2016 Open Forum

Presented by

RESPIRATORY CARE

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The Open Forum at the AARC Congress 2016 is an unique opportunity for attendees to experience the results of scientific studies performed by their colleagues. Respiratory Care is proud to present this year's Open Forum. Once again, respiratory care professionals have stepped forward and analyzed the things they do with critical eyes. This year posters will be presented in one of 3 formats:

Editors' Choice – The top ten abstracts in 2016. On the first two days of the Congress the Editors' Choice posters will be displayed by the entrance to the Exhibit Hall. On the third day, each presenter will discuss their findings in a 8-minute slide presentation, which will be followed by a 5-minute question and answer period.

Poster Discussions – Twelve sessions, grouped by topics, will be presented over three days of the Congress. During the first part of the session attendees will be able to review the posters and discuss them with the authors. In the second part presenters will expand on the work shown on the poster with a brief oral presentation (no slides).

Posters Only – Posters will be displayed inside the Exhibit Hall during two days of exhibits. Different categories each day. Authors will be present for questions and answers from 12:00 pm to 1:30 pm.

Open Forum Sessions

Saturday, October 15

Poster Discussions #1 3:15 pm – 5:10 pm	Ventilators/Ventilation – Part 1
Poster Discussions #2 3:15 pm – 5:10 pm	O_2 Therapy, Home Care

Sunday, October 16

Posters Only #1 11:30 am – 3:30 pm	
Poster Discussions #3 10:00 am – 11:55 am	Monitoring/Equipment
Poster Discussions #4 10:00 am – 11:55 am	Aerosols/Drugs
Poster Discussions #5 12:30 pm – 2:25 pm	Education – Part 1
Poster Discussions #6 12:30 pm – 2:25 pm	Neonatal/Pediatric – Part 1
Poster Discussions #7 3:10 pm – 5:05 pm	Management
Poster Discussions #8 3:10 pm – 5:05 pm	Airways Care, Sleep/Pulmonary Rehab

Monday, November 9

Editors' Choice 9:30 am – 11:55 am	Top 10 abstracts in 2016
Posters Only #2 10:00 am – 2:30 pm	
Poster Discussions #9 12:30 pm – 2:25 pm	Ventilators/Ventilation – Part 3
Poster Discussions #10 12:30 pm – 2:25 pm	Neonatal/Pediatric – Part 2
Poster Discussions #11 3:15 pm – 5:10 pm	Education – Part 2
Poster Discussions #12 3:15 pm – 5:10 pm	Asthma/Pulmonary Disease, Case Reports, Diagnostics

See pages OF61-OF66 for Open Forum Author Index

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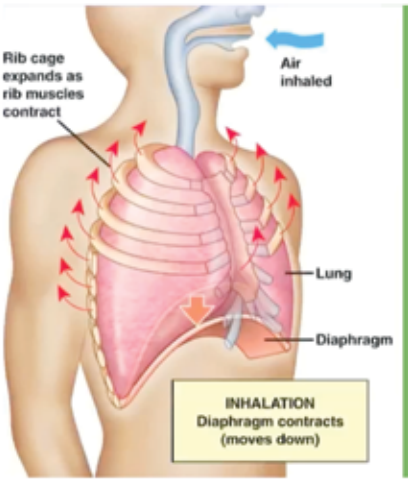

Scenario Concept Presentations lay the groundwork for hands-on simulation.

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2485990

SUPRAGLOTTIC AIRWAY PLACEMENT BY RESPIRATORY THERAPISTS FOR IN HOSPITAL CARDIAC ARRESTS DECREASES TIME TO CONTINUOUS CARDIOPULMONARY RESUSCITATION.

William D. Rosandick[2,1], David J. Heggeman[3,4], Rachel H. Boehning-Anderson[2], Andrew R. Woltmann[2]; [1]Respiratory Therapy, Mid-State Technical College, Marshfield, WI; [2]Respiratory Therapy, Ministry Saint Joseph's Hospital, Marshfield, WI; [3]Emergency Department, Ministry St. Joseph's Hospital, Marshfield, WI; [4]Emergency Medicine, Marshfield Clinic, Marshfield, WI

Background: There are few studies investigating placement of supraglottic airways during in-hospital code situations requiring cardiopulmonary resuscitation (CPR). Respiratory Therapists (RTs) are integral members of the code team, some of the first to arrive at codes to begin manual ventilation by bag/valve/mask. Often they must wait for a trained member of the code team for intubation. During the intubation process, CPR often must cease temporarily. Supraglottic airway placement allows for continuous CPR. We hypothesized that having RTs insert a supraglottic airway, the King LTS-D Airway, allows for quicker insertion of a secure airway with continuous CPR. **Methods:** IRB reviewed the proposal and deemed it a Quality Improvement (QI) study. Training for RTs who respond to codes involved watching a video on King LTS-D insertion and practicing insertion in a manikin. A written survey tool was composed and completed after each insertion by the RT placing the airway. A Likert scale of 1 – 5, with 1 being easy, was used to gauge ease of insertion. Time the code began, time of King insertion, number of attempts, size of the King (#4 or #5), methods of successful placement verification, cuff volume and complications were compiled. It was noted if the subject expired or had a return of spontaneous circulation (ROSC). If the subject regained consciousness the King was removed. In cases of ROSC, subjects had an endotracheal tube (ETT) placed after stabilization in an intensive care room. **Results:** Nineteen subjects qualified for inclusion. Results were compared to retrospective data for the same number of codes requiring an advanced airway the previous year. Ease of insertion score was 1.4. The time between code activation to time of King insertion averaged 3.9 minutes. Average time to ETT placement at codes the previous year averaged 8.7 minutes. Minor complications from King placement included cuff rupture and cuff leakage. We had zero serious complications with the King. Deaths during the King insertion trial were five, same as the sample size the previous year. **Conclusions:** Average time from code activation to advanced airway placement dropped significantly with RTs inserting the King. Our hypothesis was confirmed. From this study, having RTs insert the King LTS-D at codes dramatically decreases time to an advanced airway allowing for continuous cardiac compressions. Based on this data, more RTs should be trained to insert supraglottic airways at code situations.

Sponsored Research - None

2520276

INTERDISCIPLINARY APPROACH TO EARLY DETECTION OF SLEEP DISORDERED BREATHING IN A SELECT PATIENT POPULATION.

Bridget Gekas[1], Sunil Sharma[2], Ashley Adams[1], Katrina Flemming[1], Zenobia Black[1], Silvana Romeo[1]; [1]Respiratory Care, Thomas Jefferson University Hospital, Philadelphia, PA; [2]Pulmonary Sleep Medicine, Thomas Jefferson University Hospital, Philadelphia, PA

Background: Obstructive sleep apnea (OSA) is affiliated with cardiovascular complications, including sudden death. At Jefferson, an innovative approach is developed for early detection and diagnosis of sleep disordered breathing. **Methods:** Jefferson Hospital developed and interdisciplinary team consisting of a Pulmonary Sleep specialist, a nurse practitioner, and a respiratory therapist. The team used the "STOP" questionnaire to screen patients for sleep disordered breathing. The "STOP" questionnaire is a validated 4 question test which measures the presence of loud snoring, tiredness, observed apnea, and high blood pressure (Anesthesiology.2008 May;108(5):812-21) Patients with a body mass index (BMI) greater than 30kg/m^2 were screened, as well as patients with heart failure. Patients were screened by the respiratory therapist. Once a patient screened positive, the primary team is notified, a sleep consult is placed, and a high resolution pulse oximetry (HRPO) was ordered. HRPO results are compatible with outpatient polysomnography. Oxygen desaturation is measured by the oxygen desaturation index (ODI). An ODI of 15 or greater is considered significant for OSA and non-invasive positive airway pressure (PAP) is then started on the patient to determine efficacy. Upon discharge the patient was scheduled for outpatient follow up and polysomnography. **Results:** Prior to the screening process detection of sleep apnea in the inpatient setting was 1-2 per year, after the screening process was implemented 140 patients were diagnosed and outpatient polysomnography confirmed OSA. We found early intervention of patients who were high risk for OSA improved patient safety, which was measured by a reduction in RRS events. Patients being treated with PAP had a RRS rate of 16.99/1000 admissions compared to non-treated patients who had a rate of 56.21/1000 admissions (P=0.01) Congestive Heart Failure (CHF) patients demonstrated a reduction in readmission rates. After six months, compliant patients treated with PAP showed a reduction in hospital readmissions, and emergency room visits compared to the non-compliant group. **Conclusion:** OSA was significantly underdiagnosed in hospitalized patients. The "STOP" questionnaire combined with HRPO are easy, cost effective strategies to diagnose hospitalized patients with OSA. Once diagnosed, patients compliant with PAP can lead to an increase in-patient safety by reducing RRS events and decrease readmission rates.

Sponsored Research - None

2521066

ACCESSING INITIAL RESPONSE TO HIGH-FREQUENCY JET VENTILATION IN PREMATURE INFANTS WITH RESPIRATORY FAILURE.

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BACKGROUND: High-frequency jet ventilation (HFJV) has been used in conjunction with conventional ventilation (CV) for infants with hypercapneic respiratory failure. We sought to identify parameters that were associated with successful application of HFJV in patients with hypercapneic respiratory failure. **METHODS:** An IRB approved retrospective review was conducted on subjects who received HFJV between 01/2012-01/2016. Subjects were enrolled if birth weight ≤ 2000 grams, and capillary carbon dioxide (P_cCO_2) ≥ 55 mm Hg despite multiple attempts to optimize ventilator settings. Subjects with uncorrected complex congenital heart disease were excluded. Ventilator parameters and physiologic data were extracted and analyzed at 1 hour prior to HFJV, and at hours 1, 4, and 6 following conversion. Subjects were classified as responders if PcCO2 was reduced by ≥10% after 1 hour of HFJV. Data included Peak Inspiratory Pressure (PIP), positive end-expiratory pressure (PEEP), PcCO2, and Oxygen Saturation Index (OSI = mean airway pressure * FIO2 * 100 ÷ SpO2). Since the data were not normally distributed; they are presented as median (IQR) and a Mann-Whitney un-paired T-test was used to compare groups. Differences <0.05 were considered significant. **RESULTS:** Thirty-four premature infants (n = 24 male) were studied. The median postmenstrual age (PMA) was 26.57 weeks (25-28) in the responder group, and 30 weeks (26.64-31.86) for non-responders. Birth weight, and hours on HFJV were: 700g (0.59-0.93), 77 hours (50-189.5) in the responder group, and 1000g (0.67-1.65), 95 hours (44-195), in the non-responder group respectively. Twenty-five subjects were classified as responders, and demonstrated a significant reduction of PcCO2, FIO2 and increased pH within the first hour. The 9 subjects that did not initially respond were transitioned to HFJV from higher CV PIP, at a later PMA (p= 0.013) than their counterparts. This group had significantly higher OSI and FIO2 requirements at hour four. Ventilator parameters and physiologic data are displayed in Table 1. **CONCLUSION:** We identified a reduced PIP on CV, reduced FIO2, reduced PcCO2 and improved pH during HFJV at 1 hour were associated with good response to HFJV; without escalation in ventilator settings. These data may help to identify patients who are most likely to benefit from HFJV in the neonatal intensive care unit.

