 35.64% from 4.63 to 2.98 times ($p<0.001$), unplanned admission by 54.38% from 1.6 to 0.73 times ($p<0.001$) and the length of stay by 56.52% from 5.29 to 2.3 days ($p<0.001$). The mean Modified Borg Scale was reduced from 2.86 to 2.21 ($p<0.05$). Conclusion COPD is responsible for high disease burden on healthcare system. The Nurse-led program could help to reduce avoidable healthcare utilization and lead to control their symptom better.

Sponsored Research - None

1733089

THE USE OF THE ASTHMA BLUES© EDUCATIONAL PROGRAM AND DEVICE TEACHING TO IMPROVE ASTHMA KNOWLEDGE AND SELF-MANAGEMENT SKILLS.

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Background: Empowering patients with asthma knowledge and self-management skills is critical to their achievement of asthma control. Objective: The purpose of this study was to determine if asthma knowledge could be increased using the Asthma Blues© Educational Program and asthma self-management skills could be improved by teaching of proper use of a nebulizer machine, peak flow meter, and spacer with metered-dose inhaler (MDI). Methods: Ten patients> 18 years of age admitted to the hospital with a documented physician diagnosis of asthma were recruited by a respiratory therapist to participate in this pilot study. During their hospitalization, patients received one-on-one teaching by a respiratory therapist on both the Asthma Blues© educational program and training on how to use a nebulizer machine, peak flow meter, and spacer with metered-dose inhaler (MDI). Asthma Blues© educational program is an innovative and powerful way to improve the quality and efficiency of asthma education. Patients were asked to complete the Asthma Blues© educational program and to demonstrate proper nebulizer machine, peak flow meter, and spacer with metered-dose inhaler (MDI) technique pre and post-intervention. Results: Asthma knowledge, assessed using the 15-item Asthma Blues Test, improved by 58% after receiving the Asthma Blues© educational program. All participants scored 100% on the nebulizer machine, peak flow meter, and spacer with metered-dose inhaler checklists after receiving training on proper use of each of these devices. The mean score improved from 44.5% pre-intervention assessment of asthma knowledge to 70.8% post-intervention. Patients scored 100% in device(s) knowledge and use following the instructions. Conclusion: Respiratory therapist delivery of asthma education using the Asthma Blues© educational program and asthma self-management training by demonstration of proper nebulizer machine, peak flow meter, and spacer with metered-dose inhaler (MDI) use was well received by patients and achieved improvements in both asthma knowledge and self-management skills. Keywords: asthma, adult asthma, asthma education, asthma knowledge, asthma self-management, peak flow meter

Sponsored Research - None

Table 1. Asthma Blues© Score Pre-Post Intervention

	Treatment (n = 10)
Pre-intervention score (% items correct, mean, range)	45 (9-74)
Post-intervention score (% items correct, mean, range)	71 (43-91)
% Change (mean, range)	58 (4-65)

1733738

USE OF A LUNG SIMULATOR TO EVALUATE THE PERFOMANCE CHARACTERISTICS OF OSCILLATORY POSITIVE PRESSURE DEVICES.

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BACKGROUND: Although performance characteristics of oscillatory positive pressure devices (PEP) have been reported in the literature, no information is available describing device function with simulated physiological models. The purpose of this study was to investigate the performance characteristics of the Flutter (Axcan Scandapharm, Birmingham, AL) and the Acapella (Smiths Medical, Keen, NH) with a simulated lung disease model. We hypothesize that the performance characteristics of the devices, mean PEP, pressure amplitude and oscillatory frequency, will differ with lung disease severity. **METHODS:** The ASL 5000 simulated pulmonary mechanics reported in the literature to be characteristic of pediatric cystic fibrosis patients with moderate to severe lung disease. Resistance was standardized at 17.1cm H_2O/L/s and compliance at 42.1 mL/cm H_2O. Breathing with active exhalation was simulated by setting the breath rate at 22 breaths/min, and adjusting the muscle pressure (P_{mus}) to produce a tidal volume (V_T) 409 mL. Values for oscillatory frequency, peak pressure, positive expiratory pressure (PEP) and pressure amplitude were recorded over a 1 minute period, and graphically displayed. The devices were adjusted to give low, medium, and high mean expiratory pressure (Flutter angle at 40, 20, and 0 degrees; Acapella by dial setting -, middle and +) respectively. Data were analyzed by 2-way repeated measures analysis of variance, and differences were considered significant when p was < 0.05. **RESULTS:** There were statistically significant differences between the devices for mean pressure, pressure amplitude, PEP and oscillatory frequency, Table 1. At the lowest resistance and oscillatory frequency the flutter only produced one waveform. The Acapella devices produced the most stable waveforms at the extreme settings. The Acapella Blue device produced the most stable waveform at the lowest resistance and oscillatory frequency. The Acapella Green produced the most stable waveform at the highest resistance and oscillatory frequency. The waveform for the Flutter varied for all experimental conditions. **CONCLUSIONS:** The performance characteristics of the Acapella and Flutter differ. Clinicians must be aware of the performance limitations when selecting an oscillatory PEP device for patients. For patients with moderate to severe lung disease, the performance of the Green Acapella was more consistent.

Sponsored Research - None

1733478

THE EFFECT OF HUMIDITY ON THE BIOPHYSICAL PROPERTIES OF CYSTIC FIBROSIS SPUTUM.

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Background Humidified air has been proposed as therapy for persons with chronic airway disease with the belief that this will enhance sputum expectoration. The effect of humidity on the biophysical properties of sputum that might affect sputum clearance has not been well studied. Methods We evaluated the effect of up to 1 hour exposure to humidity on cystic fibrosis (CF) sputum weight, interfacial tension, hydration, mucociliary clearability and cough transportability. CF sputa were collected and stored at -80°C until used. Fisher & Paykel Healthcare MR850 humidifiers were modified to deliver inspiratory and expiratory humidity to sputum samples in a specially designed closed exposure chamber. Samples were exposed to 44 mgH_2O/L humidification for 10 and 60 minutes and compared to unexposed sputum samples (baseline). Data are expressed as mean of post-humidity ± SEM vs mean of baseline ± SEM. Results After 10 minutes humidity exposure, only cough transportability decreased compared to baseline (20.20 ± 2.48mm vs 25.60 ± 3.74mm; $p=0.01$). With 60 minute humidity exposure, wet weight (0.07 ± 0.025g vs 0.142 ± 0.03g; $p<0.0001$), mucus hydration (29.86 ± 10.28% vs 11.84 ± 5.96%; $p=0.0005$), mucociliary transportability (2.34 ± 1.76 vs 0.868 ± 0.30; $p<0.01$) and cough transportability (8.33 ± 2.00mm vs 25.60 ± 3.74mm; $p<0.0001$) were different from baseline, but there was no change in interfacial tension ($p=0.31$). Conclusion High humidity airflow affects surface properties and transportability of CF sputum. The decreased secretion adhesiveness contributed to improved mucociliary transportability.

Sponsored Research - Fisher & Paykel Healthcare

1733740

ARE WE ACTIVELY LOOKING FOR THE COMORBIDITIES COMMONLY ASSOCIATED WITH COPD AS RECOMMENDED BY THE GOLD GUIDELINES?

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Background: COPD often coexists with other comorbidities that have a significant impact on prognosis. In COPD, diabetes is independently associated with reduced lung function. Osteoporosis and depression are often under-diagnosed, and are associated with poor health status and prognosis.We wanted to determine the rates of screening for comorbidities commonly associated with COPD as recommended by the GOLD guidelines Methods: Design: Retrospective analysis. Setting: Community Hospital resident continuity clinic. Subjects: Patients with a billed COPD visit (ICD code 496) during 2010 or 2011 with COPD confirmed by Pulmonary Function Tests (PFTs). Records were reviewed for demographics and documentation of screening for, or diagnosis of, the following: hypertension, diabetes mellitus, metabolic syndrome, osteoporosis, and depression. Results: 335 patients with a COPD visit were reviewed. Of those, 193 patients did not have any PTF s, 19 had PFTs done beyond our study period, and 62 had PFTs that did not show COPD (normal, asthma, restrictive lung disease). Therefore, 61 patients were included in the study. We screened 100%(61/61) of our patients for hypertension. 75% (43/61) were hypertensive. We screened 80.3%(49/61) for diabetes and 30.6% (15/49) were diabetic. For metabolic syndrome, 42.6% (26/61) were screened and 76.9% (20/26) screened positive. For osteoporosis, 19.7% (12/61) were screened; of whom 41.6% (5/12) had osteoporosis, 50% (6/12) had osteopenia and 8.3% (1/12) had normal density. For depression, 49.2% (30/61) were screened and 36.7% (14/30) were depressed. Conclusion: Other than for hypertension, our screening rates were sub-optimal, especially for metabolic syndrome, depression and osteoporosis. Our findings indicate that further efforts to improve screening rates are needed.

Sponsored Research - None

1734003

ADDITIVE ANTI-INFLAMMATORY EFFECT OF ROFLUMILAST WITH LONG ACTING BETA-AGONISTS (LABA) IN THE TREATMENT OF MODERATE TO SEVERE CHRONIC OBSTRUCTIVE PULMONARY DISEASE: A META-ANALYSIS.

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Background: Airflow obstruction in COPD is caused by chronic inflammation and permanent structural changes in the smaller airways and lung parenchyma. Current studies on anti-inflammatory treatments for COPD have focused on targeted inhibition of phosphodiesterase 4, the major enzyme of cAMP in inflammatory cells. Roflumilast, a targeted inhibitor of phosphodiesterase 4, reduces inflammatory products such as reactive oxygen species, leukotriene B and TNF-a in inflammatory cells. Among patients with moderate to severe COPD, how effective is Roflumilast in addition to conventional treatment of LABA in improving lung function? Methods: The patients considered were those ≥40 years old with a diagnosis of moderate to severe COPD (confirmed by a post-bronchodilator [FEV1]/FVC ratio ≤0.70 and post-bronchodilator FEV1 ≤50% of predicted value). All patients were current or former smokers with a minimum smoking history of at least 20 pack years, and have history of chronic productive cough. The intervention being tested is Roflumilast in combination with LABA, and the search strategy focused on RCTs in which an experimental group included Roflumilast with LABA vs. LABA with placebo. The primary efficacy endpoints observed were change in pre-bronchodilator FEV1 from baseline to each post randomisation visit. Secondary endpoints included postbronchodilator FEV1, pre- and post-bronchodilator FVC and transitional dyspnea index. Statistical analyses were performed using the RevMan computer software. Results: Three thousand nine hundred and five patients were included in the three trials that reported change in mean prebronchodilator FEV1 from baseline to each post randomisation visit. LABA with Roflumilast was noted to have significant difference when compared with LABA and placebo in improving prebronchodilator FEV1 (p<0000.1). Secondary outcomes tested also showed significant difference in comparing LABA with Roflumilast vs. LABA with placebo (p<0000.1). Conclusion: Roflumilast improves lung function in patients with moderate-to-severe COPD who are already being treated with LABA. The use of oral, once daily anti-inflammatory agent instead of inhaled corticosteroids as concomitant therapy to LABA has advantages, such as increased compliance and no demonstrable increase risk of pneumonia.

Sponsored Research - None

1717187

A SIRNA MOLECULAR BEACON THERANOSTIC FOR LATENT TUBERCULOSIS.

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Introduction: Latent tuberculosis, caused by the Mycobacterium tuberculosis which can hibernate in lung epithelia for years without detection, continues to be a serious threat to third world countries. The ability of this mycobacterium to hibernate is mediated by products of the mammalian cell entry genes, mce 4A, 4B, 4 C, 4D, and 4F. Over 15% of all latent tuberculosis cases become active and infective and because world travel is very convenient tuberculosis is becoming a problem in industrialized countries like the U.S.A. Methods: In order to generate a biologic that can be used as a theranostic tool against latent tuberculosis, the infectivity of the mce 4A-B genes was assessed in E.coli by cloning and expressing these genes in E.coli and using transformed E.coli to infect epithelial cells. Results: Our experiment showed that the mce4A-B genes conferred infectivity to E. coli (Figure 1). Conclusion: Based on these results, a siRNA molecular beacon was developed against the mce4A mRNA and used successfully in detecting and attenuating Mycobacterium smegmatis infection in macrophages.

Sponsored Research - None

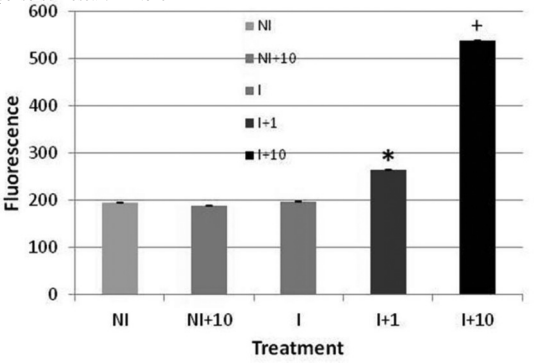

Figure 1. A siRNA molecular beacon was designed against the mce4A mRNA. The siRNA consists of a hairpin structure with a double stranded stem with a fluorophore at the 5' end and a quencher at the 3' end. To test the ability of the siRNA to detect infection in macrophages, U937 cells were infected with Mycobacterium smegmatis followed be transfection with the siRNA. Fluorescence was measured in non-infected (NI) and infected (I) which were either not transfected or transfected with 1 or 10mM of the siRNA molecular beacon followed by fluorescence measurement using a microplate reader.

1734014

TITLE: THE EFFECTIVENESS OF A STRUCTURED EDUCATION PULMONARY REHABILITATION PROGRAMME FOR IMPROVING THE HEALTH STATUS OF PEOPLE WITH MODERATE AND SEVERE CHRONIC OBSTRUCTIVE PULMONARY DISEASE IN PRIMARY CARE: THE PRINCE CLUSTER RANDOMISED TRIAL.

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Context: Pulmonary rehabilitation (PR) is key in managing COPD. However, little is known about the impact of structured education pulmonary rehabilitation. programmes (SEPRP's) delivered in primary care settings. Objective: To evaluate the effectiveness of a SEPRP based in primary care, on the health status of people with COPD Design: A two-arm, cluster randomized controlled trial, with randomization at practice level Setting: 32 family practice centers in Ireland Participants: Adults with a diagnosis of COPD. 178 participants were randomized to the intervention and 172 to the control. Intervention: Experimental group received SEPRP, delivered by a nurse and a physiotherapist, two-hours per week over 8 weeks. Control group received 'usual care'. Outcome measures: Health status, measured by the Chronic Respiratory Questionnaire (CRQ) at baseline and at 12-14 weeks was the primary outcome measure. Secondary outcomes included the incremental shuttle walk test (ISWT), self-efficacy, EuroQol EQ-5D. Outcomes assessments were blinded to group allocation. Results: 143 of 178 (52%) patients in the intervention and 134 of 172 (48%) in the control completed post intervention assessments. Multiple imputation was used to account for missing observations. Participants allocated to the intervention had statistically significant higher mean change total CRQ scores adjusted mean difference, 1.11, 95% CI 0.35 to 1.87. They also had statistically significant higher mean CRQ Dyspnoea scores after intervention adjusted mean difference 0.49, 95% CI 0.20 to 0.78 and CRQ Physical scores adjusted mean difference 0.37, 95% CI 0.14 to 0.60. However, confidence intervals for total CRQ score, CRQ Dyspnoea and CRQ Physical subscales do not exclude smaller differences pre-specified as clinically important. The NNT for the Total CRQ was 7. No other statistically significant differences between groups were seen. Conclusion: A structured education pulmonary rehabilitation programme based in primary care is feasible and may increase local accessibility to people with moderate and severe COPD.

Sponsored Research - None

1713700

EVALUATION OF INITIAL MODIFIED PULMONARY INDEX SCORE (MPIS) TO PREDICT HOSPITAL ADMISSION FOR PEDIATRIC ASTHMA EXACERBATIONS.

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Background: Patients presenting to the pediatric emergency department (PED) with asthma exacerbations require prompt evaluation and treatment. The inability of pediatric patients to perform reliable bedside pulmonary function measurements requires alternative means of evaluation; therefore, asthma scoring systems are often utilized. We implemented an evidence-based standing order-set (SOS) in February 2012. Initiation of the order-set was based upon patients' MPIS. In this investigation, we assessed the relationship between initial MPIS and patient disposition. Methods: Patients between the ages of 2 and 18 years with a history of asthma who presented to our PED were retrospectively identified from electronic health records between February 23, 2012 (date of SOS implementation) and July 23, 2012. Data collected included age, maximum initial MPIS, and patient disposition. Statistical analysis was carried out using Fisher's exact test for categorical variables and unpaired t-test for continuous variables. Results: Of the 173 SOS-eligible patients, 134 (77%, mean age 6.6±3.5 years) had an MPIS documented. Fifty-three (40%) of these patients had an initial score of < 6 (the threshold for SOS implementation), and 81 (60%) had an MPIS of ≥6. The admission rates were 7.5% and 27.8%, respectively, for these two groups ($p \leq 0.01$). The mean initial MPIS for admitted patients was 9.2±3.9 compared to 6.0±3.2 for those not admitted ($p \leq 0.01$). Admission rates for discrete initial MPIS ranges were as follows: 0-3 = 8.3%, 4-6 = 7.1%, 7-9 = 23.3%, 10-12 = 35.3%, and >12 = 62.5%. Likelihood ratios for initial MPIS score thresholds of 3, 6, 9, and 12 were 1.2, 1.9, 3.3 and 6.9, respectively. Conclusion: Patients with an initial MPIS ≥ 6 are significantly more likely to require hospital admission. An MPIS threshold of 6 appears to be a reasonable cut-off value for the implementation of our SOS for asthma patients in our PED. Higher initial MPIS values are stronger predictors of need for inpatient care.

Sponsored Research - None

1716432

IMPLEMENTATION OF A STANDING ORDER SET IMPROVES TIME TO TREATMENT IN PEDIATRIC PATIENTS WITH SEVERE ASTHMA EXACERBATIONS.

Andrew G. Miller, Moira Breslin, Leslie Pineda, James Fox; Duke University Medical Center, Durham, NC

Background: Data from our institution's Pediatric Emergency Department (PED) revealed inadequate compliance with evidence based guidelines for the initial treatment of asthma exacerbations. We implemented a triage nurse initiated standing order set (SOS) in February 2012 to address these deficiencies. Patients presenting with severe exacerbations are in greatest need of timely medication administration and we hypothesized the SOS would reduce their time to initial treatment. Methods: Patients were identified from a search of respiratory care services' electronic records for pediatric patients who received continuous albuterol in our PED following an IRB-approved protocol. The SOS was implemented on 2/23/12. The pre-SOS and post-SOS groups included patients treated from 2/21/09 - 2/22/12 and 2/23 - 10/31/12, respectively. Data tracked included age, gender, triage priority, use of SOS, time to bronchodilator treatment, time to corticosteroid administration, and total time in the PED. Time to treatment was measured from triage to medication administration. Statistical analysis was done via Fisher's Exact Test for categorical variables, and the unpaired t-test for continuous variables. Results: Two hundred and thirty-nine patients (mean age 7.2 years, 66% male) were included in the analysis. Pre-SOS (n=193) and post-SOS (n=46) groups were similar in age, gender, triage priority designation, and ED length of stay. Compared with patients in the pre-SOS group, post-SOS patients were more likely to receive inhaled bronchodilators within 30 minutes (60% vs. 89%, p=0.01); to receive corticosteroids within 60 minutes (62% vs. 78%, p=0.04); and to have shortened mean time to corticosteroid administration (58±69 vs. 36±39 minutes, p=0.04). Time to initial treatment with inhaled bronchodilators was shortened but did not reach statistical significance (32±41 vs. 20±31 minutes, p=0.06). In the post-SOS group, only 56% of eligible patients had the SOS implemented; of these only 9% had the SOS ordered by the triage nurse as planned. Conclusion: Implementing a SOS resulted in a decreased time to inhaled bronchodilator and systemic corticosteroid administration among pediatric patients presenting with severe asthma exacerbations. Strategies to increase utilization of the SOS in triage may lead to improvement in patient-oriented outcomes such as admission rate, PED length of stay, and ICU admission.

Sponsored Research - None

1729346

GENDER DIFFERENCES IN PEDIATRIC BURN PATIENTS WITH INHALATION INJURY.

Ronald Mlcak[1,2], Oscar E. Suman[2], David N. Herndon[2,1]; [1]Shriners Hospitals for Children, Galveston, TX; [2]The University of Texas Medical Branch, Galveston, TX

Introduction: Inhalation injury is associated with increased morbidity and mortality in the thermally injured patient. There is evidence that females have a better outcome in intensive care units (ICU's) when compared with males. The purpose of this study was to compare gender differences on outcomes of inhalation injury in a large group of pediatric burn patients. Methods: The records of seven hundred sixty nine pediatric burn patients with inhalation injury were reviewed. Patients were initially randomized into two groups; Males (512) and females (257). Outcome variables included demographics, length of stay (LOS), length of ventilation (LOV), incidence of pneumonia, incidence of acute respiratory distress syndrome (ARDS) and mortality. Patients were then stratified by non-survivors. Data are reported as mean ± SD. Significance was accepted at $p<0.05$. Results: The overall mortality rate for inhalation injury was 14%. The incidence of inhalation injury in males was 66% vs. 33% in females ($p<0.05$). There was no significant difference between males and females on age, gender, burn size, LOS, LOV or incidence of pneumonia/ARDS. When stratified by non-survivors, 60% of males died vs. 17% of females ($p>0.05$). There was no significant difference between males and females on age, gender, burn size, incidence of pneumonia or ARDS. However, the LOS in males was 29 ± 46 days vs. 15 ± 19 days for females ($p<0.05$). The LOV for males was 18 ± 21 days vs. 10 ± 12 for females ($p<0.05$). Conclusion: The incidence of inhalation injury is higher in males vs. females. In this large group of patients, survival is not significantly influenced by gender. In non-survivors, male patients had a greater LOS and LOV than female patients. There was no significant difference in the incidence of pneumonia or ARDS. Further studies are needed to determine what mechanisms may influence the outcomes.

Sponsored Research - None

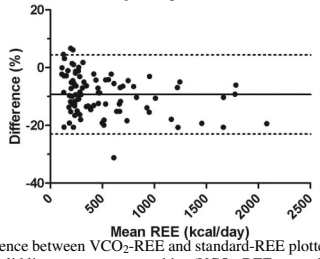
1728876

CARBON DIOXIDE ELIMINATION BASED RESTING ENERGY EXPENDITURE AND METABOLIC STATE DIAGNOSIS IN THE PEDIATRIC INTENSIVE CARE UNIT: A MULTI-CENTER VALIDATION.

Craig D. Smallwood[1], Koen F. Joosten[3], Jessie M. Hulst[3], Robert C. Tasker[1,2], Christopher Duggan[1,2], Nilesh M. Mehta[1,2]; [1]Boston Children's Hospital, Boston, MA; [2]Harvard Medical School, Boston, MA; [3]Sophia Children's Hospital, Rotterdam, Netherlands

BACKGROUND: Optimal nutrient intake during critical illness is associated with improved outcomes. Indirect calorimetry (IC) allows accurate assessment of resting energy expenditure (REE) from measured oxygen consumption (VO_2) and carbon dioxide elimination (VCO_2) incorporated into the Weir equation ($REE=(3.941*VO_2 + 1.106*VCO_2)*1440$). However, IC is not available in many centers. We aimed to examine the agreement of a simplified equation of REE incorporating VCO_2 measurement alone with standard methods. **METHODS**: The mean respiratory quotient (RQ; VCO_2/VO_2) calculated from steady state IC data in mechanically ventilated patients at Boston Children's Hospital was used to derive a simplified Weir equation, without VO_2. The equation was then applied to a Dutch validation dataset to calculate REE from VCO_2 measurements (VCO_2-REE). Bland-Altman analysis and Pearson correlation were used to assess the agreement between the standard REE and the VCO_2-REE. The VCO_2-REE was also tested for its ability to accurately classify patients into metabolic state (where hypometablism is defined as measured REE < 90% of predicted basal metabolic rate by Schofield equation). **RESULTS**: The derivation set included steady state IC measurements from 72 patients, with mean RQ (±SD) of 0.89±0.09. Using the mean RQ value, a simplified equation was derived; $REE(kcal/day) = 5.534*VCO_2(L/min)*1440$. The validation set consisted of steady state IC measurements from 94 mechanically ventilated patients (Dutch PICU dataset). Bland-Altman analysis revealed a mean bias (limits of agreement) between VCO_2-REE and standard-REE of -9.3% (-23 to 4.4%; see figure). Pearson correlation was $R^2=0.991$. Using VCO_2-REE, the metabolic state of subjects was accurately classified; overall diagnostic accuracy for the hypometabolic group was 88.4%, sensitivity and specificity were 0.96 and 0.83 respectively. **CONCLUSIONS**: A new equation for REE, using VCO_2 alone, provided a reasonable estimate of resting energy expenditure in mechanically ventilated children. Furthermore, this equation helped accurately classify subjects who were hypometabolic and at risk for overfeeding. Bedside VCO_2 monitoring may provide valuable metabolic information to guide optimal nutrient intake in the PICU.

Sponsored Research - None



Bland-Altman plot of difference between VCO_2-REE and standard-REE plotted against the mean of the two measurements. Solid line represents mean bias (VCO_2-REE – standard-REE) and dotted lines represent the limits of agreement.

1730859

THE PROCESS OF INTRODUCING CULTURAL CHANGE WITHIN A LEVEL III NICU.

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Background: In very low birth weight infants (VLBW), Respiratory Distress Syndrome (RDS), is a disease process that practitioners encounter the most. RDS symptoms usually appear a short time after birth due to lack of adequate lung tissue and surfactant. Chronic Lung Disease (CLD), which is the result of lung injury and long term respiratory issues, can develop as a result of therapy used to treat RDS. These include oxygen, positive pressure ventilation, surfactant administration, and mechanical ventilation. Method: In 2011, a multidisciplinary team was created to include; MD, nurse practitioners, respiratory therapy, RN, pharmacy, and physical therapy. After extensive literature review, re-structuring of bubble continuous positive airway pressure (BCPAP) protocol, surfactant administration, and ventilator management of the VLBW were conducted. Education began with neonatologists then the care team. Respiratory therapy conducted a majority of the education for all personnel. In June 2012, all VLBW infants admitted, in house or transported, were included in this quality study. Results: After implementation, our unit increased from 3 to 22 patients on BCPAP within a week. This unexpected increase caused a shortage in supplies, personnel, and a lack of compliance with protocols. These issues were addressed and solutions put into place. Patient population utilizing BCPAP remained at 22 and all personnel were administering care within protocol. After a 6 month review, LOS had decreased from 74.15 to 70.57 for VLBW infants.Physical therapy discovered the development of atypical development and cranial molding deformity of infants on long term BCPAP. Respiratory trialed multiple CPAP hats; until a satisfactory product was implemented. Education was conducted with the care team, along with re-education of protocols, positioning, and outcomes. Conclusion: Implementing change is never any easy task. Our protocols affected our smallest patients and multiple changes occurred at the same time. We encountered problems that were expected; lack of compliance and alteration in care by physician. Unexpected problems were the easiest to fix; sudden increase in supply and demand and increase in cranial molding. When implementing changes in practice that impact the cultural of the unit, it is integral to have the support of the entire team to achieve and maintain successful patient outcomes.

Sponsored Research - None

1729459

VOLUMETRIC CARBON DIOXIDE ELIMINATION IN MECHANICALLY VENTILATED CHILDREN AND ADULTS.

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BACKGROUND: Bedside measurement of minute-to-minute volumetric carbon dioxide elimination (VCO_2) may be a useful monitoring parameter that helps with assessing metabolic state, titrating mechanical ventilator support, monitoring response to ventilator and clinical changes and optimizing nutrition. However, there is a paucity of literature describing typical observed values in critically ill children in the pediatric intensive care unit (PICU). We describe VCO_2 data in a heterogeneous cohort of mechanically ventilated subjects in the PICU. **METHODS**: Mechanically ventilated patients who underwent an indirect calorimetry (IC) test based on institutional criteria during a 2-year period were eligible for inclusion. The Vmax Encore® was utilized to measure minute-to-minute VCO_2 for approximately 30 minutes. VCO_2 measurements (ml/kg/min) from subjects who achieved steady state gas exchange conditions (SS); defined as a period where the coefficient of variation (SD/mean) for oxygen consumption, minute ventilation and respiratory quotient was less than 10%, 10% and 5% respectively. Subject demographics were recorded and data were categorized by age. One-way ANOVA was utilized to test for differences in mean VCO_2 among the age groups. **RESULTS**: IC was completed on 120 consecutive eligible subjects. Data from 87 subjects that achieved SS were included in the analysis. VCO_2 (mean ± SD) among subjects in the cohort was 5.4±2.6 ml/min/kg. The figure illustrates VCO_2 measurements for each age group. There was a statistically significant difference in VCO_2 between ages ($P<0.001$). We also observed the greatest individual variation in VCO_2 in children <6 months of age. **CONCLUSIONS**: In a heterogeneous cohort of critically ill patients, we observed a large range of VCO_2 measurements. VCO_2 varied across age groups, with younger patients tending to produce larger amounts of CO_2 proportional to their weight, and appearing to demonstrate more patient to patient variation compared to older subjects. Despite the variability in the measurements, VCO_2 described in our cohort may allow meaningful interpretation of this variable at the bedside in the PICU. Future studies describing the relationship between VCO_2 and clinical factors during critical illness are needed.

Sponsored Research - None

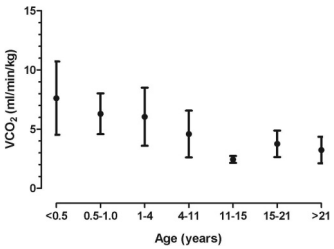

Figure: Volumetric carbon dioxide elimination plotted against categorized age. Closed circles represent mean and whiskers represent standard deviation.

1731479

CONTINUOUS INFUSION OF TISSUE PLASMINOGEN ACTIVATOR DURING VENO-ARTERIAL EXTRACORPOREAL LIFE SUPPORT FOR TREATMENT OF MASSIVE PULMONARY EMBOLUS.

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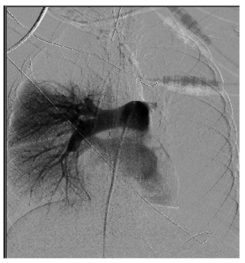
Introduction: We report a case of the effective use of continuous infusion of Tissue Plasminogen Activator (tPA) in a patient diagnosed with severe pulmonary embolism (PE) requiring veno-arterial extracorporeal life support (VA ECMO). A 15 year old, 50 kg female presented to an outside hospital with chest pain, shortness of breath, cough, desaturation (85% on room air), cyanosis, and tachypnea. Laboratory results were remarkable for thrombocytopenia, and elevated D-dimers. Initial EKG was normal. A spiral chest CTA showed large, bilateral PEs in both mainstem and segmental distributions. She was transferred to our institution for further management. Methods: Upon arrival 11/12/11, the patient was taken to interventional radiology (IR) for diagnostic angiography with potential catheter directed lytic therapy. IR showed complete occlusion of the entire left lung and the right lower lobe. A continuous tPA infusion was initiated through a catheter in the left pulmonary artery directed at the left mainstem clot at 0.5 mg/hr. The patient continued to demonstrate persistent hemodynamic instability despite significant inotropic support and the decision was made to initiate ECMO. The tPA was stopped prior to cannulation. The tPA was restarted after ECMO initiation, but due to the risk of cerebral bleeding on ECMO, the dose was reduced to 0.25 mg/hr. Results: On day two of ECMO, a longer tPA catheter was threaded deeper to improve tPA deposition into the lower left lobe. On day three of tPA therapy, the pulmonary angiogram showed significant improvement in overall thrombus load in the left and right lung with minimal areas of subsegmental perfusion defects. The tPA dose was increased to 0.5 mg/hr on this day, then discontinued on day four of ECMO. Anticoagulation therapy consisted of a heparin drip (range 5 u/kg/hr to 25 u/kg/hr) to maintain an activated clotting time range of 140 to 250. Anticoagulation monitoring was altered by frequent monitoring of fibrinogen as an indicator of excessive fibrinolysis from the tPA infusion. Circuit assessment demonstrated minimal clotting throughout circuit. No significant hemorrhage complications were noted. She was successfully decannulated after 114 hours of ECMO. Conclusion: Understanding the increased risk of hemorrhagic complications, children who present with pulmonary embolism and acute cardiorespiratory failure, concurrent therapeutic use of continuous tPA infusion and ECMO can result in a successful outcome.

Sponsored Research - None



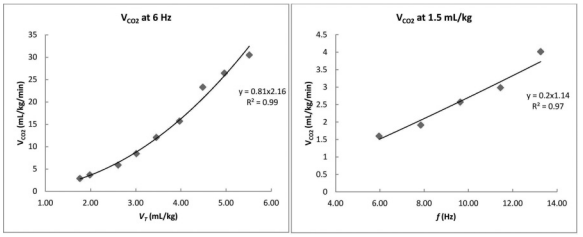
1731126

EFFECTS OF FREQUENCY (F) AND TIDAL VOLUME (VT) ON CO2 ELIMINATION (VCO2) DURING HIGH FREQUENCY OSCILLATORY VENTILATION (HFOV) IN A HEALTHY NEONATAL PIGLET MODEL.

Jeremiah Burnett, Robert Gillette; Neonatology, SAMMC, San Antonio, TX

Background: With V_t similar to dead space volume, mechanisms of CO_2 removal (VCO_2) with HFOV are believed to differ from those with conventional ventilation (CMV) or spontaneous breathing. The mathematical relationships of VCO_2 with F and V_t remain incompletely understood. Previous animal studies have suggested a linear rise in VCO_2 with F at constant V_t, and that VCO_2 may be proportional to the square of V_t at fixed F, although parameters vary significantly between studies and animal models. These relationships have not been studied with a clinically available HFOV or a neonatal animal model. Methods: VCO_2 was measured in 12 healthy, anesthetized, paralyzed neonatal piglets (2.5-4 kg). Stabilized on CMV to end-tidal CO_2 of 40±2 mmHg (correlated with arterial pCO_2) before and between measurements, the animal was then changed to HFOV (Sensormedics 3100A). VCO_2 was calculated from the CO_2 concentration measured in a continuous sidestream sample from the ventilator circuit outflow limb with a Qubit Systems S-151 Infrared CO_2 Analyzer, times the gas flow rate in the circuit measured with a TSI 4043 Mass Flowmeter. Since alveolar CO_2, thus VCO_2 which is proportional to it, changes with over or under ventilation, and to account for analyzer response time, CO_2 concentration was extrapolated to the time HFOV was started. Measurements were obtained at combinations of F from 6-14 Hz and V_t from 0.5-6 mL/kg. Mean airway pressure was set to maintain appropriate lung inflation by X-ray. V_t and F were measured with a Florian Respiratory Monitor. Results: The data were plotted and best fit for each animal, F, and V_t by the equations $VCO_2 = \alpha V_t^x$ at fixed F, and $VCO_2 = \beta F^y$ at fixed V_t. Values for α and β showed moderate variation between animals while values for x and y were less variable. Representative plots of data for one animal vs. V_t and F are shown. Data were combined for all animals at each F and each V_t, showing more scatter than with individual animals, but with combined exponents in the range of x=2 and y=1. Conclusion: VCO_2 varied between animals at each specific combination of F and V_t, implying ventilation is not determined by those two factors alone. We speculate other factors include variation in CO_2 production and storage, V/Q relationships, dead space, and airway dynamics. CO_2 concentrations in the ventilator circuit outflow can be measured with minimal modification of the circuit and could be monitored continuously clinically.

Sponsored Research - None



1731622

RETROSPECTIVE COMPARISON OF HIGH FREQUENCY PERCUSSIVE VENTILATION (HFPV) USING THE VDR-4 WITH CONVENTIONAL VENTILATION USING THE DRAGER XLT IN PEDIATRIC PATIENTS WITH RESPIRATORY SYNCYTIAL VIRUS.

Peter Quint[2], Jeff L. Heltborg[1]; [1]Respiratory Therapy, Legacy Emanuel and Randall Childrens Hospital, Portland, OR; [2]PICU Intensivists, Randall Childrens Hospital, Portland, OR

Background: HFPV has been shown to break up and clear mucous secretions and airway debris. Given the propensity for significant secretions in patients with RSV, we sought to compare our patients who were primarily ventiilated with HFPV versus conventional ventilation over a three year period. Method : We reviewed data on all ventilated patients in the PICU who were positive for RSV by viral culture. Forty six patients met our criteria. 35 patients were ventilated primarily with the Drager XLT. 11 patients were primarily ventilated using HFPV. The following data was collected: 1) Pip, 2) Peep, 3) initial FiO2 on the ventilator, 4) initial CO2 on the ventillator, 5) total ventilator hours, 6) starting pip, 7) starting peep and 10) MAP. The two ventilation groups were compared using the non-parametric Wilcoxon test. Given that higher peep can lead to lower FiO2 need, regression analysis was performed to compare the two ventilatory modes. Initial PEEP and FiO2 were used as additional predictors removing any effect of possible differences in disease severity between the two groups. For comparison of the11 patients who transitioned to HFPV the paired t-test was used to analyze this data. Results: For the HFPV patients the changes in PIP, PEEP, MAP, pCO2, and Fio2 for the three hours before and after transition from conventional ventilation were compared. Starting PEEP ($p<0.0001$) and Fio2 ($p=0.002$) were higher in the HFPV group. Total time of mechanical ventilation was also shorter in the HFPV group (132 hours vs.166 hours). For the HFPV patients transitioned from conventional ventilation, the PEEPs were not significantly higher before and after the transition ($p=0.105$). The PIP and MAP changes after the switch to HFPV was signifciantly lower ($p=0.008$ and $p=0.021$ respectively). The pCO2 was significantly less after the transition to HFPV ($p=0.001$). Conclusions: In intubated pediatric patients with RSV, utilization of HFPV appears to reduce PIP and MAP while improving pCO2 and oxygenation when compared with conventional ventilation. Since the goal of safe ventilation is to promote adequate oxygenation and ventilation at the lowest peak pressures, HFPV may be an effective ventilation mode for accomplishing these goals. Though not statistically significant, our patients treated with HFPV spent fewer hours intubated. This review, fraught with the usual difficulties of retrospective studies has encouraged us to do a randomized trial.

Sponsored Research - None

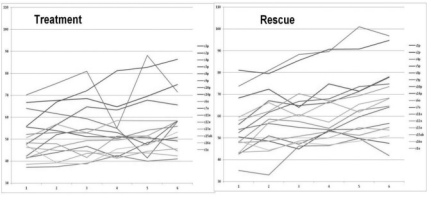
1731289

COMPARISON OF HIGH FREQUENCY OSCILLATORY VENTILATION (HFOV) TO HIGH FREQUENCY PERCUSSIVE VENTILATION (HFPV) IN A NEONATAL PIGLET MODEL OF MECONIUM ASPIRATION SYNDROME (MAS).

Lee Brock, Robert Gillette; Neonatology, SAMMC, San Antonio, TX

Background: A major component of MAS is airway obstruction with air trapping, atelectasis, and non-homogenous ventilation, also seen in other neonatal diseases (e.g. bronchopulmonary dysplasia). HFOV can be relatively ineffective due to high airway resistance (R) in these conditions. HFPV is known to promote airway clearance so we hypothesized that it would provide better ventilation in a neonatal piglet MAS model. Methods: 16 2.5-4 kg piglets were randomized to HFOV (Sensormedics 3100A) or HFPV (Percussionaire Infant Bronchotron) after injury with 20% human meconium slurry to the trachea until $pO_2 < 100$ mmHg on 1.0 F_iO_2. HFOV or HVPV was set to 18 cmH_2O mean airway pressure, 5Hz, and 3.5ml/kg tidal volume (V_t). Arterial pO_2, pCO_2, and pressure amplitude (ΔP) to give that V_t were recorded every 10 min for a 60 min "treatment" run then another 60 min after "rescue" to the other device. R and compliance (C) were recorded before and after runs. V_t, R, C, and pressures were measured with a Florian Respiratory Monitor. Power was 80% to detect 1.5 SD pCO_2 difference between ventilators, α=0.05. Results: There was no difference in pCO_2 between ventilators in either run (trend favored HFOV, $p<0.052$ in treatment; $p<0.344$ in rescue). In both runs, pCO_2 rose over time ($p<0.03$), but this effect did not differ between ventilators. The pO_2 rose over time ($p<0.02$) in both groups (no difference between groups) during treatment but not rescue. The group differences in R and C were not significant. ΔP required to maintain 3.5 ml/kg V_t was not different in the treatment run ($p<0.38$), but higher ΔP was needed in HFPV vs. HFOV ($p<0.007$) in the rescue run. In 5 of 8 HFOV piglets there were dramatic spikes in ΔP resolved by suctioning in the treatment run, but in 0 of 8 HFPV animals ($p<0.026$). No meconium was ever recovered from any animal in either group. The pCO_2 varied widely (33-101 mmHg; see figure) between animals despite fixed settings but was similar on HFOV or HFPV for each animal. Conclusion: Both pO_2 and pCO_2 rose over time with no difference between ventilators. HFOV was more likely to have acute spikes in ΔP to keep V_t constant, which would be missed without V_t monitoring, relieved by suctioning. This factor may favor clinical use of HFPV in conditions with obstruction, and favor V_t monitoring. Factors other than frequency and V_t, perhaps V/Q and dead space variability, appear to play a large role in variation of pCO_2 between animals and over time.

Sponsored Research - None



pCO_2 vs. time points for all animals

1731646

NEONATAL RESPIRATORY ROUNDS CAN IMPROVE STAFF SATISFACTION AND TIMELINESS OF INTERVENTIONS.

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Background: Interdisciplinary rounding facilitates the establishment, communication of patient care goals and monitoring of process and patient outcomes. The aim of this study was to describe staff satisfaction and process outcomes associated with respiratory- led interdisciplinary rounds in the neonatal intensive care unit (NICU). We hypothesized that the staff satisfaction would improve with the implementation of respiratory led rounds, orders would be entered into the electronic medical record (EMR) and implemented within 30 minutes of completing the rounding process. **Methods:** NICU nurses, respiratory therapists, nurse practitioners, residents and attending physicians were recruited to complete a 13 question survey eliciting demographic information, and evaluating the respiratory rounding process, perceptions of bedside care and professional satisfaction. The IRB approved survey was anonymous, confidential and informed consent implied. Respiratory Rounds process data were collected daily for a 10 day period. Timeliness of order entry, order completion, number of missing or incorrect clinical information and/or communication of inaccurate components were tracked. Data were entered into Excel for analysis. Descriptive statistics were used to report demographic and survey data. **Results:** A 94.8% response rate (n = 55) was realized. Forty percent of the respiratory therapists and nurses were baccalaureate prepared (n= 22) and had more than 20 years NICU experience (n = 22). Evaluation of the respiratory rounding process, perceptions of bedside care and professional satisfaction results are found in Table 1. Respiratory therapists reported on 135 patients. Correct patient information was provided on 95% and complete information on 93% of the patients. Forty-seven percent of orders were immediately entered into the EMR after discussion during rounds (median 0, average 23, standard deviation + 0.6 minutes). Eight six percent of the orders were immediately implemented (median 0 minutes, mean 7 minutes, standard deviation $\pm$ 0.93 minutes). There was one outlier at 5 hours 45 minutes. **Conclusions:** The implementation of respiratory rounds improved staff satisfaction and the timeliness of completing respiratory orders. Continued auditing and process change is necessary to ensure sustainability.

Sponsored Research - None

1732077

EVALUATION OF THE MODIFIED INSURE METHOD ON INTUBATED DAYS AND REINTUBATION RATES.

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BACKGROUND: The literature reports use of the InSurE method, consisting of intubation, surfactant administration and immediate extubation to non-invasive ventilation (NIV) reduces intubated days. We evaluated our modified version of the InSurE method to determine if standardization of practice reduced unplanned reintubations and intubated days. **METHODS:** To assess current practice, demographic data, surfactant use, intubated days and reintubation rate after elective extubation data were retrospectively collected for infants admitted to our Level 3 NICU from January 1, 2012 through October 31, 2012. Data were prospectively collected on infants cared for through the modified InSurE method from November 19, 2012 through May 18, 2013. Our modified InSurE method consisted of intubating the patient, surfactant administration, and determining eligibility for extubation to NIV, oxygen therapy or no respiratory support, based on sequential, objective timed assessments. Descriptive statistics were used to report demographics and patient outcomes. **RESULTS:** Prior to the initiation of the modified InSure method, eight-one infants were intubated, and eligible to receive surfactant and immediate extubation to some form of respiratory support without standardized, objective assessments and criteria. Twenty-two percent (n= 18) of which received surfactant and immediate extubation. Gestational ages ranged from 23 3/7 to 39 3/7 (mean 31 5/7, $\pm$ SD 3 4/7). Most were male (56%). Seventeen percent (n= 3) were reintubated within 48 hours. The average length of intubation/patient was 3.4 days. Twenty-five infants were treated with the modified InSurE method. Gestational ages ranged from 29 to 38 4/7 (mean 33, $\pm$ SD 2). Most were female (56%). Eight percent (n=2) of infants required reintubation within 48 hours of elective extubation. The average length of intubation /patient was 0.75 days. Infants treated with the modified InSurE method were electively extubated to NIV (n= 12), heated high flow nasal cannula (n=9), and room air (n=3). **CONCLUSIONS:** Patients treated with the modified InSurE method had fewer intubated days and need for reintubation. The higher gestational age for this group, may have impacted the number of intubated days/patient. Standardization of care with decisions based on timed assessments and a scoring system reduced the need for reintubation and number of intubated days.

Sponsored Research - None

1732185

IMPLEMENTATION OF A CONGENITAL HEART DISEASE SCREENING PROTOCOL USING PULSE OXIMETRY.

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Background: The state of Indiana has implemented a mandatory pulse oximetry screening for all newborn infants to detect possible congenital heart disease. In order to pass the screening the infant must be ≥ 24 hour of age, maintain a SpO2 ≥ 95% (pre and post ductal) and insure there is a ≤ 3% difference. Implementation of this protocol aided in the discovery of otherwise unnoticed congenital heart defects. Method: The screening protocol process was implemented on January 1 2012. The following parameters were monitored and recorded during 2012: date and time of birth, CHD screening date and time, pre and post ductal SpO2 measurements, pass/fail designation, and second or third screenings, if applicable. Data collection was inclusive to all infants born in this facility during 2012. Results: A total of 2445 patients were noninvasively tested from January 1 2012 to January 1 2013. Patients must be ≥ 35 weeks to be eligible for testing. Twenty three hundred and twenty nine (n=2329) were ≥ 35 weeks. Patients born prior to 35 weeks were tested when they matured to 35 weeks. Ninety nine (n=99) patients were born < 35 weeks. Seventeen patients had an unknown gestation. All infants with unknown gestation were tested at ≥ 24 hours of birth. The testing revealed 10 failed screens that resulted in echocardiograms. All ten echocardiograms revealed a benign cardiac condition or congenital heart pathology. The resulting anomalies are as follows: 3-mild peripheral pulmonary stenosis 2-small /patent ductus arteriosis 2-small patent foramen ovale/atrial septal defect 1-small tricuspid regurgitation/patent ductus arteriosis 1-r/o coarctation of the aorta 1-small patent foramen ovale Exclusionary patients will account for the remaining patients not completing testing. Exclusions include: 1 Refusal (Religious Reasons) 3 RHC 4 patients transferred to other facilities prior to screening 19 echocardiograms performed for prematurity and symptomology. Conclusion: Given the relatively low cost and the potential lifesaving implications, there has been little or no waste of resources or monies with this testing procedure. Implementation of the congenital heart disease screening protocol has been extremely successful and valuable in the diagnosis and care of these patients.

Sponsored Research - None

1732120

USE OF HIGH FLOW NASAL CANNULA IS ASSOCIATED WITH LONGER LENGTH OF STAY IN AN ALL REFERRAL NICU.

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Background: High flow nasal cannulas (HFNC) are a recent addition to the respiratory therapy armamentarium in neonatal intensive care units (NICU), and as with many NICU therapies there is little evidence on which to base their use. The objective of this study was to determine characteristics of HFNC use in the NCH NICU, which is an all referral level 4 unit. Methods: Data was collected from patients treated with HFNC (n = 57) or standard nasal cannula (n = 103) in the first 2 quarters of 2011. HFNC was defined as flow >1 LPM requiring a heated circuit, and standard nasal cannula (NC) was defined as never being treated with HFNC and flows ≤ 1 LPM. Results: Compared to the NC patients, HFNC patients had lower birthweight (1400g [IQR 868g – 2913g] HFNC vs 2726g [IQR 1772g – 3450g] NC, p<0.001) and lower gestational age (30 weeks IQR [26 – 38] HFNC vs 36 weeks [IQR 33 – 38] NC, p<0.001). HFNC patients had more ventilator days (7 days [IQR 0-19] HFNC vs 0 days [IQR 0-5] NC, p<0.001) and days on CPAP (10 days [IQR 0-25] HFNC vs 0 days [IQR 0-2] NC, p<0.001) than did NC patients. Multiple logistic regression using these 4 variables showed that only CPAP days were a significant (p<0.005) predictor of need for HFNC (OR 1.09, 95% CI 1.04 – 1.15). Mortality rates were low and not different between groups. Median length of stay for HFNC patients was 52 days longer than for NC patients (p<0.001). Median total charges for HFNC patients were $289,547 greater than for NC patients (p<0.001). When only considering infants born at ≤32 weeks, ventilator days were not different, while CPAP days, length of stay, and total charges remained greater (p<0.05) in the HFNC group than in the NC group. Conclusions: In this patient cohort, HFNC is utilized in patients of lower birthweight and gestational age, who remain on positive pressure longer. HFNC patients had a longer length of stay than did NC patients. These data emphasize that further studies are needed to determine optimal HFNC use, including determining eligible patients and weaning parameters.

Sponsored Research - None

1732360

THE EFFECT OF FLOW DRIVEN NEBULIZERS ON TRIGGERING DURING VENTILATION WITH THE PHILIPS RESPIRONICS TRILOGY VENTILATOR.

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INTRODUCTION: Infants with chronic lung disease (CLD) commonly require prolonged invasive ventilation beyond the ICU setting. Many of these infants are difficult to transition to sub-acute ventilators presumably due to difficulty triggering breaths. Recent technologic improvements in pediatric sub-acute care ventilators have made it possible to synchronize with weak or ineffective respiratory efforts. In the home setting, many chronically ventilated patients require aerosolized medications using a flow driven small volume nebulizer (SVN). We conducted a series of bench studies to test the hypothesis that there are no differences in the triggering of a sub-acute care ventilator with and without an SVN inline. METHODS: A Trilogy 202 (Philips Respironics, Andover, MA) ventilator equipped with a proprietary passive pediatric heated-wire circuit. A spontaneously breathing lung model (Ingmar ASL 5000) was used, configured with mechanics similar to those measured in three different sized patients with CLD via 3.0, 3.5, 4.0 mm ID Pediatric Shiley Tracheostomy tubes for the 4, 8 and 12 kg models. Settings = Mode: PC/SIMV, PIP: 25 cmH2O, PEEP: 8 cmH2O, RR: 20 bpm, TI: 0.4, 0.5, 0.6s (based on patient size), Rise Time: 1, and Flow Trigger:1L/min. A Misty Max 10 SVN (Carefusion, Yorba Linda CA) was placed inline for each patient size and measurements were made with no flow (baseline), 6 and 8 L/min. Tidal volume, PIP, and PEEP were obtained from the ASL 5000 (n=10). We assessed lung model graphics post-hoc to assess Trigger Breath %= (Total # spontaneous inspiratory efforts/# triggered ventilator breaths). RESULTS: There were no differences in tidal volume, PIP, or PEEP between testing conditions (p=0.9). There were differences in the Trigger Breath % that were related to patient size and SVN flow (see Table). CONCLUSION/DISCUSSION: These data suggest there may be clinically relevant implications in ability to trigger the ventilator in the 4 kg patient population at 6 L/min and 8 L/min, or 8 to 12 kg patient population at 8 L/min SVN flow.

Sponsored Research - None

Size	4 kg			8 kg			12 kg		
SVN Flow Rate	Baseline	6 L/min	8 L/min	Baseline	6 L/min	8 L/min	Baseline	6 L/min	8 L/min
Triggered Breath %	100	50	0	100	100	71	100	100	85

1732519

RESPIRATORY BENEFITS OF T-PIECE RESUSCITATOR AND EARLY CPAP IN THE DELIVERY ROOM.

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Background: We wanted to avert endotracheal intubation with the use of early CPAP beginning in the Delivery Room environment. These patients would then transition directly from the T-piece resuscitator to nasal CPAP upon arrival in the Infant Special Care Unit. Method: The setting was the delivery rooms at Evanston Hospital with subjects including the 26 - 28 6/7 week premature population. By establishing Functional Residual Capacity at birth in this population through the use of CPAP with a T-piece resuscitator, we could avoid immediate endotracheal intubation and invasive ventilation. We used a deidentified retrospective controlled study design. Control infants were born between 1/09 and 1/10, before we began using the T-piece resuscitator and early nasal CPAP. These patients were compared to a cohort born between 9/10 and 12/11, after the use of the T-piece resuscitator and early nasal CPAP became standard practice. Measures: Data on the incidence of intubation and oxygen requirements at 28 days of life and 36 weeks postmenstrual age were abstracted from the medical record. Results: Our results showed that 60.7% of the patients treated with the T-piece resuscitator and early nasal CPAP never required intubation during the hospital stay versus only 3.8% of the control group. Only 26.8% of the early nasal CPAP patients were on oxygen therapy at 28 days of life, while 43% of the control group was on oxygen at that point. At 36 weeks gestation 16.5% of the control group required oxygen versus only 7.1% of the early nasal CPAP group. When looking at data that included patients who either died or remained on oxygen at 36 weeks gestation, this outcome category contained only 10.7% of the early nasal CPAP patients in contrast to 25.3% of the control group. Conclusions: Our analysis of the data demonstrates the usefulness of early nasal CPAP in the 26 - 28 6/7 week premature baby. The availability of a T-piece Resuscitator device with controlled positive pressure, CPAP equipment and a staff trained in the use of this equipment were possible key success factors.

Sponsored Research - None

1732837

NON -INVASIVE BILEVEL POSITIVE AIRWAY PRESSURE (BIPAP) VENTILATION IN A YOUNG INFANT.

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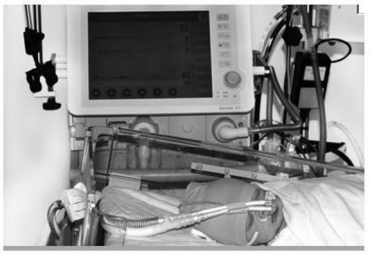
Introduction:Non-invasive ventilation (NIV) has been increasingly used in children with acute respiratory failure. But its use is limited by the lack of suitable ventilators especially when BIPAP ventilation is required in infants beyond neonatal period. We describe the successful use of Drager Savina 300 ventilator in a 3.3 kg baby with pertussis. Case Summary: A 10 week old full term infant was admitted to children's ward with fever and cough for 7 days and pertussis was confirmed. Chest X ray showed right upper lobe collapse /consolidation. He was treated with oxygen, antibiotics and nasogastric feeds; But he had to be transferred to Pediatric Intensive care Unit after 48 hours due to clinical deterioration. He was intubated and required high ventilatory support (maximum pressures 29/5, FiO2 50-70%), nitric oxide and sildenafil for pulmonary hypertension. He was extubated after 19 days of invasive ventilation on to infant flow driver (Viasys) Bilevel CPAP (pressure 9/5). Over the next 24 hours, he became more tachypnoec (RR 30 Ç75) with increasing FiO2 (30 Ç 50%). New chest X-ray changes and increasing white cell count were also noted. He was also very weak and floppy suggestive of critical illness induced myopathy. It became clear that without escalation of non-invasive respiratory support he would require reintubation and invasive ventilation. In order to avoid it, we tried him on Savina 300 ventilator (Drager) on the NIV mode via nasal prongs (Figure). He appeared uncomfortable on CPAP+ PS because of difficulties with triggering. Therefore, we tried him on PC+BIPAP mode(16/5, Inspiratory time 0.5 sec, rate 30/min,lowest trigger setting) . His breathing looked asynchronous again due to ineffective triggering, therefore pressure support was removed. Breathing became more comfortable and within 6 hours his RR (40/min) and FiO2 (30%) improved. After a stable 48 hours, we weaned him on to high flow oxygen therapy (optiflow) but his work of breathing worsened soon, therefore put back on Savina 300. He remained on Savina 300 for another 3 days and then alternated between optiflow and savina 300 for further 4 days. He was gradually weaned of his oxygen therapy and discharged home after 6 weeks. Discussion:This is the first report on safety and efficacy of Savina 300 for providing non-invasive BIPAP support in young infants. We believe it will help respiratory therapists and physicians to consider using it as there are not many choices available.

Sponsored Research - None



1732748

DEVELOPMENT AND IMPLEMENTATION OF A NEWBORN CONGENITAL HEART DISEASE SCREENING PROGRAM.

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Background: Studies document the need to screen newborns for congenital heart disease (CHD) to augment physical examination of the neonate. The State of California identified a need for CHD screening implementing AB 1731 which requires statewide screening of newborns to include pulse oximetry screening for CHD. SRMC Cardiopulmonary Services Department implemented a newborn CHD screening program to assist physicians with detecting critical, life threatening congenital heart defects in newborns. Method: The SRMC Cardiopulmonary Services Department worked with a multidisciplinary team to develop and implement a screening program before the state law took effect. The protocol was designed around the 'Proposed Pulse-Oximetry Monitoring Protocol by Expert Panel' described by Kemper et al in Pediatrics 2011. The protocol was approved by the medical director of the NICU and the Department of Pediatrics. Staffs were trained on the protocol and competency was validated by direct observation of technique. Results: The CHD screening program was implemented on December 10, 2012. In a period of 4 months we performed 722 CHD screenings. In 3 cases the patient failed the screening and was referred for follow-up by neonatology including echocardiogram. The patients were subsequently sent to a tertiary pediatric center for care. Follow up testing revealed 1 patient with Tetrology of Fallot, 1 patient with a persistent Patent Ductus Arteriosis and 1 patient with a myocardial tumor. In all 3 cases, there were no significant symptoms identified in the pediatrician's assessment documentation and the families were preparing for discharge home when the failed screening identified the risk. Staffs believe there was significant risk averted by identifying these anomalies with CHD screening. This data is consistent with CDC data which document 7 to 9 babies per 1,000 live births having some form of Complex Congenital Heart Disease. Studies indicate that late diagnosis is associated with significantly worse prognosis and increased risk for complications. Conclusion: Implementation of a CHD screening program by Respiratory Care Practitioners has successfully met the goal of detecting critical congenital heart defects. In addition this program has improved relationships between Respiratory Care Practitioners, nurses and neonatologists who see increased value in assessment by qualified RCP staff.

Sponsored Research - None

1733083

COMPARISON OF TWO VOLUME TARGETED NEONATAL ALGORITHMS WHEN SWITCHING BETWEEN TRIGGERED AND NON-TRIGGERED BREATHS.

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BACKGROUND: Volume targeted ventilation is common in NICU's. It is offered on many neonatal ventilators which have subtle differences in the ventilation algorithm. Neonates can switch between short periods of time when all breaths are either triggered or non-triggered. PIP requirements on volume targeted ventilation change as the effort of the neonate changes. We wanted to compare two volume targeted algorithms that differ when switching between triggered and non-triggered breaths. METHODS: We used a simulated neonatal patient triggered test lung bench model. Draeger Infinity V500 (V500) has a new dual algorithm, PIP for triggered and non-triggered breaths are separate. Draeger Evita XL (XL) adjusts PIP breath to breath regardless of triggering. The following settings were used in this evaluation: Volume Assist Control with Autoflow, Vt = 7 ml, Rate = 35, IT=0.40 seconds, PEEP=5 cmH20. Five trials were performed with a series of non-triggered breaths that switched to a series of triggered breaths. Five trials were performed with a series of triggered breaths that switched to a series of non-triggered breaths. Data collected included: number of breaths until PIP and tidal volume became stable and maximum deviation of the tidal volume from the stable tidal volume. RESULTS: Six to seven breaths were required by the XL to fully adjust PIP when switching between triggered and non-triggered breaths. The V500 fully adjusted PIP on the first breath. Tidal volume increased transiently by + 13.8% when switching from non-triggered to triggered breaths on the XL. The tidal volume decreased transiently by - 25.2% when switching from triggered to non-triggered breaths on the XL. The V500 volume was stable when switching between triggered and non-triggered breaths. CONCLUSIONS: 1) Subtle differences in ventilator algorithms can causes differences in ventilation of the patient. 2) The new dual algorithm which separates triggered and non-triggered breaths functions as intended, maintaining consistent PIP and tidal volume when ventilation changes from triggered to non-triggered or vice versa. 3) Algorithms that don't separate triggered and non-triggered breaths may subject neonates to tidal volume variation during ventilation when patient triggered periods start and stop.

Sponsored Research - None

Tidal Volume Deviation and Number of Breaths To Adjust When Switching From Patient Triggered To Non-Triggered And Vice Versa

	Average Tidal Volume Deviation (%)	Average # Breaths To Fully Adjust
XL - From Triggered to Non-Triggered	+ 13.8%	7.2
V500 - From Triggered to Non-Triggered	- 0.6%	1
XL - From Non-Triggered to Triggered	- 25.2%	6.0
V500 - From Non-Triggered to Triggered	- 0.3%	1

1733125

DECREASING UNPLANNED EXTUBATIONS IN THE NEONATAL INTENSIVE CARE UNIT: A MULTI-DISCIPLINARY APPROACH.

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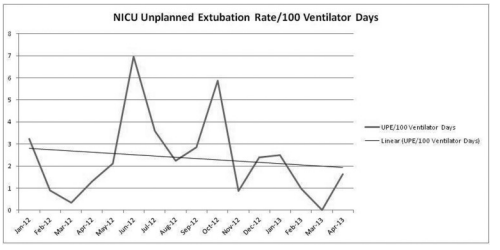
BACKGROUND: Unplanned extubation (UPE) can lead to significant clinical compromise in the neonatal patient. In early 2012 the UPE rate in our 122 bed Level III Neonatal Intensive Care Unit was noted to be climbing to an unacceptable rate. In January 2012 the UPE rate reached 3.24/100 ventilator days. A quality improvement project was implemented to determine common factors associated with UPEs and work to decrease their occurrence. METHODS: A multi-disciplinary workgroup consisting of Respiratory Therapists, Nurses, Neonatal Nurse Practitioners, Neonatologists and Performance Improvement Specialists was formed in order to decrease UPE in the NICU. Upon review of all UPEs, two clear causal factors were identified: lack of consistency among caregivers in securing the endotracheal tube and loss of airway during kangaroo care (specifically when moving the baby back into bed from the parent/caregivers arms). During this investigation, it was also observed that many NICU caregivers had come to regard UPE as a reasonable occurrence in this patient population. Between February and August 2012, all NICU staff were re-educated on the clinical significance of UPE and correct airway securing techniques. Caregivers began more frequent assessment and documentation of airway placement and security. They also started utilizing a two person technique for all kangaroo care. The two person technique included one person, typically the respiratory therapist, whose only purpose was to monitor the airway during movement into the parent's arms and upon return to bed. RESULTS: At the beginning of the measurement period the rate UPE was 3.24/100 ventilator days. Following re-education regarding the significance of UPE and correct airway securing technique, the rate decreased by 31% to 2.25/100 ventilator days. After the additional implementation of two person technique for all kangaroo care the rate dropped even further to 1.64/100 ventilator days. This marked a 50% decrease in UPE. CONCLUSION: A multi-disciplinary quality improvement project focusing on staff education, tube securement and maintaining the airway during kangaroo care has been shown to decrease unplanned extubation in the neonatal intensive care unit. Future research is recommended to validate this statement.

Sponsored Research - None



1721935

COMPLIANCE WITH RECOMMENDED NON-PHARMACOLOGICAL MANAGEMENT IN COPD PATIENTS.

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Background: Smoking cessation slows the decline in FEV1 in COPD patients. Pulmonary rehabilitation reduces hospitalizations and improved the quality of life in this population. The Healthy People 2020 Goals set by the US Department of Health and Human Sciences include annual influenza vaccination rate of 90% and pneumococcal vaccination rate of 60% in high-risk populations such as COPD.To determine the rates of smoking cessation counseling, pulmonary rehabilitation referral, and influenza and pneumococcal vaccination in COPD patients. Methods: We performed a retrospective chart review of PFT- confirmed COPD patients (ICD 496) seen at our resident-faculty practice. Patient demographics, smoking status and counseling, pneumococcal and influenza vaccine administration rates and pulmonary rehabilitation referrals were collected and analyzed. Results: Of the 335 patients with COPD ICD code 496, 61 patients were confirmed to have COPD based on the pulmonary function tests. Thirty one percent (19/61) were current smokers and 100% of these were counseled regarding smoking cessation. Based on FEV1, 16.4% (10/61) were GOLD Class 1, 57.4% (35/61) were GOLD Class 2, 24.6% (15/61) with GOLD Class 3 and 1.6% (1/61) were GOLD Class 4. By FEV1 Class, 26.2% (16/61) were eligible for pulmonary rehabilitation. Of these, 37.5% (6/16) patients were referred, 31.3% (5/16) were not referred because of current smoking status, 6.3 % (1/16) were lost to follow up and 25% (4/16) had no documentation regarding referral. Regarding immunization status, 64% (39/61) received annual influenza vaccine and 78.7% (48/61) received pneumococcal vaccine. Conclusions: About 30% of our COPD patients continue to smoke despite 100 % cessation counseling. Only 37.5% of our eligible COPD patients were referred for pulmonary rehabilitation. Our influenza and pneumococcal immunization rates were 64% and 79% respectively. Our practice attained the pneumococcal immunization goal but not that for influenza immunization.

Sponsored Research - None

1734008

NON-BRONCHOSCOPIC BRONCHIAL ALVEOLAR LAVAGE - A SAFE AND COST EFFECTIVE PROCEDURE FOR EARLY DETECTION AND TREATMENT OF VENTILATOR ASSOCIATED PNEUMONIA (VAP) AS WELL AS OTHER PULMONARY INFECTIONS - A SEVEN YEAR, 5000 PROCEDURES STUDY.

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INTRODUCTION: Significant mortality and morbidity are attributed to Ventilator Associated Pneumonia (VAP). Diagnosis of bacterial, viral or fungal infections is complicated by possible contamination of upper airway secretions and microbes.VAP diagnosis by false positive results is 23% - 65%. Positive identification of the pathogens is critical in accurate diagnosis and treatment. In the Intensive Care Units, the current practice of obtaining sputum specimens has either been by Fiberoptic bronchoscopy, sputum Induction or trans-tracheal suctioning. Fiberoptic bronchoscopy is the most accurate of all these techniques, but is expensive and requires a Physician led team. Non Bronchoscopic Bronchial Alveolar Lavage (NB-BAL) is performed by licensed Respiratory Care Practitioners (RRT, RCP) who are trained at CPIS score calculation, trained with NB-BAL competency, 24/7. This procedure has gained widespread acceptance and has been increasingly used since its introduction in June 2005, in the Intensive Care Units at Northwestern Memorial Hospital, Chicago, Illinois. During a seven year period, (June 2005 - December 2012), we have performed over 5000 NB-BAL procedures with remarkably low complications (< 2.0 %) and great success rate. PROJECT: Northwestern Memorial Hospital, located in Chicago IL, is a Level one Trauma Center, where Registered and licensed Respiratory Therapists (RRT, RCP) are trained to perform NB-BAL using a BAL Catheter by Kimberly Clark. Unlike Bronchoscopic BAL, NB-BAL consists of blind placement of a double lumen Catheter into the lung (right or left) to retrieve broncheal- alveolar fluid specimen. RESULTS: Between June 2005 and December 2012, we have performed 5051 NB-BAL Procedures with great accuracy and success; at the same time, with minimal complications. Major complications have been at < 2.0% and minor (Transient) complications at < 15%. (See Table) COST EFFECTIVENESS: In comparison to Bronchoscopic BAL, which is performed by Physicians, at a much higher cost, NB-BAL is less expensive (~10 times less expensive) and is readily available 24/7, as it can be performed by RTs any time of the day or night. (See Table). Once the order has been placed, NB-BAL is performed and specimen sent to the Microbiology lab within four hours. This makes treatments faster with greater accuracy and at much lower cost.

Sponsored Research - None

Year	June 2005	2006	2007	2008	2009	2010	2011	2012	TOTAL for 2005-2012	Complications (Major)	Complications (Minor)	Projected For Bronch BAL	Cost Cost For NB-BAL ($700.00)
NB-BALs Total	73	408	451	599	734	884	1016	886	5051	< 2%	< 15%	$30.31 Million	

Total Cost for NB-BAL = $3.54 Million
Projected savings for patients = $26.77 Million

1723719

DIAGNOSTIC BRONCHOSCOPY IN IMMUNOCOMPROMISED PATIENTS.

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BACKGROUND: Several diagnostic procedures are routinely used to help establish the cause of pulmonary infiltrates in the immunocompromised host. Fiber optic bronchoscopy (FOB) is generally considered the safest of these procedures, although the diagnostic yield in the immunocompromised host is variable (31-80%), with little information available concerning patient or radiographic characteristics associated with a higher or lower diagnostic yield. There is no consensus on which diagnostic procedure to pursue in the individual patient. OBJECTIVE: To better understand the diagnostic value of bronchoscopy in immunocompromised patients by determining whether there is a relationship between CT imaging patterns and diagnostic yield. METHODS: This study is a retrospective cohort study in a university hospital. Immunocompromised patients who had undergone FOB were identified and radiographic patterns were determined through CT imaging analysis. A chart review was conducted for microbiology and pathological results from FOB. A database of a sample population of 90 immunocompromised patients (48 consolidation/pneumonia patterns and 42 small nodular patterns) with the associated compiled information was constructed. The data was analyzed using z-test for comparison of two proportions – diagnostic yields of patients demonstrating consolidation or ground glass opacification versus nodular or interstitial patterns on CT imaging. RESULTS: A total of 35 diagnoses were made in the 90 cases (38.89%). Diagnoses were made in 20 of 48 patients that demonstrated a consolidation/pneumonia radiologic pattern (41.67%) and 15 of 42 patients that demonstrated a nodular radiographic pattern (35.71%). The diagnostic yield was not statistically different between these two groups (p = 0.56). The most common diagnosis was infection, and the majority of the organisms isolated were of bacterial origin (62%consolidation group; 56% nodular group).CONCLUSIONS: The study did not show a significant relationship between CT imaging patterns and diagnostic yield.

Sponsored Research - None

Diagnostic Yield

Diagnosis	Consolidation (n = 48)	Nodular (n = 42)	Total (n =90)
Undiagnosed	28 (58.33%)	27 (64.29%)	55 (61.11%)
Diagnosed	20 (41.67%)	15 (35.71%)	35 (38.89%)

Statistical Analysis (2-sided z-test for comparison of two independent proportions): 95% confidence interval, p = 0.56

1728442

EVALUATION OF SCREENING SPIROMETRY IN MILITARY PERSONNEL.

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Purpose: Recent debate has emerged regarding the frequency of pulmonary disease in deployed soldiers returning from Southwest Asia. Evaluations may identify an underlying pathology even when pulmonary function tests (PFTs) are normal in symptomatic subjects. Requiring predeployment PFTs in all military personnel may provide a baseline study to distinguish new respiratory disease in deployers. This study investigated the feasibility of performing baseline screening spirometry in an active duty population. This evaluation will determine the prevalence of abnormal values requiring additional testing during screening of this asymptomatic population. Methods: Active duty military personnel 18-35 years old were recruited for this two phase study with the first phase aiming to enroll 2000 subjects. Phase I participants complete a pulmonary questionnaire and underwent portable spirometry. Subjects with abnormal spirometry findings, along with matched controls, were asked to participate in the second phase in which they will undergo further pulmonary function testing to confirm spirometric findings. Abnormalities were classified according to NHANES III reference values. Results: Phase I (initial screening spirometry) has 331 participants to date. The majority of spirometry values are normal with 69 (20.8%) of subjects having at least one spirometric abnormality requiring additional testing. Of these abnormalities, 18 (5.4%) suggested a restrictive defect and 31(9.4%) had an obstructive defect. Thirty-seven (11.2%) abnormalities were noted only on the flow-volume loops. None of the subjects with any history of asthma or asthma medication use were noted to have spirometric abnormalities. Conclusion: Preliminary data shows greater than 20% of studies were abnormal and would require further evaluation. A medical history of asthma or smoking did not correlate with findings of abnormal spirometry in this population. Spirometry did not reliably detect presence or absence of underlying lung disease or correlate with symptoms.