Sponsored Research - None

		Responders	Non-responders	P
Pre-HFJV	CV PIP (cm H_2O)	19 (17.5 -21)	25 (23-25)	.005
	PEEP (cmH_2O)	5 (5-6)	6 (5-7)	.146
	P_cCO_2 (mm Hg)	72 (63-90)	71 (61-93)	.798
	OSI	5.08 (3.45-7.22)	6.98 (5.18-8)	.126
	F_iO_2	.5 (.35-.7)	.6 (.52-.88)	.157
	pH	7.10 (6.98-7.16)	7.14 (7.06-7.24)	.22
HFJV Hour 1	HFJV PIP (cm H_2O)	25 (22.5 -31)	26 (19.5 -33)	.946
	PEEP (cmH_2O)	7 (6-8)	7 (6-9)	.767
	P_cCO_2 (mm Hg)	49 (42-57.5)	87 (66.5-100)	<.001
	OSI	4 (2.49-9.51)	6.9 (5.43-8.93)	.217
	F_iO_2	.4 (.3-.52)	.6 (.45-.8)	.015
	pH	7.24 (7.18-7.31)	7.11 (7.05-7.26)	.031
HFJV Hour 4	HFJV PIP (cm H_2O)	25.5 (23 -31.5)	31 (23.5-38)	.285
	PEEP (cmH_2O)	8 (6-9)	8 (6-9.5)	.744
	P_cCO_2 (mm Hg)	47 (43.5-57.5)	52 (37-109)	.728
	OSI	3.36 (2.62-5.95)	7.25 (4.09-9.72)	.029
	F_iO_2	.35 (.29-.5)	.6 (.42-.8)	.038
	pH	7.25 (7.18-7.28)	7.23 (7.10-7.32)	.819

2525791

IMPACT OF A RESPIRATORY THERAPY ASSESS AND TREAT PROTOCOL ON CARDIOTHORACIC READMISSIONS.

Robert T. Dailey, Thomas Malinowski, Mitchel Baugher, Daniel D. Rowley; Pulmonary Diagnostics & Respiratory Therapy Services, University of Virginia Medical Center, Charlottesville, VA

BACKGROUND: Respiratory Therapist managed "assess and treat" (RTAT) protocols have been shown to be effective in the alignment of therapeutic interventions to patient need. The purpose of this retrospective medical record review was to report on recidivism to the ICU among post-surgical cardiothoracic patients managed with a RTAT. **METHODS:** We reviewed 1008 medical records of cardiac and thoracic post-operative patients between January 2015 and April 2016. The RTAT is driven by a standardized patient assessment tool which is completed by a Registered Respiratory Therapist. The tool develops an individualized respiratory severity score for each patient and directs interventions for bronchial hygiene, aerosol therapy, and lung inflation therapy based on an algorithm. The RTAT protocol was implemented in mid-November 2015, with 2-weeks "onboarding" to allow for education and training. January 2015 through November 15, 2015 served as the control period during which no protocol was applied. The protocol period commenced on December 1, 2015 and continued through April 2016. Information relative to unplanned admissions (unplanned readmission or unplanned escalation) to the ICU for all cause as well as respiratory-related causes was evaluated. A chi-square test for independence was computed to determine whether there was an association between RTAT and unplanned ICU admission. Descriptive statistics were calculated on data pre- and post- RTAT implementation. **RESULTS:** The chi-square test for independence was used to compare both overall unplanned ICU admissions and respiratory-related readmissions. There was no statistically significant difference in unplanned ICU admission rate between the control and protocol groups (P =.77). There was however, a difference in respiratory-related readmissions. The frequency of respiratory-related unplanned ICU admissions was significantly lower with RTAT (P = .0498). **CONCLUSIONS:** The implementation of RTAT reduced respiratory-related unplanned ICU admissions in the protocol group. Further study is needed to determine the RTAT effect on LOS and ICU costs.

Sponsored Research - None

Period	Pts.	Unplanned ICU admits (% pts)	Resp. related ICU admits (% all unplanned ICU admits)
1/1/15-11/30/15	748	9% (n = 65)	54% (n = 35)
12/1/15-4/18/16	260	8.6% (n = 22)	23% (n = 5)*

*Chi-square statistic 3.8457, P = 0.0498

2526918

THE IMPACT OF PHARMACY AND RESPIRATORY THERAPY EDUCATION ON 30-DAY HOSPITAL READMISSION.

Richard Rice, Scott Marlow, Umur Hatipoglu; Respiratory Institute, Cleveland Clinic, Cleveland, OH

Background: With the focus on decreasing 30-day readmissions for patients diagnosed with chronic obstructive pulmonary disease (COPD), efforts are being made to improve their overall care. One aspect of this care is patient education focused on metered dose inhaler (MDI) self-administration. **Methods:** In 2014, inpatient pharmacy COPD education was implemented at Cleveland Clinic to discuss the indication, compliance, and potential side effects for MDI use. This pharmacy education did not include a review of MDI technique. All of these patients also receive a comprehensive COPD education binder. In April 2014, an outpatient COPD exacerbation clinic was established to provide multidisciplinary outpatient follow up for patients within 1 week of discharge from Cleveland Clinic main campus. 15 minutes of this one hour visit is spent with a respiratory therapist educator where much of this time is devoted to having the patient demonstrate their current MDI use via the teach back method. This technique is recorded at the beginning of this visit and further education and remediation is provided as needed. **Results:** Between April 23, 2014 and March 7, 2016, 190 patients were seen in the COPD exacerbation clinic. 33 (17%) were readmitted to the hospital within 30 days after discharge. 140 of these patients received either inpatient pharmacy education, outpatient respiratory therapist education, or both. 119 patients (85%) were not readmitted, while 21 of the 140 (15%) had a 30-day hospital readmission. 12 of the 50 patients who did not receive any pharmacy or COPD clinic education were readmitted to the hospital within 30 days which was not significantly higher compared to the education group (24% versus 15%, P = .15). Of the 99 patients who had MDI technique assessment, only 49 (49%) were able to demonstrate proper MDI technique. **Conclusions:** Patients who received MDI education, either by inpatient pharmacy or outpatient respiratory therapy, were less likely to be readmitted to the hospital within 30 days of discharge. We also found that despite receiving MDI education in the hospital, patients may not leave the hospital with a proper understanding of MDI use. Limitations of this analysis include small sample size and lack of risk adjustment.

Sponsored Research - None

2528350

SPONTANEOUS BREATHING TRIALS AND CONSERVATIVE SEDATION PRACTICES REDUCE MECHANICAL VENTILATION DURATION IN PATIENTS WITH ACUTE RESPIRATORY DISTRESS SYNDROME.

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Background: In the general intensive care unit (ICU) population the introduction of spontaneous breathing trials and daily sedation interruptions have reduced the duration of mechanical ventilation (MV) and ICU length of stay (LOS). However, patients with ARDS often require high amounts of sedation and analgesia that prolong MV duration and weaning.[1] To our knowledge, these practices have not been investigated specifically in patients with acute respiratory distress syndrome (ARDS). In January 2008 both SBT and DSI were instituted as standard practice at our hospital. In 2013, targeted light sedation also was introduced. We used our ARDS quality assurance data base (spanning 2002-2015) to assess whether patients with ARDS also benefit from these interventions. **Methods**. The data base was queried for all ARDS survivors and then partitioned into 2 groups: the pre-implementation cohort (June 2002-December 2007) consisting of 401 patients and the post-implementation cohort (January 2009-December 2015) with 634 patients. Ninety-nine ARDS patients from 2008 (the wash-in or transition period) were excluded from the analysis. Data included MV duration, ICU LOS, Lung Injury Score (LIS), Acute Physiology and Chronic Health Evaluation (APACHE II) score, and Simplified Acute Physiology (SAPS II) score, age, Oxygenation Index (OI), and measures of adherance to lung-protective ventilation practices: V_T, plateau pressure (Pplat) and driving pressure (plateau pressure-PEEP). Data is reported as mean (± sd); statistical analysis was done using unpaired t-tests. Alpha was set at 0.05. **Results**: The introduction of SBT and conservative sedation practices was associated with significant reductions in both the duration of MV and ICU LOS. This occurred despite that fact that patients in the post-intervention cohort were significantly older, had significantly higher illness severity scores, more severe lung injury and oxygenation defects at ARDS onset. **Conclusion:** The introduction of SBT and conservative sedation practices substantially reduced the duration of MV and ICU LOS in patients with ARDS. Arroliga AC, et al. Use of sedatives, opioids and neuromuscular blocking agents in patients with acute lung injury and acute respiratory distress syndrome. Crit Care Med 2008;36(4):1083-88.

Sponsored Research - None

	Pre-Implementation	Post-Implementaion	p
Days MV	20.7 ± 20.8	13.0 ± 13.0	< .0001
ICU LOS (days)	26.0 ± 42.5	16.5 ± 14.5	< .0001
Post ICU LOS (days)	18.5 ± 50.4	16.0 ± 29.6	.32
Age	44.8 ± 15.6	50.1 ± 16.4	< .0001
LIS	2.50 ± 0.54	2.6 ± 0.50	.005
APACHE II	19.0 ± 7.6	21.2 ± 7.6	< .0001
SAPS II	40.8 ± 14.6	45.5 ± 15.1	< .0001
OI	11.6 ± 8.8	13.3 ± 9.5	.003
VT (mL/kg PBW)	7.6 ± 1.5	7.2 ± 1.3	< .0001
Pplat (cmH2O)	25.4 ± 5.3	23.7 ± 5.1	< .0001
Pplat-PEEP (cmH2O)	16.7 ± 6.2	15.0 ± 4.2	< .0001

2529117

SEVERITYOF HYPOXEMIA IN ACUTE RESPIRATORY DISTRESS SYNDROME INFLUENCES THE PERCENTAGE OF PATIENTS WHO RESPOND TO AEROSOLIZED PROSTACYCLIN.