Sponsored Research - None

1731567

COMPARISON OF FIO2 IN THREE HIGH ALTITUDE SIMULATION TEST INTERFACES.

Sasha Cook, Doug Pursley, Keatyn Garton, Aaron Light; Ozarks Technical Community College, Springfield, MO

Background: Some patients suffering from COPD or other cardiopulmonary diseases may develop significant hypoxemia when flying or visiting high altitudes. The high altitude simulation test or HAST can help determine the need for supplemental oxygen during flight. This test has a patient breathe 15.1% oxygen for a short period of time to simulate cabin pressure of 565 mmHg or altitude of 8,000 feet, the minimum required by US federal regulations. Since there are various methods available to deliver sub-ambient oxygen, we assembled three popular devices and sought to determine which one(s) most accurately delivered the set FIO2 to the airway. Method: We tested the following devices: a vented, Pulmodyne full-face BiPAP mask with a reservoir bag set to deliver an FIO2 of 15.0% from a gas mixture cylinder; an AirLife venti-mask (VM) driven with 100% nitrogen on 40% setting, which would result in an FIO2 of 15.675%; and a Westmed non-rebreathing mask (NRBM) set to deliver 15.0% oxygen from a gas mixture cylinder. The three interfaces were placed on an Armstrong Medical adult intubation manikin connected to a Hans-Rudolph 1101 breathing simulator. A calibrated, Teledyne MX300 oxygen analyzer was placed between the manikin and simulator in order to measure tracheal FIO2 while the simulator was set to deliver minute ventilations of 9, 12, 15, and 18 l/m. For the BiPAP mask, we set the flowrate so that the valve on the mask remained open and the bag stayed inflated at all times. The VM was set at 15 l/m resulting in a total flow of 60 l/m while the NBRM was set for 15 l/m. Results: Using the BiPAP mask with reservoir, the difference between set and measured FIO2 was only 0.1-0.4% across all four minute ventilations. With the VM set to deliver 15.675%, we measured FIO2 between 15.0% and 16.2%, the widest variance being 0.675%. The NRBM produced a difference of 2.0-3.1% between set and measured FIO2. Conclusion: The BiPAP mask and the VM were most accurate and produced the least difference between set and measured FIO2. We believe this is a result of these systems meeting and/or exceeding the inspiratory flow demands of the patient. The NRBM while set for 15.0% measured an FIO2 of 17.0-18.1%. This correlates to a mean barometric pressure of 638 mmHg or altitude of 4,000 feet instead of the 8,000 feet standard. If a NRBM must be used for HAST, the flowrate on this traditional low-flow device should be increased to meet the inspiratory flow needs of the patient.

Sponsored Research - None

1732994

COMPARISON OF SAMPLER FILLING TIMES AMONG SELECTED ARTERIAL BLOOD SAMPLERS.

Christine McMillen, Stephen Adu-Yeboah, Elisabeth Kagarise, Rebecca Morton, Basak Yuce, F. Herbert Douce; The Ohio State University, Columbus, OH

Background: True arterial blood samples are essential in making clinical decisions for respiratory patients. Previous studies using only the Portex Pro-vent® arterial sampler have shown a significant difference between arterial and venous filling times. The purposes of this study were to determine if there is a statistically significant difference between sampler filling times measured at a normal mean arterial pressure (MAP) among multiple arterial samplers with plungers and to determine if there is a statistically significant difference in filling times between venous and normal MAP for a sampler without a plunger. Methods: We assembled an extracorporeal laboratory model to circulate normal saline at a constant pump speed of 1,500 rpm, and we used hemostats to create pressures within the circuit. We randomly selected samplers and measured the filling times of four arterial samplers with plungers at a normal MAP (93±1 mm Hg). We also measured the filling time of one arterial sampler without a plunger at normal MAP and at a simulated venous pressure (9±2 mm Hg). We used ANOVA and Tukey's post hoc comparison to compare arterial filling times in samplers with plungers, and we used a t-test for independent samples to compare venous and arterial filling times in the sampler without a plunger. Results: Sampler filling times varied by brand and type (see Table 1.). There was a statistically significant difference between sampler filling times among the four arterial samplers with a plunger ($P<0.001$). There was a statistically significant difference between arterial and venous pressure filling times for the sampler without a plunger ($P<0.001$). Conclusion: Although there was a statistically significant difference between arterial filling times among various samplers with plungers, the difference was less than one second and not deemed clinically important. Regardless of the sampler brand being used, respiratory therapists and other clinicians performing arterial punctures can use sampler filling time to identify a successful arterial puncture while drawing blood.

Sponsored Research - None

Sampler Brand	Optimedical Comfort Sampler®	WestMed Pulset®	Marquest Quik ABG®	Portex Pro-vent®	Radiometer safe PICO®	P
Arterial filling times	5.080 ± 0.512	5.290 ± 0.137	5.640 ± 0.296	6.145 ± 0.547	6.235 ± 0.245	< 0.001

1733338

COMPARISON OF TWO DEVICES ON THE MEASUREMENT OF NASAL NITRIC OXIDE.

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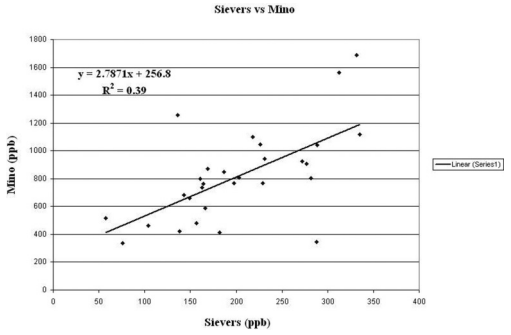
Introduction: Exhaled nitric oxide (eNO) is a biomarker of airway and sinus inflammation. The American Thoracic Society (ATS) and European Respiratory Society (ERS) guideline published in 2005 describes the testing methods for both oral and nasal eNO but were based on available testing methods at the time. A new portable analyzer uses a different testing method for measuring nasal eNO then in the guideline. We propose testing subjects using the recommended technique and traditional chemiluminescence analyzer (Sievers) and comparing the results to those measured on this new portable device. Hypothesis: The nasal eNO data measured by the Sievers analyzer using the current ATS-ERS recommended testing technique is comparable to those measured using the portable Aerocrine Mino. Methods: 30 subjects (> 16 yrs) for whom nasal exhaled nitric oxide was ordered as a clinical test was be used in the comparison. Both the Sievers and Aerocrine units were calibrated according to manufactures recommendations prior to testing and compliance with pretest instructions were evaluated by the testing technologist. The subjects alternated between either testing with the Aerocrine or Sievers unit first. Data was analyzed using a linear regression and Bland Altman plot. Figure: Conclusion: The two testing methodologies/devices yield significantly different test results (mean difference 614ppb; range 56-1355ppb). However there is a linear correlation ($R=0.63$) between the two datasets and a regression equation is proposed ($y = 2.7871x + 256.8$). A larger sample size would be advantageous in characterizing this relationship. ATS/ERS Recommendations for Standardized Procedures for the Online and Offline Measurement of Exhaled Lower Respiratory Nitric Oxide and Nasal Nitric Oxide. Am J Respir Crit Care Med 2005 Vol 171. pp 912–930.

Sponsored Research - None



1733413

PULMONARY REHAB PARTICIPATION AND ITS EFFECT ON PATIENT OUTCOMES AND 30 DAY HOSPITAL READMISSIONS.

Melinda A. Hester[1], Michelle R. Brown[1], Scott H. Haave[1], Dan Schuller[1,2]; [1]Respiratory Care Services, Bellevue Medical Center, Bellevue, NE; [2]Pulmonary, Critical Care and Sleep Medicine Division, Creighton University Medical Center, Omaha, NE

Background: The outcomes of an outpatient pulmonary rehab program (PR) for stable patients with lung disease which has compromised their overall quality of life were evaluated. Criteria for inclusion consisted of but were not limited to a decreased ability to perform activities of daily living, or a decline in clinical, nutritional, psychosocial or strengthening status due to lung disease. During the initial 18 months of the program, 56 referrals were received, 96% with a diagnosis of chronic obstructive pulmonary disease (COPD). The mean age was 69, and the group was predominantly female. A care plan was created for each patient by a team comprised of a Respiratory Therapist, RN, Exercise Physiologist, Nutritionist, and Social Worker under the direction of a Pulmonologist. Care plans included aerobic exercise, strengthening strategies, education, nutritional and psychosocial support. The patients' rates of perceived dyspnea and exertion were measured during each exercise modality, allowing the exercise prescription to be titrated accordingly. Method: Assessment measures were established for health related quality of life (HRQOL), utilization of health care resources, and patient centered outcomes. HRQOL was assessed using the St. George Respiratory Questionnaire (SGRQ), which was administered at the initial and final pulmonary rehab sessions. Patient outcomes were evaluated with standard Excel (2010 Microsoft, Redmond, WA) applications using histogram analysis of the data. Candidate outcomes for 30 day readmissions were compared within the referral group using Excel Q1Macros 2013 Chart Analysis. Six month pre-post program readmission data was collected. The referral groups preprogram data served as control. Results: 88% of the program graduates improved in SGRQ Total Score, with a mean improvement of 14.9%. Participation in the program produced a favorable trend in reducing the hospital readmission rates. 23% of participants had a hospital 30 day readmission within six months of program initiation, non-participants 48%, compared with the control group rate of 48%. Conclusion: A multi-disciplinary, evidence based pulmonary rehab program focusing on patient centered outcomes, with the cardinal virtue of optimizing a patients' quality of life also brings the added potential financial benefits to the health-care system associated with the reduction of 30 day hospital readmissions.

Sponsored Research - None

1712038

COMPARISON OF SUPERVISED GROUND AND TREADMILL WALK TRAINING IN PATIENTS WITH STABLE CHRONIC OBSTRUCTIVE PULMONARY DISEASE PATIENTS.

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BACKGROUND: Endurance walk training is an inevitable component of respiratory rehabilitation. Supervised walking programs are carried out in treadmill where as unsupervised level (ground) walk programs are just prescribed unstructured by the therapists and pulmonary health care providers as a continuum of home respiratory care. The benefits of ground walk training (GWT) are still yet to be explored over benefits of universally accepted treadmill walk training (TWT). OBJECTIVE: To compare the efficacy of GWT over TWT in improving the functional capacity and quality of life in COPD patients. METHODOLOGY: we conducted a single blinded (assessor blind) randomized controlled trial including 30 COPD patients (GOLD stage II to IV) in a tertiary care hospital. Group-A, (N = 15) received GWT and in Group – B (N = 15) participants received TWT. Pre and post functional capacity and quality of life were measured before and after six weeks of GWT and TWT. Using SPSS 12.01, the data were analyzed. RESULTS: The paired test revealed a significant difference in functional capacity (Group A – 55.13 and Group B – 44.26 meters; p = 0.000) and quality of life scores (Group A – 1.18 and Group B – 0.78; P = 0.000). CONCLUSION: GWT may be a useful and effective alternative modality to fascinated costly TWT in pulmonary rehabilitation arena.

Sponsored Research - None

1723270

PULMONARY FUNCTION OF MYOTONIC DYSTROPHY WITH CHRONIC VENTILATORY FAILURE.

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Background: Chronic ventilatory failure is a common complication of neuromuscular disorders, and generally parallels the development of limb and respiratory muscle weakness. Myotonic dystrophy (MD) is the commonest adult muscular dystrophy, and is associated with chronic ventilatory failure as one of its multi-systemic clinical manifestations However in MD, ventilatory failure may occur when respiratory muscle weakness is not marked. We aimed to correlate daytime pulmonary function studies with nocturnal ventilatory status of MD patients. Method: MD who had applied noninvasive home mechanical ventilator at pulmonary rehabilitation center at Gangnam Severance hospital due to ventilatory impairment during overnight capnometry and oxymetry studies became candidates. We retrospectively reviewed daytime pulmonary function data at the point of ventilator application, and correlations were sought between the two. Results: 18 MD patients (M:7, F:11, mean age 45.9±12.5 years) were recruited. During overnight studies, mean maximal CO2 was 56.6±9.1mmHg, and mean nocturnal O2 saturation was 93.6±3.9%. On pulmonary function, mean normal predicted forced vital capacity (FVC) in sitting position was 37.8±17.8%, and 5 patients presented >50% of normal predicted FVC. Mean value of maximal inspiratory pressure (MIP) and maximal expiratory pressure (MEP) was 33.6±18.8cmH2O and 42.7±16.8cmH2O respectively. Conclusions: In MD patients, the occurrence of nocturnal ventilatory failure can be difficult to predict from daytime measurement of pulmonary function. In order to find out latent ventilatory failure, nocturnal capnometry and oxymetry studies can be helpful for patients even with tolerable range of pulmonary function. Pathophysiology of ventilatory failure in MD may include other mechanism like abnormal central respiratory drive as well as respiratory muscle weakness. Further research is warranted on this issue.

Sponsored Research - None

1733633

HOME MECHANICAL VENTILATION IN PATIENTS WITH NON-NEUROMUSCULAR CAUSES OF VENTILATORY IMPAIRMENT.

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Background: To survey the use of invasive and noninvasive methods of home mechanical ventilation (HMV) in patients with non-neuromuscular causes of ventilatory impairment from the perspective of physical medicine and rehabilitation (PM&R). Method: For 55 users of HMV, retrospective reviews of PM&R interventions and survey HMV methods employed from Mar 2000 to Dec 2009. Results: Of the 55 users, the majority of whom with spinal cord injury (SCI) (n=32), only 7 initially used noninvasive mechanical ventilation (NIV). Among the other 48 who were using tracheostomy mechanical ventilation (TMV), 34 successfully switched to NIV as part of their rehabilitation. Mean age at initial HMV application was 45.4±18.0 yrs, and initial HMV dependent hours were 12.7±7.3 in a day. When the application status was reinvestigated at Oct. 2010, HMV dependent time was decreased to 8.7±8.0 hours, and 12 succeeded in total weaning of HMV. Conclusion: Noninvasive was preferred over invasive management and transition to the former was a result of PM&R interventions.

Sponsored Research - None

Basal Characteristics and Initial Application Mode of HMV

	SCI (n=32)	Cerebral Diseases (n=10)	Miscellaneous (n=13)	Total (n=55)
Current Age (yr)	48.0±17.9	46.8±20.2	48.9±17.1	48.0±17.8
Age at ventilator application (yr)	45.5±18.0	45.1±21.0	45.5±17.3	45.4±18.0
Sex Male	26	4	7	37
Female	6	6	6	18
Invasive	30	9	9	48
Non-invasive	2	1	4	7

Values are mean ± standard deviation

HMV: home mechanival ventilation, SCI: spinal cord injury, Miscellaneous: lung parenchymal disease (n=3) (s/p lung transplantation, bilateral phrenic N. palsy, Tbc dystroyed lung), Guillian-Barre syndrome (n=4), central hypoalveolar syndrome (n=1), Down syndrome with obstructive sleep apnea (n=1), cor pulmonale d/t kyphoscoliosis (n=2), Myesthenia gravis (n=2)

1731957

RESULTS OF AN OUTPATIENT PULMONARY REHABILITATION PROGRAM ON EXERCISE TOLERANCE AND HEALTH-RELATED QUALITY OF LIFE.

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BACKGROUND: Pulmonary rehabilitation (PR) is an evidence-based, comprehensive, and multidisciplinary approach in the management of patients with chronic pulmonary disease. The continued success of PR programs is linked to improved patient health outcomes that include, but are not limited to, exercise capacity, health-related quality of life, and psychosocial outcomes. The purpose of this study was to determine if there were meaningful clinical changes in the six minute walk distance test (6MWD), St. George Respiratory Questionnaire (SGRQ) health-related quality of life assessment, and the Patient Health Questionnaire (PHQ-9) brief depression assessment for patients who completed a 12-week, outpatient PR program. METHODS: This was a retrospective analysis of existing archived data containing patient information retrieved for internal auditing and reporting purposes and review of medical records for all patients enrolled in the PR program over a one year period. Patients with complete data sets were used for comparisons. Improvement in outcomes variables were measured by change in pre- and post-rehabilitation scores. Regression analysis was used to determine if any significant relationships existed between outcome and predictor variables. RESULTS: A total of 153 patients enrolled in the outpatient PR program from June 2012 to May 2013. Ninety-two patients completed the program for a completion rate of 60%. Complete baseline and follow-up assessment data were available for 66 of the 92 patients who completed the program. Patients completing PR had improvements in the 6MWD, SGRQ, and PHQ-9 (see Table 1). Multiple regression analysis revealed that FEV1% of predicted and initial 6MWD were significantly related to improvement in exercise tolerance. Presence of COPD, presence of cardiovascular disease, age, number of sessions attended, and gender were not related to changes in exercise tolerance, health-related quality of life, or depression symptoms. CONCLUSION: Patients completing the 12-week, outpatient PR program experienced improvements in exercise tolerance, health-related quality of life, and symptoms of depression. Exercise tolerance and health-related quality of life reached minimal clinically important difference for patients in this study.

Sponsored Research - None

Table 1: Means, Standard Deviations, and Comparisons for 6MWD, SGRQ, and PHQ-9

Variables	Initial	Follow-up	Difference	t value	p value
6MWD	269.2±115.2	366.4±132.5	97.2±74.0	10.7	<0.001
SGRQ	51.1±17.1	38.3±18.1	-12.8±13.9	-7.5	<0.001
PHQ-9	6.5±5.9	3.3±3.9	-3.2±2.0	-5.5	<0.001

Note. Six minute walk distance test (6MWD), St. George Respiratory Questionnaire (SGRQ), Patient Health Questionnaire (PHQ-9). Minimal clinically important difference for 6MWD = 54 meters, SGRQ = 4 units, PHQ-9 = 5 points.

1734055

PHASE II OF A MULTI-PHASE INTERDISCIPLINARY STUDY AIMED AT REDUCING ENDOTRACHEAL TUBE DEVICE-RELATED HOSPITAL ACQUIRED PRESSURE ULCERS IN CCU PATIENTS.

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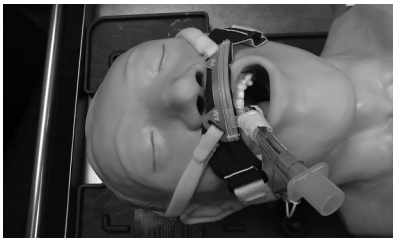
Purpose: To decrease the incidence of device-related hospital-acquired pressure ulcers (HAPU) in the CCU by 1) using a commercial endotracheal (ET) tube stabilizer to secure ET tubes and 2) to identify clinical opinions as reported by Registered Nurses, (RN's) and Respiratory Therapists (RT's) in a proposed protocol change from tape to a commercial ET stabilizer device. Background: Routine skin rounds and quarterly prevalence studies at our urban acute care hospital critical care unit (CCU) revealed an increasing number of device-related HAPU on the head and neck. Results of our Phase I study indicated a need and preference for a collaborative study with nursing and respiratory therapy to use an alternative to tape as the method to secure ET tubes. Method: A descriptive quasi-experimental intervention study was implemented. An anonymous three question semi-structured qualitative survey was distributed by email/survey monkey to every CCU RN and RT for 10 days prior to intervention. Questions were aimed at identifying clinical opinions regarding use of tape versus a commercial ET tube stabilizer for prevention of ET tube related HAPU. An adjustable ET tube stabilizer with head strap manufactured by Marpac was used on all CCU patients intubated for greater than 48 hours over a 2 month period. The RT educator randomly audited 3-6 patients/week for a total of 29 during the intervention period. The same survey was distributed post intervention to all CCU RN's and RT's. Results: There was one incident of an upper lip deep tissue injury during the study for a 3.4% incidence rate, which is not statistically significant. The RT, RT educator and Wound Care NP determined incorrect application technique was the likely cause of injury. Thirty-two RN's/RT's completed the post survey. 62.5% agreed or strongly agreed tape is a causative factor in facial HAPU's; 59.4% agreed or strongly agreed a commercial ET stabilizer facilitated tube repositioning & inspection; and 50.1 % agreed or strongly agreed a commercial stabilizer is effective in preventing facial HAPU's Conclusion: A commercial adjustable ET stabilizer can be effective in decreasing, but not necessarily in eliminating all device-related HAPU. While RN's and RT's strongly agree that tape is a causative factor, only 50% agreed that a commercial stabilizer is a completely effective alternative. Education and reinforcement of correct application technique is necessary.

Sponsored Research - None



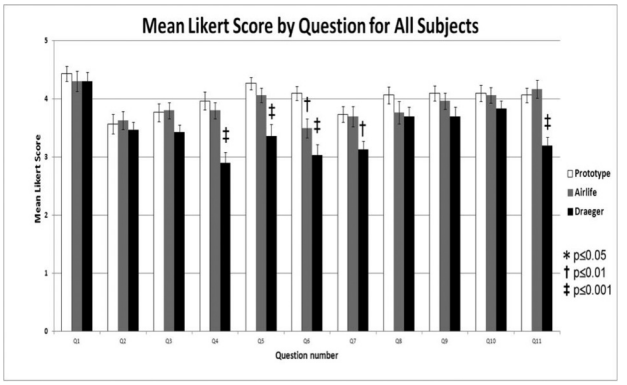
1724009

DESIGNING A NEW NASAL CPAP HEADGEAR.

Vrati Bagia, Steven Powell; Respiratory Care, Rush University Chicago, Skokie, IL

Background: CPAP is applied to the neonate through nasopharyngeal tubes, nasal prongs, or a nasal mask. Complication and hazards with the nasal tube include decannulation or malpositioning of the prongs or nasopharyngeal tubes, which can lead to fluctuations or reduction of CPAP levels. Improperly secured CPAP headgear can cause skin irritation of the head and neck, as well as facial trauma. We believe that improved headgear design can improve the function of nCPAP and reduce injuries Methods: 15 Nurses and 15 respiratory therapists in the NICU at Rush Medical Center were surveyed after comparing the newly designed CPAP headgear, the current Draeger headgear, and the Cardinal Airlife CPAP headgear. Survey questions include: The device is easy to understand after a one-time explanation; It is easy to maintain the nasal prongs in the correct position with this device; The device allows the nasal prongs to sit securely; The device is easy to place on a neonate; The headgear is made of material that is soft and comfortable; The headgear seems to have low risk of injury to the infant's face; Headgear is available in enough sizes to meet the needs of every infant; Using the device, the infant can be positioned prone; Using the device, the infant can be positioned side lying; The device does not seem to interfere with or hinder infant feeding; I am comfortable using this device on patients. Results: See table 1. Conclusions: The prototype was surveyed as significantly higher than the current Draeger headgear in categories of ease to place, soft and comfortable material, low risk of injury, size availability, and user comfort, and higher than the Airlife in risk of injury.

Sponsored Research - Draeger provided a student scholarship to conduct this study.



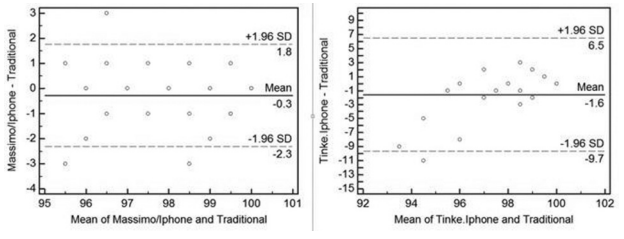
1726043

COMPARISON OF IPAD/IPHONE SPO2 DEVICES TO A TRADITIONAL PULSE OXIMETER.

Kristie McCoy, Kevin Limron, Aaron E. Light, Doug Pursley; Respiratory Therapy, Ozarks Technical Community College, Springfield, MO

Introduction: Recently, two commercially available iPhone/iPad pulse oximeter applications came on the market, the Tinke (Zensorium, Synapse, Singapore) and the Masimo iSpO2 (Masimo Corp., Irvine, CA). We set out to compare the two devices to the Masimo Radical 7 (Rad7) to assess the agreement of the new devices to the traditional device. Methods: After obtaining IRB approval, we recruited 55 adult subjects from the community at a local college event and on campus. The subject's left hand was placed on the Rad7 and their right hand was placed on either the Tinke or the iSpO2. The readings were timed to determine how long it took to achieve a reading and the SpO2 was recorded. The left was then changed to the other commercially available device, that device was timed and the SpO2 reading recorded. A Bland-Altman plot was produced by MedCalc statistical software to test for agreement. A t-test was performed to determine if the difference in the average time to achieve a reading of the SpO2 was different between the two commercially available pulse oximeters. Results: The Bland-Altman plots show that the iSpO2 device had better agreement with the Rad7 than the Tinke. However, the Tinke's agreement did improve at the higher SpO2 readings. Although, still wider than the iSpO2. The Bland-Altman plot for the Tinke appears to demonstrate a linear drop in agreement as the SpO2 reading decreases on subjects. Additionally, the Tinke only provided a SpO2 reading 45% of the time, despite repeated attempts. Conversely, the iSpO2 reported a SpO2 every time. The average time to report a SpO2 reading was 20.09 seconds (8.11 Stdev) with the iSpO2 and 59.40 seconds (25.75 Stdev) with the Tinke. The difference in time was statistically significant ($p<0.05$). Conclusion: Our findings demonstrate that Masimo iSpO2 had better agreement to the traditional pulse oximeter than the Tinke. Additionally, the Tinke took longer to report a SpO2 reading and did not report a result as often as the iSpO2. The lack of reported values from the Tinke was investigated and found to be closely related to when the device was utilized in an outdoor environment. The Massimo iSpO2 appears to be interchangeable with the traditional pulse oximeter in healthy patients. However, further studies need to be performed on non-healthy patients to determine the agreement of this new device.

Sponsored Research - None



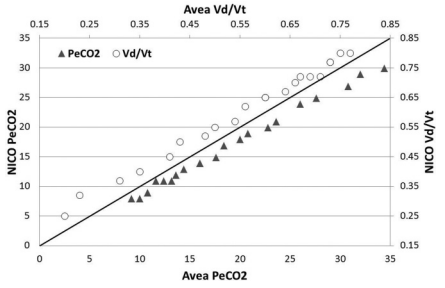
1733780

COMPARISON OF VD/VT AND MEAN EXPIRED CO2 MEASUREMENTS USING THE CAREFUSION AVEA VENTILATOR VS THE RESPIRONICS NICO2 MONITOR.

Mark Siobal, Leo Bandian, Roberto Bautista, Kelly Ho; UCSF Department of Anesthesia, San Francisco General Hospital, San Francisco, CA

Background: The upgraded CareFusion Avea Ventilator is equipped with software for integrated volumetric CO2 monitoring that enables Vd/Vt calculation. We compared Vd/Vt calculations from the Avea ventilator and compared it to measurements from the Respironics NICO2 Monitor during lung model simulation. Method: An Avea Ventilator set to Vt = 500mL, RR = 10, PEEP = 10 cm H2O, Insp. Time = 0.75 sec., Insp. Flow = 50 L/min, and FiO2 = .50 was attached to a single chamber of a Michigan Instruments Test Lung. The ventilator flow sensor and mainstream CO2 sensor, and the NICO2 monitor combined CO2 / flow sensor were calibrated and attached between the ventilator circuit and test lung chamber. 100% CO2 bleed-in to the test lung chamber was adjusted until an end tidal CO2 of approximately 35 mm Hg was displayed on the NICO2 monitor. Ventilation of the test lung was then changed in increments of 1 L/min by increasing the RR by 2 breaths per minute increments up to a RR of 30. After a stabilization period of 5 minutes at each RR setting, PeCO2 was recorded from the NICO2 monitor and a PaCO2 of 40 mm Hg was used to calculate Vd/Vt on both devices. Since the PeCO2 is not displayed on the Avea ventilator the PeCO2 was calculated by using the following equation: $PeCO2 = PaCO2 – (Vd/Vt \times PaCO2)$. The proximal and distal position of the ventilator CO2 sensor, and the NICO2 combined CO2 / flow sensor were then reversed and the measurements were repeated. A total of 22 measurements were recorded and compared. Results: There was a strong correlation between Avea ventilator and NICO2 monitor measurements of PeCO2 ($r = 0.997$, r squared = 0.994, $p < 0.0001$) and Vd/Vt ($r = 0.996$, r squared = 0.993, $p < 0.0001$). Bias and precision for Vd/Vt was $– 0.049 \pm 0.021$ and for PeCO2 $+ 2.2 \pm 0.09$ comparing the Avea ventilator to the NICO2 monitor. Conclusion: The Avea ventilator consistently measured higher PeCO2 and therefore calculated lower Vd/Vt values in this invitro lung model study.

Sponsored Research - None



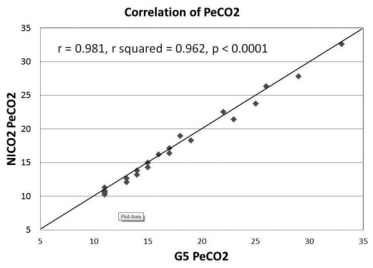
1728451

COMPARISON OF MEAN EXPIRED CO2 MEASUREMENTS CALCULATED USING THE HAMILTON G5 VENTILATOR VOLUMETRIC CAPNOGRAPHY VS THE RESPIRONICS NICO2 MONITOR.

Mark Siobal, Paul Fisher, Justin Phillips; UCSF Department of Anesthesia, San Francisco General Hospital, San Francisco, CA

Background: Calculation of VD/VT requires a PeCO2 measurement. The Hamilton G5 ventilator is equipped with integrated volumetric CO2 monitoring and calculates VCO2. This enables calculation of PeCO2 using ventilator measurements of VCO2 and VE. By dividing the VCO2 by the VE, the fraction of exhaled CO2 (FeCO2) can be calculated (FeCO2 = VCO2 / VE). We calculated the PeCO2 from the Hamilton G5 ventilator measurements and compared it to PeCO2 measurements from the Respironics NICO2 Monitor during simulated ventilation. Method: A Hamilton G5 ventilator set to Vt = 500mL, RR = 10, Insp. Flow = 50 L/min, and FiO2 = .50 was attached to a single chamber of a Michigan Instruments Test Lung. The ventilator flow sensor and mainstream CO2 sensor, and the NICO2 monitor combined CO2 / flow sensor were calibrated and attached between the ventilator circuit and test lung chamber. 100% CO2 bleed-in to the test lung chamber was adjusted until an end tidal CO2 (ETCO2) of 35 – 36 mm Hg was displayed on the NICO2 monitor. PeCO2 calculated by NICO2 monitor and PeCO2 calculated from the ventilator measurements were recorded. Ventilation of the test lung was manipulated by increasing the RR by 2 breaths per minute incrementally up to a RR of 30. PeCO2 measured by the NICO2 monitor and PeCO2 calculated from the G5 ventilator measurements of VCO2 and VE was recorded at each step. The proximal and distal position of the ventilator flow sensor and CO2 sensor and the NICO2 combined CO2 / flow sensors were then reversed and the measurements were repeated. A total of 20 measurements were recorded and compared. Results: There was a strong correlation between Hamilton G5 ventilator and NICO2 monitor measurements of PeCO2 ($r = 0.981$, r squared = 0.962, $p < 0.0001$). Bias and precision by Bland-Altman method was - 0.07 ± 1.2 mmHg. Conclusion: PeCO2 calculated from measurements of VCO2 and VE from the Hamilton G5 ventilator are in strong agreement with acceptable bias and precision compared to PeCO2 measurements from the NICO2 monitor during simulated ventilation. In-vivo comparisons of the two PeCO2 measurements and the correlation, bias, and precision of VD/VT measurements need to be validated.

Sponsored Research - None



1733565

ARE WE SUCTIONING THE LIFE OUT OF OUR VENTILATED PATIENTS?

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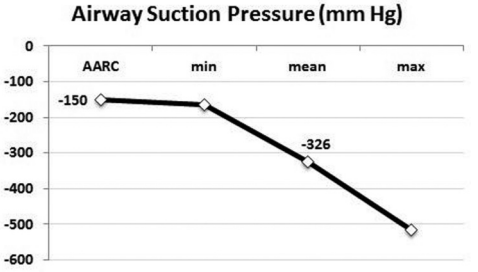
Background: When taking care of patients with artificial airways, a major hindrance is secretion clearance. Endotracheal suctioning is considered one of the most often performed procedures in the ICU. Although the AARC CPG recommends adult suction pressures not to exceed -150 mmHg, this pressure is not routinely monitored and rarely documented. The goal of our study was to determine the amount of negative pressure used in ICU patients and determine the magnitude of deviation from AARC recommendation. Methods: Prospective observational study at a university-affiliated, 496-bed hospital, in San Antonio, Texas. We collected data from 38 patients admitted to the MICU and SICU who had either an endotracheal tube (ETT) or tracheostomy tube (TT). We recorded the amount of negative pressure displayed in the manometer after occluding the end of the suction tubing used for airway suction. These values were compared to the recommended suction pressures to calculate percent deviation. Results: The mean negative pressure recorded was -326.1 mmHg (+/- 95.3). No significant differences were observed on the suction pressure between patients with TT (-336.2 mm Hg +/- 110.2) or ETT (-322.4 +/- 93.1; $p = 0.33$). The negative pressure recorded was 117% higher than the recommended by the AARC CPG. Conclusion: The amount of negative pressure routinely used for these patients in ICU significantly exceeded the recommended suction pressures. This practice can put patients at risk for well documented adverse events. Suction pressures should be monitored, recorded, and always readjusted by the clinician before suctioning each patient with an artificial airway to ensure overall safety of the patient and to provide standard of care.

Sponsored Research - None



1728652

CONTROLLING ETT CUFF PRESSURE DURING MECHANICAL VENTILATION WITH CONTINUOUS CUFF REGULATION DEVICES.

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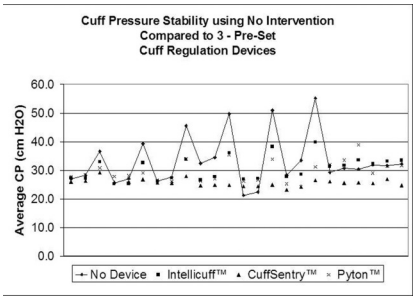
BACKGROUND: Maintaining artificial airway cuff pressure (CP) between 20 and 30 cm H2O is recommended. Routine cuff checks have been reported to be inconsistent and unreliable in performing this practice. Continuous CP regulation devices have been developed and are designed to avoid these inconsistencies. In this study we wanted to identify if CP can be maintained at a predetermined setting using 3 currently available continuous cuff regulation devices. METHODS: An artificial trachea (aerosol tubing) was intubated with an 8.0 MicroCuff ETT, (Kimberly Clark, Irving, TX) and the ETT was connected to a standard patient circuit from a Hamilton G-5 ventilator (Reno, NV). The intubated trachea was attached to an ASL 5000 breathing simulator (IngMar Medical, Ltd, Pittsburgh, PA) with compliance set for 30 mL/cm H2O and a resistance of 20 cm H2O/L/sec. Separately, three continuous cuff regulation devices, Intellicuff, (Hamilton Medical, Reno, NV), Pyton, (ARM Medical, Bristol, CT), and CuffSentry, (Outcome Solutions, Mocksville, NC) set at a CP of 25 cm H2O were connected by a 3-way stopcock to a certified Puritan Bennett PTS-2000 analyzer (Covidien, Mansfield, MA). The following test scenarios were evaluated in volume cycled mode: VT 300 mL, 500 mL and 800 mL, RR 20 BPM, PEEP 5 and 10 cm H2O, I:E 1:2, 1:1, 2:1. Time Cycled Pressure Control mode of ventilation was also evaluated at 30 cm H2O of targeted pressure, RR 20 BPM, and PEEP 5 and 10 cm H2O, I:E 1:2, 1:1, 2:1. Mean CP (± SD) for the 3 devices determined and compared using one-way analysis of variance (ANOVA). RESULTS: CP mean differences (± SD) from baseline with Intellicuff was 2.54 (3.96) ($p = 0.65$), Pyton 4.69 (4.87) ($p = 0.48$), and CuffSentry 1.24 (1.69) ($p = 0.94$). The chart below illustrates CP stability using cuff regulation devices compared to not using one. CONCLUSIONS: There was no significant difference from baseline CP with the 3 cuff regulation devices tested. Current generation continuous control cuff inflation devices are effective in maintaining a stable CP with the test scenarios described in this evaluation.

Sponsored Research - None



1731689

CLINICAL EVALUATION OF END TIDAL CO_2 MEASUREMENT DURING NONINVASIVE VENTILATION.

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Background: Measurement of end-tidal CO_2 ($etCO_2$) during noninvasive positive pressure ventilation (NPPV) is difficult because: 1) expired gas mixes with air in the mask, 2) expired gas is lost to mask and planned leak before it can be measured, and 3) expired gas is diluted by flow from the positive ventilator pressure during expiration. We evaluated a method of mathematically compensating the measured $etCO_2$ for the effect of gas mixing and leak during NPPV so that $etCO_2$ can be calculated from the raw CO_2 and flow signals of the volumetric capnography sensors placed between mask port and the exhalation port. We evaluated the mathematical compensation method in critical care patients being treated with NPPV. **Methods:** A combination flow and on-airway CO_2 sensor was placed between the NPPV mask and the exhalation port in 10 critical care patients. Four of the patients were fitted with a full face mask and six were fitted with a mask that covers the mouth and nose only. CO_2 and flow signals were recorded continuously throughout the study. Periodic arterial blood gas samples were drawn. Raw (uncompensated) and compensated end tidal CO2 ($etCO_2$) measurements were compared against the invasive PaCO2 data. Our mathematical model assumes that the mask volume represents a mixing chamber and that mixing in the mask is a first-order system where the volume of the mask equals one time (volume) constant. **Results:** Comparisons from 10 test patients for whom P_aCO_2 measurements were available were analyzed. There were 22 total blood gas comparisons in the data set: 8 were from patients with a full face NPPV mask and 14 were from patients with a nose and mouth mask. The table below shows the results for each mask type. The uncompensated $etCO_2$ is the maximum observed CO_2 with no compensation. **Conclusions:**It is difficult to assess the accuracy of the compensation method because the reference method is arterial $P_aCO_2$2, rather than $etCO_2$ measured in a sealed ariway. P_aCO_2 is similar to $etCO_2$ in normal healthy patients who do not have severe ventilation perfusion (V/Q) mismatch problems. In most cases, it is expected that the $etCO_2$ would be less than the P_aCO_2 and should sometimes be much less than $etCO_2$ depending on the severity of the lung disease. The overall average error appears to be effectively reduced using this method. This method requires the user to enter the mask type and size in order to obtain accurate results.

Sponsored Research - None

Mask Type	Average Uncompensated Difference (raw $etCO_2$ - P_aCO_2)	Average Compensated Difference (comp $etCO_2$ - P_aCO_2)
Full Face (n=8)	-38.1±22.4 mm Hg	-4.6±7.8 mm Hg
Mouth and Nose (n=14)	-26.2±7.9 mm Hg	-3.65±10.5 mm Hg
Combined Data (n=22)	-30.5±15.4 mm Hg	-4.0±9.4 mm Hg

Table shows the average difference between $etCO_2$ and P_aCO_2 for raw and compensated CO_2 signal for each mask type and as combined data

1731882

SUCCESSFUL UTILIZATION OF TELEMEDICINE TO PROVIDE SPECIALTY CARE TO RURAL LOCATIONS.

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Background: The Ventilator Care Program (VCP) in our pediatric hospital serves chronically ventilated children throughout a seven state region, including those in rural communities with limited access to specialty care. Specialty care for VCP patients is limited to the main hospital campus and families travel long distances to be seen. We hypothesize that telemedicine will improve access to specialty care, decrease travel distance, and have little impact on the perception of care as compared to that of the main campus clinic. Methods: VCP patients, who live outside the metropolitan area, were invited to participate in a pilot Telemedicine clinic 65 miles from the main hospital. Patients and families arrived at this patient site, were placed in an exam room, and communicated with the interdisciplinary VCP team using videoconferencing Telemedicine equipment. Two Bluetooth-enabled stethoscopes permitted remote auscultation. The VCP team obtained a comprehensive history, performed a cardiopulmonary and tracheostomy exam, reviewed ventilator/settings, and provided patient education. The patient site respiratory therapist assisted the pulmonologist with remote chest auscultation and printed the educational instructions. After the Telemedicine clinic, an unbiased staff member contacted each caregiver to conduct a 15-question survey. 4 questions measured the Telemedicine experience, 9 questions determined the perception of care, and 2 sought direct feedback. Results: Each Telemedicine patient (n=7) was successfully evaluated and treated across sites with the Telemedicine technology. All families who participated in the Telemedicine clinic were surveyed and compared to families at the main hospital clinic (n=21). On the five-point Likert scale, overall quality of care was rated 4.4 for Telemedicine and 4.6 for the main hospital clinic (p=NS). The thoroughness of the examination and treatment was rated 4.4 for Telemedicine and 4.3 for the main hospital clinic (p=NS). The convenience and personnel connection of telemedicine was rated 4.7. "No show" rates were compared between main hospital clinic and Telemedicine clinic with little improvement. Telemedicine reduced travel time by 77.7%. Conclusion: Telemedicine is an effective way to provide interdisciplinary follow-up care to complex technology-dependent children while minimizing the risk and financial burden of traveling to a regional hospital.

Sponsored Research - None

1732270

THE EFFECTS OF POSITIONING AN IN-LINE INTRAPULMONARY PERCUSSIVE VENTILATION CIRCUIT ON MEASURED MEAN AIRWAY PRESSURE DURING MECHANICAL VENTILATION.

Nancy Johnson, Kathleen Deakins; Peds Respiratory, UHHS RBC Case, Cleveland, OH

Introduction: Intrapulmonary Percussive Ventilation (IPV) (Percussionaire, Sandpoint ID) is utilized for airway clearance or hyperinflation for atelectasis on intubated mechanically ventilated patients. At Rainbow Babies & Children's, IPV is delivered in-line as opposed to stand-alone therapy when substantial ventilator support is required. The purpose of this study was to determine if delivered mean airway pressure was effected by the location of the IPV manifold placed within the ventilator circuit. Methods: An Airlife pediatric circuit with active humidification (Carefusion, Yorba Linda CA) was attached to a Draeger XL ventilator (Draeger Medical, Telford, PA) and a BC Biomedical Infant Smart Lung (BC Biomed, St. Louis MO) set with compliance at 5 ml/mbar and a resistance 5 L/sec. The ventilator was set at PCV +, PIP 30 cm H20, PEEP +10 cm H20, frequency 30/min, pressure support 5 cm H20, FIO2 30% in a pediatric mode. An IPV breathing manifold was placed in three different positions on a ventilator circuit connected by a T adaptor: 1) on the inspiratory limb 2) at the inlet (dry) side of the humidifier, and 3) at the outlet (wet) side of the humidifier. IPV was cycled for a period of one minute at the following settings; driving pressure 30 cm H20, pressure 20 cm H20, and frequency 220 breaths/min. Mean airway pressure was recorded with IPV in line with the ventilator circuit once per minute for a period of 10 minutes each at all three positions. Differences in mean values for mean airway pressures were compared with the IPV circuit in-line in three positions Results: One way ANOVA tests followed by a Post Hoc Analysis was conducted to compare mean pressures at each position of the IPV circuit with a statistical significance set at p=<0.05. There was no statistically significant difference in mean values for mean airway pressures delivered when placing the IPV manifold on the inlet side of the humidifier versus the inspiratory limb or the outlet side of the humidifier. Mean pressures and standard deviations are displayed in the table below. Conclusion For mechanically ventilated patients that require IPV therapy in-line with the ventilator, there is no preferred position for placing the IPV manifold within the ventilator circuit.

Sponsored Research - None

Mean Pressure & StDev

	1 Inspiratory Limb	2 Outlet of humidifier	3 Inlet of humidifier
Mean Pressure	19.5	19.1	21
StDev	(0.850)	(0.738)	(0.471)

1731791

THE EFFECTS OF IN-LINE INTRAPULMONARY PERCUSSIVE VENTILATION ON DELIVERED INHALED NITRIC OXIDE DURING MECHANICAL VENTILATION.

Nancy Johnson, Kathleen Deakins; Peds Respiratory, UHHS RBC Case, Cleveland, OH

Introduction: Intrapulmonary Percussive Ventilation (IPV) (Percussionaire, Sandpoint ID) is utilized for airway clearance or hyperinflation for atelectasis on intubated mechanically ventilated patients. IPV is delivered in-line with the ventilator when inhaled Nitric Oxide (iNO) is required. A significant reduction in delivered NO was previously demonstrated when IPV was introduced into the inspiratory limb (10% of the desired*). The purpose of this study was to determine if delivered iNO concentration is achieved if IPV circuit is positioned in line with the ventilator prior to the injector module attached to the iNO Max DS ir. Methods: An Airlife pediatric ventilator circuit (Carefusion, Yorba Linda CA) was connected to a Draeger XL ventilator (Draeger Medical, Telford, PA) and a BC Biomedical Infant Smart Lung (BC Biomed, St. Louis MO) with compliance at 5 ml/mbar and a resistance 5 L/sec. A pediatric mode, PCV +, PIP 30 cm H20, PEEP +10 cm H20, frequency 30/min, pressure support 5, FIO2 30% was selected for the evaluation. An IPV breathing circuit was connected to the inlet side of the ventilator humidifier with a T adapter. The iNO max DS ir (Ikaria: Hampton NJ) flow injector was placed in-line proximal to the IPV tee and set at NO levels: 10, 20 and 40 ppm. As iNO levels stabilized, delivered values were recorded from the sample line on the inspiratory limb five inches from the patient wye. IPV was placed in line and cycled at the following settings; pressure 20 cm H20, frequency 220/bpm, for a period of one minute. Delivered iNO measurement was repeated after introducing IPV. The differences in measured iNO values were compared set iNO with IPV running in line with the ventilator Results: The table displays mean values and standard deviations for measurements of three iNO levels during IPV. Therapy. The coefficient of variation (standard deviation/mean) was < 0.25 for all three levels of measured iNO. There was no clinically important difference in desired iNO concentrations and when delivering with IPV in line with the ventilator if the iPV manifold was placed prior to the injector module. Conclusion: For mechanically ventilated patients that require iNO and IPV, there is no significant reduction in delivered iNO when the IPV manifold is introduced prior to the injection module. *Johnson N, Deakins K, Myers T. Evaluation of the effects of in-line IPV on delivered nitrix oxide during mechanical ventilation Resp Care 2012;57;10:1781

Sponsored Research - None

Measured Mean NO & Standard Deviation

10 ppm	20 ppm	40 ppm
9.25 (0.99)	19.4 (.489)	40.3 (.643)

174304

THE EFFECTS OF CIRCUIT SELECTION ON FLOW AND TIDAL VOLUME USING THE RAM CANNULA AND THE TRILOGY VENTILATOR.

Nancy Johnson, Kathleen Deakins; Peds Respiratory, UHHS RBC Case, Cleveland, OH

Background & Introduction: The RAM Nasal Cannula has been utilized in the neonatal patients to provide Non—invasive Ventilation to neonates with post-extubation respiratory distress and/or apnea. Because this interface is and well tolerated, it has been proposed as a non-invasive interface for large infants requiring home going NIV support. The purpose of this study was to determine if a passive or active PAP circuit provides equally sufficient flow needed to deliver tidal volume using a Trilogy ventilator. Methods: Premie, Newborn and Infant size RAM Nasal cannulas (Neotech Products, Valencia CA) were attached to a Philips Respironics Disposable Peds Heated wire Circuit connected to a Trilogy ventilator: (Philips, Murrysville PA) in an, Active, Positive Airway Pressure (PAP) setting. The cannulas were attached to a mannequin with pressure tubing connected to each cannula and an Ingmar Neonatal Demonstration Lung Model (Ingmar Medical, Pittsburgh, PA) with a set compliance of 2 mL/cmH20. Pressure Control, IPAP 22, EPAP 4, frequency 30/min, inspiratory time 0.8 (sec), FiO2 21% were settings used for the evaluation. Following 2 minutes of continuous ventilation, flow measurements were recorded from the ventilator with no leak and with a 30% induced leak. The evaluation was repeated using a passive circuit (and mode) at the same settings. All tests were repeated 10 times. Results: Measured flow rates and tidal volumes were compared using a paired t-tests with a significance level set at p<.0001. There was a statistically significant difference in flow rates and tidal volumes generated by the active PAP versus passive circuits with and without an induced leak. There was a 36% reduction in flow delivered when using the passive circuit with the Trilogy ventilator. The flow rate generated in the passive circuit did not meet the manufacturer's recommendations of 12-18 lpm. Mean values and standard deviations for flow rates with and without induced leak are listed in the table below. Conclusion: The Active PAP mode and circuit maintains the recommended flow rate for tidal volume delivery with and without leak for use with the RAM cannula while the Passive circuit did not. The Passive circuit on the Trilogy ventilator is not recommended for use with the RAM nasal cannula.

Sponsored Research - None

Active PAP versus Passive Circuits

Active PAP No leak Flow (lpm)	13.99 (0.405)	Passive No leak Flow (lpm)	8.817 (0.294)
Active PAP 30% leak Flow (lpm)	14.33 (0.689)	Passive 30% leak Flow (lpm)	5.24 (0.291)
Active PAP No leak Tidal Volume (ml)	31.67 (1.67)	Passive No leak Tidal Volume (ml)	24.87 (1.25)
Active PAP 30% leak Tidal Volume (ml)	94.67 (2.87)	Passive 30% leak Tidal Volume (ml)	8.03 (1.3)

1732295

IMPACT OF SUDDEN CHANGES IN OXYGENATION ON THE MEASUREMENT OF NON-INVASIVE HEMOGLOBIN (SPHGB).

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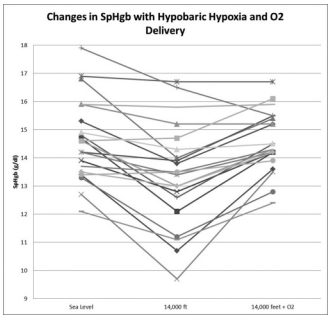
Background: Hypoxemia secondary to reduced barometric pressure is a complication of ascent to altitude. Current medical operations in support of warfighters often require ascent to 14,000 feet or more in unpressurized aircraft during evacuation of casualties. We evaluated the impact of hypobaric hypoxemia at 14,000 feet and reversal of hypoxia by oxygen administration on the non-invasive measurement of hemoglobin (SpHgb). (Masimo Radical 7, Masimo, Irvine, CA). Method: Following informed consent, 20 healthy volunteers were, seated in an altitude chamber, and exposed to a simulated altitude of 14,000 feet (PB 428 mmHg). Subjects breathed room air for 10 minutes to induce hypoxemia (SpO2 goal of 82-84%). After establishment of hypoxia, oxygen was administered via nasal cannula to return SpO2 to sea level values. Measurements of oxygen saturation (SpO2) end-tidal carbon dioxide (EtCO2), respiratory rate (RR) heart rate (HR) (CapnoStream 20, Oridion) SpHgb, and tissue oxygenation (StO2) were continuously recorded (Inspectra STO2, Hutchinson Technology, MN). SpHgb at sea level vs. SpHgb at 14,000 feet and SpHgb at 14,000 feet with and without oxygen were compared using a paired T-test. Study was approved by the University of Cincinnati and Wright Patterson Air Force IRB's. Results: At sea level with normoxia (SpO2 = 97±1.7%) the mean SpHgb was 14.6±1.4 g/dl, at 14,000 feet (SpO2 = 83±1.1%) mean SpHgb was 13.4±1.8 g/dl, at 14,000 feet with reversal of hypoxemia (SpO2 = 97±2.1%) mean SpHgb was 14.6 ±1.1 g/dl. Figure 1 demonstrates changes for each individual subject. SpHgb and SpO2 changes were statistically significant ($p<0.001$) during the change from normoxia to hypoxia and on return to normoxia. Conclusion: Sudden changes in SpO2 resulting from hypobaric hypoxia result in a sudden artifactual fall in SpHgb. Reversal of hypoxia results in an increase in SpHgb. These are important findings as sudden hypoxia may appear to be associated with blood loss during monitoring. Changes in SpHgb following large changes in SpO2 should be verified with standard hemoglobin monitoring using a blood sample.

Sponsored Research - None



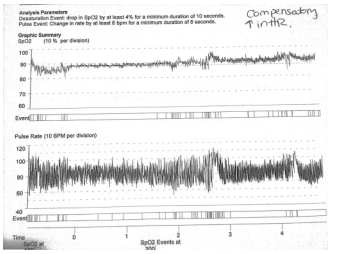
1732324

TREND SETTERS: OPTIMIZING NONINVASIVE VENTILATION IN PATIENTS WITH ALS.

Rocio Carrizales[1], Leo Wittnebel[2], Leslie Gonzalez[3], Emma Silva[3], Isaac Maldonado[3]; [1]Respiratory Care, The University of Texas Health Science Center at San Antonio, San Antonio, TX; [2]Respiratory Care, The University of Texas Health Science Center, San Antonio, TX; [3]The Medical Arts and Research Center, The University of Texas Health Science Center, San Antonio, TX

Background: Patients with Amyotrophic Lateral Sclerosis (ALS) suffer from a progressive neuromuscular disease ultimately leading to mortality associated with worsening respiratory failure. These patients are evaluated for the need for ventilatory support in the form of respiratory mechanics as forced vital capacity and maximum inspiratory pressure, as well as spirometry. Based on results, NIV is implemented in the home setting. Factors such as poor reimbursement, inequitable access to resources, and patient geographic location make follow-up and assessment of the efficacy of NIV difficult. Nocturnal trending pulse oximetry efficiently allows the clinician to implement NIV or assess the need for changes in settings to optimize NIV. Method: Nocturnal trending pulse oximeters were provided to patients as per physician order. Patients received device instruction from respiratory care students and were given a postage box to return the device and results in a timely manner. All results obtained were forwarded to the treating physician. Results: In total we provided nocturnal oximetry to 13 patients, all of whom showed a need for NIV or changes in their current settings. In the average sleep time of 1-11 hours (87 total hours of sleep) for all 13 patients there were 1-54 episodes of desaturation less than normal (90%) for more than 10 seconds with 213 desaturation total events throughout 1 night. This indicated that patients were in either need for NIV or in need of parameter changes due to their disease progression. Conclusions: Factors including funding and equipment acquisition, varying numbers of patients, and logistical issues such as device return delayed the provision of service to subsequent patients. Despite barriers, we identified an average of 16.3 desaturation episodes per patient with 213 total desaturations, which qualified patients for NIV or changes in settings. In the future, we strive for our study to inform a pilot project for a larger study seeking to make nocturnal oximetry standard of care to frequently monitor the disease progression of each patient.

Sponsored Research - The University of Texas Health Science Center for Medical Humanities and Ethics



1732511

CONTINUOUS PULSE OXIMETRY MONITORING WITH CLINICIAN NOTIFICATION IS ASSOCIATED WITH LOWER PATIENT MORTALITY IN POST-SURGICAL/MEDICAL PATIENTS.

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Background: Continuous pulse oximetry monitoring with clinician notification of clinically relevant events has been recommended by patient safety organizations to prevent adverse events and unrecognized deterioration in hospitalized patients but the contribution of continuous monitoring to patient outcomes requires validation. We sought to evaluate the effect of a continuous pulse oximetry patient surveillance system in a post-surgical/medical unit by comparing patient outcomes before and after implementation. Methods: After implementation, each patient in a 33 bed post-surgical/medical unit was continuously monitored with the Masimo SafetyNet System, version V4000, software 1405, which was comprised of pulse oximeters with radio transmitters (Rad-87 Pulse CO-Oximeter and ReSposable sensor, Masimo Corp, Irvine CA) for wireless notification of nurses via pagers connected to a central station for admissions, discharges and remote surveillance of all monitored beds. Prior to implementation, patient monitoring was conducted by nurse surveillance and intermittent manual recording (spot checking) of vital signs by protocol and physician order. Number of rapid response team activations, unplanned transfers to critical care and mortality during the 15 months before implementation was compared to 12 months following implementation, by testing for statistical significance with a t-test for 2 proportions and chi square analysis. Results: Data were collected from 10856 patient days prior to and 8737 days following SafetyNet implementation. Comparisons of outcome measures pre and post implementation are shown in Table. Conclusions: Preliminary data showed that continuous surveillance monitoring with clinician notification was associated with reduced mortality in post-surgical patients. The increase experienced in rapid response team activations was not statistically significant and the ICU transfers rate remained unchanged. A previous study1 found that continuous surveillance monitoring detects unrecognized postoperative deterioration and prompts clinical interventions, improving patient safety. Our results expand these findings showing implementation of continuous pulse oximetry monitoring with clinician notification improved patient outcomes by reducing mortality in post-surgical/medical patients. 1.Taenzer et al. Anesthesiology 2010;112:282-287.

Sponsored Research - None

Events per 1,000 patient days	Before Implementation	After Implementation	p value
Rapid Response Team Activations	7.6	10.1	0.075
ICU Transfers	1.0	1.0	0.985
Mortality	0.7	0.1	0.049

1732818

PERFORMANCE COMPARISON OF OXYGEN DELIVERY DEVICES IN PATIENTS WITH VARYING INSPIRATORY DEMANDS.

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BACKGROUND Limited research on delivered F_IO_2 for oxygen delivery devices makes choosing the most effective device for our patients difficult. This is particularly true when caring for patients in high levels of respiratory distress. Hypothesis: When a patient's level of distress increases, the actual F_IO_2 differs from the following published estimates: 0.28 - 0.36 on 2 - 4 LPM via nasal cannula, 0.40 - 0.60 on 6 - 10 LPM via simple mask, 0.60 - 0.80+ on 12 - 15 LPM via nonrebreather mask, 0.80 - 1.0 on 30 - 50 LPM via high flow nasal cannula and 0.24 - 0.90 on 1 - 15 LPM via OxyMask™.[1] METHODS A *2010 Hans Rudolph, Inc. Series 1101 Breathing Simulator* was attached to a mannequin using large bore tubing and one way valves in order to simulate inhalation and exhalation. A new sensor was placed in a *Hudson RCI galvanic fuel cell oxygen analyzer*, calibrated to room air and 100% oxygen, and used to measure F_IO_2 in the trachea. The oxygen delivery devices were connected via small bore tubing to an H/K tank using a Thorpe tube to measure oxygen flow. The baseline values were as follows: R_{AW} 3 $cmH_2O/L/sec$, C_{ST} 60 mL/cmH_2O, respiratory rate 20 br/min, percent inhale 20%, load effort SHORTIE, and effort slope of 20. The manipulated variables were oxygen flow rate and level of distress. The oxygen flow rates tested were between 2 and 50 LPM. The level of distress was represented by PIFR (peak inspiratory flow rate) which was established by increasing amplitude to result in PIFR of 40, 70 and 90 LPM. With each oxygen flow rate and level of distress, a measurement was taken after the F_IO_2 had stabilized for 60 seconds. RESULTS At a PIFR of 40 LPM, all devices performed at or above F_IO_2 expectations with the exception of the OxyMask™. At a PIFR of 40 LPM and oxygen flow rates of 10 LPM or greater, the OxyMask™ performed below the published F_IO_2. Actual F_IO_2 delivery for all devices was lower than published estimates when the PIFR was 90 LPM. CONCLUSIONS We found that actual F_IO_2 delivery for all tested devices was lower than published estimates when the level of distress increased.

Sponsored Research - None

Device	Patient Inspiratory Flow Rate	2 LPM	4 LPM	6 LPM	10 LPM	12 LPM	15 LPM	30 LPM	50 LPM
Nasal Cannula	40 LPM	0.36	0.47						
	70 LPM	0.26	0.32						
	90 LPM	0.24	0.28						
Simple Mask	40 LPM			0.60	0.74				
	70 LPM			0.36	0.51				
	90 LPM			0.30	0.34				
Nonrebreather Mask	40 LPM					0.86	0.91		
	70 LPM					0.56	0.58		
	90 LPM					0.48	0.51		
High Flow Nasal Cannula	40 LPM							0.85	0.85
	70 LPM							0.80	0.85
	90 LPM							0.76	0.84
OxyMaskTM	40 LPM	0.30	0.37	0.42	0.48	0.53	0.56	0.58	0.60
	70 LPM	0.25	0.29	0.31	0.37	0.40	0.44	0.53	0.58
	90 LPM	0.24	0.27	0.29	0.32	0.35	0.38	0.50	0.53

1733062

TRACHEAL INTRACUFF MONITORING: BALANCE BETWEEN LEAK AND OVERINFLATION.

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Background: The cuff of an artificial airway is designed to provide a seal within the trachea. A cuff pressure (CP) greater than 20 cm H2O has been recommended to prevent leakage of air or fluid around the ETT since microaspiration around the cuff can lead to VAP, among other complications. Several studies have reported that nearly 50% of the intratracheal cuffs are overinflated (> 25 to 30 cm H2O). Both issues carry significant risks and have been associated with increase morbidity. Therefore, CP should be routinely monitored and adjusted. An inflator/manometer, while recommended, is rarely used or available for the routine once-a-shift measurement. Instead, the minimal leak technique (MLT) or going by the "feel" of distension provided by the pilot balloon have become the most popular techniques. The two goals of this study were: 1. to measure CP values in patients admitted to ICUs where manometric measurement and adjustment of cuff pressure is not routinely performed, and 2: to determine whether or not manometric measurement can be substituted with MLT. Methods: Prospective observational study at a university-affiliated, 496-bed hospital, in San Antonio, Texas. A cufflator (Posey, Arcadia, CA) was used to measure the CP from patients with cuffed ETT (n=13) or tracheostomy tubes (TT; n=5). Mean CP was calculated between groups and compared to the recommended range (20-30 cmH2O). Results: The mean CP was 26.19 cm H2O (SD +/-12.04). There was no significant difference between CP obtained from patients with an ETT (26.92 +/- 13.63) or TT (24.00 +/- 5.89; p=0.69). The rate of under inflation (Sponsored Res

1728573

VENTILATOR ALARMS: THE SOUND OF SILENCE AROUND THE CLOCK.

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Background: RTs in the ICU may easily be captivated by the symphony of repetitive alarms resonating upon entering the unit. With no current AARC CPG for setting ventilator alarms, their management must rely solely upon the judgment of the RT on a 24/7 basis. Ventilator "checks", performed routinely 8 to 12 times a day, provide ample opportunity for RTs to adjust alarms and improve patient safety. Unfortunately, these alarm settings are often widened to prevent "false" alarms or simply to prevent alarm fatigue, culminating with inevitable silence. The focus of this study was to provide evidence of how these parameters are in agreement with typical recommendations (10-15% from baseline, 10 cmH2O above PIP) and whether or not there was a difference between day and night shift behaviors. Methods: Retrospective review of EMR of 10 mechanically ventilated patients admitted to two ICUs at a university-affiliated, 496-bed hospital, in San Antonio, Texas during May of 2013. A total of 66 "vent" checks over several days including both day (n=34) and night shifts (n=32) were recorded. The alarm settings selected for analysis were high respiratory rate (HI RR), high peak inspiratory pressure (HI PIP), and high and low minute volume (HI MV, LO MV), as they represent the most frequently documented alarms. Results: The selected alarm settings ranged from 120% to 260% from patient's baseline parameters (Mean 171%; SD 50.68%). There was not a significant difference between how day and night shift RTs set all alarm parameters (p= 0.67). Conclusion: Our study revealed that alarm settings are consistently mismanaged on both day and night shifts. The lack of significant variation between shifts and therapists clearly indicate lack of adjustment to individual patient parameters. If these alarm parameters are being set purposefully in order to avoid false alarms and/or fatigue, an issue of beneficience that requires further research and serious attention. Such widening of the alarms settings as observed in our study deems every alarm as nonfunctional since they will remain dangerously silent around the clock.

Sponsored Research - None

% Alarm Setting Deviation from Patient's Ventilator Parameter				
	Hi RR	Hi PIP	Hi MV	Lo MV
DAY SHIFT	140%	155%	132%	255%
NIGHT SHIFT	145%	120%	138%	260%
p value	0.74	0.21	0.82	0.90

1727004

ARE WE CONSISTENTLY DOING SOMETHING WRONG WHEN SETTING VENTILATOR ALARMS? A COMPARISON BETWEEN PRACTICES IN TWO COUNTRIES.

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Background: Intensive care units usually stand out from other areas of a hospital due to the endless beeping echoing from room to room. Some studies have shown that clinicians are slowly trending towards broader alarm parameters in order to avoid false alarms and/or alarm fatigue. We have previously reported that in a group of patients admitted to ICU in Saudi Arabia the ventilator alarms were set far from patient parameters. The goals of this study were to provide evidence of the degree of discrepancy between ventilator alarm settings and patient parameters and to determine whether or not this practice differs in two different countries. Methods: Retrospective review of EMR of 10 mechanically ventilated patients admitted to two ICUs at a university-affiliated, 496-bed hospital, in San Antonio, Texas during May of 2013. A total of 66 "vent" checks over several days including both day (n=34) and night shifts (n=32) were recorded. The alarm settings selected for analysis were high respiratory rate (HI RR), high peak inspiratory pressure (HI PIP), and high and low minute volume (HI MV, LO MV), as they represent the most frequently documented alarms. This data was compared with information previously collected and analyzed of 35 patients admitted to medical-surgical ICUs at the National Guard Health Affairs in Riyadh, Saudi Arabia. Results: The mean deviation of the analyzed ventilator alarm settings from patient parameters in the ICUs of both countries was 105.5%. The alarm parameter that appeared to be more distantly set from patient data was the HI MV (140.5%), followed by the HI RR (114%), HI PIP (105%), and LO MV (62%). Although there was not an overall difference in how the alarms were set in both countries (p= 0.09), there was a significant difference between HI RR (p= 0.0009) and HI PIP (p= 0.008). Except for the HI MV, all the alarm settings were set more distant from patient data in the US. Conclusion: Our data shows that ventilator alarm settings are often set very far from patient parameters. Despite the geographical and cultural differences, it appears that the practice of setting the ventilator alarms is consistently followed. However, it is not to guarantee awareness of patient's changes in status but clearly to avoid false alarms and/or fatigue. This practice needs to be seriously evaluated.

Sponsored Research - None

	HI RR	HI PIP	HI MV	LO MV
US	142%	138%	135%	67%
Saudi Arabia	86%	72%	146%	57%
	% ALARM SETTING DEVIATION FROM PATIENT DATA			

1733590

A SURVEY OF PUBLIC PERCEPTION ON PULSE OXIMETER APPLICATIONS DESIGNED FOR IPHONE/IPADS.

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Background: The use of smart phones and tablets are becoming more prevalent in modern society. Applications for the iPhone and iPad, such as the Tinke (Zensorium, Synapse, Singapore) and the Masimo iSpO2 (Masimo Corp., Irvine, CA), now offer pulse oximetry readings with the use of pulse oximeter probe hardware. However, we wondered if the public would trust medical information coming from a nonmedical device and if they would have any security concerns with medical information stored on mobile devices. Methods: We surveyed 54 individuals after they used the iSpO2, Tinke, and the Masimo Radical 7. Subjects provided their age, gender, level of education, healthcare provider experience, credentials, smart phone and application usage. Participants were then asked which mobile device they preferred, if they would trust the accuracy of medical information from a mobile device, and if they would trust the security of a mobile device with their medical information. Data was analyzed with R statistical software using generalized linear regression. Generalized linear regression was used to evaluate the effect of collected demographic variables (medical experience, age, gender and smart phone ownership) upon a participant's likelihood of trusting the apps' accuracy and security. Results: 48 out of 54 (88.89%) subjects stated that they preferred the iSpO2 and 2 stated that they liked both devices. All individuals with medical provider experience preferred the iSpO2. Smart phone users accounted for 59% (32/54) of those polled and 81% (26/32) those subjects download and use apps, 31% (10/32) download and use medical apps. Overall, 74% trusted the accuracy of pulse oximetry using a mobile device, and 76% trusted the security of their pulse oximetry data on the mobile device. Smart phone users were significantly more likely (P<0.05) to trust the accuracy of the app. No other demographic variables were significant predictors of trust in accuracy and none were significant predictors of trust in security. Conclusion: We found a significant preference for the iSpO2 over the Tinke and the majority of those polled trust the accuracy and security of this data. People generally trust the phone program independent of the possible predictive variables that we studied. These findings suggest that a broad set of patients may be willing to use these smartphone apps for testing and storing data.

Sponsored Research - None

1733824

AN INTERPROFESSIONAL SIMULATION ACTIVITY TO PROVIDE EARLY MOBILIZATION OF THE VENTILATED PATIENT IN AN ICU SETTING.

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Background: Inactivity can have long term consequences in mechanically ventilated patients. This observation has increased interest in providing early mobility for these patients. Given that medical errors have been attributed to poor/ineffective healthcare team communication and the moving a critically ill patient requires a skilled team effort, it seems logical to provide health professionals involved in this process opportunity to participate in such a simulated activity in their preclinical education. The Institute of Medicine has proposed a set of five core competencies, that health professionals should possess, one of which is to work in interdisciplinary teams that collaborate, communicate, and integrate care that is continuous and reliable. To meet that competency we developed a combined lab with respiratory care and occupational therapy students to provide mobilization for a ventilated patient (Laerdal SimMan) in an ICU setting as an interdisciplinary team. Method: Teams of students coordinate sitting the patient on the edge of the bed after discussing how to best accomplish the objective. Upon initiating movement the patient coughs and the ventilator alarms. Moving the patient to the edge of the bed, the circuit becomes disconnected and the ventilator alarms. In both cases students must respond appropriately. After the scenario students will debrief and discuss how to improve the process and how to anticipate and identify possible problems. Students are surveyed before and after the exercise to determine knowledge of and comfort level with performing the activity. The laboratory exercise is setup with four identical stations, equipped with SimMan being mechanically ventilated. The lab accommodates 52 OT students and lasts 20 minutes with a 10 minute debriefing session. One respiratory student is assigned to each ventilator station. To measure students' perception of interprofessional learning activities they were asked to complete the Readiness for Interprofessional Learning Scale Questionnaire several weeks before and then again immediately after completing the exercise. Results: The exercise demonstrates the benefit of interdisciplinary training to provide complex, potentially hazardous care in a safe and effective manner. Conclusion: Collaboration amongst health professions educators in the development of these types of interdisciplinary activities fosters an environment for the appropriate exchange of information and coordination of care.

Sponsored Research - None

1732062

CLINICAL PRECEPTOR TRAINING PROGRAM TO MEASURE AND EVALUATE INTER-RATER RELIABILITY.

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Background: CoARC standard 3.11 is problematic for many of our colleagues. Just as daunting for our profession is the challenge of advancing the entry-level requirement. This project aimed at tackling both issues through collaboration and sharing of resources. We previously presented a tool to evaluate preceptor agreement using a modified DataArc competency rubric, video-taped pre-clinical performances and the intra-class correlation coefficient (ICC). The realization that developing a video-library would be a colossal task for any one program had us explore partnering with other programs in our area to develop a "gold standard" library of performance on common clinical competencies. This library could be used for clinical preceptor training and determining agreement amongst preceptors in a program, as well as ultimately within the profession. Collaboration in this project by associate and baccalaureate degree programs models how we can share resources and advance our entry-level requirement. Method: We organized a workshop with regional educational programs to present a discussion of IRR, the use of ICC to measure consensus, and identify common barriers to consensus. Three video-taped competencies were reviewed and evaluated using a modified competency rubric. Results: The most common reason for lack of consensus was in the understanding of the rubric, followed by inability to evaluate an item because the item was missing from the video performance. The ICC was computed for each of the nine categories of the rubric. In the first workshop there was consensus on overall performance (ICC 0.786); however, there was poor consensus on three of the categories (equipment, implementation, and knowledge; ICC < 0.508). The group refined the rubric and agreed to develop scripted videos that would demonstrate varying competency based upon the new rubric. Videos will be recorded for patient assessment, manual ventilation, oxygen therapy, incentive spirometry, suctioning, and assessment of ventilator graphics. The group will reconvene in August to evaluate the library and measure ICC. The library and rubric will then be shared among educational programs for the purpose of documenting training and evaluation of clinical preceptors. Conclusion: With this library we hope to reduce the burden of assessing IRR, promote collaboration among associate, baccalaureate, and graduate degree programs, and advance the goal of teaching the competencies needed for 2015.