Richard Kallet[1], Gregory Burns[1], Antonio Gomez[2], Michael Lipnick[3]; [1]Respiratory Care Services, San Francisco General Hospital, San Francisco, CA; [2]Pulmonary and Critical Care Medicine, San Francisco General Hospital, San Francisco, CA; [3]Anesthesia, San Francisco General Hospital, San Francisco, CA

Background: Functional residual capacity (FRC) may determine the effectiveness of aerosolized prostacyclin (AP) in severe ARDS. Because FRC is essentially the alveolar volume, and also the primary determinant of oxygenation and respiratory system compliance (C_{RS}), we hypothesized that the initial response to AP in ARDS would be greater in those with less impaired oxygenation. We used the ratio of arterial oxygen tension-to-inspired oxygen fraction (Pa_{O2}/Fi_{O2}) and C_{RS} as indirect signifiers of FRC status. Our hospital's ARDS quality assurance database was utilized to examine the effectiveness of AP in ARDS. **Methods:** 66 patients meeting the Berlin definition for moderate or severe ARDS received AP. 42 had an ABG prior to and following initiation of AP, without intervening increases in PEEP, Recruitment Maneuvers or Prone Positioning. The time between pre- and post-ABG was 101 ± 53m and from initiation of AP to post-ABG was 45 ± 24m. Response to AP was assessed by changes in Pa_{O2}/FI_{O2}. Baseline data for the entire sample was: Fi_{O2}:0.97 ± 0.08, PEEP: 14 ± 5 cmH_2O, Minute ventilation 12.4 ± 3.1 L/min, V_T: 6.8 ± 1.1 mL/kg, C_{RS}: 17 ± 12 mL/cmH_2O, pH 7.26 ± 0.11, Pa_{CO2}: 48± 16 mmHg, Pa_{O2}: 68 ± 25 mmHg. Data was analyzed according to hypoxemia cohorts using arbitrary cut-offs in baseline Pa_{O2}/Fi_{O2}: Group A (< 60), B (60-90) and C (>90). Marked improvement in oxygenation was defined pre-hoc as a Pa_{O2}/Fi_{O2} response of ≥ 20 mmHg; a negative response was defined as no change or decreased Pa_{O2}/Fi_{O2}. Within group pre-post data was analyzed using Wilcoxon Signed-Rank Tests and between group comparisons were made using Friedman Test and Dunn's Post Test. Comparison of response rate was assessed by Fisher Exact test. Alpha was set at < 0.05. **Results**: Patients with less impaired oxygenation had a higher likelihood of responding favorably to AP. The Odds Ratio for an improvement of ≥ 20 mmHg in Pa_{O2}/Fi_{O2} was 5.6 and 7.5 for Groups B (P = .06) and C (P = .023) compared to Group A. The magnitude of oxygenation improvement was only different between Groups A and C. Yet the clinical relevance of a 10 mmHg mean improvement in Pa_{O2}/Fi_{O2} is questionable. **Conclusion:** The effectiveness of AP appears to be higher in those with less severely impaired oxygenation. This suggests that AP effectiveness may be improved when used together with strategies that improve FRC (e.g. prone positioning, high PEEP).

Sponsored Research - None

	Group A	Group B	Group C
N	19	12	11
PaO2/FiO2 (Pre)	48 ± 6	70 ± 7§	110 ± 21‡
PaO2/FiO2 (Post)	77 ± 19	102 ± 41	142 ± 54
Δ PaO2/FiO2	29 ± 58	31 ± 9	40 ± 18†
% Marked Improvement	26%	67%	73%
% Negative Response	26%	17%	18%
Max ↑ PaO2/FiO2	243	132	101
CRS (mL/cmH2O)	25 ± 9	31 ± 9	40 ± 18†

§ P = 0.005 compared to Group A, † P = .03 compared to Group A, ‡ P = .02 compared to Group A

2529865

A RESPIRATORY CARE PRACTITIONER DISEASE MANAGEMENT PROGRAM FOR PATIENTS HOSPITALIZED WITH COPD.

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Background: Patients with chronic obstructive pulmonary disease (COPD) often require repeated emergency department (ED) visits and hospitalizations for COPD exacerbations. **Methods:** To determine whether a respiratory therapist-disease management (RT-DM) program could reduce re-hospitalization and ED visits via a prospective, randomized trial. **Results:** The primary outcomes were the number of non-hospitalized ED visits and hospital readmissions for a COPD exacerbation during the 6-month follow-up period after the index hospitalization. We enrolled 428 subjects (214 intervention, 214 control). The total number of non-hospitalized ED visits for COPD exacerbations was similar between groups (35 visits versus 59 visits, P = .603). Re-hospitalization for a COPD exacerbation was significantly lower in the intervention group (56 readmissions versus 100 readmissions, P = .026). Inpatient hospital days (306 days versus 523 days, P = .021) and intensive care unit days (17 days versus 53 days, P = .018) due to COPD exacerbations were significantly less for the intervention group. The number of subjects with multiple ED visits (0.9% versus 7.0%, P = .001) and multiple readmissions (4.2% versus 10.3%, P = 0.015) was significantly lower for the intervention group. Mortality was similar for the intervention and control groups (1.4% versus 0.9%; P > .99). **Conclusions:** Our RT-DM program was associated with less re-hospitalization and fewer hospital days due to COPD exacerbations. Further studies are needed to determine the optimal utilization of RT-DM teams for patients with COPD following hospitalization in order to optimize patient outcomes and prevent return hospital visits.

Sponsored Research - AARC grant

2532008

EVALUATION OF ENDOTRACHEAL TUBE SCRAPING ON AIRWAY RESISTANCE AND WEANING TRIAL SUCCESS IN DIFFICULT TO WEAN MECHANICALLY VENTILATED PATIENTS.

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Background: Spontaneous breathing trials (SBTs) are commonly used to assess readiness for extubation. If airway resistance (RAW) is elevated, this imposed work of breathing can lead to failed SBTs. Biofilm and mucus buildup within the endotracheal tube (ETT) may cause an increase in RAW. Scraping the ETT can remove biofilm and mucus from the ETT. The primary aim of this study was to evaluate the impact of ETT scraping on RAW in patients with a measured RAW of 10 cm H_2O/L/s or greater. The secondary aim was to determine if decreasing imposed work of breathing impacted success of the subsequent SBT. **Methods:** After IRB approval, intubated, mechanically ventilated subjects were enrolled if they failed an SBT and had an airway resistance of 10 cm H_2O/L/s or greater. Failure of the SBT was based on institutional guidelines. Airway resistance was calculated by subtracting the difference between peak and plateau pressures divided by flow at 1 L/sec using a square flow waveform. Once inclusion criteria were met, the EndOclear™ (EndOclear LLC, San Ramon, California) device was inserted into the ETT and withdrawn to scrape the biofilm and mucus from the airway. Scraping was repeated until the ETT was cleared. Airway resistance was recorded pre and post ETT scraping. Subsequent SBT pass/fail status was also recorded. A paired t-test was conducted to evaluate the mean difference in pre and post ETT scraping. A Mann-Whitney U test was used to evaluate the difference in percentage change in airway resistance between SBT groups. **Results:** There were 29 subjects that completed the study. The mean pre and post ETT scraping airway resistance was 15.17 ± 3.83 cm H_2O/L/s and 12.05 ± 3.19 cm H_2O/L/s, respectively (P < .001). The success of subsequent SBT was 48%; however, there was no difference in percent change in airway resistance between subsequent passed SBT (18.61, IQR 8.90-33.93) and failed SBT (23.88, IQR 0.00-34.80), U = 78.5, z = -.284, P = .781. No adverse events were noted with ETT scraping. **Conclusion:** This study revealed that ETT scraping can reduce RAW. The decrease in resistance in patients with an RAW of 10 cm H_2O/L/s or greater did not affect subsequent SBT success. Future studies are needed to understand the level of RAW at which ETT scraping would impact SBT success.

Sponsored Research - None

2532063

GENERAL CARE IMPROVEMENT PROJECT: COPD 30 DAY READMISSIONS. SEARCH FOR G.O.L.D.

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Introduction: Our Respiratory Care Management Team in collaboration with the Hospital Medical Practice Group, and Hospital Practice Leadership utilized the DMAIC (Define, Measure, Analyze, Improve, Control) framework to develop and support a hospital based Respiratory Therapist (RT) Quality Initiative (QI) aimed at reducing our 30 day hospital readmission rate for COPD. **Methods:** Administrative data was abstracted to characterize the inpatient COPD population, care provided, and potential causes of readmissions in the preceding 18 month timeframe. January 2014 stakeholders were identified, potential gaps in quality of care, measurement metrics, causes for COPD readmission, and an intervention plan utilizing a Chronic Pulmonary Disease Clinical Specialist-RT was established. The projected COPD 30 day Readmission was a reduction from 16% to less than 11% within a timeline of 12 months. **Results:** Multiple causes were identified for COPD 30 day readmission. A major gap identified is the loss of continuity during the transition from inpatient to outpatient care within the narrow 30 day window. Stakeholder buy-in was secured and a manual of therapeutic options designed to comply with RT scope of practice was formulated. A daily disease registry of patients who met the criteria for COPD exacerbation was created. RT facilitates completion of a standardized COPD assessment tool, provides specific interventions for education, equipment, care planning, provision of therapy, and specialty consult recommendations. Communications with patients, primary hospital teams, DME purveyors, and outpatient clinics were mapped. Recommendations for COPD medications, homecare, outpatient testing, and specialty consults. Phone follow-up after discharge within 24-48 hours and on day 10 was formulated. Preliminary data review reveal an all-cause 30 day readmission rate of 8.8% and 30-day readmission for COPD cause at 3%. **Conclusions:** In collaboration with the COPD Readmission Prevention Group, Hospital Practice Leadership support we developed an RT led strategy which is a patient centered approach to identify patient's priority and secure engagement. A pilot to assess outcomes has been completed. Continued collaboration within all levels of the practice is necessitated to refine current processes, use of rapid Practice, Study, Do, Act (PDSA) cycles, collaboration with hospital, primary care, transition, or home care teams, are all integral for continued success of this RT led QI

Sponsored Research - None

2483374

USING PROPORTIONAL ASSIST VENTILATION TO WEAN ADULT DIFFICULT-TO-WEAN PROLONGED MECHANICALLT VENTILATED PATIENTS.