Sponsored Research - None

1732106

"I CAN DO IT!" – IMPROVING STAFF CONFIDENCE THROUGH SIMULATED LEARNING.

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Introduction: Respiratory Care Services (RCS) at this facility recertifies in Basic Life Support (BLS) biannually. Rather than using a traditional classroom with mannequins, we utilized the simulation learning center located on campus. After a brief scenario overview, staff members were placed into a simulated environment where their clinical responses were monitored and recorded. At the conclusion of the scenario, staff participated in a debriefing session which included reviewing the recorded session and discussing their performance. **Hypothesis:** Personal confidence to perform clinical skills improves when competence is validated in a simulated learning environment. **Methods:** To evaluate the transition to the simulation learning center, a survey was conducted which contained 9 questions (3-demographic, 4-Likert Scale, 2-Yes/No). The survey was available to RCS staff after their simulation session was completed. Prior to validation, staff was asked to review material available online. The material included summarized steps for infant, pediatric and adult BLS, 2010 BLS Guidelines, and Automated External Defibrillator. **Results:** 178 RCS staff completed the survey. Age of respondents was evenly distributed (range 21–59 years) and 126 (71%) were female. Work experience ranged from new graduates to seasoned therapists with 53 (30%) having greater than 20 years of experience. Most respondents (n=152 [85%]) utilized the review materials and indicated they prepared them for the simulation experience. Respondents agreed that learning in the simulation learning center significantly increased confidence in their ability to perform BLS correctly (n=171 [96%]), and they also preferred simulation training over traditional methods (n=168 [94%]). Respondents indicated their learning increased when they were able to watch their performance and have it compared to the recommended guidelines (n=175 [98%]). Respondents agreed that debriefing with recorded video was a powerful learning tool (n=176 [99%]). **Conclusion:** Learning through simulation provides a more realistic teaching environment, which enhances critical thinking and ultimately improves learning. Debriefing places the learner in the role of instructor, allowing them to view their performance from a critical perspective. Further, it provides the ability to compare their performance with the recommended guidelines for a given procedure. We found that most staff responded positively to this method of learning.

Sponsored Research - None

1732285

USE OF HUMAN PATIENT SIMULATION TO IMPROVE CRITICAL THINKING AND PERFORMANCE ON THE CSE.

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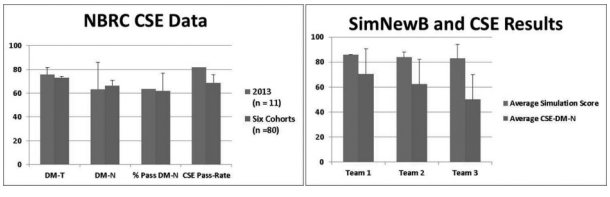
Background: We previously suggested that the use of SimNewB to provide hands-on experience with simulated, high-acuity neonates would improve critical thinking skills and decision-making with respiratory care students. The average performance of our graduates' decision-making ability on passing attempts of the NBRC clinical simulation exam (CSE), which includes one neonatal patient, has been 72.9 +/- 1.3 (N = 80; 6 cohorts). In evaluating our students passing attempts on the CSE since 2007, 61.9% +/- 14.7 (N = 80; 6 cohorts) passed the decision-making portion for neonatal patients. We hypothesized that providing clinical simulation with SimNewB would improve this performance. Method: In the past year we implemented the use of neonatal scenarios with our students after their neonatal didactic course and before their NICU clinical rotations. Using Laerdal's SimNewB, integrated with the Ingmar ASL 5000, we developed scenarios allowing students to assess and make clinical decisions based on each scenario. All students are provided the same simulation experience. Students were placed in teams, with 4 students per team and performance was evaluated. Students were provided feedback during debriefing sessions. The students participated in 3 different simulations before attempting the CSE. Our students provide us with the results of their CSE passing attempt when completed. From this data we were able to compare performance on the CSE, to performance in simulated scenarios. Results: The average performance for teams on decision making for these scenarios was 76%. Performance on decision making improved with each subsequent simulation. Pass rates on the decision making section of the CSE neonatal patient was 60.6% compared to a historic pass rate for our students of 61.9%. Conclusion: Our students (n = 80; 6 cohorts) have averaged a 72.9 +/-1.3 on the decision making section of the passing attempt of the CSE, with an average of 66.4 +/- 4.3 on neonatal cases. Implementing SimNewB scenarios, as part of the clinical curriculum, did not demonstrate an increase in performance on the neonatal decision making of the CSE; 66.4% vs. 63.3% +/- 23.2 (p = 0.76). However, we were able to observe a positive correlation between the average team performance on these simulations and the average of the team members performance on the decision making section of the CSE neonatal case (r = 0.86) with the use of SimNewB having predictive value in performance on the CSE.

Sponsored Research - None



1732453

INTRODUCTION OF COMPUTERIZED TOMOGRAPHY TO RESPIRATORY THERAPY STUDENTS IN A BASIC PATIENT ASSESSMENT COURSE: A CASE STUDY.

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RATIONALE: Registered Respiratory Therapists (RRTs) work in a technology rich environment. Utilizing data from all sources is important when determining best practice. Traditional instruction has mainly included chest x-ray (CXR) interpretation. Computerized tomography (CT) presents a multi-dimensional view of the patient allowing better determination of best practice in clinical situations METHOD: CT interpretation was introduced during the first semester in a basic patient assessment curriculum. Following the introduction to radiology and CXRs, CT interpretation discussed via power point detailing orientation of image, anatomical alignment, and other physiological features. Instruction continued during lab where multiple scans were introduced for the purpose of strengthening core concepts introduced via power point. Apps obtained via Apple App Store (Radiology 2.0 and Radiopedia) introduced and encouraged further self-study. Student teams reviewed digital films and presented to their peers. RESULTS: Class interest in CT films was very high and enthusiastic. Many students sought additional information via the web and offered additional sites that can be utilized to enhance learning in the future. Most students defined the orientation of the scan and correctly identified left, right, up, and down which are key concepts in interpreting CT scans. Most students could identify the different opacities and distinguished air from fluid. A general understanding was identified. CONCLUSION: The first semester is a difficult time to learn the information presented. Most RT students do not have a basic knowledge of disease processes at this time. Anatomy and physiology is a prerequisite and is assumed that students have knowledge thereof. The team approach worked well. Students actively discussed films to present the best possible therapy and diagnosis. Lack of knowledge concerning the characteristics of disease processes also inhibits the learning process. Some students were focused on the diagnostic view versus the physiological view. Based on these factors, adaptations to the CT module have taken place to enhance learning potential.

Sponsored Research - None

1733008

EVALUATION OF INTERPROFESSIONAL LEARNING THROUGH A VENTILATOR BUNDLE PATIENT CASE SIMULATION.

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Background: To describe the impact of an interprofessional educational program on pharmacy, medical, nursing, and respiratory therapy students' perceptions towards interprofessional learning before and after completion of a simulation exercise. Methods: Respiratory therapy (n=9), medical (n=6), nursing (n=19), and pharmacy (n=9) students completed 6 online modules related to implementing a ventilator bundle. Students then participated in a patient case simulation, using a high fidelity simulator, where they formed 9 groups of 5 to 6 students. Pre-test to assess baseline knowledge and post-test to assess learning following completion of online modules were administered. Students completed a survey before and after participating in a patient case simulation. Survey questions examined students' perceived preparedness towards team-based competencies including roles, interprofessional communication, values for interprofessional practice, and teamwork. Questions used a visual analogue scale for students to rate their level of agreement to each statement, anchored by "not at all" and "most possible." Descriptive analyses were used to analyze demographic items, participation, and competencies. Paired-samples t-tests were used to compare pre- and post-test results for knowledge and perceptions. Results: Forty five students participated in the educational program. At baseline, combined discipline baseline scores demonstrated moderate agreement with each statement. Statistically significant differences were found for all team-based competencies from baseline to post-simulation ($p<0.05$). Students' felt significantly more prepared to evaluate interprofessional team performance (mean change ± SD; 27.578 ± 23.295). The average increase in pre- to post- test scores was 14%. Conclusion: In this pilot study, implementation of an interprofessional simulation appears to significantly change students' perceptions towards interdisciplinary learning.

Sponsored Research - None

1733423

CREDENTIALING SUCCESS IN RESPIRATORY THERAPY EDUCATION: REVISITING BOURDIEU'S CONCEPTS OF FIELD AND CAPITAL.

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Background: The field of Respiratory Therapy is expected to experience a workforce shortfall over the next decade. The numbers of both program applicants and graduates have declined in recent years, necessitating strategies to improve board exam pass rates for future graduates. As if in response to the pending employment crisis, CoARC has published Programmatic Outcomes Data detailing individual program statistics. A theoretical framework adapted from Pierre Bourdieu's Concepts of Field and Capital was proposed to explain a possible re-stratification of RT programs. It states, in part, that a modification of position-takings within the RT educational field may be a consequence of this publication and the resources (capital) of students, clinical sites, faculty, and financial advantage will accompany the newly established positions. Method: A descriptive study utilizing e-mail survey methodology was developed to gather baseline data from RT program directors in the areas of program characteristics and average board exam scores in 17 curricular content areas. A convenience sample of programs was solicited from the top and bottom thirds of all programs with published programmatic outcomes. Results: SPSS was utilized for statistical processes; frequency counts, percentages and means were used to describe the data. Comparison of survey responses (46% return) between the top and bottom thirds of the sample population indicated that not-for-profit programs were more frequently represented in the top third, whereas for-profit schools were equally represented in both sectors. When curriculum alignment indicators (see table) were described as a percentage difference between top and bottom performers, strengths and weaknesses were revealed. When grouped by domain, the indicators revealed curricular gaps directly related to CRT and RRT exam content. Conclusion: Optimal credentialing outcomes were more frequently associated with not-for-profit programs. Also, a new way to assess curriculum alignment against board exam summative reports may be a useful vehicle for early recognition of programmatic weaknesses. Results further indicated the need for follow-up studies to evaluate the long-term impact of programmatic outcomes reporting and how the results of this study may be utilized to focus program curricular remediation for improved outcomes.

Sponsored Research - None

1733346

IMPROVING INSERVICE ATTENDANCE AND STAFF SATISFACTION.

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BACKGROUND: One of our department objectives is to offer continued education opportunities for our staff. It was observed that attendance to "live" in-services had declined over the past year. Our goal was to increase staff attendance and satisfaction in our in-service program using on-line media. METHOD: A Web Based learning management system was selected and education modules were created including tools to validate competence. The online training program was made available to staff members. Therapists were trained on how to register for courses, completing post tests and filing out course evaluations on-line. Staff were given the choice of attending live in-service presentations, or viewing in-services online. Staff was informed of new on-line learning program via emails and department postings. Attendance records were obtained from five in-services offered prior to the implementation of web based learning program. Attendance records were obtained from five in-services after a year of web based learning program implementation was made available. A staff satisfaction survey with on-line based training was conducted. RESULTS: Attendance records before and after implementation of web based training revealed that one year prior to implementation that out of 98 possible staff attendance, the average attendance was 36.3 employees or 36.9% of total possible attendance. One year post implementation of web based training revealed an average of 49.8 employees out of 105 attended in-services, a 47.4% of total possible attendance. The variance between the two attendance records show a 28.6% increase in attendance. Forty recipients or 83% that responded to an employee survey prefer the online in-servicing model and 67.5% strongly agreed to the statement "Having in-services made available online provides me with more flexibility in viewing in-services", and the main reasons provided for not attending department live in-service is "flexibility/time/geographic location". CONCLUSIONS: Staff prefers the option of attending continued educational activities online for the flexibility and convenience is provides. We plan to follow through with online training to include preparation for competency validation activities. We will also gauge employee participation and attendance levels with on-line training in addition to consideration of introducing hospital wide mandatory training on line versus live attendance.

Sponsored Research - None

1733699

INTER-PROFESSIONAL MULTI-PATIENT CLINICAL SIMULATION BY HEALTH SCIENCES STUDENTS.

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Background: Inter-professional education is recommended as a standard in the training of students in healthcare professions. While previous studies have made advances towards discovering the effectiveness of inter-professional simulation, many aspects have not yet been explored. The development of an inter-professional approach to these simulations allows for the various disciplines to collaborate in treating the simulated patient. Purpose: The purpose of this study was to explore inter-professional education through the use of a multi-patient clinical simulation. The effect on teamwork, communication, and understanding roles was examined. Methods: This was a descriptive study using a mixed-method design. Over 400 health professions students from a variety of disciplines: Nursing, RT, Medical Dietetics, Physical Therapy, Pharmacy, Medicine and Nurse Practitioner programs completed a pre-simulation survey to examine attitudes and the understanding of the other professions' roles. The simulation was a 2-hour experience which involved inter-professional rounds and care of a mechanically ventilated high-fidelity simulator as well as a standardized patient. Pre- and post-simulation surveys were utilized and video-recorded debriefing sessions followed which yielded qualitative data. Results: Descriptive statistics and t-tests were performed as appropriate. Participation in the simulations reflected a positive change in attitude. All post survey items indicated a statistically significant ($p<0.05$) improvement. Additionally, participants noted increased confidence on the post simulation survey ($p<0.05$). Data collected from video analysis displayed increased collaborative care and more interactions after first rounds. Using inductive analysis, four themes were identified from the final simulation debrief sessions; understanding roles, seeing the big picture, increased trust, and opinions about simulation. Conclusions: Inter-professional education has demonstrated a strategy to better prepare students for the clinical setting. This study reinforces results from the literature that illustrate attitudes, teamwork and communication improved following clinical simulation. This study contributes evidence utilizing a broader scope of represented professions and unique multi-patient scenarios. Future research is needed to examine the long-term effects of clinical simulation and the translation of this educational method to professional teamwork and patient care.

Sponsored Research - None

1733819

HOW END OF LIFE VENTILATOR MANAGEMENT PROTOCOLS CAN ENHANCE THE OPPORTUNITY FOR POTENTIAL ORGAN DONATION.

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Background The National Organ Donation Breakthrough Collaborative (ODBC) was created by Health and Human Services Secretary Tommy Thompson in 2003 that focused on improving organ donations. This Gift of Life Donation Initiative challenged the University of Wisconsin Organ Procurement Organization (UW-OPO) to work on increasing organ donation rates. The UW-OPO partnered with an interdisciplinary team at the University of Wisconsin Hospital and Clinics(UWHC) to identify opportunities to improve the process of organ donation. The transition from actively treating the critically ill patient to supporting an organ donor can be a difficult time for many clinicians. The use of standardized protocols can provide clarity in communication and ease the transition for all involved. Protocols were developed to outline criteria for the ventilator management of the patient for donation to be successful. Each protocol is specific to the type of patient situation at hand: Terminal Ventilator Wean, Donation after Cardiac Death (DCD), or Brain Dead Donor (BDD). Method An interdisciplinary group that consisted of physicians, nurses, and respiratory therapists developed a Terminal Vent Wean protocol to help manage end of life sustaining measures for patients. With the increased collaboration, our team identified gaps in our current practice and recognized a need for the development of patient care order sets for organ donation candidates. The DCD and BDD protocols, which were imbedded in the order sets that were created for use in the electronic medical record, were developed to help the RT optimize ventilation in these patient cases until organ procurement could take place, thereby increasing the number of organs transplanted per donor (OTPD). Results In September 2010, the order sets were developed and implemented for each type of organ donation. In 2012, we reviewed the number of organ donors, OTPD and types and amounts of organs donated and the table below illustrates the trend between the organ type and the OTPD. Of note, from 2005-2012 the OTPD increased from 3.45 to 3.54 and the organ type donated, specifically lungs, increased from 4 to 14. Conclusion The use of end of life ventilator management protocols by a collaborative interdisciplinary team may improve the opportunity for potential organ donation and promote better communication amongst healthcare providers.

Sponsored Research - None

Organ Type	2005	2006	2007	2008	2009	2010	2011	2012
Lung	4	1	2	2	4	7	8	14
OTPD	3.45	3.11	2.73	2.89	3.00	3.33	2.87	3.13

1733935

THE RELATIONSHIP BETWEEN RESPIRATORY CARE EDUCATIONAL PROGRAM DIRECTOR LEADERSHIP STYLE ON CRT VS. RRT CREDENTIALING SUCCESS, PROGRAM ATTRITION AND JOB PLACEMENT.

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Background: It is not clear if leadership styles of allied health program directors affect program and student outcomes. The intent of this study was to examine the leadership style of respiratory care program directors and assess their relationships to various program and student outcomes (attrition, job placement and CRT vs. RRT credentialing success). Methods: After refining and restructuring a researcher designed Program Director Leadership Questionnaire, along with the Multifactor Leadership Questionnaire (MLQ), directors of fully accredited respiratory therapy programs (n=453) by the Committee on Accreditation of Respiratory Care across the United States were recruited to participate in the study. Outcome variable data were collected via the Director Leadership Questionnaire. A total of 14 program directors participated in the study. Data were analyzed using the Spearman rank order correlation. Results: There were significant positive correlations between the leadership trait of intellectual stimulation (transformational leadership) with program directors' extra effort ($r = 0.614702$) and effectiveness ($r = 0.834891$) as well as student employment ($r = 0.618365$). There was no correlation between the leadership style traits and pass rates on the CRT, RRT and/or clinical simulation exams. Conclusion: Although the transformational leadership style did not impact credentialing success, it did impact student employment. Further research is needed regarding leadership styles impact on the affective domain and credential success of students.

Sponsored Research - None

1733913

PULMONARY EMBOLISM OR PRIMARY PULMONARY ARTERY INTIMAL SARCOMA- A DIAGNOSTIC CHALLENGE.

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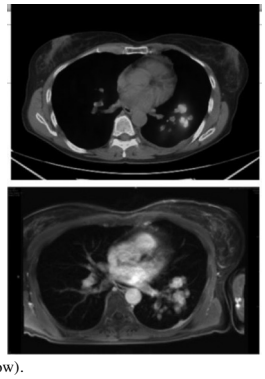
Introduction:Primary pulmonary intimal sarcomas are exceedingly rare, malignant neoplasms. Most cases of are misdiagnosed as pulmonary embolism, leading to late diagnosis and poor prognosis. We present a case of primary pulmonary sarcoma promptly diagnosed and treated owing to an elevated index of suspicion.Case summary:A 53-year-old female, lifelong non-smoker was seen in the pulmonary clinic due to cough and pleuritic chest discomfort for 3 months. Prior evaluation included two courses of antibiotics and non-contrasted CT of chest, which showed predominantly non-specific peripheral pleural-based opacities. Evaluation was notable for a pleural rub and normal spirometry, lung volumes and diffusing capacity. A CT angiogram identified a large filling defect in left main pulmonary artery, hence the patient was anticoagulated. She returned to the pulmonary clinic 2 months later, with progressive dyspnea desoiteiingoing anticoagulation. A repeat CT angiogram 11 weeks after her first one demonstrated propagation of the filling defect into the right main pulmonary artery suggesting warfarin failure or a non-thrombotic pulmonary artery filling defect. A PET/CT, which followed, revealed the endoluminal abnormality to be hyper metabolic with an SUV of 6.8. A soft tissue mass in the distal left pulmonary artery with non-enhancing thrombus in the more proximal portion of the left pulmonary artery was shown on chest MRI. CT guided biopsy revealed malignant cells consistent with primary pulmonary artery intimal sarcoma. The patient underwent left pneumonectomy, tumor embolectomy with pulmonary endarterectomy. Two months later, imaging showed a new hypermetabolic filling defect in right pulmonary artery, consistent with recurrent sarcoma, subsequently confirmed by biopsy. Patient was started on chemotherapy and has an excellent functional status a year after her diagnosis.Discussion: Propagation of the filling defect despite anticoagulation is unusual in cases of pulmonary embolism that have been appropriately anticoagulated. Complete resolution of pulmonary thromboembolism is not routinely achieved between 8 days and 11 months after acute PE. Routine re-imaging of patients after cessation of anti-coagulant therapy has been suggested in order to achieve a new baseline. We believe that short interval follow up CT angiogram should be recommended when there are atypical features in history, imaging or course of recovery.

Sponsored Research - None



PET scan (above), MRI chest (below).

1733962

2+2 ASTHMA EDUCATION CREW.

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Authors:E Real, PK Giang, A Escobedo, K Ramirez, L Gonzales, D Rhodes, D Gardner Background: Asthma is the leading cause for school absenteeism and over 7.1 million children reportedly have asthma. Minorities and children living in low-income areas are known to have more emergency room visits, hospitalizations, and deaths as a result of their asthma. More than half of children who have an asthma attack miss about 4 days of school and 13 million school days are missed each year due to asthma. An Elementary School in Bexar County is predominately Hispanic (85.2%), 81.9% of students are economically disadvantaged and has a high asthma prevalence rate (12%). Controlled asthma means students perform well in school and participate in all activity, however students with asthma who miss school have a difficult time meeting their academic potential. The Asthma Blow Out Education Model (ABOEM) created by D. Rhodes, utilizes a variety of hands on teaching stations. Respiratory therapy students utilized this model to teach Kindergarten through 5th graders. Methods: The student completed a questionnaire gauging asthma knowledge and the Asthma Control Test (ACT). Students rotated through six hands-on interactive stations; What is Asthma, Early Warning Signs, Trigger Awareness, Medication Management, Trigger Avoidance and Living with Asthma .Parents of students with asthma completed the ACT and attended an asthma presentation. The school nurse followed students attendance and PRN albuterol use. Results: 17% of the students (10 male; 6 female) diagnosed with asthma participated in the program. The mean pre -ACT score for all students was 20.3 (27, 7) and 25% had an ACT less than 19. All student asthma knowledge mean post questionnaire increased to a 8.83 from 7.92. Post program all student absences did not change. Post program all student PRN albuterol use decreased by 18%. Conclusions: Elementary school students diagnosed with asthma and their parents attended the 2+2 asthma education program after a variety of barriers were removed (free meal, after school care, and sibling care). All student knowledge increased immediately after the program. All students have the potential to control their asthma and succeed academically and physically for a life time. Programs like this one can make a sustaining difference when continued more frequently.

Sponsored Research - The Center for Ethics and Humanities at the University of Texas Health Science Center at San Antonio provided a small community service learning grant to provide funding to purchase the items used in this community service learning project.

An inflammed asthma airway model

1734041

REDEVELOPMENT AND REIMPLEMENTATION OF THE POSTOP HEART SURGERY RAPID WEAN PROTOCOL.

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Background: Consultants noted our rapid extubation rate with our postop open-heart surgery patients was outside the national average of 43%. 2012 indicated that 5% of our patients were extubated in <6 hours. And our sister University of California(UC) medical centers had a high average of 44%. Our department always focuses on being protocol driven, having three in place regarding weaning. The Standard weaning protocol, the Open Heart Surgery Rapid Wean protocol and the Postop Day 1 Open Heart Surgery weaning protocol. Cardiac surgeons automatically selected the Postop Day 1 Open Heart Surgery Weaning protocol. Surgeons being mandated to meet national standards, they look to Respiratory Care to help increase extubation rates. Method: A push was made for the immediate selection of the current rapid wean protocol(RWP). And because of many factors involved in extubation, such as preop risk, intraoperative risks and sedation, a special task force was formed of Surgeons, Anesthesiologist, Pulmonologist, intensive care nurses, and respiratory therapists to redevelop the postop RWP. Issues regarding each discipline was address. For the Surgeons, evidence based data for identification and categorization of preop high, medium, and low risk patients. Thus making it easier to place patient in the appropriate weaning protocol. For the Anesthesiologist, they had to make changes to their induction and intraoperative sedation guidelines, Nurses had to make it a priority to collaborate with respiratory therapist to rapidly extubate the patient. Changes to the actual respiratory protocol included: Synchronized intermittent mandatory ventilation wean to a sprint, elimination of number of attempts and time limits, changes in intraoperative contraindication limits, and addition of preop risk categories. Results: Immediate selection of current RWP resulted in a 30% extubation rate. Results after the task force changes to the protocol resulted in a 46% extubation rate. Recommendations were made by consultants to use RWP to at all UC medical centers. Conclusions: Although protocols can be well established, evaluation of effectiveness must be monitored. After notification of our postop open heart surgery rapid extubation was well below average. It was determined that the current RWP was underutilized and was not as effective. The mutlidisciplinary task force formed was able to effectively use the latest evidence base data to improve to rates above the national average.

Sponsored Research - None

1734079

A REMINDER TO ALL RESEARCHERS AND AUTHORS

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Consult the Research Office of your institution for help registering your study. Your Research Office can help you decide whether your study needs to be registered and they can help you register it if necessary.

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NON-INVASIVE VENTILATION: REDUCING RE-HOSPITALIZATION THROUGH A CLINICAL DRIVEN PATHWAY.

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Background: In 2003 we were approached by a pulmonologist whose challenging patient was frequently being admitted into the hospital for chronic respiratory failure, and hypercapnia. During the hospital admission the patient's hypercapnia would be treated using non-invasive ventilation. Once patient discharged to home, within 3-4 weeks this patient would experience exacerbation of symptoms requiring re-hospitalization. With collaboration between the pulmonologist and therapist, the patient at home was placed on a ventilator via mask with a set respiratory rate to stabilize CO2 levels. Objective: Develop and implement a clinical pathway utilizing a home ventilator via mask, and monthly home visits with a therapist. The goal of this clinical pathway are to reduce exacerbations, re-hospitalization, and improve quality of life. Method: The clinical pathway was implemented for patients identified with chronic CO2's greater than 52 on blood gases, diagnosis of chronic respiratory failure, and frequent exacerbations requiring re-hospitalization. During an initial patient assessment the therapist discusses disease management, goals of therapy, follow-up visit schedule, set-up of equipment, and determination of appropriate masking. Monthly home visits with therapist provide ongoing education, monitor compliance of therapy, functionality of equipment, and appropriateness of ventilator settings. This clinical supervision, along with close monitoring of the patients respiratory status allows therapist to coordinate with physicians to intervene before an exacerbation occurs requiring management in an acute care setting. Results: Since implementing this therapy for chronic respiratory failure patients, it was recognized that these patients had less re-hospitalization for exacerbations. We tracked the initial 18 patients placed on this clinical pathway. Hospital admissions 12 months prior to clinical pathway totaled 104 admissions. Hospital admissions 12 months post initiating clinical pathway totaled only 4 admissions. Conclusions: In the past 10 years, it is hypothesized that utilizing a ventilator with a set respiratory rate along with clinical oversight by a therapist can decrease the amount of re-hospitalizations/ED visits for patients with chronic respiratory failure.

Sponsored Research - None

1733270

COPD ASSESSMENT TEST (CAT) SCORES AND ACUTE EXACERBATION HISTORY IN COPD PATIENTS ENROLLED IN A TRANSITION OF CARE PROGRAM FOLLOWING HOSPITAL DISCHARGE FROM AN EXACERBATION.

Brian W. Carlin[1], Dan Easley[2], Kim Wiles[2]; [1]Sleep Medicine and Lung Health Consultants, Ingomar, USA Minor Outlying Islands; [2]Klingensmith HealthCare, Ford City, PA

Background: The thirty day readmission rate for patients with COPD who have been hospitalized with a COPD exacerbation approaches 25% in many areas within the United States. The COPD Assessment Test (CAT) is being used more frequently in patients with COPD to help assess the overall severity of a patient's underlying illness. Exacerbation history has been shown to influence future exacerbations. Purpose: To evaluate the CAT test scores and exacerbation history in a group of patients entered into a respiratory therapist drive transition of care program following hospital discharge. Methods: All patients entered into the Discharge Assessment and Summary at Home (DASH, Klingensmith HealthCare, Ford City, Pennsylvania) from February 2013 through May 2013 completed a CAT as well as an exacerbation history (including hospitalization, urgent care or emergency department visit) on entry into the program. All patients were receiving supplemental oxygen on hospital discharge. The DASH program is a respiratory therapist driven program that includes at home visits by the respiratory therapist on days 1 and 30 following hospital discharge. All testing was performed on day 1 following discharge. Results: A total of 101 patients were entered into the program during this four month period. Sixty four of the 101 (63%) had a CAT score greater than or equal to 10. Eighty of the 101 (79%) had a least one exacerbation in the year prior to this hospitalization. A total of 13 patients (12%) were readmitted to the hospital within a 30 day period. Of those with a CAT score greater than or equal to 10, 2 (15%) were readmitted. For those with an exacerbation history, 12 (92%) were readmitted within a 30 day period. Conclusions: A significant number of patients who are discharged following hospital admission for a COPD exacerbation have a history of previous exacerbations as well as an elevated CAT score. For those patients readmitted to the hospital following a COPD exacerbation, a majority had had a previous exacerbation within the year prior to hospitalization yet only a minority an elevated CAT scale score.

Sponsored Research - The study was performed in patients entered into a transition of care program that was conducted by Klingensmith HealthCare.

1734032

DEPRESSION SCREENING AND TRANSITION OF CARE FOR PATIENTS WHO HAVE BEEN HOSPITALIZED FOR A COPD EXACERBATION.

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Background: Depression and anxiety are common comorbidities in patients who have stable COPD. The incidence of depression in patients with COPD approaches 25%. The incidence of depression in those patients who have been hospitalized with a COPD exacerbation is unknown. Purpose: To evaluate the incidence of depression in a group of patients with COPD who have been hospitalized with a COPD exacerbation who are enrolled in a transition of care program. Methods: All patients with COPD who were entered into a transition of care program following hospitalization for a COPD exacerbation were asked to complete the Hospital Anxiety and Depression Scale. The transition of care program includes those patients who have a discharge diagnosis of COPD and who require supplemental oxygen on hospital discharge. The HADS scale was completed on the first visit by the respiratory therapist following discharge. In addition evaluation of the COPD assessment test (CAT) and the number of acute exacerbations in the year previous to that hospital admission was performed. Results: A total of 101 patients were entered into the Discharge Assessment and Summary at Home transition of care program (DASH, Klingensmith HealthCare, Ford City, Pennsylvania) over a two month period from February 2013 through May 2013. Ninety patients completed the assessment. Of these, 8/90 (9%) had a HADS score greater than or equal to 8. Of these 8, 7 (88%) had an acute exacerbation during the previous 12 months. Seven of the eight (88%) had a CAT score of greater than or equal to 10 with six of these seven (86%) having a CAT score greater than or equal to 20. Conclusions: The incidence of depression in this group of patients is lower than would otherwise be expected for patients with COPD. For those with an elevated HADS score there was an increased number who had an acute exacerbation in the year previous to hospital admission as well as an elevated CAT score (with most having a significantly elevated CAT score). Further investigation into the reasons for this low incidence of depression in this group needs to be performed.

Sponsored Research - The study was performed with patients who were entered into the DASH program. This program have been developed and maintained by Klingensmith HealthCare.

1734022

COMPARATIVE STUDY OF CIRCUIT PRESSURES AND CPAP EFFECT FOR FOUR HIGH FLOW NASAL CANNULA DEVICES.

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Background: High pressures can be generated within the circuit of heated high flow nasal cannula (HHFNC) systems. A comparative study was undertaken to determine the pressures generated within the circuit and the patient interface of four HHFNC devices. **Methods:** Four nasal cannula devices: Fisher/Paykel Optiflow (F/POP), Fisher/Paykel Salter (F/PS), Westmed (WES) and Neotech Ram (RA) were studied comparing maximal pressures both distal and proximal. Target flow rates for cannula sizes were: 6 LPM in premature infant cannulas, 7 LPM in infant/newborn cannulas, 8 LPM in pediatric/infant cannulas. Three of each cannula brand was used. Data were collected at 37°C and F_IO_2 1.0. The external diameters and lengths of each cannula were measured with calipers. Measurements of flow and pressure were acquired using the Biopac MP-100 System. The Fisher & Paykel MR850 was used to maintain humidification. For the F/PS, RA, and WES nasal cannulas, one 0-35 LPM pneumotachograph (PNT) was placed where the large bore tubing connects to the nasal cannula, and one 0-35 LPM PNT was connected directly to the portion of the cannula that would be inserted in the nares. For the F/POP cannula, one 0-35 LPM PNT was placed at the humidification system, and one 0-35 LPM PNT was connected directly to the portion of the cannula that would be inserted in the nares. Data were collected for 60 seconds. Results are presented as mean $\pm$SD and range. Comparisons between cannula brands for distal mean pressure were made utilizing an ANOVA; $p<0.05$. **Results:** At the lower flow (6 LPM), distal mean pressures were lowest in the RA cannula (10 ± 0.2 cmH_2O), followed by the F/POP (18 ± 2 cmH_2O) and WES (35 ± 1 cmH_2O) cannulas. The highest system pressures were noted in the F/PS (42 ± 2 cmH_2O). At the two higher flows (7 and 8 LPM), system pressures were lowest in the F/POP (5 ± 0.4 and 5 ± 0.2 cmH_2O, respectively), followed by the RA (10 ± 0.3 and 11 ± 1 cmH_2O) and F/PS (31 ± 2 and 34 ± 0.03 cmH_2O) cannulas. The highest system pressures were noted in the WES cannula (53 ± 5 and 67 ± 3 cmH_2O); $p<0.008$. Proximal mean pressures ranged from 0.3–0.4 cmH_2O. **Conclusion:** The RA and F/POP cannulas had consistently less distal mean pressure than the F/PS or WES cannulas. Minimal pressures were generated at the patient interface in all four cannulas; thus, reducing concern over higher pressures with increasing flow. Additionally, the diameters and lengths of the cannulas may be responsible for the pressures generated in the circuit.

Sponsored Research - None

1722953

FRACTION OF DELIVERED OXYGEN TITRATION BY ADJUSTMENTS IN FLOW ON FOUR DIFFERENT MANUAL RESUSCITATORS.

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BACKGROUND: Recent publications have suggested that hyperoxia plays a significant role in poor outcomes for patients who have had a return of spontaneous circulation after cardiac arrest. There are no commercially available options to adjust the Fraction of Delivered Oxygen (FDO2) with a standard manual resuscitator (MR) without using an oxygen blender. We sought to determine if we could reliably determine the FDO2 at different oxygen flow rates delivered with a consistent minute ventilation. METHODS: A bench model was constructed with manual resuscitator connected to flow and oxygen analyzer (BC Biomedical PFC-3000) then to an Ingmar ASL 5000 test lung. A mushroom-valve was connected proximal to the ASL to vent expiratory gases. We tested four separate MRs (Rusch, Portex, Laerdal, and Ambu) at four different flow rates: 2, 5, 7, and 10 L/min. The principle investigator (KL) operated each MR with a rate of 12 and a 500 mL tidal volume using the ASL for feedback. After each run the MR were operated for one minute and the FDO2 was recorded. Each test was completed in triplicate with a new MR. Between each run the MR's were disconnected and manually ventilated until the analyzer read 21%.Data is presented as mean ± sd. Differences were determined using ANOVA. RESULTS: Under these experimental conditions MRs were able to reliably deliver less than 100%. However, wide variability existed between different MR at higher flow rates. For all MR the mean (± SD) FDO2 for 2, 5, 7, and 10 L/min were 38.0 ± 4.6, 62.2 ± 10.5, 81.8 ± 14.5, and 88.6 ± 14.5 % respectively. There were significant differences between 2 and 5 L/min ($p < 0.05$) with no differences between 7 and 10 L/min (p=.444). CONCLUSIONS: Based on this research operating a MR with lower oxygen flow rates will deliver less than 100% FDO2. However, further research is needed to determine how FDO2 is affected by changes in minute ventilation and if providers would be able to accurately deliver a predictable FDO2 in a clinical setting.

Sponsored Research - None

1724095

ACCURACY AND CONSISTENCY OF SETTING OXYGEN FLOW METERS BY RESPIRATORY THERAPISTS IN A HEALTHCARE FACILITY.

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Background: Respiratory therapists (RTs) initiate, monitor, and maintain oxygen (O_2) therapy on patients routinely. Setting flows accurately is an integral part of this process. The purpose of this project was to analyze the accuracy and consistency of RTs setting flows using three O_2 flowmeters (FM) having different scales of measurement. **Methods:** Fifty RTs (5 CRTs and 45 RRTs) participated. Mean work experience was 17±10 years. Three O_2 FM were used (scales of 0-3 LPM, 0-15 LPM, and 0-70 LPM). RTs were instructed to set pre-determined flows on Precision Flowmeters. A nipple adapter and O_2 tubing were connected to the FM. RTs set three different flows on each FM. The FM was at a height of 152 cm above floor level. Flows were set to 0.5, 1.5, and 2.5 (0-3 LPM FM); 2, 5, and 10 (0-15 LPM FM); and 10, 25, and 40 (0-70 LPM FM). Flows were measured with a Timeter Series RT-200 Calibration Analyzer (calibrated-11/12). Mean differences (MD) were calculated as set flow minus measured flow. Comparisons were made using ANOVA ($p \leq 0.05$) and Pearson Correlation. **Results:** The accuracy of RTs setting flow was very good for all range of FM: 0-3 LPM (R^2=0.998); 0-15 LPM (R^2=0.996); and 0-70 LPM (R^2=1). MD was < 1.5 LPM for all FM ranges with small changes in accuracy between and within each group. MD increased as FM range increased (low {0-3 LPM} -0.04±0.05; mid {0-15 LPM} -0.12±0.21; and high {0-70 LPM} range FM -1.06±0.42, $p \leq 0.03$). In addition, all MD were negative indicating measured flow was greater than set. For the low range FM {0-3 LPM}, MD decreased as set flow increased (set 0.5 LPM [-0.07±0.03]; set 1.5 LPM [-0.03±0.04]; and set 2.5 LPM [-0.01±0.04], $p \leq 0.02$). For the mid-range FM {0-15 LPM], MD was greater for set flow 2 LPM [-0.18±0.06] compared to the higher set flow 10 LPM [-0.05±0.32], p=0.01. For the high range FM {0-70 LPM}, MD increased as set flow increased (set 10 LPM [-0.66±0.22]; set 25 LPM [-1.06±0.25]; and set 40 LPM -1.47±0.31]), $p<0.001$. MD was not affected by years of experience, credentials, or individual RT. **Conclusion:** Flows set by RTs were very accurate. Flows were set slightly more accurate at the higher settings for the low and mid-range FM, and slightly more accurate at the lower setting for the high range FM. It was noted that each RT maneuvered to a position where they could read the FM at eye level. Further study will be pursued with FM placed at various heights to ascertain if accuracy in setting flows is affected.

Sponsored Research - None

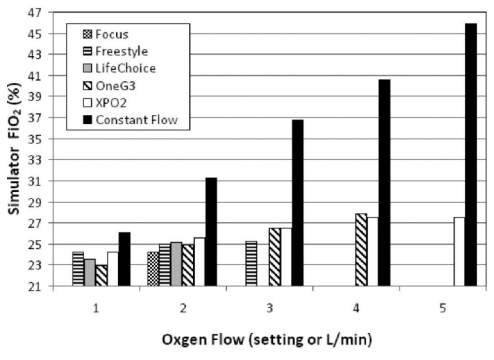
1726932

PERFORMANCE EVALUATION OF PORTABLE OXYGEN CONCENTRATORS IN A SIMULATED PEDIATRIC MODEL.

Kristianna S. Turley[2], Robert L. Chatburn[1]; [1]Respiratory Institute, Cleveland Clinic, Cleveland, OH; [2]Nursing, St Louis University Hospital, St Louis, MO

BACKGROUND Portable oxygen concentrators (POC) have pulsed dose oxygen conserving devices (PDOC) calibrated for adult tidal volumes. No published data are available regarding their use with children. The purpose of this study was to describe the performance of 5 POCs using simulated pediatric breathing patterns. **METHODS** An active lung simulator (ASL 5000, IngMar Medical Inc.) was programmed with 5 different breathing models based on data from a study of children (height 114 – 147 cm) with cystic fibrosis (J Aerosol Med 1999;12(4):265-279). The flow pump of the ASL 5000 was set for frequency 20 breaths/min, tidal volume 257-399 mL, inspiratory time fraction (rise+hold+release) 0.433-0.475. FiO_2 inside the simulator was the average of 10 breaths after stabilization. POCs were: Focus and FreeStyle (AirSep Corp), LIfeChoice (Inovo Labs), Inogen One G3 (Inogen), XPO2 (Invacare). Devices were connected to the simulator using a pediatric nasal cannula (Westmed) and model nose. Constant flow (CF) using compressed oxygen was also evaluated. Data were analyzed with linear regression. **RESULTS** None of the devices delivered as much oxygen as CF (Figure). Prediction equations for FiO_2 (%) for devices with more than 1 setting (all but Focus) were: Freestyle O_2 = 0.5 x setting + 24; LifeChoice O_2 = 1.6 x setting + 22; Inogen One G3 O_2 = 1.6 x setting + 21; XPO2 O_2 = 0.9 x setting + 24; CF O_2 = 4.9 x setting + 21. All r-squared values were > 0.92. **CONCLUSIONS** FiO_2 delivery was 1-34% more than values reported for adults (Respir Care 2010;55(4):433– 442) due to the smaller tidal volumes. Oxygen delivery by POC was much less than CF and the difference increased with the setting. The settings on the POCs should not be interpreted as being similar to CF pure oxygen.

Sponsored Research - Vendors loaned the POCs. No other funding was received. The study was entirely performed at Cleveland Clinic



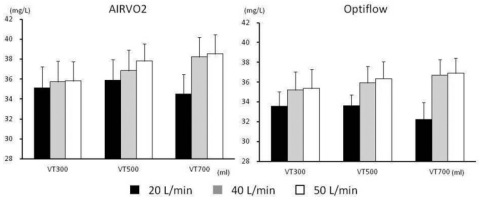
1729246

HUMIDIFICATION PERFORMANCE OF HIFH FLOW NASAL CANNULA THERAPY: A BENCH STUDY.

Yusuke Chikata[1,2], Taiga Itagaki[1], Hideaki Imanaka[3], Masaji Nishimura[1]; [1]Emergency and Critical Care Medicine, The University of Tokushima Graduate School, Tokushima, Japan; [2]Medical Equipment Center, Tokushima University Hospital, Tokushima, Japan; [3]Emergency and Disaster Medicine, Tokushima University Hospital, Tokushima, Japan

Background High flow nasal cannula (HFNC) therapy becomes popular for patients with respiratory failure. It supplies heated and humidified gas at high flow through a nasal cannula. HFNC is considered to create low level of PEEP and to reduce dead space. However, humidification during HFNC therapy remains to be clarified. The aim of the study was to evaluate humidification during HFNC. Method We evaluated 2 types of HFNC (AIRVO2 and Optiflow, Fisher&Paykel) . Each HFNC was connected to a simulated external nares by the manufacturer's standard circuit. AIRVO2 controlled temperature at distal end of the breathing circuit, and it was set at 37°C. Optiflow incorporated an O2/Air blender and a heated humidifier (MR850, Fisher&Paykel). MR850 was set as invasive mode (40°C /-3). HFNC flow was 20, 40 and 50 L/min for both systems. We simulated spontaneous breathing (SB) by using a mechanical ventilator and TTL model lung. Tidal volumes (VT) were 300, 500 and 700 mL, and respiratory rates were 10 and 20 breath/min. Inspiratory time was 1 sec and it resulted in 18, 30, and 42 L/min of inspiratory flow of SB. The TTL was connected to the simulated external nares with a simulated trachea (a standard corrugated circuit). The trachea was put in an incubator. Temperature inside the incubator was kept 37°C to prevent condensation. Prong size was small, medium and large. When experimental setting was changed, we waited for at least 30 minutes. Absolute humidity (AH) of inspired gas was measured with a hygrometer between the simulated external nares and the trachea. Results AH was above 30 mg/L in all experimental settings. As flow increased, AH increased with both HFNCs. AH was 35.3±2.0, 37.1±2.2 and 37.6±2.1 mg/L with the AIRVO2, and 33.1±1.5, 35.9±1.7 and 36.2±1.8 mg/L with the Optiflow at 20, 40 and 50 L/min of flow, respectively. At 40 and 50 L/min of HFNC flow, AH did not differ among 300, 500 and 700 mL of VT. At 20 L/min of HFNC flow, AH decreased as VT increased (Figure), probably because SB inspiratory flow exceeded HFNC flow. Prong size did not influence AH. Conclusions We evaluated inspiratory gas humidification during HFNC therapies with a simulated spontaneous breathing. As HFNC flow increased, AH increased. When SB inspiratory flow was above HFNC flow, AH decreased with high VT. AH was above 30 mg/L in all experimental settings. Humidification during HFNC was better than during conventional oxygen therapy.

Sponsored Research - None



1729490

COMPARISON OF TWO HUMDIFIER SYSTEMS FOR THE DELIVERY OF HEATED HIGH-FLOW NASAL CANNULA FOR INFANTS AND PEDIATRICS.

Darren Bullock[1], Zachary Quinby[1], Courtenay Matthews[2], Tasha Moore[2]; [1]Respiratory Care, Children's Hospital Colorado, Aurora, CO; [2]Respiratory Care, Children's Hospital Colorado at Memorial, Colorado Springs, CO

Background: Heated high-flow nasal cannula (HHFNC) is a therapeutic modality that has enjoyed increasing popularity in the past decade. At Children's Hospital Colorado (CHCO) we have two facilities that use different devices for this therapy. To identify the optimal system for delivery of HHFNC, we sought to measure humidity output from both devices. Method: The Fisher & Paykel (F&P) HHFNC system (F&P MR850 with F&P BC3780 and BC2745 Pediatric Oxygen Therapy Nasal Cannulas) was compared with the Hudson RCI HHFNC system (Hudson ConchaTherm Neptune with Hudson RCI 2411-02 and 2411-03 ComfortFlow cannulas). Both systems were setup per manufacturer specifications and connected to pediatric and neonatal cannulas. The cannulas were inserted into 15mm adapters which was then connected to 6in of corrugated tubing. The corrugated tubing was terminated with a Vital Signs HCH5701 and a AirLife 001851 filter. The entire setup was sealed using silicone sealant. Both humidifiers were preheated to 37 degrees celcius. The circuits were then attached and ran on 7lpm for 1 hour each. The circuit, including the 15mm adapter, corrugated tubing, cannula, and both filters were weighed before and after each test. Humidity output was extrapolated by comparing pre- and post-weight of each circuit. To ensure that cannula was not a significant contributing factor, each system was cross-fitted to the competitor's humidifier. Results: The Hudson RCI consistently produced greater humidity measured at the distal end of the patient circuit. Further analysis is indicated to determine if this remains consistent at higher flowrates. Unfortunately, the F&P system is not rated by the manufacturer beyond 7lpm for infant cannula size and was therefore our limiting factor. Additionally, the Hudson RCI was noted to alarm immediately upon termination of flow. After 5 minutes of zero flow, the F&P system did not alarm. Conclusions: For HHFNC delivery, the Hudson RCI system produces greater humidification. Additionally, the alarm is useful to alert caregivers of upstrem termination of flow, which may improve safety.

Sponsored Research - None

Measurements

Device	F&P 850 with BC3780 (Ped)	F&P 850 with BC2745 (Infant)	F&P 850 with 2411-02 (Ped)	F&P 850 with 2411-03 (Infant)	ConchaTherm Neptune with 2411-02 (Ped)	ConchaTherm Neptune with 2411-03 (Infant)	ConchaTherm Neptune with BC3780 (Ped)	ConchaTherm Neptune with BC2745 (Infant)
Pre-weight (mg)	72	67	64	61	66	59	70	67
Post-weight (mg)	75	70	69	64	71	62	76	73
Humidity produced (mg)	3	3	5	3	5	3	6	6

1732617

OBSERVATIONAL ASSESSMENT OF HEATED HUMIDIFIED HIGH FLOW NASAL CANNULA VS. STANDARD NASAL CANNULA IN POST EXTUBATED PATIENTS.

Peggy Watts, Lisa Cracchiolo, Darnetta Clinkscale, Marin Kollef; Respiratory Care Services, Barnes-Jewish Hospital, St. Louis, MO

Introduction: Post-extubation dyspnea in patients requiring mechanical ventilation is a common finding for which there is little information on how to optimally manage it. Methods: We conducted a single center study to determine whether two different oxygen delivery methods can influence the degree of post-extubation dyspnea. Standard nasal cannula (SNC) oxygen and heated humidified high-flow nasal cannula (HHHFNC) oxygen delivery were compared by randomly administering these oxygen delivery methods consecutively to patients in the immediate post-extubation period. Oxygen delivery was set to maintain the partial pressure of arterial oxygen above 92% as assessed by pulse oximetry. Tolerance of the two oxygen delivery systems was assessed using a comfort visual analog scale (VAS) (1 [most comfortable] to 5 [least comfortable]) and the modified Borg dyspnea scale (0 [no dyspnea] to 10 [maximal dyspnea]). Results: Thirty consecutive mechanically ventilated patients providing informed consent were enrolled. Randomization allocated 16 (53.3%) patients to receive oxygen delivery by HHHFNC followed by SNC and 14 (46.7%) patients to receive oxygen delivery starting with SNC followed by HHHFNC. The comfort VAS measurements were similar for oxygen delivery via the HHHFNC and the SNC [median (25th and 75th percentiles), 1.0 (1.0, 2.0) vs. 2.0 (1.0, 2.0); P = 0.902]. The modified Borg dyspnea scale measurements were also similar for oxygen delivery via the HHHFNC and the SNC [1.0 (1.0, 2.0) vs. 1.0 (1.0, 2.25); P = 0.982]. Conclusions: There is no difference in patient comfort and dyspnea in the immediate post-extubation period between oxygen delivered by HHHFNC and SNC.

Sponsored Research - None

1733310

TEMPERATURE COMPARISONS IN THREE HEATED HIGH FLOW NASAL CANNULAS.

Jim Hynson, Gary R. Lowe, Randy Willis; Respiratory Care Services, Arkansas Children's Hospital, Little Rock, AR

Background: Heated high flow nasal cannulas (HHFNC) have become an integral part of pediatric respiratory care. A comparative study was performed to observe the temperatures (TEMPS) inside the tip of the three brands of nasal cannulas (NC) to determine which NC was the most effective in maintaining the heat of the gas that would reach a patient. **Methods:** An in-vitro study was conducted comparing TEMPS inside the tip of three NC: Fisher/Paykel Salter (F/PS), Neotech Ram (RA) and Fisher/Paykel Optiflow (F/POP). Three sizes of each NC brand were studied including premature (PRE), infant (INF), and pediatric (PED). TEMPS were observed at flows of 2, 4, and 6 LPM in the PRE; 2, 4, and 7 LPM in the INF; and 2, 4, and 8 LPM in the PED. Three separate NC and circuits were used for each experimental run. The Fisher & Paykel (F/P) MR850 was used to maintain humidification. Data were collected at 37°C (invasive mode) and F_IO_2 was 1.0. Measurements of flows were adjusted with a Timeter RT-200 Calibration Analyzer to confirm flow output (±0.1 LPM). TEMPS were measured using the F/P Duotemp Temperature Monitor (400 Series) probes at the MR850 chamber and at the circuit TEMP probe site. Cannula TEMPS were measured inside the NC tip with the SE-310 Humidity Temperature Meter. Mean values for NC TEMP (°C) were calculated for each NC size, brand, and liter flow. Results are presented as mean ± SD. Comparisons were made between NC brands and then for each NC brand and size utilizing ANOVA ($p \leq 0.05$). **Results:** Overall, the F/PS (32.1±0.9) NC had lower TEMPS than the RA (34.0±0.8) or F/POP (34.3±0.8), $p<0.001$. However, when we compared TEMPS for each NC size and brand, we found that only the PRE NC showed a significant difference. The F/PS (32.0±0.8) had lower TEMPS than the RA (33.9±0.8) and F/POP (34.0±0.7), $p<0.05$. For the INF NC, there were no differences between NC brands (F/PS 32.1±1.1; RA 34.3±0.8; F/POP 34.4±1.0). The same was true for the PED NC as there were no differences between NC brands (F/PS 32.3±1.0; RA 33.9±1.0; F/POP 34.5±1.0). **Conclusion:** Based on these results, the RA and F/POP were more effective at delivering gas at higher TEMPS than the F/PS in the invasive mode. Two advantages of maintaining higher gas TEMPS may result in: 1) a reduction in condensate in the distal tubing and NC, reducing the amount of water that could be introduced into the upper airway; and 2) less energy expenditure, which may be crucial in smaller patients.

Sponsored Research - None

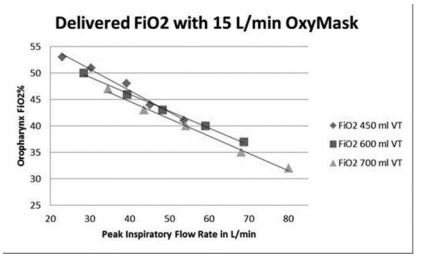
1733079

BENCH STUDY OF THE OXYMASK AT 15 L/MIN USING AN OROPHARYNX CATHETER.

Aaron E. Light, Doug Pursley; Respiratory Therapy, Ozarks Technical Community College, Springfield, MO

Introduction: The OxyMask (Southmedic Inc, Canada) is an open-designed oxygen mask that, according to the manufacturer's website, is capable producing an FIO2 of 60%-90% at 15 L/min or greater of O2 flow. This study will utilize an oropharynx catheter to sample the delivered gas to a head model using different respiratory rates and VT's that result in different inspiratory flowrates. Methodology: A model was created by incorporating a Hans-Rudolph Series 1101 Breathing Simulator with an Armstrong Medical Adult Intubation Manikin. Using large bore tubing and appropriate adapters the manikin's trachea was connected to the breathing simulator's outlet so that as the simulator operates, air flows in and out through the manikin's mouth and nares. This essentially creates a "breathing patient" and allows tidal volume, respiratory rate, I:E ratio, and inspiratory flowrate to be independently monitored and controlled by making adjustments to the computerized simulator. An 8 French suction catheter was inserted through the nares with the tip resting in the oropharynx. A TSI Certifier FA Plus ventilator tester (TSI Inc., Shoreview, MN) and a Teledyne Analytical Instruments oxygen analyzer was attached to the catheter and then connected to a suction regulator. The TSI and O2 analyzer determined the flow and FiO2 being removed from the oropharynx. The suction pressure was adjusted to achieve a flowrate of 5 L/min out of the oropharynx. 15 different breathing patterns were tested. Tidal volumes of 450 ml, 600 ml and 700 ml were paired with RR's of 12, 18, 24, 30, and 36. Data was recorded at each VT and RR combination and then reviewed. Results: The delivered FiO2 to the model with a 450 ml VT goal was 53-41%. At 600 ml Vt's the FiO2 was 50-37%, and at 700 ml VT's the FiO2 was 47-32%. The 15 different patient breathing patterns resulted in an average FiO2 reading of 43.33% with a Stdev of 6.01%. Conclusion: This bench study differed from other studies of the Oxymask in that it measured the FiO2 delivered to the patient's oropharynx at different Vt's, RR's and inspiratory flowrates. The study does not support the manufacturer's claim of 60-90% FiO2 and the FiO2 delivered to the patient varied greatly with changes in patients breathing pattern. These findings suggest that care should be taken when assuming delivered FiO2 to a patient's airway using this mask.

Sponsored Research - None



1733776

DETERMINING THE EFFECT ON FIO2 OF COMBINING THE FLOWS FROM TWO OXYGEN CONCENTRATORS.

William French, Catherine Kenny; Respiratory Therapy, Lakeland Community College, Kirtland, OH

Background Oxygen concentrators are often used in places where bulk oxygen is not available. The typical concentrator has a maximum flowrate of 5 Lpm. However, some oxygen devices (e.g.nonrebreather masks) may require flows higher than 5 Lpm. For these devices, it would seem logical to combine the flows from two concentrators to create flows higher than the maximum on one. The null hypothesis that prompted this study is that combining the flows will have an adverse effect on the FiO2 generated by the concentrators. Method We took two fairly typical oxygen concentrators with a maximum flowrate of 5 Lpm (Invacare Perfecto 2) and measured the FiO2 at each whole number flow setting using a calibrated concentrator test station (US LX System) and allowing for adequate stabilization time. Data was analyzed via computer using the Concentrator Data Acquisition System. At each flow setting, the indicator ball was placed so that the center of the ball was dissected by the indicator line. Once the control FiO2s were recorded, we banked the two concentrators together and measured the FiO2 of the output flow at each flow setting. Measurements were recorded only after the FiO2 had stabilized at each setting. Results Control Data Flowmeter Setting Concentrator 1 FiO2 Concentrator 2 FiO2 1 94.7 94.5 2 94.8 94.7 3 94.8 94.7 4 94.6 94.7 5 94.3 94.7 Combined Flows Flowmeter Setting Combined Measured FiO2 2 (1 + 1) 93.9 4 93.9 6 94.3 8 94.8 10 94.9 Conclusion The difference in the FiO2 from each individual concentrator compared to the FiO2 from the combined flows ranged from a high of 0.9 to 0.1. This is within the tolerance range normally expected of concentrators. The difference is not clinically significant and the null hypothesis is rejected.

Sponsored Research - None

1733812

COMPARISON OF FIO2 IN THREE DIFFERENT NONREBREATHING MASKS.

Nicole Yannizzi, Doug Pursley, Aaron Light, Eric Day, Matthew Jay, Allison Burris, Weston State; Ozarks Technical Community College, Springfield, MO

Background: Non-rebreathing masks (NRBM) are manufactured in a variety of configurations, primarily relating to the number of one-way cheek valves, composition of the plastic, shape of the mask itself, and thickness of the reservoir bag. We sought to determine if variations in the design of three commercially available masks affected delivery of oxygen to the airway. Method: Non-rebreathing masks manufactured by AirLife, Hudson, and Westmed were tested. We evaluated the masks using a model consisting of an Armstrong Medical adult intubation manikin connected to a Hans-Rudolph 1101 breathing simulator set to deliver a sine wave flow pattern. A calibrated, Teledyne MX300 oxygen analyzer was placed between the manikin and simulator in order to measure tracheal FIO2. The simulator tidal volume was set for 550 ml (533-562) and the masks were tested at respiratory rates of 15, 20, 25, and 30.This resulted in four different minute ventilations – 8.25 l/m, 11.0 l/m, 13.75 l/m, and 16.5 l/m. After setting the first VE on the simulator, the oxygen flowrate was set to 15 l/m and each mask was placed on the manikin with a snug fit – the strap positioned above the ears and around the crown of the head. After a stabilization period, FIO2 was then recorded. Subsequent VE's were set and the procedure was repeated until twelve FIO2's were recorded. Results: At a VE of 8.25 l/m, tracheal FIO2 for the AirLife was 71.8%, Hudson 70.9%, and Westmed 71.5%. When the VE was increased to 11.0 l/m, the AirLife produced an FIO2 of 63.2% while the Hudson and Westmed produced FIO2's of 66.0% and 63.7% respectively. At the higher minute ventilations of 13.75 l/m and 16.5 l/m, all three masks fell in the range of 56.5% to 58.9%. Conclusion: The three NRBMs we tested had slight differences in design. The AirLife had one cheek valve, the Hudson had two cheek valves, and the Westmed had two cheek valves with a thinner plastic reservoir. There were also minor variations in the shape of the masks. All three had one-way valves between the mask in the reservoir bag. Regardless of design, we found little difference in delivered tracheal FIO2 between the three masks. We believe that a more important factor in NRBM FIO2 achievement is mask fit with the goal of achieving the best fit possible. In this study we found that mask design and configuration did not affect FIO2 since the difference between the three masks was a clinically insignificant 0.7% to 2.8% across the four minute ventilations.

Sponsored Research - None

1733920

DETERMINING THE EFFECT ON FLOWRATE OF COMBINING THE FLOWS FROM TWO OXYGEN CONCENTRATORS.

William French, Catherine Kenny; Respiratory Therapy, Lakeland Community College, Kirtland, OH

Background Oxygen concentrators are often used in places where bulk oxygen is not available. The typical concentrator has a maximum flowrate of 5 Lpm. However, some oxygen devices (e.g.nonrebreather masks) may require flows higher than 5 Lpm. For these devices, it would seem logical to combine the flows from two concentrators to create flows higher than the maximum on one. The null hypothesis that prompted this study is that combining flows from two concentrators will have an adverse effect on the total flow (e.g. 3 Lpm + 3 Lpm π 6 Lpm). Method We took two fairly typical oxygen concentrators with a maximum flowrate of 5 Lpm (Invacare Perfecto 2) and measured the flowrate from each device at each whole number flow setting using a recently calibrated concentrator test station (US LX System). Data was analyzed via computer using the Concentrator Data Acquisition System. At each setting, the indicator ball was placed so that the center of the ball was dissected by the indicator line. Once the control flows were recorded, we banked the two concentrators together and measured the output flows at the same flow settings. Results Control Flowmeter Setting Concentrator 1 Concentrator 2 1 1.0 1.0 2 1.9 2.0 3 3.0 3.0 4 4.0 4.0 5 5.0 5.0 Combined Summed Flows Measured Flows 2 2.0 4 4.0 6 5.8 8 7.6 10 9.4 Conclusion As can be seen from the data, there is a slight but progressive decrease in the combined flowrate from 3 Lpm to 5 Lpm (0.2 - 0.6). This decrease is possibly explained by the inherent inaccuracy of setting the flow by eye (as a clinician would). Thus, given the most likely uses of the combined flow (e.g. nonrebreather mask), the slight decrease is probably not clinically significant.

Sponsored Research - None

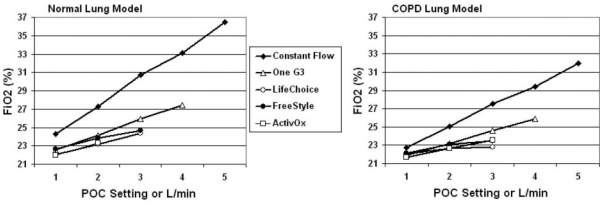
1733828

THE EFFECT OF DISEASE STATE ON LOW FLOW OXYGEN DELIVERY BY NASAL CANNULA: CONSTANT FLOW VS PORTABLE OXYGEN CONCENTRATOR.

Steven Zhou, Robert L. Chatburn; Respiratory Institute, Cleveland Clinic, Cleveland, OH

BACKGROUND: Oxygen therapy using a nasal cannula with constant flow relies on the anatomic reservoir (AR) filling during expiratory pause time (EPT), contributing significantly to the fraction of inspired oxygen (FiO_2). In contrast, portable oxygen concentrators (POC) administer oxygen in pulse doses and do not require the reservoir. Patients with COPD do not have EPT due to gas trapping. The purpose of this study was to test the hypothesis that disease state decreases FiO_2 for CF but not POC. **METHODS:** A lung simulator (IngMar Medical ASL 5000) was programmed using published data for healthy resting patients with (Normal: f = 15, R_{in} = 4, R_{out} = 4, C = 60, V_T = 685, Pmax = 11.95, increase = 33%, release = 28; COPD: f = 20, R_{in} = 12, R_{out} = 25, C = 66, V_T = 685, Pmax = 24.52, increase = 35%, release = 23%). Standard nasal cannula and model nose were connected to simulator. CF source was compressed gas. POCs used were SOLO2 (Invacare), FreeStyle (AirSep), One G3 (Inogen), LifeChoice, and ActivOx (Inovalabs). FiO_2(%) was measured with the simulator. Mean FiO_2s (10 breaths) were compared with t-test with $P < 0.05$ considered significant. **RESULTS:** CF produced substantially higher FiO_2 than the POCs for both normal and COPD models (see figure). FiO_2 was lower with COPD (1.5 – 4.5 %, $P < 0.001$) for CF. For POCs, the largest difference was 1.5% (for Lifechoice setting 3, $P < 0.001$), but this value is not clinically important. **CONCLUSION:** Constant flow oxygen delivery through a nasal cannula is significantly reduced by elimination of the anatomic reservoir with COPD yielding clinically relevant decreases in FiO_2. The POCs are relatively unaffected, relying instead on pulse doses of oxygen delivery. Numerical values for POC settings do not equate to either CF L/min or to settings on other POC devices.

Sponsored Research - Manufacturers loaned POCs. No other financial support was obtained. All research was conducted at the Cleveland Clinic.



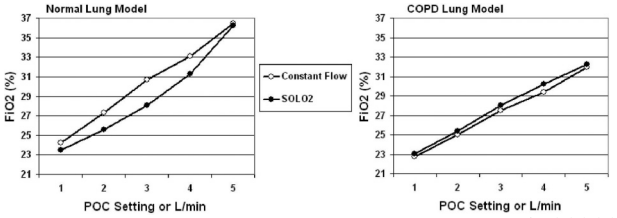
1733578

DISEASE STATE LOWERS FIO2 FOR CONTINUOUS FLOW NASAL CANNULA BUT NOT FOR PULSE DOSE PORTABLE OXYGEN CONCENTRATOR.

Robert L. Chatburn, Steven Zhou; Respiratory Institute, Cleveland Clinic, Cleveland, OH

INTRODUCTION: Long term, low flow oxygen therapy in the home is most often delivered using a nasal cannula. The model for FiO_2 with constant flow (CF) nasal cannula has 3 main assumptions: (1) oxygen is delivered at 100% purity, (2) the presence of anatomic reservoir comprised of upper airways, (3) a normal breathing pattern. Portable oxygen concentrators (POC) deliver oxygen at about 93% purity and use pulsed dose oxygen conserving devices that do not depend on the anatomic reservoir. The purpose of this study was to compare the FiO_2 delivered by nasal cannula attached either to a constant flow of pure oxygen or a pulsed flow from a POC. **OBJECTIVES:** (1) Compare FiO_2 between CF and POC and (2) determine if disease state of the lungs affects FiO_2. **METHODS:** A lung simulator (IngMar Medical ASL 5000) was programmed using published data for healthy resting patients with (Normal: f = 15, R_{in} = 4, R_{out} = 4, C = 60, V_T = 685, Pmax = 11.95, increase = 33%, release = 28; COPD: f = 20, R_{in} = 12, R_{out} = 25, C = 66, V_T = 685, Pmax = 24.52, increase = 35%, release = 23%). The nasal cannula was attached to a model nose connected to the simulator. Oxygen at CF (1-5 L/min) was delivered from a compressed source. The POC was SOLO2 (Invacare Inc) using settings 1-5. Mean FiO_2 was based on 10 breaths. **RESULTS:** For normal lungs, CF produced higher FiO_2 at all settings (S) than SOLO2 (CF FiO_2 = 3.0×S + 21.3; SOLO2 FiO_2 = 3.1×S + 19.6). For COPD lungs, FiO_2 was virtually identical for CF and SOLO2 (CF FiO_2 = 2.3×S + 20.5; SOLO2 FiO_2 = 2.3×S + 20.8). For CF, FiO_2 dropped 2 to 5%. For SOLO2, FiO_2 did not change for settings 1-3. It dropped 1% at setting 4 and 4% for setting 5. **CONCLUSIONS:** For the normal lung model, CF produces higher FiO_2s than the POC tested. COPD reduces the oxygen delivery from CF but had smaller, variable effect for the POC. FiO_2 delivery for CF and SOLO2 were clinically equivalent for COPD model (FiO_2 difference was always less than 1%). Numerical values for POC settings were clinically equivalent to CF values in L/min for this COPD model.

Sponsored Research - Vendors loaned POCs. No other funding was received. All research was conducted at the Cleveland Clinic.



1733929

DOES THE DISTANCE OR FLOW AFFECT GAS MIXING? A BENCH TEST OF A GAS MANIFOLD.

Keith R. Hirst, Parviz Zohdi; Respiratory Care, Rush University, College of Health Sciences, Chicago, IL

BACKGROUND: Alternative gases (Heliox, Nitrogen) are used to treat patients in the critical care setting. There is lack of research about where to bleed in these alternative gases in a clinical setting. This study aimed to determine whether distance and/or flows affect the mixing of gases. METHODS: The set up included the use of a Fischer Paykel (Fischer & Paykel HealthCare limited, Auckland New Zealand) gas manifold. A MaxO2Me (MaxTech, Salt Lake City, Utah) gas analyzer was placed in the manifold and another placed post humidifier chamber which was empty of water. Both oxygen analyzers were calibrated to 1.0 and .21 prior to the beginning of the trial and recalibrate to .21 between each trial run. A 70/30 mix of Heliox at 6 L/min was wyed in using approximately 7 feet of oxygen tubing prior to the manifold and then wyed in at manifold. Oxygen at 2 L/min, 6 L/min, 10 L/min, and 15 L/min flows were used as the driving gas with the Heliox. The same set up was used for Nitrogen at 1 L/min except air was used as the driving gas. Each gas was measured three times and was analyzed pre and post an empty humidifier. Statistical analysis was done with a Wilcoxon Signed Rank test. RESULTS: There was a significant difference between pre and post gas analysis at the manifold for both distances (84 inches p=0.05) and at the manifold (p = 0.03). Flow was not a significant factor. CONCLUSION: The study showed that caution should be used when measuring and blending gases at the manifold before the heater.

Sponsored Research - None

Table 1 – Average of Gas Trial Runs

70/30 Heliox @ 6 L/m				Nitrogen @ 1 L/m			
O2 @ 2 L/min				Air @ 2 L/min			
Wye		Manifold		Wye		Manifold	
Pre	Post	Pre	Post	Pre	Post	Pre	Post
47.2%	47.4%	51.7%	48.4%	13.8%	13.8%	17.4%	13.6%
70/30 Heliox @ 6 L/m				Nitrogen @ 1 L/m			
O2 @ 6 L/min				Air @ 6 L/min			
Wye		Manifold		Wye		Manifold	
Pre	Post	Pre	Post	Pre	Post	Pre	Post
65.8%	66.6%	77.9%	66.6%	17.8%	17.8%	19.1%	17.7%
70/30 Heliox @ 6L/min				Nitrogen @ 1 L/min			
O2 @ 10 L/min				Air @ 10 L/min			
Wye		Manifold		Wye		Manifold	
Pre	Post	Pre	Post	Pre	Post	Pre	Post
73.3%	74.2%	84.4%	75.3%	18.9%	18.8%	18.8%	18.8%
70/30 Heliox @ 6 L/min				Nitrogen @ 1 L/min			
O2 @ 15 L/min				Air @ 15 L/min			
Wye		Manifold		Wye		Manifold	
Pre	Post	Pre	Post	Pre	Post	Pre	Post
77.1%	78.8%	83.3%	79.6%	19.4%	19.5%	19.0%	19.4%

1734028

COMPARISON OF OXYGEN DELIVERY PERFORMANCE IN THREE NON-REBREATHING MASKS USING A MODIFIED VERSION OF THE ALVEOLAR AIR EQUATION.