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Background: Weaning is the process of liberating patients from mechanical ventilation (MV). 6% of ventilated patients are prolonged mechanically ventilated (PMV) and 20% to 30% are difficult-to-wean. The respiratory muscle function is an important determinant of success or failure of the weaning process. Proportional assist ventilation (PAV+) is a novel mode of MV that is designed to keep up the changing patient's breathing demand and lung mechanics, and unload respiratory muscles. **Objectives:** This study was designed to determine the effect of PAV+ on adult difficult-to-wean PMV patients. **Methods:** After multiple conventional weaning attempts of PSV had failed for eight adults, PMV patients who spent more than three weeks but less than three months on MV and were difficult-to-wean /failed SBT trials with PSV more than five times. We switched them to PAV+ mode using predetermined PAV+. Negative Inspiratory Force (NIF and Airway Occlusion Pressure (P 0.1) were measured throughout PAV+ trails. **Results:** Fourteen adult patients were included in this study. All patients were on tracheostomy tube. Ten of the patients with mean duration of MV was 53.2 days prior to PAV+ trial. On PAV+, NIF and P 0.1 measurements improved by 87% and 79% respectively from the baseline (Figure.1). They were successfully weaned off MV with an average weaning time of 5.8 days. **Conclusion:** PAV+ can be used safely and efficiently to wean adult difficult-to-wean PMV patients. PAV+ provides opportunity for a respiratory muscle to recover and strengthen, increasing the likelihood of weaning success.

Sponsored Research - None

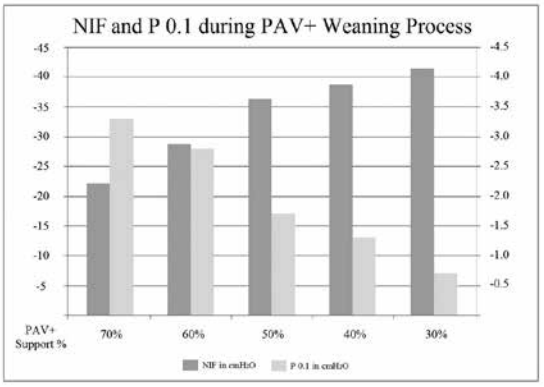

Figure.1: NIF and P 0.1 measurements throughout PAV+ trails.

2488222

THE EFFECT OF AIRWAY RELEASE VENTILATION ON CIRCULATON AND RESPIRATION IN POST-OPERATION OF CARDIAC SURGERY PATIENTS.

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Introduction Postoperative pulmonary complications (PPCs) are a major cause of morbidity and mortality in cardiac surgery patients, and are responsible for higher healthcare costs. The purpose of this study was to investigate the effects of APRV on hemodynamic and respiration in post-operation of cardiac surgery patients. **Methods** 56 patients who were 18 years age or older post-operation of cardiopulmonary bypass patients, between November 2013 and February 2014, were prospectively enrolled, randomized divided into two groups, 27 patients with PCV and 28 patients with APRV. After admitted to ICU, all patients were ventilated with conventional ventilation (Pressure control ventilation, assist control) with tidal volume of 6 ml/kg and positive end-expiratory pressure (PEEP) of 5-10 cmH_2O for 30 minutes. PCV group continued to previous setting, APRV group set $PEEP_{high}$ according to the mean pressure, T_{high} was > 90% respiratory cycle, adjusted parameters based on the oxygenation and. After a 5-minute stabilization period, hemodynamics and respiratory parameters had been continuously observed until 3days. **Results** The APRV group presented a higher CI (3.1±0.7 vs. 2.8±0.8, p<0.05) SI (35.4±9.2vs. 33.1±9.7, p<0.05) and RVSW(11.1±4.8 vs. 9.3±4.5, p<0.01) compared with PCV group. And APRV result in better PaO2/FiO2 (340±97 vs. 301±82, p<0.05). Lactate and ScvO2 were increased in APRV group (4.23±2.67 vs. 6.76±3.43, p<0.01). In addition, Chest radiograph score (CRS) revealed less lung injury in APRV mode (0.4±0.7 vs. 1.2±0.7, p<0.01). **Conclusions** APRV mode and PCV mode can more effectively improve oxygenation and less lung injury in post-operation of cardiac surgery patients, as well as hemodynamics including CI and SI. APRV could be the first choice for the post-operation of cardiac surgery patients.

Sponsored Research - None

2507654

THE UTILIZATION OF HIGH FREQUENCY PERCUSSIVE VENTILATION TO REDUCE EXTRACORPOREAL OXYGENATION MEMBRANE SUPPORT.

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To minimize the chance of ventilator induced lung injury (VILI), in patients who develop adult respiratory distress syndrome ARDS), Extracorporeal Oxygenation Membrane (ECMO) is a common clinical intervention. The goal of venous-venous ECMO is to provide stable gas exchange, while the goal of the ventilator is to preserve the patient's pulmonary mechanics and minimize VILI. When ECMO parameters are maximized and gas exchange is marginal, often then the ventilator is called upon to help improve or maintain gas exchange often requiring high pressures and oxygen delivery (FIO2). An alternative strategy to meet this objective is to utilized high frequency percussive ventilation (HFPV) via the VDR-4 (Sandpoint, Idaho). HFPV provides both an endobronchial wedge via the percussive rate and an oscillatory plateau via the connective rate. With this strategy lower pressures and oxygen delivery can be employed and ECMO parameters can be often reduced. From Jan 2015 to Feb 2016 we utilized the VDR on fifteen V-V ECMO patients. Thirteen (86.7%) of fifteen patients both ECMO FIO2 and sweep were reduced with in twenty-four hours. (Table 1) HFPV pressures and FIO2 were maintain lower than 60% and airway pressure≤40cmH20. (Table 1) Prior to placing on HFPV a pressure/tool measurement was performed to determine starting airway pressure and PEEP parameters to set on the VDR. Based on the above results, HFPV can help ECMO maintain gas exchange for patients at a lower FIO2 and sweep settings.

Sponsored Research - None

Patient	Pre ECMO FIO2%	Pre ECMO LPM	Post ECMO FIO2	Post ECMO LPM	VDR FIO2%	VDR PIP/PEEP cm/h20
1	100%	6lpm	70%	4lpm	40%	40/16
2	100%	7lpm	60%	5lpm	50%	38/20
3	100%	8lpm	80%	6lpm	50%	40/16
4	100%	7lpm	60%	5lpm	50%	38/18
5	100%	7lpm	100%	6lpm	90%	40/22
6	100%	9lpm	60%	6lpm	40%	40/18
7	100%	6lpm	70%	4lpm	40%	34/16
8	100%	6lpm	90%	4lpm	50%	38/18
9	100%	8lpm	60%	7lpm	40%	36/16
10	100%	7lpm	80%	5lpm	50%	40/18
11	100%	8lpm	90%	4lpm	50%	34/16
12	100%	7lpm	80%	5lpm	50%	40/16
13	100%	8lpm	60%	5lpm	40%	40/16
14	100%	8lpm	60%	6lpm	40%	38/14
15	100%	9lpm	100%	8lpm	90%	40/22

2510908

IMPLEMENTING A PHYSICAL THERAPY DRIVEN EARLY MOBILITY PROTOCOL SIGNIFICANTLY DECREASED HOSPITAL LOS OF PATIENTS ON MECHANICAL VENTILATION.

Kenneth Miller, Michael Pechulis, Rita Pechulis, Anne Rabert; LVHN, Allentown, PA

Historically, early mobilization in the ICU was common practice. Recent evidence indicates that reviving principles of early mobility within the intensive care unit (ICU) may decrease both ICU duration and hospital length of stay (LOS). Our goal was to determine if using a physical therapy (PT) driven early mobility protocol, along with early ambulation with mechanical ventilation, and with respiratory therapy assistance, would result in decreased ICU LOS, days on mechanical ventilation (MV) and hospital LOS at a university affiliated ICU. This study was granted IRB approved. Our study included all medical patients admitted to the Medical/Surgical ICU at Lehigh Valley Health Network, Allentown PA (n=1298). Surgical patients (n=101), patients without PT orders (n=478), patients readmitted to the ICU (n=33,) patients transferred among multiple ICUs (n=38) and patients whose PT orders were not placed until after leaving the ICU (n=129) were excluded from the study. Patients ambulated with mechanical ventilation or high flow oxygen (n=36). For 10 weeks (intervention period) we increased the PT staffing ratio in the ICU from 0.7FTE/36 patients to 4 FTE/36 patients and compared this to the 10 week period prior to intervention (control group 1) and 10 week period post intervention (control group 2). We evaluated LOS in the hospital, LOS in the ICU and number of days on MV. See Table 1 for results In a post study analysis 23% of mechanically ventilated patients were mobilized on a given day. 86.6% of mechanically ventilated patients who were mobilized did activities in bed or dangled at edge of bed. 48.3% of mechanically ventilated patients who were mobilized did activities in bed. 11.7% of mechanically ventilated patients were ambulated. Physical Therapists are trained to identify somatic disorders and implement a plan of care that progresses a patient from debilitation to independence. Respiratory Therapists are trained to assess a patient's work of breathing and provide clinical interventions to maintain or reduce any increase in work of breathing. In this study of 486 patients, we found implementing a PT driven early mobility protocol significantly decreased hospital LOS. To optimize patient outcomes a multidisciplinary approach to patient mobility should be advocated, even in this era of scare resources.

Sponsored Research - None

	Control group 1 n=147	Intervention group n=215	Control group 2 n=124
Hospital LOS	14.0 +/-13.1 days	10.6 +/-10.1 days p=0.01	12.0 +/-9.2 days
ICU LOS	6.4+/-9.1 days	5.0/+/-8.0 days p=0.07	5.1 +/- 5.1 days
MV pts.	62	58	60
MV duration	10.0 +/- 10.6 days	6.9 +/-11.1 days p=0.06	6.4 +/- 5.6 days

53% of physical therapy work load was mechanically ventilated patients

2514209

RE-ESTABLISHING BASELINE WITH TRANSPORT VENTILATORS WHEN TRANSITIONING FROM ICU VENTILATOR.

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BACKGROUND: Patients who are transitioned from their ICU ventilator to a portable or transport ventilator are expected to be managed with equivalent support. To avoid physiological compromise, equivalent delivery would ideally be re-establishing critical care ventilator values without delay upon connection of the transport device. We wanted to know when using a comparable mode if there was delay in reaching equivalent delivery of PEEP, V_E, mPAW, and FIO_2 between a benchmark ICU ventilator and our portable ventilators. **METHODS:** Our set-up included a standard ventilator patient circuit connected to an ASL 5000 (IngMar Medical Ltd, Pittsburgh, PA), with C = 20 mL/cmH_2O and R = 5 cmH_2O/L/sec. The benchmark ventilator was a Hamilton Medical G5, (Hamilton Medical, Reno, NV), Mode = (S)CMV. The portable ventilators included a Hamilton T-1 and MR-1, (Hamilton Medical, Reno, NV), Pulmonetics LTV-1000, (CareFusion Corp, San Diego, CA), and Newport/Covidien HT-50 and HT-70, (Covidien, Mansfield, MA), using a volume-targeted mode. Set V_E = 4, 5, 10, 15, and 20 L/m, FIO_2 = 100%, I:E = 1:2. Measurements were recorded every second with a TSI-4080 FA-Plus analyzer, (TSI Inc., Shoreview, MN), to determine the elapsed time for stability of PEEP, V_E, Mean AWP, and FIO_2. Comparisons to stabilized measurements of PEEP, V_E, mPAW, and FIO_2 were made to the benchmark and the data were analyzed using ANOVA and paired t-tests with $p < 0.05$ considered significant. **RESULTS**: Compared to the baseline MD (±SD) PEEP = 0.1 cmH_2O, (±0.8 cmH_2O) ($p > 0.05$), V_E = 0.2 L/m (±1.1 L/m), ($p > 0.05$), mPAW = 1.6 cmH_2O (±3.2 cmH_2O), ($p < 0.01$), and FIO_2 = 1.2% (±2.3%), ($p > 0.05$). The Table below illustrates the elapsed time to stability of the specific measured outcomes, ($p < 0.01$). **DISCUSSION/CONCLUSIONS:** These data suggest that the evaluated transport ventilators achieve comparable measurements to benchmark values. However there were significant delays in obtaining these end-points.

Sponsored Research - None

	PEEP	V_E	mPAW	FIO_2
T1	0:00:16	0:01:12	0:00:56	0:00:46
MR1	0:00:12	0:02:05	0:01:55	0:00:49
LTV	0:00:28	0:00:37	0:01:10	0:01:33
HT50	0:00:07	0:00:39	0:00:22	0:00:01
HT70	0:00:12	0:00:38	0:00:25	0:00:40
Time to stability Volume Targeted	**0:00:17**	**0:01:02**	**0:00:58**	**0:00:46**
Time to stability Pressure Targeted	**0:00:03**	**0:00:27**	**0:00:30**	**0:00:16**

Elapsed time to measured outcome stability

2523680

COMPARISON OF TRIGGER SENSITIVITY BETWEEN TWO HOME-CARE VENTILATORS AND ONE INTENSIVE CARE VENTILATOR WITH DECREASING INSPIRATORY MUSCLE PRESSURES IN A SIMULATED NEONATE LUNG MODEL.

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BACKGROUND: Transitioning patients who require long-term mechanical ventilation from intensive care ventilators to home care ventilators can present many challenges, especially in neonatal and infant populations. Synchronization and/or the ability of these patients to trigger home-care ventilators can delay transition, increase length of stay and may inadvertently be perceived as an acute change in patient condition. 2 brands of home-care ventilators and 1 intensive care ventilator were tested to compare trigger sensitivity at decreasing inspiratory muscle pressures. **METHODS**: To account for variability, a total of 9 ventilators (3 Servo i's, 3 Trilogy 202's, and 3 LTV 1200's) were tested. Each was attached to a lung simulator (Ingmar ASL 5000) using the same circuit/s within each brand of ventilator (Trilogy – propriety passive and active infant circuits, LTV – proprietary infant circuit, Servo i – Fisher & Paykel infant circuit). A normal spontaneously breathing neonate model was chosen on the ASL with compliance and resistance set at 8 mL/cm H2O and 40 cm H2O/L/s. RR's of 16 and 32 breaths/min were tested. Ventilators were set in their respective spontaneous modes with a PIP of 10, PEEP of 5, cycle off at 20% with rise times of: Trilogy 1, LTV 3, and Servo i .10 sec. Trigger settings used: Trilogy – passive circuit: flow 1 & autotrak sensitive, active circuit: flow 1, LTV – sensitivity 1, Servo i – green 1, 3, & 6. Each simulation was run for a minimum of 3 minutes at inspiratory muscle pressures of -4, -3, -2, -1.5, & -1 cmH20 for a total of 210 simulations. Post-run waveform analysis was used to assess triggering, the first 20 seconds of each simulation was discarded to allow for stabilization and the subsequent 2 minutes were used for analysis. Comparative analysis was performed by One-way ANOVA and Holm-Sidak post hoc. **RESULTS**: At a RR of 32 there was no significant difference (P>0.05) in percentage of triggered breaths between ventilators at inspiratory muscle pressures of -4 or -3 cmH20, but was significant at -2, -1.5, & -1 cmH20 (P<0.001). At a RR of 16 there were significant differences (P<0.001) at all inspiratory muscle pressures except for -4 cmH20 (P>0.05). **CONCLUSION**: Significant differences and variations existed between brands and ventilators. The Trilogy with passive circuit set at flow trigger of 1 performed as well as the Servo i ICU ventilator up to an inspiratory muscle pressure of -1 cmH20.

Sponsored Research - None

2524430

FILTERING CONTINUOUSLY ADMINISTERED AEROSOL TO PROTECT VENTILATOR'S EXHALATION VALVE FROM CONTAMINATION.

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BACKGROUND: Inhaled aerosolized medications including bronchodilators, epoprostenol, and antibiotics, are frequently administered to mechanically ventilated patients. Without supplemental filtration, patient circuit occlusions have occurred. We wanted to know if placing a filter between the end of the patient circuit's expiratory limb and the exhalation valve assembly would protect the ventilator from contamination and without adding resistance or PEEP. **METHODS:** We used a Hamilton G5 ventilator and test lung, (Hamilton Medical, Reno, NV), with an F&P RT-210 heated wire patient circuit and model 850 humidifier, (Fisher & Paykel Healthcare, Irvine CA), set for 37^{O}C. Ventilator settings: VT = 650 mL, RR = 14 BPM, PEEP = 5 cmH_2O, flow-trigger = 5 L/m. A single Smiths Medical #002873 hydrophobic HEPA filter (Smiths-Medical, Keene, NH), was placed between the end of the circuit's expiratory limb and the exhalation valve assembly. A Bodyguard-575 infusion pump, (CME America, Golden, CO), provided continuous delivery of 3% NaCl at a rate of 10 mg/hr. This was aerosolized in continuous mode with an Aerogen Solo nebulizer, (Aerogen, Galway, IE). Both expiratory resistance and PEEP were measured and recorded with comparisons made to initial baselines. The data were analyzed using ANOVA and paired t-tests with $p < 0.05$ considered significant. **RESULTS:** The test was conducted without interruption for 4 consecutive days. Ten measurements were recorded/hour totaling 940 measurements. The MD (±SD) of expiratory airway resistance after 93 hours compared to the initial baseline was 0.09 cmH_2O/L/sec (±0.48 cmH_2O/L/sec) ($p > 0.05$). There was no change in PEEP after 93 hours ($p > 0.05$). During hour 94, although resistance did not rise, PEEP increased to 5.3 cmH_2O with the decision made to conclude the experiment. There were extensive salt deposits within the filter but no salt residue on the exhalation membrane. **DISCUSSION:** Expiratory-side filtration is not provided with most current generation ventilators - nor is there a consensus for the need to do so. However, aerosolized inhaled medication can affect circuit resistance and increase the risk of occlusion. Within the limits of this study we suggest that a hydrophobic filter provided reasonable protection of the ventilator's exhalation valve. Further study is recommended to determine if these findings are applicable to a full spectrum of inhaled medications that are currently aerosolized.

Sponsored Research - None

2524653

OPEN HEART WEANING PROTOCOL - A PERFORMANCE IMPROVEMENT PROJECT.

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Background: Protocols and guidelines are used in many aspects of clinical care and have been proven to improve outcomes. However, they are not often updated as the literature evolves. We wanted to implement a new open heart weaning protocol that would give bedside practitioners the autonomy to make adjustments to patient care in a timely manner based on the current literature surrounding ventilator and sedation management. **Methods:** We developed a new protocol that incorporates the latest literature supporting the use of protective ventilator strategies and minimal sedation. Once the protocol was developed and approved by all the interested parties, education was provided to all respiratory care and nursing staff that provide clinical care to open heart patients. After local IRB approval, we collected data retrospectively for 3 months prior to protocol implementation and then for 3 months prospectively as patients were being taken care of following the new protocol. Median hours intubated, days in the ICU, and days in the hospital were noted and compared. Other demographics were also compared. **Results:** A total of 114 patients were evaluated. 61 patients were in the before protocol group and 53 patients were managed using the new protocol. Median hours on the ventilator before the new guideline was 5.08, and after was 3.83 for a difference of 1.25 hours (p=<0.0001). Median days in the ICU were 1.90 days (45.6 hours) and 1.81 (43.44 hours) for a difference of 0.09 (2.16 hours) (p=0.34) and Median days in the hospital were 7.77 (186.5 hours) before the protocol and 7.22 (173.28 hours) after for a difference of 0.55 (13.22 hours) (p=0.01). **Conclusions:** This study demonstrated that a new protocol focusing on protective ventilation strategies, conservative sedation practices, and more autonomy over ventilator management resulted in fewer hours on the ventilator, in the ICU and in the hospital. There were no significant differences in survival or complications as only one patient returned to the operating room and only one patient did not survive till discharge. **Disclosures**: Keith Lamb has consulted for Bayer Pharmaceuticals and Medtronic.