Joseph Baclian[2], Leah Hacker[1], Joanna Hamelink[1], Doug Pursley[1], Aaron Light[1], Rachel McGrath[1]; [1]Ozarks Technical Community College, Springfield, MO; [2]Respiratory Care Department, CoxHealth, Springfield, MO

Background: Non-rebreathing masks (NRBM) are manufactured in a variety of configurations, primarily relating to the number of one-way cheek valves, composition of the plastic, shape of the mask itself, and thickness of the reservoir bag. We sought to determine if variations in the design of three commercially available masks affected delivered FIO2 in young, healthy individuals with normal diffusion across the alveolar-capillary membrane. Methodology: After obtaining IRB approval from our institution, we recruited 18 healthy adults with a mean age of 25.7 years into our study. All participants were required to be less than 35 years of age, have a DLCO value of 90% of predicted or greater, be a non-smoker, and have no history of lung disease. Individuals meeting these criteria were then seated, and randomly placed on an AirLife, Hudson, or Westmed NRBM. Subjects were instructed to relax, breathe normally, and not talk for a period of 15 minutes. The NRBMs were operated at 15 L/m. During the testing period, all subjects were observed to perform quiet, restful breathing. At the end of the fifteen minute period, we performed a radial artery blood gas and measured pH, PaCO2, and PaO2 using a GEM 4000 blood gas analyzer. No air bubbles were observed in any of the syringes and all samples were analyzed within five minutes. Assuming that our young, healthy subjects had normal cardiopulmonary anatomy and physiology, we estimated PAO2 by dividing PaO2 by a normal a/A ratio of 0.9 to reflect a ten percent higher partial pressure of oxygen in the alveoli than in arterial blood. Knowing approximate PAO2, we then calculated FIO2 by the following formula: FIO2 = [(PaO2 ÷ 0.9) + (PaCO2 x 1.20)] ÷ (PB - 47). Results were recorded and analyzed using ANOVA with significance determined by a pValue <0.05 Results: 5 males and 13 females were tested. 6 subjects were tested on each mask. The mean FiO2 produced by the Airlife was 66.97 (Stdev 8.32), Hudson 72.24 (Stdev 29.07), and Westmed 72.18 (Stdev 12.74). The subjects had a mean PaCO2 of 37 mmHg and mean DLCO of 109.63% of predicted. Conclusion: The three NRBMs we tested had slight differences in design. The AirLife had one cheek valve, the Hudson had two cheek valves, and the Westmed had two cheek valves with a thinner plastic reservoir. There were also minor variations in the shape of the masks. Regardless of design, we found there was no statistically significant difference in FiO2 produced by any of the three masks.

Sponsored Research - None

1733958

HIGH FLOW OXYGEN DEVICES AND NOISE LEVEL SAFETY.

Mary Ann Couture, Courtney E. Malone; Respiratory Care, Hartford Hospital, Hartford, CT

BACKGROUND: Various configurations of mask and nasal cannula with heated high flow oxygen devices (HF) and large volume nebulizers (LVN) at high liter flows are becoming popular in the treatment of hypoxic respiratory failure. While there is little information on the safety of these devices, we heard of 2 patients with severe hearing loss and using different HF devices complain that their hearing aids (HA) were not working efficiently. HA sound levels were restored when the oxygen devices were discontinued. We looked at the decibel range (dB) of heated HF and cool devices including a standard LVN as a control. METHODS: We used an A-weighted sound level meter and followed OSHA recommendations for a noise survey. Samples were taken from the ear location on a manikin and then from several points of the HF and LVN interfaces. Inter-rater agreement was performed with each assessment. Measured devices include mask and nasal cannula (NC) for the Fisher & Paykel (F/P) with Bird or Maxtec blenders, and 2 different LVNs with mask at 10 and 14L, respectively. RESULTS: Mean dB levels from various flow rates, O2 ranges, and mask or NC between different devices are shown in the Table. The highest dB ranges start at the flow meter and attenuate down the circuit. DISCUSSION: A literature review showed that HAs have complex programming specific to the individual person. HAs may have binaural processing to send sound from ear-to-ear, and customized sound filtering. HAs should have limited exposure to humidity. OSHA recommends limiting time exposure at > 85 dB, which may cause permanent hearing loss. At 80 dB the allowable recommended exposure is 24 hours. Noise levels at 70 dB can be compared to a vacuum cleaner. CONCLUSION: When using HF devices on patients with HAs, it may be prudent to notify them of potential HA noise reduction, which will resolve upon discontinuation of the HF. Noise exposure is high at the flow meter, which should be kept away from the patient.

Sponsored Research - None

Decibel ranges for high flow and large volume nebulizer devices

Device	Flow meter	Between device and proximal hose	Mask or nasal cannula	Ear level
F/P with Bird blender at 30L with O2 50-95%	105	76 (71-81) 91	76.9 (70-83)‡	64.5 (64-65)
F/P with Maxtec blender at 30, 40 & 50 L with O2 50-95%	81.5 (81-82)	68 (66-70)	66.7 (62-73)‡	65.3 (60-72)
LVN AirLife, (Care Fusion) at 10L with O2 40 & 90%	112	91	72●	72 (71-73)
LVN Thera-Mist (Smiths) at 14L with O2 40% & 90%	105	85.7 (80-93)	66 ●	62.3 (57-66) †
			‡ nasal cannula had the lower dB ● mask only	† lowest % had the highest dB

Sound level measurements are dB mean and (range)

1711933

UTILIZATION OF RT SERVICES IN ACADEMIC MEDICAL CENTER ADULT EMERGENCY DEPARTMENTS.

Matthew Trojanowski, Pedro Mendez-Tellez; The Johns Hopkins Hospital, Baltimore, MD

BACKGROUND: The provision of adequate respiratory care to patients in the adult emergency department (ED) is an important responsibility of respiratory therapy (RT) departments. Unfortunately, staffing limitations often restrict which services, and potentially the quality of those services, that an RT department can consistently provide to this vulnerable group of patients. We hypothesized that a large percentage of RT work in the ED is unaccounted for in billing data, and that alternative means for workload measurement are needed to justify the need for appropriate staffing resources in the ED. METHODS: Contact information for 133 academic medical centers was obtained through the UHC database. An anonymous survey (Google Docs) was sent to department managers at these facilities. 14 e-mail addresses were invalid, and 6 participants did not meet inclusion criteria based on their responses. Of the remaining 113 institutions a response rate of 58.41% (n = 66) was achieved. Participants were asked to identify services performed in the ED and whether or not those services are billable. In addition, participants were asked if they include ED workload in their productivity calculations. Survey responses were compiled in Excel for analysis. RESULTS: The mean number of ED beds was 50.98. 65.15% (n = 43) of participants indicated that the RT providing services to the ED carries an additional assignment. 62.12% (n = 41) of participants indicated that they include ED workload in productivity calculations. The remaining results for procedures and billing practices are summarized in table 1. CONCLUSION: It appears that there is wide variation among the number of RT services provided to the ED within a given institution. Billing practices also varied widely and a measurable portion of tasks are not eligible for billing. Given that a significant amount of RT services in the ED are unaccounted for, it is crucial for departments to develop a robust productivity system that accurately demonstrates the value of RT services in the ED. Because billing regulations are often beyond the control of RT department leaders, it is critical for managers to implement validated measurement systems to accurately capture workload in the ED to justify necessary staffing resources.

Sponsored Research - None

Table I. Services Provided and Services Billed

Service	# of participating hospitals providing service	% of participating hospitals providing service	# of participating hospitals providing service that are able to bill for service	% of participating hospitals providing service that are able to bill for service
Intubation/Assist	58	87.88	24	41.38
Extubation	55	83.33	10	18.18
CPAP/BiPAP	66	100.00	58	87.88
Mechanical Ventilation	66	100.00	57	86.36
Spontaneous Mechanics	44	66.67	19	43.18
Continuous Nebulizers	59	89.39	48	81.36
Bronchodilator Treatments	54	81.82	50	92.59
ABG Sampling	49	74.24	38	77.55
Oxygen Therapy	42	63.64	15	35.71
Pulmonary Hygiene	38	57.58	25	65.79
Tracheostomy Care	37	56.06	17	45.95

1732111

THE PREVALENCE OF WORKPLACE BULLYING AMONG RESPIRATORY THERAPISTS IN OHIO.

Sarah M. Varekojis, Jessica Haines, Kali Moore, Kieran Suminski; The Ohio State University, Columbus, OH

Background: There have been many studies conducted regarding the prevalence and effects of workplace bullying in the nursing field. Workplace bullying affects self-esteem, job satisfaction and patient care. Working environments for respiratory therapists are similar to nurses, but there has been no research conducted on the subject of workplace bullying among respiratory therapists. The purpose of this study was to determine the prevalence of workplace bullying among respiratory therapists in Ohio. Methods: We used the Negative Acts Questionnaire-Revised (NAQ-R) survey instrument to measure the prevalence of workplace bullying among staff respiratory therapists. The instrument includes a 5-point weighted Likert-type scale and several additional descriptive questions. A link to the electronic survey was emailed to all licensed respiratory therapists in the State of Ohio (n = 7,363) using the Ohio Society for Respiratory Care (OSRC) database. Results: We received 897 responses (12.2%), with 611 (8.3%) of these being from staff therapists who were eligible to complete the remainder of the survey. 173 participants experienced bullying (weekly or daily experience of 2 or more NAQ-R items), and therapists employed at smaller hospitals experience bullying less frequently (P = .038). The mean NAQ-R summary score was significantly higher for those that were bullied versus those that were not (P = 0.00). About 50% of participants correctly perceived that they did not experience any bullying at work, while only about 7.6% correctly perceived that they experienced bullying at work. Conclusion: Respiratory therapists do experience workplace bullying, at a rate similar to that reported in nursing literature. The extreme difference in mean NAQ-R summary score between those that experience bullying and those that do not indicates that when bullying is present it is relatively severe. Despite this, only a small portion of respiratory therapists that were bullied at work accurately perceived the extent of the bullying. Workplace bullying among respiratory therapists warrants further exploration regarding consequences to the individual as well as to the patients and healthcare facilities.

Sponsored Research - None

1732958

RESPIRATORY THERAPY STAFFING AND PATIENT SAFETY IN OHIO.

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Background: Staffing of RT departments impact patient safety, cost, provider satisfaction, and overall quality of care. Previous research has shown that RT departments may have inadequate staffing levels due to utilizing inappropriate staffing models. The purpose of this study was to gather information from RT department directors/managers in Ohio to determine general staffing levels and practices specific to the state. Methods: Respiratory Therapy department directors or managers at adult and pediatric inpatient acute care hospitals identified by The Ohio Hospital Association were contacted via phone to explain the study and request participation. Following agreement, a link to the online survey instrument was sent via email. The North Carolina Respiratory Care Board originally designed the survey. Information regarding staffing levels, methods of determining staffing, perceptions of understaffing, patient safety issues due to understaffing, and therapist to ventilated patient ratio was collected. Results: Of the 153 hospitals contacted, 78 completed the survey, resulting in a 51% response rate. The results indicated 32.1% of departments did not have adequate staff to meet the needs of their patients over the past year and 25.6% reported chronic understaffing in the past year. 39% - 47% of respondents reported using metrics to determine staffing that are not recommended by the AARC's "White Paper on Productivity and Staffing", while only 19% reported using the AARC's Relative Value Units (RVUs) to determine adequate staffing. 23.9% of respondents identified patient safety issues due to understaffing, and 95.8% felt professional judgment of respiratory care management/supervisors was needed to determine safe staffing levels. Conclusion: Several issues of concern related to adequate staffing of RT departments and patient safety were identified by this study. The results of this study, in conjunction with the AARC's "White Paper on Productivity and Staffing", are intended to assist the Ohio Respiratory Care Board in the development of a position statement relative to the role of the RT department director/manager in determining appropriate staffing to ensure patient safety. The authors would like to thank Mr. Dan Grady and the NCRCB for their collaboration on this project.

Sponsored Research - None

1732936

OVERCOMING BARRIERS TO RESPIRATORY THERAPIST ENGAGEMENT IN IMPLEMENTATION OF THE ABCDE BUNDLE.

Meg Blankinship[1], Alan Yee[1], Alan Cubre[2], Tamra L. Kelly[2,3], Deborah Massey[1], Kelly Switzler[2], Leticia Hampel[4], Heidi Reams[3], Maria Goettle[1], Andrea Papavisit[1], Tanya Kapitula[2], Tim Sammons[5], Chris Chaney[6]; [1]Pulmonary Services Department, Sutter Medical Center Sacramento, Sacramento, CA; [2]Cardiopulmonary Department, Sutter Roseville Medical Center, Roseville, CA; [3]Cardiopulmonary Services Department, Sutter Auburn Faith Hospital, Auburn, CA; [4]Cardiopulmonary Department, Sutter Davis Hospital, Davis, CA; [5]Cardiopulmonary Department, Sutter Amador Hospital, Jackson, CA; [6]Chris Chaney, Sutter Solano Medical Center, Solano, CA

Background: The American College of Critical Care Medicine (ACCM) has developed a clinical practice guideline for the management of pain, agitation, and delirium in adult patients in the Intensive Care Unit. This guideline is based on evidence that critically ill patients are at risk for development of dangerous conditions such as ICU delirium and weakness. The RT departments in our hospital system collaborated to implement an interprofessional bundle approach to reduce these adverse events. Respiratory Therapists identified barriers to this project including workload and productivity concerns, fear of patient discomfort, and fear of inadvertent extubation during awakening and mobility. Methods: To overcome these barriers a variety of methods were used to engage staff. Staff were invited to attend an educational symposium where experts presented data on the adverse events caused by current ICU care methods. Volunteers were solicited to be champions of the ABCDE bundle project and were trained on team building and use of resources to gather evidence to promote evidence based best practices. The volunteers worked to develop order sets and procedures to promote best practices such as daily rounds, delirium assessments, correct medication selection, daily awakening and spontaneous breathing trials and early mobility. Historically we tracked ventilator length of stay, we added re-intubation rate to our tracking as a balancing measure. To ensure workload neutrality we decreased routine ventilator monitoring from every 2 hours to every 4 hours. Results: Since implementation, daily interprofessional rounds are occurring, standardized scales are now being used to assess delirium and sedation levels, criteria for pain and sedation medication has been modified, daily awakening and SBT's are being performed and patients who meet safety screening criteria are being mobilized. Patients are more awake and participating in ventilator weaning trials and mobilization. Ventilator length of stay has decreased with no increase in re-intubation rate. Conclusion: The ABCDE bundle was successfully implemented with high quality clinical outcomes. Management, clinical leaders and staff worked in tandem to remove barriers in conjunction with staff engagement which was critical to successful implementation. Further study is needed to evaluate participation and engagement in use of the bundle.

Sponsored Research - None

1733145

HIGH PLATEAU PRESSURE - A PREDICTOR OF HIGH MORTALITY AND MORBIDITY IN MECHANICALLY VENTILATED PATIENTS.

Cherian K. Paily, Richard Wunderink, Nicole Willis; Respiratory Care, Northwestern Memorial Hospital, Chicago, IL

BACKGROUND: Mechanically ventilated patients are at higher risk of acute lung injury (ALI). Patients with ARDS or severe pneumonia may present with high Plateau Pressures. Plateau Pressure or PEI is the pressure measured at the smaller airways; it can be referred to as alveolar pressure. High plateau pressures cause excessive stretch of alveoli which leads to ALI. Plateau pressures >30 cm H2O can be fatal unlike Peak Inspiratory Pressure (PIP), which is the pressure measured at the larger airways and is not fatal compared to plateau pressure. METHOD: Between September 2011 and December 2012, we studied over 150 patients who have been intubated and mechanically ventilated for impending/acute ventilatory failure. Patients ranged in age from 21 to 93 years, both males and females. All patients have been ventilated for > 3 days. Many patients were also diagnosed with other conditions such as sepsis; cancer, COPD/ Asthma, neuromuscular diseases, nosocomial infections, HAP and VAP. All patients have been ventilated using Puritan Bennett 840 series ventilators. Patients were receiving bronchodilators and secretion mobilization therapies in addition to appropriate antibiotics based on culture and sensitivity findings mostly from Non-Bronchoscopic Bronchial Alveolar Lavage.Plateu pressures were measured Q4 hrs through inspiratory pause functionality in PB 840 ventilator. RESULTS: Patients were categorized into four groups: Patients whose plateau pressures were normal, i.e. < 28 cwp in range 1; patients whose plateau pressures were 30- 35 cwp in range 2; patients whose plateau pressures were 35 - 40 cwp in range 3 and patients whose plateau pressures were greater than 40 cwp in range 4. From a respiratory standpoint, patients whose plateau pressures were in the 20s were able to be weaned off the ventilator and were extubated within a week. However, patients whose plateau pressures remained in the 30- 35cwp range had a mortality rate of 60- 80%; 35- 40 cwp range had a mortality rate of 80-90% and patients whose plateau pressures were greater than 40 cwp had a mortality rate of almost 100%. CONCLUSIONS: We conclude that from a respiratory stand point, it is vital to try to keep the plateau pressures below 28 cwp, by preventing VAP and other respiratory infections. Early interventions such as culture and sensitivity, lung protective strategies, ARDS protocols, early diagnosis and treatments are very important to prevent patients from irreversible conditions.

Sponsored Research - None

Plateau Pressure as Predictor of high Mortality and Morbidity

Range 1	PEI < 30 cwp	VAP; PNA treatable	Weaned off the vent.
Range 2	PEI 30- 35 cwp	VAP; PNA acute	Weaned off vent with difficulty. 60-80% mortality.
Range 3	PEI 35- 40 cwp	VAP, PNA severe	Unable to be weaned off the vent. 80- 90% mortality.
Range 4	PEI > 40cwp	VAP, PNA unresponsive to Txs	100% mortality.

High Plateu Pressures, 35- 40 cwp, poise 80- 100% mortality.

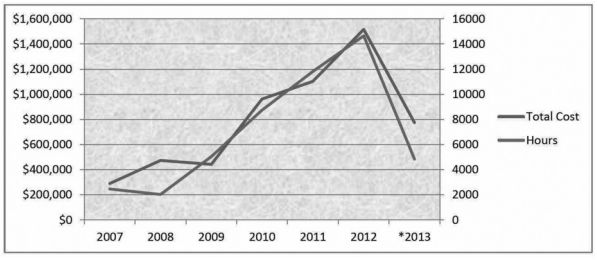
1733242

THE REDUCTION OF NITRIC OXIDE UTILIZATION IN AN ADULT POPULATION: AN EXAMPLE OF COLLABORATION PRODUCING COST SAVINGS.

Peggy Watts, Thomas M. Schaltenbrand, Darnetta Clinkscale; Respiratory Care Services, Barnes-Jewish Hospital, St. Louis, MO

Background: Nitric oxide is a costly selective pulmonary vasodilating agent used in the management of pulmonary artery hypertension. The team's collaboration focused on maintaining quality of care while reducing cost. It has been well documented that there are more cost effective alternatives to nitric oxide, such as epoprostenol. 2007 to 2012 data revealed a 523% increase in the cost of nitric oxide with a 594% increase in utilization. Our efforts to curb the costs has targeted towards reducing the use of nitric oxide under an hourly contract. There was a spike in use in the past two years since Barnes-Jewish Hospital selected an unlimited usage contract. With the recent historical usage in mind it was imperative that we reduced the utilization of nitric oxide to realize any financial benefits from an hourly contract. Methods: In order to see reductions in the use and cost of nitric oxide, Barnes-Jewish Hospital presented a unified strategy to all stakeholders who use this drug. Respiratory Care Services policies were revised which included a component to educate and direct staff at the time of order to query the ordering physician's choice. Additionally, practices were changed to rapidly assess if the agent was of benefit to the patient. Utilization data was shared with physician leadership in an ongoing basis. Physicians, respiratory care practitioners and leadership were motivated and energized to see real reductions in cost secondary to reduced utilization of nitric oxide. Evidenced-based research served as the foundation of our efforts. This coupled with historical use and contractual changes served as the over-arching motivation for our improvement efforts. Results: Initial results have been dramatic. As of April 30, 2013, we have successfully reduced the use of nitric oxide by 51% of budget; and, should current trends continue, we will reduce our projected costs by ~$700,000. Conclusion: Evidenced-based medicine and effective collaboration with stakeholders lead this hospital on a path of meaningful change in its utilization and cost of nitric oxide.

Sponsored Research - None



1733494

PROTOCOL BASED RESPIRATORY CARE SERVICES - NOT NECESSARILY THE EXPECTED RESULTS...

Russell E. Graham, Michael Bernstein, Roberta Melton, Adrianne Gentry, Stanley Rhone; Respiratory Care, Memorial Hermann - Texas Medical Center, Houston, TX

Background: Resource utilization has been and remains a major issue in Respiratory Care (RC). RC literature provides an abundant supply of articles as recently as March 2013 to support the need for Patient/Therapist Driven Protocols(1). Most findings have shown a decrease in total number of procedures performed, supporting the theory of misallocation of RC Services within the hospital(2). Our RC Department sought to implement Protocol-Based RC services (PBRCS) to decrease the misallocation of care within our institution. Our findings, while positive, have not supported the trend towards decreased procedures. Methodology: Ongoing retrospective data review of workload statistics. Our facility has initiated the conversion to PBRCS, implementing protocols for Oxygen, Medicated Aerosol, and Volume Expansion in October of 2012. These protocols include both a flowchart and scoring matrix was developed to determine type/frequency of care based on a comprehensive Patient Assessment, which is performed by each shift. Therapists and Physicians are given the option to opt patients out of the Protocols at their discretion based on clinical condition. Data for the same 6 month time period of two consecutive years was compared to ensure accuracy for seasonal variation. Findings: The total procedure count remained statistically unchanged, dropping by only 0.5% for the compared period. By category, Volume Expansion actually increased (6%), while Medicated Aerosol and Oxygen both decreased (6% and 8%, respectively). Conclusions: In our institution, we have found that Protocol Based Respiratory Care Services has not significantly diminished the workload. Given the added time necessary to perform the comprehensive assessment, our workload has in all probability increased. Our findings appear to support the misallocation of resources when compared to traditionally ordered services when individual procedure categories are compared. Our institution has noted an improvement in staff morale as well as a sharp increase in Patient Satisfaction. It is unknown exactly what role PBRCS has played in this. Further study, including outcomes comparison(s) is indicated. 1 Respir Care, March 2013 58:3, 431-437 2 Respir Care, July 2004 49:7, 761-765

Sponsored Research - None

1733401

MANAGEMENT VS. STAFF HIRING COMMITTEE: DOES IT HAVE AN EFFECT ON RETENSION AND STAFF MORALE IN AN ACADEMIC CENTER.

Bhavisha Patel, Clarence Finch; Respiratory Care, The University of Texas MD Anderson Cancer Center, Houston, TX

BACKGROUND: The Affordable Care Act has the left the healthcare industry undergoing substantial transformations. The need for proper talent management has and will become increasingly important in relations to long and short term goals, retention and recruitment. Traditionally, new candidates were interviewed and selected by members of management. Over the past few years, the Respiratory Care Department at M.D. Anderson Cancer Center has seen a decline in staff retention rates specifically within the first two years of employment. We hypothesize that through the development of a hiring committee, the one and two year rate of both voluntary and involuntary termination would decrease. METHOD/INTERVENTION: In March 2012, a staff hiring committee (HC) was formed and composed of individuals of varying years of service, level of experience, and fields of expertise. Members had no previous experience with the departmental hiring process. The members met with a Human Resources (HR) consultant to discuss the interview process and any legal concerns. A new behavioral based questionnaire that incorporated the institutional core values was created. The questionnaire focused on analytical thinking, work ethic, along with the qualities and characteristics staff seeks in choosing a department. Offers for employment were made to candidates with the highest scores. On their first day, the new hire was met by a member of the HC for lunch followed by the tour of the hospital & department, ending with introductions to staff and members of the management team. In addition, the new hires were subsequently paired with a member of the HC for orientation and to be their Mentor. RESULTS: After implementation of the HC in March 2012, a total of 50 interviews were conducted, resulting in employment offers to 18 candidates with a percent change in the one year retention rate of 55% post implementation of the hiring committee (13.15% to 5.69%). CONCLUSION: The development of a staff lead hiring committee proves to be an invaluable tool allowing staff to have ownership in the selection process, strengthens transitional bonds between old and new staff making the adjustment period easier thus leading to an increase overall staff morale. A continued analysis is warranted to evaluate sustainability.

Sponsored Research - None

17733632

EVALUATION OF A STAFF HIRING COMMITTEE: ONE YEAR POST IMPLEMENTATION.

Bhavisha Patel, Jorge Rodriguez, Clarence Finch; Respiratory Care, The University of Texas MD Anderson Cancer Center, Houston, TX

INTRODUCTION: The process of hiring is often tedious. A good understanding of your departments' culture should be a good starting point. Although a new hired employee doesn't guarantee satisfactory performance nor peer harmony historically the process is often left to the responsibility of the management team. Due to high turn-over rates we established a staff driven hiring committee (HC) in March 2012 with the objective in one (1) year to survey the HC and new employee of its performance. METHODS/INTERVENTION: Thirteen (13) staff members volunteered to participate on the hiring committee. No members had any previous hiring experience. All applications were forwarded to the HC chair who would then disburse the resume's to the members. As each candidate completed his/her interview the HC would score the candidate using the ranking on the questionnaire. Fifty (50) candidates were interviewed during one year period resulting in addition of eighteen (18) new members. At the one (1) year period a survey was provided to both the newly hired employee and the HC to evaluate its effectiveness. RESULTS: The survey yield a participation rate of 80% vs 83% between the new hires and HC respectively. Ninety one (91) percent of the new hires felt welcomed as compared with other institutional interviews. Regarding one year compatibility analysis 100% new hires felt compatible with other members in the department and 80% of the HC felt that the new hires were compatible. Regarding committee participation, 91% of the new hires would like to become a member of the HC compared to 80% of the current HC would like to continue participating. Ninety (90) percent of the HC members also either strongly agree or agree that they feel more empowered in knowing that the management team trusts their ability to select quality new hire. CONCLUSION: The use of a staff lead HC and behavioral trait questionnaire may improve the overall selection of new hires. HC members may be more critical in their evaluation and unlikely to overlook key aspects. Candidates may be less guarded during the interview process speaking to non-managerial staff. Overall, 100% of the HC members agree that they feel great about the new hiring process.

Sponsored Research - None

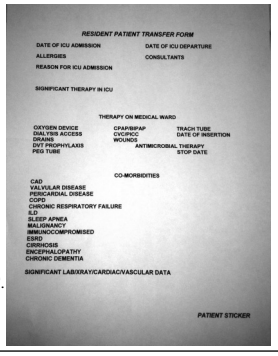
1733637

PATIENT HANDOVER PROTOCOL FROM INTENSIVE CARE UNIT, EFFECT ON INTENSIVE CARE UNIT READMISSION RATE, AND PREDICTABILITY OF CLINICAL VARIABLES IN INTENSIVE CARE UNIT READMITTED PATIENTS.

John Frattini, Bhavna Desai; St. Luke's Hospital, Chesterfield, MO

Background: Transition of healthcare from intensive care unit (ICU) to medical ward is a critical handover for physicians, nurses, and therapists. Patient decompensation may result in readmission to ICU. ICU readmission will have a negative impact on a patient's outcome, resulting in longer ICU and hospital length of stay, and higher morbidity and mortality. Patient handover protocols are not currently standardized. We believe improved patient handover between physicians will enhance patient care, lower ICU readmission rate, and foster collegial medical discussion and learning. Method: We prospectively studied a handover protocol in medically ill patients, between ICU and medical ward. We utilized written and verbal handover between ICU and ward residents, We hypothesized that written and face to face verbal handover between internal medicine residents would lower ICU monthly readmission rate. We used readmission data from the same months during previous year as a comparison group. We studied all patients admitted to an ICU from September 2012 until December 2012. Readmitted patients during this time were initially admitted to ICU, transferred to ward, and then readmitted to same ICU. We excluded all palliative care patients. We also reviewed characteristics in both readmitted patient groups to identify variables, which might have predicted readmission to ICU, prior to transfer to ward. We reviewed over fifty variables including demographic data, co-morbid conditions, vital signs, clinical and laboratory data. Results: We admitted 175 patients to ICU during 91 day period. Ten patients were readmitted. September readmission rate was 7.1% (3/42), October readmission rate was 7.5% (5/67), and November readmission rate was 3.1% (2/65). The average monthly ICU readmission rate was 5.9%. The comparison group ICU monthly readmission rate was 3.6% with a range 0% to 10%. We found no specific variable (P<0.05 two tail t test) which would have predicted a readmission to ICU. Conclusion: Although no statistically significant result was obtained, our protocol had a more favorable readmission rate range. We need more study to substantially lower ICU readmission rates and to predict ICU patient readmission.

Sponsored Research - None


RESIDENT PATIENT TRANSFER FORM

DATE OF ICU ADMISSION
DATE OF ICU DEPARTURE
ALLERGIES
CONSULTANTS
REASON FOR ICU ADMISSION
SIGNIFICANT THERAPY IN ICU
THERAPY ON MEDICAL WARD
OXYGEN DEVICE
DIALYSIS ACCESS
FOLEY
DVT PROPHYLAXIS
PEG TUBE
CPAP/BIPAP
CVC/PICC
WOUNDS
TRACH TUBE
DATE OF INSERTION
ANTIMICROBIAL THERAPY
STOP DATE
CO-MORBIDITIES
CAD
VALVULAR DISEASE
PERICARDIAL DISEASE
COPD
CHRONIC RESPIRATORY FAILURE
ILD
SLEEP APNEA
MALIGNANCY
IMMUNOCOMPROMISED
ESRD
CIRRHOSIS
ENCEPHALOPATHY
CHRONIC DEMENTIA
SIGNIFICANT LAB/XRAY/CARDIAC/VASCULAR DATA
PATIENT STICKER

SAMPLE PATIENT TRANSFER FORM USED FOR HANDOVER PROTOCOL FROM ICU RESIDENT TO WARD RESIDENT. RESIDENT CAN MAKE OVERSIZE INDEX CARD FOR EACH PATIENT.

1734031

THE IMPACT OF TRANSITIONING FROM A WEIGHTED TIME STANDARD SYSTEM TO DETERMINE FTE REQUIREMENTS.

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Introduction: Since 1994 UCSD Medical Center utilized time weighted units of service to quantify the monthly variability in service demand and determine the number of staff required. Staffing requirements were reflected in the flex budget as Full Time Equivalents (FTE). Use of weighted metrics associated with statistical valid time standards allowed for determination of necessary staff and the provision of services within the guidelines contained in the AARC Uniform Reporting Manual. In 2012 our Finance Department implemented a non-weighted flex budget accounting system. In addition, procedures counted were limited to only those included in the Ambulatory Payment Classification group used by the Centers for Medicare/Medicaid. Using this method, limited subsets of procedure were counted and all had an identical time based relative value unit. To evaluate the ability of the new system to appropriately determine FTE requirements, we tracked and compared the monthly variability of units of service used to predict FTEs by both systems. Methods: Procedure counts were generated through the Respiratory Care Management Information System from July 2012 to March 2013 and data integrated into an Excel spreadsheet. The spreadsheet was configured to generated both weighted and non-weighted metrics. The monthly variability in units of service were compared by a Bland-Altman plot. Results: The non-weighted method differed substantially from the weighted method. The 95% limits of agreement in monthly variability between the two methods was from -16.0% to +19.0%. There was a bias towards overestimation of the month-to-month variability by the non-weighted system of 1.5% (SD 8.9%) of the total hours. Discussion: Using a non-weighted model with a limited sub-set of data to determine staffing needs frequently resulted in overestimated or underestimated of FTE requirements. Non-weighted systems can increase the potential to overstaff or understaff the department. We recommend that respiratory care staffing requirements be determined by the use of statistically valid time standards in which procedures that significantly drive labor be counted. The ability of departments to maintain such data through internal systems is of benefit as hospital financial systems are refined.

Sponsored Research - None

1733867

AXILLARY TEMPERATURE IN INFANTS UNDERGOING CHEST CT AND PULMONARY FUNCTION TESTING.

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Background: Monitoring body temperature is an important practice in hospitalized infants. However, when infants are transported to other hospital locations, are measures being taken to prevent heat loss and falls in temperature? We regularly transport infants to the CT suite and infant pulmonary function testing (IPFT) lab for clinical studies. To prevent overheating of the scanner, the CT suite is kept cool. During transport monitoring, we noticed that infant temperatures frequently declined during chest CT scanning. Methods: Temperatures were monitored using a skin temperature probe (Phillips Medical Systems, Andover, MA) placed in the axilla. Two groups were monitored: 1) infants undergoing testing in the CT suite and then the IPFT lab (Group A, CT then IPFT) and 2) infants undergoing testing in only the IPFT lab (Group B, IPFT only). Temperatures, in °C, were recorded for Group A at baseline, leaving the CT suite, leaving the IPFT lab and arriving back in the room and for Group B, at baseline, leaving the IPFT lab and arriving back in the room. Environmental temperatures were recorded in the hospital room, CT suite and IPFT lab. Age, weight and height were recorded. The significance of changes in temperature between groups and locations were evaluated using Mann-Whitney Rank Sum tests. Results: Twenty seven infants were monitored, 14 in Group A (age 41±33 wks) and 13 in Group B (age 50±16 wks). For Group A the mean temperature in infant rooms was 23.2, CT suite 20.8 and IPFT lab 23.0. For Group B temperature in the room was 22.2 and IPFT lab 22.3. Infants in Group A (CT then IPFT) had a decline in mean temperature from 36.1 (baseline) to 35.0 (leaving CT), a change of -1.1 °C. Temperature did not return to baseline during the IPFTs and was 35.3 on arrival back in the room. Infants in Group B (IPFT only), had a temperature of 36.1 at baseline, 36.0 leaving the IPFT lab and 36.1 on returning the room. The pre/post CT changes in temperature in Group A differed significantly from the pre/post IPFT changes in Group B ($p<0.001$). Conclusions: These results demonstrate that infants leaving their rooms for chest CT imaging have significant declines in axillary temperature compared to infants undergoing IPFTs only. Temperature declines during chest CT imaging failed to return to their baseline temperature levels during IPFT testing. These data suggest that measures to prevent heat loss in infants undergoing chest CT imaging need be investigated.

Sponsored Research - None

1733424

RESPIRATORY THERAPISTS CAN IMPACT THE INTENSIVE CARE NURSERY BY PRACTICING DEVELOPMENTAL CARE THROUGH SOUND REDUCTION.

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Background: Noise generated by respiratory equipment and related procedures in the Neonatal Intensive Care Unit (NICU) often exceed the recommended 45 dB limit. Noise is an environmental stressor that has been shown to negatively impact the vulnerable preterm infant. These negative effects include apnea, bradycardia, tachycardia, tachypnea, and increased caloric requirements needed for growth and healing. The preterm infant is also unable to produce sufficient amounts of cortisol when under stress (physical as well as environmental). This can lead to insufficient suppression of pulmonary inflammation and free radical oxidative damage predisposing to chronic lung disease. The objective of this study was to better quantify sound levels of various equipment/procedures in the NICU. Methods: Seven respiratory care patient encounter types were monitored continuously over a 5 minute period, both with and without a sound reducing intervention. The following devices/procedures were studied: 1) Airlife CPAP System, 2) Bunnell Jet Ventilator, 3) Drager 8000 Ventilator, 4) Drager isolette, and 5) Neosucker/suction tubing. Sound data were collected using a SL-814 digital sound monitor. We compared data points using the non-parametric Wilcoxon Rank Sum Test (STATA 12). We considered $p< 0.05$ statistically significant. Results: 10-24 observations were collected for each encounter type. Data are displayed in the table as median (5th, 95th %ile). Conclusions: Sound levels using all types of types of equipment were above 45 dB, with or without intervention. Noise reduction interventions, however, were statistically significant for each equipment type. Based on previous research, a 3 dB change equates to a sound pressure level variation of about 50%. Respiratory therapists can greatly impact their patients' exposure to noise which may promote improved clinical outcomes.

Sponsored Research - None

EQUIPMENT	SOUND LEVEL WITHOUT INTERVENTION (dB)	SOUND LEVEL WITHOUT INTERVENTION (dB)	P
Airlife CPAP System	76.9 dB (76.8,77.1) (exhalation tubing in isolette)	72.3 dB (72.1,72.4) (exhalation tubing outside isolette)	<0.001
Bunnell Jet (HFJV)	69.1 dB (68.6,69.7) (jet box uncovered in isolette)	66.7 dB (66.2,67.1) (jet box covered with 2 cloth diapers)	<0.001
Drager Isolette (removing top)	73.5 dB (68.8,77.2) (one person removing top)	67.5 dB (66.6,69.1) (two people removing top)	0.010
Drager Isolette (moving bed tray)	81.8 dB (78,85)	67.2 dB (66.7,71.2) (pulling gently, supporting tray)	<0.001
Drager Ventilator (vent on pt's right)	71.9 dB (71.5,72.5) (alarm with isolette doors open)	68.8 dB (68.4,69.2) (alarm with isolette doors closed)	<0.001
Drager Ventilator (vent on pt's left)	70.5 dB (69.7,70.7) (alarm with isolette doors open)	67.6 dB (66.7,68.2) (alarms with isolette doors closed)	<0.001
Suction Tubing / Neosucker	81.7 dB (80.1,88.5) (secretions remain in tubing)	66.3 dB (66.1,67.1) (tubing rinsed with saline)	0.009

1733654

ENDOTRACHEAL TUBE DIAMETER IS NOT A RISK FACTOR FOR EXTUBATION FAILURE IN PREMATURE INFANTS.