Sponsored Research - None

Data and Outcomes

Parameter	Before New Protocol	After New Protocol	Difference	P Value
N = 114	61	53	8	NA
Median time on Ventilator (hours)	5.08	3.83	1.25	<0.0001
Median time in ICU (hours)	1.90 (45.6)	1.81 (43.44)	0.09 (2.16)	0.34
Median time in Hospital (hours)	7.77 (186.5)	7.22 (173.28)	0.55 (13.22)	0.01
Returned to Operating Room	1	0	1	NA
Reintubated	0	1	1	NA
CABG	43	37	6	NA
CABG + AVR	8	5	3	NA
MVR + AVR	10	11	1	NA
IABP	4	2	2	NA
Rehabilitation	2	0	2	NA
Deceased	0	1	1	NA
Male	42	41	1	NA
Female	19	12	7	NA
Age (Median)	69	71	2	NA

CABG = Coronary Artery Bypass Graft, AVR = Aortic valve Replacement, MVR = Mitral Valve Replacement, IABP = Intra-Aortic Balloon Pump

2525146

P LOW OF 0 CMH20 MAXIMIZES PEAK EXPIRATORY FLOW RATE WHILE OPTIMIZING CARBON DIOXIDE REMOVAL IN AIRWAY PRESSURE RELEASE VENTILATION.

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BACKGROUND Airway Pressure Release Ventilation (APRV) is described as continuous positive airway pressure (CPAP) with a brief release to augment carbon dioxide (CO_2) removal. Based on 2005 APRV published guidelines, clinical studies and multiple experimental models have validated setting a pressure low (P Low) of 0 cm H_2O and time low (T Low) to terminate (T) at 75% of the Peak Expiratory Flow Rate (PEFR) maintains adequate end expiratory lung volume without a subsequent increase in CO_2. Because diffusion of CO_2 occurs during the prolonged CPAP phase (≥90% of the total respiratory cycle) and convective removal during the sub-second release phase (T Low), increasing P Low >0 cmH_2O could increase the expiratory resistance resulting in an increase in CO_2. A previously published abstract using a single comparment test lung model demonstrated that a P Low >0 cmH_2O would increase the PEFR. Our hypothesis was that a P Low >0 cmH_2O with a T Low set to 75% T-PEFR in patients would decrease PEFR and subsequently cause an increase in CO_2 as measured by end tidal CO2 (etCO2). **METHOD** After receiving IRB approval, we studied 20 patients on APRV with initial settings of P Low of 0 cmH_2O and T Low of 75% T-PEFR. The P Low was increased in increments of 5 cmH_2O from 0 to 15. Three (3) minutes between each P Low level was used as an equilbration period and the following data was collected: PEFR, T-PEFR, release volumes, $etCO_2$, MV and assessment of patient comfort using a scale of 0-5 where 0 was no change in level of comfort and 5 was most uncomfortable. **RESULTS** In each case, a P Low of 0 cmH_2O demonstrated the highest PEFR as compared to P Low >0 cmH_2O with statistical difference seen as a decrease in PEFR when changing P Low from 0-15, 5-15 and 0-10 cmH_2O (see Table 1). The $etCO_2$ increased in 16 of the 20 patients while decreasing in the remaining 4 patients; however, a concomitant increase in respiratory frequency and signs of increased work of breathing was noted in these 4 patients, which may caused a decrease in etCO2 due to increase respiratory frequency. Visual assessment and patient comfort scores demonstrated 13 of the 20 patients became uncomfortable, agitated, coughing, and and exhibited increased respiratory frequency and use of accessory muscles to actively exhale. **CONCLUSION** Setting a P Low of 0 cmH_2O in APRV maximizes PEFR while efficiently removing CO_2 as assessed by $etCO_2$ and was associated with the greatest comfort.

Sponsored Research - None

Ordered Differences Report

Level	- Level	Difference	Std Err Dif	Lower CL	Upper CL	p-Value
PEFR 0	PEFR 15	22.05000	3.801852	12.0633	32.03670	<.0001*
PEFR 5	PEFR 15	18.20000	3.801852	8.2133	28.18670	<.0001*
PEFR 0	PEFR 10	13.50000	3.801852	3.5133	23.48670	0.0036*
PEFR 5	PEFR 10	9.65000	3.801852	-0.3367	19.63670	0.0620
PEFR 10	PEFR 15	8.55000	3.801852	-1.4367	18.53670	0.1195
PEFR 0	PEFR 5	3.85000	3.801852	-6.1367	13.83670	0.7425

Table 1: P Low changes from 0 to 15 cmH_2O with statistical difference seen as a decrease in Peak Expiratory Flow Rate (PEFR) between P Low changes from 0-15, 5-15 and 0-10 cmH_2O

2527091

COMPRESSION VOLUME LOSS CAN BE REDUCED BY ADDING END-INSPIRATORY PAUSE IN A PEDIATRIC LUNG MODEL.

Lance Pangilinan, Earl Mangalindan, Kelly Ho, Justin Phillips, Joseph Booze, Richard Kallet; Respiratory Care Services, San Francisco General Hospital, San Francisco, CA

Background: Pressurization of the ventilator circuit causes a portion of the V_T to be compressed (V_{CMP}) and trapped within. In theory, adding an end-inspiratory pause (EIP) may partially compensate for V_{CMP} because the pressure gradient between peak and plateau (PIP-Pplat) should inject gas into the lungs depending on 4 factors: the magnitude of PIP-Pplat, pause time (T_{EIP}) airways resistance (R_{AW}) and compliance (C). We asked if EIP reduced V_{CMP} in a pediatric lung model as driving pressure (P_{DR}: PIP-PEEP) increased. **Methods:** A Michigan Instruments Test Lung was used. Increasing P_{DR} (10, 20 and 30 cmH_2O) was accomplished using a combination of 3 endotracheal tubes (5.5, 4.5 4.0 mm ID) and C set between 10-35 mL/cmH_2O. The effects of EIP were measured on 3 ventilators: Drager XL (DXL), Covidien 980 (C980) and Viasys Avea (AVE); set for a hypothetical 7 yo child (25kg PBW) ventilated at 8 mL/kg [V_T: 200 mL, Rate: 30, peak inspiratory flow (Square): 25 L/min, PEEP: 5 cmH_2O. T_{INSP} was set at 0.5s with EIP of 0, 0.2 and 0.4 s. A Fisher-Paykel heated wire circuit and a filled MR290 chamber (heated for 30 m) were used. V_{CMP} was calculated as the difference between inspired V_T measured by the ventilator and at the circuit wye with a NICO (Philips) monitor. **Results**: Adding EIP effected small reductions in V_{CMP}. The magnitude varied by ventilator. Variations in R_{AW} and C required to achieve each P_{DR} (as well as small differences in PIP-Pplat during EIP) may have interacted with differences in ventilator compensation strategies for limiting V_{CMP}. **Conclusion:** Adding EIP effects small reductions in V_{CMP} Our results suggest that EIP reduces V_{CMP} in direct relation to the magnitude of PIP-Pplat and EIP duration, whereas increased R_{AW} and decreased C attenuate the effectiveness of EIP. Also, differences in ventilator compensation algorithms for V_{CMP} likely influence these results. A higher ventilator-delivered V_T (i.e. more aggressive volume compensation) increases V_{CMP} that theoretically, might provide a larger potential gas bolus available for injection into the lungs during EIP.

Sponsored Research - None

		TEIP:0	TEIP:0.2	TEIP:0.4	PIP-Pplat	RAW	C
PDR:10	C-980	12%	9%	7%	6	14	30
	DXL	13%	12%	11%	6	16	35
	AVE	9%	6%	5%	5	13	34
PDR:20	C-980	12%	10%	9%	4	14	11
	DXL	10%	10%	9%	5	13	11
	AVE	9%	8%	8%	3	8	12
PDE:30	C-980	14%	12%	11%	13	35	11
	DXL	9%	7%	7%	8	21	8
	AVE	10%	9%	9%	10	26	9

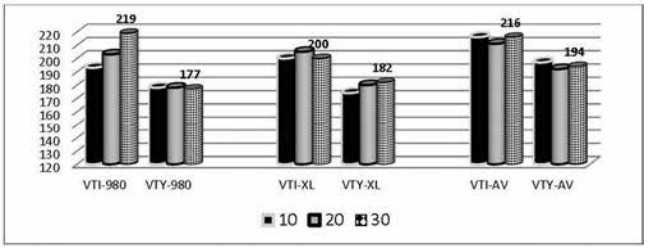
2527102

VENTILATOR COMPRESSION VOLUME COMPENSATION DOES NOT MAINTAIN PRE-SET TIDAL VOLUME.

Justin Phillips, Lance Pangilinan, Kelly Ho, Earl Mangalindan, Joseph Booze, Richard Kallet; Respiratory Care Services, San Francisco General Hospital, San Francisco, CA

Background: Current ventilators are equipped with software that corrects for compression volume (V_{CMP}) lost in the circuit during pressurization based upon measured circuit compliance. The ability of this feature to ensure delivery of the pre-set V_T as driving pressure (P_{DR}) increases has not been reported. We evaluated this feature on 3 ventilators using a pediatric circuit. **Methods:** A Drager XL, Covidien 980 and Care Fusion Avea ventilator underwent a systems test using a pediatric Fisher-Paykel heated wire circuit and MR290 chamber that was preheated (for a minimum of 30 m) prior to testing. A Michigan Instruments Test Lung was used with compliance settings between 10-35 mL/cmH_2O and 3 endotracheal tube sizes (5.5, 4.5, 4.0 mm ID) to create P_{DR} of 10, 20 and 30 cmH_2O. All ventilators were set for a hypothetical 7 y.o. child of 25kg PBW ventilated at 8 mL/kg (V_T: 200 mL, Rate: 30, Tinsp: 0.5s, Peak inspiratory flow (Square): 25 L/min, PEEP:5 cmH_2O. V_{CMP} was calculated as the difference between the inspired V_T measured by the ventilator and V_T measured at the wye adapter using NICO pulmonary mechanics monitor (ie. V_{TI} and V_{TY}). **Results**: Initial V_{CMP} loss was 2-13% of the V_{TI} or 0.1 to 1 mL/kg at the lowest P_{DR}; only the Avea ventilator compensated for V_{CMP}. As P_{DR} increased, only the Covidien 980 failed to compensate for V_{CMP} which remained ~22mL (0.9 mL/kg; 11-12% of V_{TI}). In contrast, the Drager XL reduced V_{CMP} from 26 to 18 mL (1.0 to 0.7 mL/kg; 13% to 9% of V_{TI}), and the Avea maintained V_{CMP} < 10 mL (2-4% of V_{TI}). Nonetheless, the differences found in this study are of uncertain clinical significance (i.e. V_{CMP} never exceeded 1 mL/kg). **Conclusion:** Of the tested ventilators, only the Avea returned V_T to within 5% of the pre-set value. Instead the other ventilators prevented further volume loss as P_{DR} increased. The degree of V_{CMP} loss appears relatively minor in a model of pediatric mechanical ventilation.

Sponsored Research - None



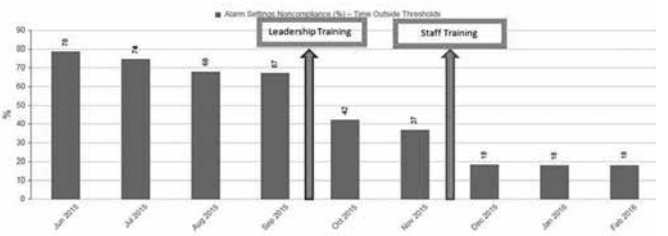
2528101

SUCCESSFUL DEFINING AND ADHERENCE TO VENTILATOR ALARM GUIDELINES

ursula d. alexander, SUSAN BARLOW, PHILLIP IRVIN; Respiratory Therapy, Texas Health Resources, Plano, TX

Introduction: Proper management of ventilator alarms is an essential element of patient safety and one mandated by governmental oversight and regulations. While alarm safety is a given, clear guidelines don't currently exist with regard to setting of alarm parameters and methods to ensure compliance. Historically, collection of compliance to alarms data has been an arduous and manual task, which has further distanced us from the goal of utilizing the most appropriate settings. National Patient Safety Goals (NPSG's) require us to give attention to alarms. We report a process that consistently leads to successful vent alarm compliance that can be sustained. **Methods:** Sampling of data was facilitated by the acquisition of an automated, real time data collection tool (CareFusion's Respiratory Knowledge Portal). Utilizing Lean Six Sigma methodology, a multidisciplinary team was assembled to participate in a one day Kaizen event to determine the "why's" of noncompliance as well as discuss barriers that need to be overcome in order to establish a safe operating environment. Definitions were created to address the barriers and a daily surveillance process was initiated to address compliance. In setting the alarm thresholds, the team recognized that there would be outliers due to critical conditions. However, the team reached consensus on monitoring guideline compliance-high VE, low VE, high PP and low PP and agreed these could be achieved 80% of the time. A control tool was created to monitor and ensure sustainability. **Results:** Initial results prior to the Kaizen event showed 0-5% compliance with our policy. Simply discussing our findings raised awareness and resulted in a rapid upturn of our results to 58% compliance but still fell short of the goal of 80%. At "go live" the team recorded a quick up tick to 82% and within the month we had hit our target and sustained an 82-86% success rate. **Conclusion:** Alarms management is a complex issue that involves the entire ICU team. A more specific understanding of what barriers exist is crucial to compliance. Sustainability, however is accomplished by having intentional conversations with each therapist responsible for ventilation in the ICU. This daily attention to alarm compliance combined with the automated ability to collect alarm compliance data not only satisfies the NPSG's but ensures the safety of our patients which is the ultimate goal.

Sponsored Research - None



2528511

FILTERING AEROSOLIZED TOBRAMYCIN DURING MECHANICAL VENTILATION.

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

BACKGROUND: The majority of mechanical ventilators do not have manufacturer provided expiratory-side filtration. The recommendation for the Hamilton G5, (Hamilton Medical, Reno, NV), that we use is to remove the expiratory-side filter during nebulization. Without filtration during inhaled medication delivery we found that the exhalation valve has been compromised resulting in patient circuit occlusions. We wanted to know if placing a filter prior to the exhalation port would effectively protect the exhalation membrane from contamination of i-Tobramycin without adding resistance or PEEP to the circuit. **METHODS:** The G5 ventilator was fitted with an F&P RT-210 heated wire patient circuit and model 850 humidifier, (Fisher & Paykel Healthcare, Irvine CA), set for 37^{O} C. Ventilator settings: VT=650 mL, RR=14 BPM, PEEP=5 cmH_2O, flow-trigger = 5 L/m. One Smiths Medical #002873 HEPA hydrophobic filter, (Smiths-Medical, Keene, NH), was placed on the expiratory limb prior to the expiratory valve assembly. Four vials of 300 mg/5mL i-Tobramycin (Akorn Pharmaceuticals, Lake Forest, Illinois), were aerosolized 12 hours apart with an Aerogen Solo nebulizer, (Aerogen, Galway, IE). Expiratory resistance (Rexp) and PEEP were measured and recorded for 48-hours. Comparisons were made to initial baselines and the data were analyzed using ANOVA and paired t-tests with $p < 0.05$ considered significant. **RESULTS:** Baseline: Rexp = 10 cmH_2O/L/sec; PEEP = 5 cmH_2O. There were 10 measurements recorded/hour for a total of 480 measurements. The MD (±SD) of Rexp after 48 hours compared to the initial baseline was 0.37 cmH_2O/L/sec (±0.57 cmH_2O/L/sec), ($p > 0.05$). PEEP MD (±SD) was 0.0004 cmH_2O (±0.01 cmH_2O) ($p > 0.05$). There was no detectable contamination on the exhalation membrane or exhalation housing after 48 hours nor were there any alarm conditions of circuit occlusion during the 48 hour testing. **DISCUSSION:** Expiratory-side filtration is not provided with most current generation ventilators nor is there a consensus for the need to do so. However, aerosolized products concurrent with high levels of humidity can affect circuit resistance and increase the risk of occlusion. Within the limits of this study we suggest that a hydrophobic filter provided reasonable protection of the ventilator's exhalation valve for a period of 48 hours. Further study is recommended to determine if these findings are applicable for the full spectrum of inhaled medications that are currently aerosolized.

Sponsored Research - None

2529259

VENTILATOR ALARM LIMITS VS MEASURED VALUE: A QUALITY ASSURANCE STUDY.

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Background: Alarm fatigue is a growing concern in the health care arena and is associated with morbidity and mortality. The Joint Commission established alarm management as a Hospital National Patient Safety Goal. We sought to determine how ventilator alarms are set related to measured patient values. **Methods:** Retrospective data was gathered manually from the electronic medical record. The data included gender, height, ICU, shift, ventilator mode, measured exhaled VT, and peak airway pressure (Ppeak), also alarm limits for VT and Ppeak were recorded. We chose to focus on the high VT and Ppeak limits which might be considered important in providing lung protection. For the VT limit analysis, we expressed the limit in mL/kg of PBW. For the Ppeak limit analysis we determined three levels, <15 cmH_2O, 15 -25 cm H_2O, and >25 cm H_2O. Data was collected and summarized in Excel and processed using SPSS. **Results:** Data from 45 patients was obtained representing 134 total samples, and 6 ICUs. The ventilators included the Draeger V-500 (97), Puritan Bennett 840 (33), Carefusion AVEA (2) and Respironics LTV (2). The Ppeak limits were set at 40 cm H_2O 25% of the time, at 45 cm H_2O 18%, at 49 cmH_2O 2%, at 50 cm H_2O 48% of the time, >50 in 7%. 90% of Ppeak limits were set >15 cm H_2O above the actual Ppeak and 40% were set >25 cm H_2O above, regardless of mode or breath type. 60% of CPAP/PS alarms were set >25 cm H_2O above actual Ppeak. The VT limits were set to 1000 mL 75% of the time and 35% of these represented a volume >15 mL/kg. When set to >1000 mL, 100% of time this was >15 mL/kg. More than 95% of limits were set >12 mL/kg and >42% were set to >15 mL/kg, regardless of mode or breath type. **Limitations**: Limitations include the small sample size and focusing only on specific alarm limits. **Conclusions:** The Ppeak high limits were set substantially above Ppeak. When adjusting the limit to accommodate a procedure, such as a recruitment maneuver, it is important to readjust it back down. It is important to monitor VT especially in pressure ventilation, yet about 50% of alarms were set >15mL/kg. Interventions and education of staff will be pursued and a follow up study completed. **Disclosures:** We have no financial or other conflicts of interest to disclose.

Sponsored Research - None

2529456

COMPATIBLITY OF THE IC-2A MR VENTILATOR WITH A 7 TESLA MRI.