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BACKGROUND: Endotracheal tube (ETT) diameter and its effect on extubations have not been widely studied. We investigated if there was a difference between extubation failure and ETT diameter in neonates; our hypothesis being that there is no difference between ETT diameter (ETT) in neonatal extubation success or failure. Our secondary hypothesis is that there is no difference between Nasal CPAP (nCPAP) levels and neonatal extubation success or failure. METHODS: Retrospective chart review of neonates <33 weeks' gestational age (GA; n=78) admitted to our level 3 NICU from Jan 2011 to Nov 2012. A total of 121 planned extubations were analyzed. Data were stratified into two groups based on GA <27 weeks (n=81) or >27 weeks (n=40). ETT diameter prior to extubation and initial nCPAP level post-extubation were collected. Extubation failure was defined as reintubation within 48 hours. Criteria for reintubation included: blood gas pH < 7.20, P_{CO2} > 65 mm Hg, F_{IO2} > 0.60; apnea and bradycardia events requiring positive pressure ventilation. Data were analyzed using a two-tailed independent sample t-test. RESULTS: 121 extubations in 78 infants with a mean GA of 26.3 ± 2.3 weeks (range 23.3-33) were recorded. Mean ETT diameter at time of extubation did not differ with extubation success. The ETT diameter in infants <27 weeks' GA with successful extubation was 2.7 ± .3 mm (n=54), while those who failed extubation had 2.8 ± .3 mm (n=27; *P*=.77). Infants >27 weeks who were successfully extubated had a diameter of 2.6 ± .3 mm (n=34), while those who failed extubation had 2.7 ± .35 mm (n=6; *P*=.83). Post-extubation nCPAP level in infants less than <27 weeks was 6.7 ± 1.2 cm H2O in infants who extubated successfully vs. 7.2 ± 0.9 cm H2O in infants who failed extubation (*P*=.03). Infants who failed extubation in the < 27 weeks' GA group were smaller by an average of 349.5 g (*P*=.02). Infants >27 weeks who were extubated successfully had a post-extubation nCPAP level of 5.8 ± .90 cm H2O. Subjects who failed extubation had a nCPAP level of 6.7 ± 1.2 cm H2O (*P*=.03). There was no statistically significant difference in weight at extubation in this group (*P*=.52). CONCLUSIONS: ETT diameter is not a statistically significant factor in extubation outcomes; however, initial nCPAP level post-extubation is a significant element. Larger prospective studies are needed to evaluate if there is a relationship between ETT diameter at extubation and extubation success or failure.

Sponsored Research - None

	GA < 27 Weeks (n=81)			GA ≥ 27 weeks (n=40)		
	Success (n=54)	Failure (n=27)	*P* value	Success (n=34)	Failure (n=6)	*P* value
ETT diameter (mm)	2.7	2.8	.68	2.6	2.7	.83
nCPAP Level (cm H_2	6.7	7.2	.03*	6.7	5.8	.03*
PEEP prior to extubation (mm Hg)	5.5	5.9	.07	5.0	4.6	.24
Weight at extubation (g)	1342	992	.02*	1452	1666	.52
Duration of Intubation (days)	18.6	15.9	.42	6.6	8.4	.54

*statistically significant

1733634

MONITORING CHANGES IN TIDAL VOLUME DUE TO CHANGES IN LUNG MECHANICS ON THE VDR-4® - A BENCH MODEL.

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Background: In the neonatal/pediatric population, high frequency percussive ventilation (HFPV) is used in select patients with acute lung injury. HFPV is chosen for patients who are failing conventional mechanical ventilation and have inspissated secretions, as it reportedly has airway clearance capabilities superior to other modalities. The Volumetric Diffusive Respiration (VDR®) ventilator provides HFPV and has been successfully used for airway clearance in pediatrics and adults with severe lung injury while maintaining adequate ventilation. Lung protective strategies can be achieved using the VDR-4®; however, this remains a challenge. Not unlike other high frequency ventilators, tidal volumes are not measured and the set pressure can vary as compliance or resistance change. Since airway clearance is often a reason for the use of the VDR-4®, we hypothesize that changes in lung mechanics in the infant and pediatric lung models leads to large swings in tidal volume delivery of the convective breath in the VDR-4® with little to no recognizable changes in monitored parameters. Methods: This experiment was a bench study using the ASL 5000 Active Servo Lung Precision Breathing Simulator©. The ASL 5000 was programmed to simulate four infant lung models and four pediatric lung models utilizing two different VDR-4® ventilators and the two available circuit configurations. See table 1a for bench model details. The ventilator was set with a percussive rate of 550, convective rate of 20, I:E 1:1, i:e 1:1, inspiratory and expiratory times of 1.5 seconds, demand PEEP of 2 cm H2O, oscillatory PEEP of 8 cm H2O, FIO2 of 0.60, and nebulization on. Descriptive statistics were utilized to compare mean exhaled tidal volume measurements for convective breaths within each normal and diseased lung model, and a percent change in exhaled tidal volume from baseline was calculated at each resistance and compliance setting. Results: See table 1b for a summary of results. Conclusion: Changes in compliance and resistance change the tidal volume of convective breaths on the VDR-4® in a manner that is clinically significant. This can alter gas exchange and possibly lead to lung re-injury through volutrauma if additional precautions are not established. Further study to validate the efficacy of transcutaneous CO2 monitoring or frequent blood gas assessment as a means of detecting physiologic improvement while using the VDR-4® may be warranted to prevent further lung injury.

Sponsored Research - None

1733766

ASSESSMENT OF SAFETY OF TRACHEAL INTUBATION PRACTICE IN THE PEDIATRIC ICU AND DEVELOPMENT OF A QUALITY IMPROVEMENT BUNDLE TO REDUCE TRACHEAL INTUBATION ASSOCIATED EVENTS.

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Background: Pediatric Tracheal Intubation (TI) is hazardous and associated with adverse outcomes. A multicenter quality improvement (QI) registry of TI (National Emergency Airway Registry for Children:NEAR4KIDS) was launched in 2010 to categorize and quantify the events that occur surrounding this procedure. We hypothesized that an evidence-based QI intervention bundle could be generated for TI and tested through the NEAR4KIDS network. Method: Outcome data on 1715 TIs in 15 academic Pediatric Intensive Care Units were prospectively collected from 7/2010 to 12/2011. Sites were required to report ≥95% of TIs. Outcomes of interest was adverse tracheal intubation associated events (TIAEs) or severe TIAEs such as cardiac arrest. Univariate analyses identified variables associated with TIAEs. A multidisciplinary QI committee used those with p-values <0.1 for TIAEs to formulate a bundle checklist and pilot-tested it in 7 Units. Based on their feedback, the committee revised the bundle checklist. Results: The bundle checklist consists of 3 parts: Assessment and Planning for anticipated TI, Pre-intubation timeout, and Post-intubation huddle. The "Assessment" includes factors associated with TIAEs: history of difficult airway (p=0.04 for any TIAE), limited mouth opening (p=0.03 for severe TIAE), small thyromental space (p=0.02 for severe TIAE) or upper airway obstruction (p=0.01 for TIAE, p=0.04 for severe TIAE). Intubation for oxygen failure (p<0.001 for severe TIAE) or ventilation failure (p=0.002 for severe TIAE) and unstable hemodynamics (p=0.01 for TIAE, p<0.001 for severe TIAE). The "Planning" component included "who", "how", and "when" questions for TI and addressed training level of the provider which was associated with TIAEs. The pre-procedure timeout includes important bedside processes (role clarity, position of providers and patient, IV access, medications, appropriate monitoring, airway equipment and backup plans). The post-procedure huddle collects multidisciplinary feedback. Each site receives benchmarking report with incidence of TIAEs, severe TIAEs and number of intubations requiring three or more attempts. Conclusions: A multicenter pediatric Airway Bundle Checklist was successfully developed with ongoing deployment. Implementation of the Airway Bundle Checklist may improve the safety and quality of TI in critically ill children.

Sponsored Research - None

1733811

CAN AN AIRWAY BUNDLE CHECKLIST IMPROVE THE SAFETY OF TRACHEAL INTUBATION IN PEDIATRIC INTENSIVE CARE UNIT?

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Background: Pediatric tracheal intubation (TI) is hazardous and associated with adverse outcomes. A multicenter quality improvement (QI) registry of TI (National Emergency Airway Registry for Children: NEAR4KIDS) actively captures process and outcome data on TI in Pediatric Intensive Care Units (PICUs) to benchmark adverse tracheal intubation associated events (TIAEs). An Airway Bundle was developed by consensus to decrease the baseline TIAE rate of 20%. The bundle consists of 2 phases to improve the communication and safety surrounding TI: Airway Bundle Checklist (comprised of 3 sections performed by the bedside staff – pre-planning, pre-procedure timeout, and post-procedure huddle) and unit QI with multidisciplinary discussion. We hypothesize the Airway Bundle use will be associated with fewer TIAEs. Method: At the Children's Hospital of Philadelphia, we implemented the Airway Bundle in 1/2013. We tracked TIAEs from Jan 2010 through May 2013. Every patient admitted to the PICU with anticipated TI requires the pre-planning section. If the patient requires TI, this section is utilized to prepare for TI and the remaining two sections are completed at the bedside. We initiated the multidisciplinary process with each discipline to own a section. (Respiratory Care for pre-planning, Nurses for pre-procedure timeout and Critical Care physician for the post-procedure huddle). The Bundle compliance and TIAE rate are reported at divisional QI meeting bi-monthly. Analysis of TIAE pre-bundle vs post-bundle was accomplished by Fisher's exact, P<0.05 as significance. Results: After a 2 month implementation (March-April, 2013), we achieved 80% compliance for appropriate airway bundle usage, for patients with anticipated TI. Complete airway bundle application for those that progressed to TI was 46%. Although overall TIAE rate in the unit did not decrease (12.8%), TIs where the airway bundle was used were associated with a lower TIAE rate (p=0.07). Conclusions: Preliminary data suggests that the use of airway bundle checklists may improve the safety of TI in the PICU. Further effort is necessary to improve compliance rate and to evaluate the impact on safety.

Sponsored Research - None

Bundle use vs. incidence of TIAEs

Bundle checklist used?	TIAE	No TIAE
Checklist used	2 (8%)	22 (92%)
Not used	13 (28%)	34 (72%)

1733820

CAN A NEBULIZER BE USED TO DELIVER HIGH FREQUENCY HIGH FLOW NASAL CANNULA ($(HF)_2NC$) VENTILATION?

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Introduction: The Vortan Percussive NEB™ (P-NEB) is a compact, disposable high frequency intrapulmonary percussive nebulizer for the clearance of endobronchial secretions in adults. According to the specification, "During exhalation the pneumatic capacitor and pulmonary modulator cycle to deliver high frequency (typically 11-30 Hz) pressure bursts to provide an effective intrapulmonary percussion treatment." We demonstrated the potential for HFV using this device (Snowbird 2013), but noted that the PEEP levels produced might not support its use in situations where more pressure was required. Hypothesis: We asked if the P-NEB produced adequate flow to use as a ($(HF)_2NC$) device. Materials and Methods: Wall flow was connected to the P-NEB. The P-NEB outlet was connected in parallel with a Fleisch pnuemotachograph connected to Validyne Flow and Pressure transducers. Flow to the P-NEB was varied from 35-50 LPM while the nebulizer "bias" control was "twisted" to its maximal setting. The exit port of the pneumotachograph was occluded to simulate low compliance. Data was sampled at 1kHz using Easy Sense (Validyne) and analyzed in Matlab R2012b(8.0.0.783) (The Mathworks, Inc.) using Signal Processing Toolbox 6.18. Data was analyzed using Statistica 10 (StatSoft, Inc. (2011). STATISTICA, version 10. www.statsoft.com). Results: As shown graphically for the 50 LPM setting, changes in the bias flow produced significant flow perturbations as well as a logarithmic increase in positive duty (proportion of time in high flow) with increased "twists". Frequency varied from 7.5 to 47 Hz. Discussion: Although the mean airway pressure has been shown to be at low end, there may be application of this technology to nasal ventilation. Although high frequency nasal ventilation has been studied, it has only been described using pressure settings. These results demonstrate the feasibility of a nasal cannula flow based oscillation using the P-neb, which provides flow based nebulizer treatments. The frequency range measured extends beyond the specification and may enhance the usefulness of the device. At 35 LPM (below stated minimum flow), the dynamic appeared flow "starved". At the higher flow (50 LPM), there may not be enough flow entrainment for larger pediatric or adult patients. Conclusion: Although the P-NEB may not have enough flow to provide useful ventilation in all situations, its ability to generate an oscillating flow signature may be useful in neonatal ($(HF)_2NC$).

Sponsored Research - None

1733855

INHALED NITRIC OXIDE IN ECLS SWEEP GAS TO INHIBIT PLATELET ACTIVATION.

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INTRODUCTION: Inhaled nitric oxide (iNO) is an effective pulmonary vasodilator and can improve outcomes for patients with hypoxic respiratory failure. Inhaled nitric oxide also exerts effects outside the lung, including cyclic guanosine monophosphate dependent inhibition of platelet aggregation. We investigated whether iNO decreases clot formation and extends circuit life when delivered directly to an extracorporeal life support (ECLS) oxygenator. CASE STUDY: A term infant underwent cardiac surgery for single-ventricle heart disease at eight days of age. The infant initially required 13 days of postoperative venoarterial ECLS due to inadequate cardiac output. Although the patient was successfully decannulated, the patient was placed back on ECLS two days later due to another low cardiac output state. Fibrinous stranding and thrombi developed in the oxygenator within a few hours of reinitiation of ECLS. The patient developed refractory thrombocytopenia and biochemical evidence of disseminated intravascular coagulopathy (DIC) requiring multiple platelet transfusions. The patient underwent three circuit exchanges during the subsequent 36 hours of support to address recurrent clot formation within the oxygenator and consequent disparity in pre/post oxygenator pressures. The decision was made to administer iNO directly to the ECLS oxygenator to potentially reduce platelet aggregation within the circuit. iNO was proportionally injected into the sweep gas of the oxygenator using an Ikaria INOmax® DS System at a concentration of 33 ppm for the remainder of the ECLS course. Fibrin deposition and clot formation within the circuit were markedly reduced after the addition of iNO to the sweep gas (Table 1). Although platelet transfusions were still required after iNO therapy, no additional circuit changes were required during the subsequent four days of support. The patient was successfully separated from ECLS.DISCUSSION/CONCLUSION: This case suggests that iNO may be a useful adjunct therapy for patients on ECLS with refractory hypercoagulable states. Controlled studies are needed to confirm whether iNO is beneficial in these high risk patients and whether iNO therapy can reduce the frequency of circuit exchange in ECLS patients who have an intact coagulation system.

Sponsored Research - None

1733872

COMBINED ILOPROST/INHALED NITRIC OXIDE DRUG DELIVERY DURING INFANT MECHANICAL VENTILATION: EFFECT OF SAMPLING PORT TYPE AND NEBULIZER LOCATION.

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INTRODUCTION: Iloprost and inhaled Nitric Oxide (iNO) are selective pulmonary vasodilators that are used in neonates with hypoxic lung disease and pulmonary hypertension. There are safety concerns related to iNO gas sampling and occlusion alarms can result from aspirated nebulized medication into the iNO delivery system. There are also concerns related to the location of nebulizer and how sampling may affect drug delivery to the patient and/or the iNO sampling system. We hypothesized that the quantity of Iloprost drug would not be different between different types of iNO sampling ports and locations during simulated neonatal ventilation. METHODS: A neonatal test lung model (ASL 5000, Ingmar Medical) was ventilated with a conventional ventilator (Draeger; Lubeck, Germany). Two types of iNO sampling adapters were tested: the standard Ikaria T-adapter (sidestream) and a novel adapter (mainstream). Iloprost (10 mcg) was delivered with the Aeroneb Solo (n=3; Aerogen, Galeway, Ireland). Each was tested in triplicate prior to (distal) and following (proximal) the sampling adapters. Iloprost was nebulized comparing these conditions with iNO 20 ppm provided with the INOvent DSIR. Iloprost was recovered by eluting the filter with ethanol and quantified using HPLC. RESULTS: Although there were no significant differences between testing conditions (p=0.89; Figure), drug delivery was greatest when the nebulizer was placed proximal to the lung model and while sampling iNO with the mainstream adapter. DISCUSSION/CONCLUSIONS: These results suggest overall poor drug delivery in these testing conditions. This is likely the result of the high bias flows (6 l/min) with the ventilator used and dose of Iloprost. When delivering Iloprost with iNO, continuous sampling with the mainstream adapter placed prior to the nebulizer and distal to the patient may result in improved drug delivery to a filter. Although there were no significant differences between testing conditions, we speculate that this configuration may result in less medication being aspirated into the sampling lines and thus, more available for the patient during iNO, especially when long-term therapy is considered.

Sponsored Research - This study was funded by Ikaria

1733880

CONTINUOUS HIGH FREQUENCY OSCILLATION THERAPY IN MECHANICALLY VENTILATED PATIENTS GREATER THAN TWO YEARS OF AGE IN THE PEDIATRIC INTENSIVE CARE UNIT.

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Background: Continuous high frequency oscillation (CHFO) may facilitate secretion removal and treatment of atelectasis. Providing CHFO during inspiration and expiration creates a pressure gradient in the small airways that accelerates expiratory flow and promotes the movement of secretions. Our objective was to describe the impact of CHFO therapy on mechanically ventilated patients >2 years of age. Method: We retrospectively reviewed medical records of all mechanically ventilated children > 2 years of age treated with CHFO (The MetaNeb® System; Hill-Rom) at our institution from July 1, 2007 through August 31, 2012. Data collected included demographics, blood pressure, heart rate, SpO2, ETCO2, chest radiograph findings, and ventilator settings. The development of new air leak while being treated with CHFO was recorded. We evaluated the association between number of CHFO treatments and vital signs using linear regression with clustered sandwich variance estimators, controlling for patient characteristics. Results: Our cohort included 29 intubated patients > 2 years of age. Median age was 10 years (range: 3 – 34 years) and median weight 28 kg (13-90 kg). 235 total CHFO treatments were provided (range per patient: 1-39 treatments) with over 70% of patients receiving less than 10 total treatments. At the time of initiation of CHFO therapy, 45% of the patients were supported with PC/SIMV + PS, 33% with SIMV + PS, 15% with PRVC, and 10% with other modes of ventilation. There was no significant change in systolic blood pressure, diastolic blood pressure or heart rate with increasing number of CHFO treatments, even after controlling for age, weight and ventilator settings. 1 (3%) of the 29 patients developed a small pneumomediastinum that did not require intervention.. Conclusions: CHFO therapy is feasible and seems safe in our cohort of mechanically ventilated pediatric patients. Larger, prospective clinical studies are needed to fully evaluate the clinical efficacy and safety of CHFO therapy in children receiving invasive mechanical ventilation.

Sponsored Research - Hill-Rom

1733964

EXTUBATION READINESS TEST DELAY IN THE NICU.

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INTRODUCTION Mechanical ventilation remains an imperative standard of care in the neonatal intensive care unit (NICU). However, it is desirable to minimize the duration due to complications associated with mechanical ventilation. We have developed a guideline (extubation readiness test or ERT) to facilitate extubation of mechanically ventilated infants of ≥ 35 weeks gestational age. Utilization of an ERT to facilitate extubation may lead to reduced duration of ventilation in a NICU. We hypothesize that simple delays in 1) conducting an extubation readiness test and 2) extubation after passing ERT could lead to prolonged ventilation. METHODS A retrospective chart review of mechanically ventilated infants ≥ 35 weeks gestational age was completed. The ERT delay was calculated as the difference between the time when the infant first met criteria for ERT and the time when the ERT was initiated. Ventilator settings were recorded at time of eligibility for ERT and immediately pre-ERT. In addition, time from the beginning of ERT to extubation was recorded. RESULTS A total of 40 infants were included for analysis. There were a total of 51 extubation readiness test conducted in the cohort. The mean ERT delay time was 17.6 hours +/- 17.5. The mean time from ERT to extubation was 5.3 hours +/- 5.9. The table below demonstrates ventilator data collected at each interval. CONCLUSION Although the mean delay in performing an ERT after eligibility was less than one day, the variation was quite high and it was over 50 hours in three subjects. Data suggests that during this time additional ventilator weaning occurred to minimal ventilator settings. Further, there was a slight delay in the time to extubation after the infant successfully passed the ERT. It is important to identify eligible patients and conduct the ERT in a timely manner. Doing so may limit unnecessary time on the ventilator.

Sponsored Research - None

	Ventilator Settings when Eligible for ERT	Ventilator Settings at Initiation of ERT
PIP (cmH_2O)	19.3 +/- 2.9	17.7 +/- 2.0
PEEP (cmH_2O)	5.1 +/- 0.3	5.0 +/- 0.2
Pressure Support (cmH_2O)	9.9 +/- 2.2	9.8 +/- 2.3
Rate (breaths/minute)	20.3 +/- 5.7	16.5 +/- 4.5
FIO_2	0.27 +/- 0.05	0.25 +/- 0.05

1733907

INTERDISCIPLINARY PROCESS IMPROVEMENT TO REDUCE PICU ADMISSION AND URGENT INTERVENTIONS USING HIGH FLOW NASAL CANNULA ON AN ACUTE CARE UNIT IN INFANTS WITH BRONCHIOLITIS.

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Background: Guaranteeing high quality outcomes and reducing costs are at the forefront of healthcare as hospitals try to define the value of care delivery. Utilization of PICU beds is expensive, but often necessary for infants with bronchiolitis due to severity of illness and need for advanced respiratory support. Utilization of high flow nasal cannula (HFNC) using an interdisciplinary, evidence based plan of care on an acute care (AC) unit will decrease need for PICU admissions and urgent interventions (Code Blue or rapid response team). HFNC reduces work of breathing and improves oxygenation in bronchiolitis patients. Methods: An interdisciplinary team including respiratory, nursing, and physicians was formed to evaluate the safety of HFNC in an AC unit for infants with bronchiolitis and to develop an evidence based plan of care for its use, aimed at reducing PICU utilization. Criteria developed included utilization of the BedsidePEWS for initiating and maintaining HFNC and for considering transfer to the PICU. HFNC was delivered at a maximum of 60% FiO2 with a maximum flow of 6lpm for patients less than 12 months and 8lpm for patients greater than 12 months. All health care providers involved in this pilot were educated on the use of HFNC and the plan of care for these patients. Weekly meetings were held to develop rapid cycle improvements. Data were collected on patient age, outcome (remained on floor or transferred to PICU), duration of HFNC on the AC unit and the need for urgent intervention. We compared urgent intervention data for the unit from the same time period in the prior year. Results: No HFNC patients required urgent intervention. Patients requiring transfer to the PICU received HFNC for an average of 9.8 hours prior to transfer. When comparing data for the entire unit (includes patients not in this cohort) there was a reduction in urgent interventions. In 2012 there were 16 urgent interventions (14 RRT, 2 Code Blue) and in 2013 there were 3 RRTs and no Code Blues. Refer to the table for additional outcomes. Conclusion: An interdisciplinary team utilizing the evidence can quickly and effectively make changes to patient care practices and contribute to cost savings initiatives. Initial data suggests that this change improved value and care by decreasing utilization of PICU resources and decreasing the need for urgent interventions.

Sponsored Research - None

1734001

IN-VITRO EVALUATION OF THE PRESSURE VOLUME CHARACTERISTICS OF A HIGH FIDELITY SIMULATION MANIKIN FOR NEONATAL RESUSCITATION TRAINING.

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Background: High fidelity simulation manikins (HFM) are becoming more prevalent and accepted as valid models for training and certification of neonatal resuscitation skills. Despite the significant advancements in many aspects of these simulation manikins relative to their predecessors, very little has been published regarding the pressure-volume (P-V) characteristics of these simulators when compared to the patient population they are designed to represent.The purpose of our study was to evaluate the P-V characteristics of one such manikin used in our institution for certification and training of neonatal resuscitation skills. Methods: We evaluated a HFM designed to mimic a 3.5 kg body weight neonate, (Sim Newbie, Laerdal). The HFM was intubated with a properly positioned 3.5 mm ID endotracheal tube (ETT) for all measurements. The HFM was modified to incorporate a differential pressure transducer (CO2SMO) internally placed immediately proximal to the lung compartment and used to measure both pressure and volume. The HFM was then ventilated using a T-piece resuscitor (Neopuff) and a static P-V curve was generated using pressures ranging from 7 through 32 cm H2O with pressure adjusted in nominal increments of 2 cm H2O. Pressure and tidal volume were averaged over 10 breaths. Results: Tidal volumes ranged from 0 mL at pressures from 7 through 11 cm H2O. At 32 cm H2O, the tidal volume average was 8.9 (± 0.06) mL. Conclusion: The P-V characteristics of the HFM we evaluated do not acurately represent the P-V characteristics of a healthy newborn which is commonly referenced to be 1 mL/cm H2O/kg. The average compliance of the breath subgroup between pressures of 13 and 32 cm H2O was 0.25 mL/cm H2O (± 0.05) and ranged from 0.15 to 0.33 mL/cm H2O. Training Implications: Use of HFM, as currently configured, may not be a safe haptic training model. Assuming a minimum effective neonatal tidal volume of 4 mL/kg, this HFM would require ventilating pressures well above 30 cm H2O, considered unsafe as a lung protective ventilation approach. If ventilated using a conventional 20 cm H2O peak inspiratory pressure to guide ventilation, the resultant tidal volume of 3.8 mL or approximately 1.1 mL/kg would be inadequate. More research is needed to identify the best approach for incorporating HFM in effective neonatal resuscitation training and certification. Manufacturers of HFM are encouraged to improve the P-V characteristics of their HFM.

Sponsored Research - None

1734039

THE INCONSISTENCY OF PROVIDING VENTILATION WITH A T-PIECE STYLE RESUSCITATOR: A BENCH MODEL STUDY.

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Introduction: Providing consistent ventilation during any resuscitation event is critical in optimizing gas exchange. This is especially vital when interacting with the neonatal patient population. This may be difficult to achieve if the equipment or patient population is unfamiliar to the clinician involved in providing ventilation. The t-piece is a pressure target hand-bag resuscitator, which the operator sets a PIP and a PEEP and is utilized in neonatal ventilation. To test the ability to provide a consistent and adequate ventilation rate we compared the rate at which therapists deliver ventilation with a t-piece with the standard rate of 40 breaths per minute. Methods: Seventy-one RRTs took part in the study. Data was collected regarding the therapist's role and years of experience. (Fig. 1) We were also interested whether or not the therapist worked in the labor and delivery and/or the ED. Participants were instructed to administer 40 breaths per minute using the t-piece for a 5 minute period (200 breaths). A baby manikin was placed on the resuscitation bed to allow for proper set up and hand position. Prior to the test each RRT was given a refresher on how to use the t-piece properly. Testing was completed in two rooms with identical set ups. In each room there was a designated time keeper and two counters. The counters were responsible for recording the number of breaths administered for minute 1, minute 2, minutes 3 and 4 (total), and minute 5. Minutes 3 and 4 were grouped together because participants experienced distractions during this time frame to simulate the chaos of a labor and delivery suite. Results: Only 31 of the 71 (43.66%) study participants meet the target threshold of 200 breaths in the five minute time fame. Lower percentages resulted minute by minute. The range of breaths varied significantly from less than one hundred to greater than four hundred breaths during the five minute period. Conclusion: Optimal ventilation is paramount to providing optimal gas exchange. Air trapping, hemodynamic insult, and inadequate ventilation are all potential hazards associated with providing inconsistent levels of ventilation. Our study demonstrates that in a bench model stimulation, ventilation rates vary during the utilization of the t-piece over a five minute interval from practitioner to practitioner. More research is warranted in this clinical area including the development of enhanced technology.

Sponsored Research - None

Fi g 1

	Labor and Delivery	ED	Not specificed
Participants	35	41	25
% Totals	49.3%	57.7%	35.2%

1687973

DIVENT DECREASING INVASIVE VENTILATOR TIME IN PREMATURE NEONATES.

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Background: The average number of ventilator days in premature babies <32 weeks corrected gestational age is often times longer than needed. Increased ventilator days lead to increased risk of ventilator associated pneumonia, greater need for home oxygen use and increased risk of bronchopulmonary dysplasia (BPD). Additionally, risk for adverse neurodevelopmental outcomes significantly increases with each additional day of mechanical ventilator support. Objective: The aim of this quality improvement project was to reduce invasive ventilator days in infants <32 weeks GA by 20% at the University of Utah Neonatal Intensive Care Unit. Methods: We proposed to improve outcomes of invasively ventilated neonates by 1) updating Respiratory Care Guidelines; 2) setting daily respiratory goals; 3) devising specific intubation and extubation protocols; and 4) increasing awareness and involvement among physicians, nurse practitioners and respiratory therapists. We use a historical cohort (infants admitted before 2010) and a post QI implementation cohort (5/2012 to 1/2013) Results: This is an ongoing project that started in May 2012. Up to date, we have achieved a significant reduction in ventilator days with an increase in Non-invasive ventilator support days (table 1). Conclusion: This is an ongoing QI project that through several key interventions has been able to successfully decrease invasive ventilator days in premature infants <32 weeks CGA. The process included 1) standardization (standard approach to extubation/intubation); 2) Modification and update of Respiratory Guidelines; 3) Education and training for neonatologists, bedside nurses, respiratory therapists and neonatal nurse practitioners; 4) Empowering respiratory therapists to take initiative to wean ventilator settings; 5) Implementation of simplified Respiratory Algorithm based on our guidelines; and 6) change in culture

Sponsored Research - None

Results Table 1

	Baseline (historical cohort) n= 163	Post-Implementation n= 117	P
Invasive Ventilatory Days (median, 25-75%)	4 (1.0-19.3)	0.8 (0.2-13.0)	0.001
Non-Invasive Ventilatory Days (median, 25-75%)	5 (2.0-11.5)	20.5 (3.3-40.6)	0.016

*Mann Whitney U Test

1735773

EVALUATION OF A QUANTIFIED APPROACH TO OPTIMIZE VENTILATOR SUPPORT IN CHRONICALLY VENTILATED PEDIATRIC PATIENTS.

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BACKGROUND: The goals of ventilator management in chronic pediatric patients are to reduce the work of breathing to support growth and development, reduce repeated respiratory infections, prevent overt cardiopulmonary failure, and allow these children to transition safely to thier home environment. There has been little previous literature focused on optimizing ventilation in these patients. Standard titration utilizes physical exam, chest radiographs, continuous oxygen monitoring and intermittent measurements of PaCO2 and/or end tidal CO2 (ETCO2) and tidal volume, using targets based on underlying medical condition. We sought to evaluate a non-invasive approach to chronic ventilator management by comparing the ability of ventilator settings titrated by intermittent measurements (standard titration) to achieve target EtCO2, leak%, and Vte/kg for at least 75% of the ventilation time as compared to titration directed by continuous quantitative measures of these parameters (quantitative titration). METHODS: From February 2012 – September 2012 all patients less than 18 years of age admitted for chronic ventilator titration were evaluated. The study was approved by the IRB. Patients were required to be at baseline state of health, and were nearing readiness for discharge to home. Physicians were asked to titrate ventilator settings by the standard approach. These settings were evaluated for a 20-24 hour period and downloaded by continuous quantitative monitoring using an NM3 flow/CO2 sensor (Phillips Respironics, Carlsbad, CA). Settings were then further titrated as necessary, utilizing a quantitative approach. The goal to achieve ETCO2, Vte/kg, and Leak % within the defined, patient-specific target range for ≥75% of the ventilated portion of the day and/or night. The percent time in target range achieved by standard approach titration was compared to quantitative approach. The interventions required to improve ventilation to targets were documented. Statistical Anlaysis was performed using Wilcoxin signed ranks test in SPSS version 20. RESULTS: 14 patients were enrolled in the study. See graph for results. DISCUSSION/CONCLUSION: There was a significant improvement in measured parameters defining adequate ventilation following quantitative titration. The greatest variability was due to high Leak% and Vte/kg. All parameters could be more tightly correlated with interventions following continuous monitoring compared to standard titration alone.

Sponsored Research - None

1703849

TRANSITION OF RESPIRATORY TECHNOLOGY-DEPENDENT PATIENTS FROM PEDIATRIC TO ADULT PULMONOLOGY.

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BACKGROUND Advances in medical care and technology have increased the lifespan of children with chronic conditions who previously would have not survived into adulthood. This has driven the initiative for transition from pediatric to adult care for children and youth with special heath care needs (CYSHCN). Some groups such as cystic fibrosis (CF) have had transition programs in place for many years. There is literature regarding transition of CYSHCN but the respiratory technology dependent (RTD) patient has not been described. Our aim was to determine if other institutions utilize a standardized process for transition of RTD patients from pediatric to adult pulmonology. METHODS Children's hospitals with Accreditation Council for Graduate Medical Education pediatric pulmonary fellowship programs were invited to participate in a survey which inquired about the process used for transitioning RTD patients from pediatric to adult pulmonology. We defined RTD as having a diagnosis such as neuromuscular disease, spinal cord injury, spina bifida, bronchiectasis, chronic lung disease of infancy, cerebral palsy or similar condition excluding CF and requiring an airway clearance device, ventilator or tracheostomy to maintain stability. Responses were collected electronically via Survey Monkey and summarized as a percentage (frequency/total N). RESULTS The response rate was 64% (32/50) however not all answered each question. The majority of respondents, 68% (19/32), reported they do not utilize a standard process for transition. Timing of transition varies by physician or family according to 62% (18/29). Of all disciplines having a specific role with the process, the physician (82%, 23/28) had the most involvement followed by the nurse (61%, 17/28), social worker (54%, 15/28) and respiratory therapist (39%, 11/28). Dissatisfaction with the adult team was reported by 43% (12/28). Overall, almost half (45%, 13/29) were not satisfied with the current process. CONCLUSION The majority of pediatric pulmonary fellowship-affiliated programs surveyed do not utilize a standardized process for transition of RTD patients from pediatric to adult pulmonary care. Many are also not satisfied with their current practices or involvement from the adult team. The pediatric and adult teams should collaborate to improve existing processes. Resources and information for providers are available from the National Health Care Transition Center to assist with program development.

Sponsored Research - None

1733280

SUCCESSFUL TRACHEAL DECANNULATION IN A CHILD WITH CCHS.

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Introduction Congenital Central Hypoventilation Syndrome (CCHS) is a rare disorder affecting the automatic control of breathing and is characterized by alveolar hypoventilation. Ventilator support is required primarily during sleep but may be needed while awake depending upon the severity. CCHS is typically diagnosed in the newborn period but can present in later childhood. Case Summary A 22 month old female with history of "difficult" behavior was admitted for evaluation following a choking episode. She was observed to have oxygen desaturation during sleep. Polysomnogram (PSG) revealed significant hypoventilation. Genetic testing was positive for the CCHS PHOX2B mutation with the 20/25 genotype. Non-invasive ventilation (NIV) with a bi-level device was attempted during sleep but was unsuccessful due to non-acceptance. A tracheostomy was placed at 2.5 years of age for mechanical ventilation. She required only night time support which was tolerated without difficulty and her behavior improved significantly. By age 3 she was able to tolerate a capped tracheostomy tube during awake hours. At 7 years of age, a step wise approach was taken to transition from invasive to NIV. Since she already was able to tolerate capped tracheostomy tube, she was fitted with a nasal mask to use with the ventilator only while awake for desensitization while continuing her previous nighttime regimen. She did very well with this and was admitted to the hospital to begin nighttime NIV under observation. The tracheostomy tube was downsized and ventilator adjustments made based on PSG. She was discharged home to use the mask with capped tracheostomy and returned one month later for decannulation, just prior to her 8th birthday. She now successfully utilizes NIV during sleep. Discussion While there is a clinical policy statement for managing the care of individuals with CCHS, there are not clear guidelines on how to best approach tracheal decannulation. More research is needed to standardize this for children with CCHS who are candidates for decannulation.

Sponsored Research - None

1722158