Robert B. Johnson; Respiratory Care Dept, UAB Hospital, Birmingham, AL

Robert Johnson, UAB Hospital, Birmingham, Al. Background: Tesla (T) is the unit of measure that quantifies the strength of a magnetic field. Current standard for hospital magnetic resonance imaging (MRI) is 1 - 1.5 T. Dr Taub is conducting an IRB approved study of Constraint Induced (CI) movement therapy with a post trauma patient that is ventilator dependent. CI movement therapy uses an auditory and visual biofeedback device that has assisted in the retraining of the movement of the patient's right arm. The use of only the right arm may have made physiological changes to the patient's left side gray matter of the spinal cord. To check for changes Dr Taub wants to perform an MRI in Auburn University's 7 T "Magnetom" MRI. Because the patient is ventilator dependent this would require a MRI conditional ventilator. Method: The Bio-Med Devices, Inc. IC-2A MR ventilator is certified MRI conditional to a static magnetic field of 3 T. The first set of tests was performed in a non-magnetic environment; the second set of tests was performed one foot from the opening of the running 7 T MRI. Because of the 7 T MRI's active shielding the ventilator is operating in only a 1 to 2 T environment. Both sets of tests looked at PIPs and RRs to determine proper function of the ventilator in the magnetic field. Five different test lung settings produced five PIPs readings from 10 to 37 cm H_2O. The PIP tests were done using 250 and 500ml test lungs and three settings on the Ingmar QuickLung. All PIP tests were done with a T_I of .4 sec, T_E of 4 sec, flow of 20 L/min, and 6 PEEP. Two different RR were tested; RR of 16 bpm (T_I of 0.4 sec with T_E of 4 sec) and RR rate of 30 bpm (T_I 1 sec with T_E of 1 sec). Results: The IC-2A MR ventilator functioned the same next to the 7 T MRI as in a non-magnetic environment, PIPs and the RRs results were identical (see table). Results were given to UAB's IRB; approval was given and the 7 T head/neck MRI scan was performed while the patient was being ventilated using the IC-2A MR ventilator. The scan was approximately 90 minutes without any changes in the patient's vital signs or condition. Conclusion: Due to the improved shielding of the 7 T MRI and the normal location of the ventilator. The IC-2A MR conditional ventilator can be safely used in conjunction with the 7 T Magnetom MRI. Before using any new equipment in the magnetic field of a MRI, the RT should consult with the MRI Department and the equipment guidelines. Sponsored Research - None

Sponsored Research - None

Table 1. PIP and RR Tests

Peak Inspiratory Pressure Test		
	Non-Magnetic (cm H2O)	7 T MRI (cm H2O)
250 cc Test Lung	37	37
500 cc Test Lung	12	12
50 Rp Ingmar Lung	24	24
20 Rp Ingmar Lung	12	12
5 Rp Ingmar Lung	10	10
Respiratory Rate Test		
	Non-Magnetic (bpm)	7 T MRI (bpm)
.4 sec TI, 4 sec TE	16	16
1 sec TI, 4 sec TE	30	30
All tests with flow rate 20 L/min and 6 PEEP		

2529948

CLINICAL MANAGEMENT STRATEGIES FOR AIRWAY-PRESSURE RELEASE VENTILATION: A SURVEY OF CLINICAL PRACTICE.

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Background: Airway-pressure release ventilation (APRV) is a widely used mode of ventilation designed to increase mPaw (and thus oxygenation) through prolonged inflation times and unrestricted spontaneous breathing. Different strategies for clinical management have been described in the literature; however, consensus on ventilator settings and clinical management strategies is lacking. The purpose of this study was to determine how APRV is currently managed by surveying practicing respiratory therapists. **Methods:** A 15 item survey was developed by the authors, posted on the AARConnect online media platform in January 2016 after approval from our institution's IRB. Survey questions were derived from a literature review of available information regarding APRV. Responses were limited to one per institution. **Results**: The survey was completed by 68 respondents, 88% of whom used APRV. No differences in hospital size, number of adult ICU beds, or the proportion of trauma centers for those who use APRV were reported. The most common intervention for patients failing conventional mechanical ventilation (CMV) was APRV (74% of respondents), followed by prone positioning (14%), pulmonary vasodilators (8%), HFOV (3%), and ECMO (2%). Initial APRV settings varied considerably amongst the respondents (table 1). The targeted release phase tidal volume was > 8 ml/kg for 44%, 6-8 ml/kg for 38% and 4 to 6 ml/kg for 19%. The maximum allowed P-high was ≥ 35 cmH_2O for 81% of respondents. When oxygenation was below target, the next change in order of response frequency was: increase P-high, increase FiO_2, increase T-high/decrease t-low, and increase P-low. When pH was below target the next change in order of response frequency was: increase P-high, increase RR/decrease t-high, increase t-low/decrease t-high, adjust sedation to increase spontaneous breathing, and add pressure support. **Conclusion:** There was no consensus for initial APRV settings or changes for suboptimal gas exchange. Many centers appear to be exposing patients to potentially harmful ventilator settings.

Sponsored Research - None

Table 1: Initial APRV Settings

P-high, n=48		P-low, n=50	
Equal to plateau pressure on CMV	23 (48%)	0 cmH2O	39 (78%)
2-5 cmH2O above mPaw on CMV	15 (31%)	2-5 cmH2O	6 (12%)
Equal to mPaw on CMV	6 (13%)	Variable depending on oxygenation	3 (6%)
Goal Vt of 6 ml/kg/pbw	2 (4%)	Match PEEP on CMV	2 (4%)
25 cmH2O	2 (4%)		
T-high, n=49		T-low, n=49	
4-6 seconds	32 (65%)	Set time	19 (39%)
Desired Ve and RR	5 (10%)	When expiratory flow equals 56-75% of PEF	18 (37%)
Desired I:E ratio	5 (10%)	When expiratory flow equals 41-55% PEF	5 (10%)
2-3 seconds	4 (8%)	Per desired I:E ratio	5 (10%)
6-8 seconds	3 (6%)	When expiratory flow equals 25-40% PEF	2 (4%)

Table legend: CMV = conventional mechanical ventilation, PEF = peak expiratory flow, n=number of respondents to each question, Vt = tidal volume, mPaw = mean airway pressure, pbw = predicted body weight, I:E = inspiratory to expiratory ratio

2514185

FILTERING ROOM AIR ENTRAINED BY VENTURI OF SINGLE-LIMB-CIRCUIT - EFFECT ON FIO_2 DELIVERY.

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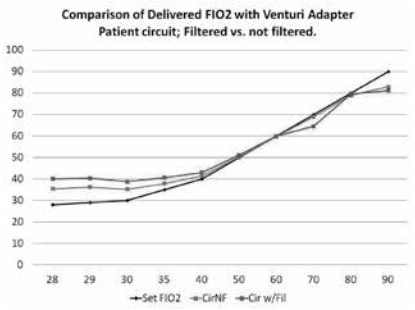
BACKGROUND: Exposure to environmental airborne pathogens may result in infections associated with significant morbidity and/or mortality.[1] A recommended strategy in preventing hospital acquired pneumonia is to avoid the transmission of microorganisms that may occur with the use of venturi air entrainment devices.[2] In our facility we provide heated humidification and oxygen that entrains room air using a venturi-adapter delivery system. This is used with many of our spontaneously breathing patients including those with tracheostomy tubes. With heightened concern around airborne contaminants we considered adding a bacterial/viral filter distal to the venturi adapter to protect patients from room-air entrainment of airborne pathogens. We wanted to know if the concentration of delivered oxygen was affected by this intervention. **METHODS**: Our standard F&P RT-408 patient circuit, (Fisher & Paykel Healthcare, Irvine CA), including an adjustable venturi adapter and model 850 humidifier chamber was assembled according to manufacturer directions. Flowrate and FIO_2 were adjusted for each concentration (28, 29, 30, 35, 40, 50, 60, 70, 80, and 90%). Baseline FIO_2 was measured with a 2-point calibrated AII-2000M oxygen analyzer, (Analytical Industries, Pomona, CA). Repeat measurements were recorded after connecting a Portex 002862 bacterial/viral filter, (Smith Medical, Keene, NH), between the venturi adapter and the dry inlet side of the F&P humidifier chamber. FIO_2 was measured after 96 hours and compared to baseline. The data were analyzed using ANOVA and paired t-tests with $p < 0.05$ considered significant. **RESULTS**: FIO_2 comparisons after 96 hours compared to baseline are illustrated in the graph below. The FIO_2 MD (±SD) between baseline and after 96 hours was 0.88% (± 2.79%) ($p > 0.05$). The FIO_2 MD (±SD) after 96 hours comparing a filtered circuit to a non-filtered circuit was 1.51% (± 1.36%) ($p > 0.05$). **CONCLUSIONS:** Protecting patients from air-borne contaminants entrained by venturi-adapters with a protective filter did not alter oxygen concentrations in our evaluation. Patients who may benefit from this protection might include those having tracheotomies. 1. Guidelines for Environmental Infection Control in Health-Care Facilities. 2003; www.cdc.gov/ncidod/hip/enviro/guide.htm 2. Guidelines for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia. Am J Respir Crit Care Med Vol 171. pp 388–416, 2005.

Sponsored Research - None



2514197

COMPARING HIGH FLOW NASAL CANNULA SYSTEMS - THE EFFECT OF INCREASING MINUTE VOLUME AND FLOWRATE ON FIO_2.

William R. Howard; Respiratory Care, Brigham and Women's Hospital, Boston, MA

BACKGROUND: Oxygen delivered with the high flow nasal cannula (HFNC) is reported to meet or exceed patient demand, prevent secondary air entrainment, and assure stable FIO_2. The alternative delivery designs include direct O_2 flow from a 0-15 L/m flowmeter, contrasted by electronic or pneumatic control of air and O_2 mixing and flowrate control designs. We compared these systems to determine if 100% O_2 delivery and carinal FIO_2 were comparable as minute ventilation increased. **METHODS:** HFNC performance was evaluated by measuring carinal FIO_2 with the following devices: (A) Salter 1600HF, (Salter Labs, Arvin, CA), (B) Vapotherm 2000i Precision Flow, (Vapotherm, Exeter, NH), (C) Airvo-2, (Fischer & Paykel Healthcare, Irvine CA), and (D) ResMed AcuCare, (ResMed Ltd, San Diego, CA), using an independent blender and flowmeter. We used a manufacturer provided circuit for (A-C). For (D) the cannula was connected to a Model-850 humidifier and RT-202 breathing circuit, (Fisher & Paykel Healthcare, Irvine CA), with O_2 flow from a Precision HF blender and HF flowmeter, (Precision Medical, Northampton, PA). Individually the cannulas were attached to a LifeForm LF03699U adult airway management trainer, (Nasco, Fort Atkinson, Wisconsin), connected to an ASL 5000 breathing simulator, (IngMar Medical Ltd, Pittsburgh, PA). Spontaneous breathing mode was programmed for 220 – 820 mL for a predicted VT to simulate 100 – 300 lb patients, RR = 14 and 20 BPM. Flowrate = 15 L/m for (A) and 40 L/m for (B), (the manufactured reported maximum for each respectively), and 20, 30, 40, 50, and 60 LPM for (C) and (D). Carinal FIO_2 was measured using an Analytical Industries AII-2000M oxygen analyzer, (Analytical Industries, Pomona, CA), located at the airway's carina. FIO_2 was recorded after stabilization at each flow setting for a total of 120 measurements. The data were analyzed using ANOVA and paired t-tests with $p < 0.05$ considered significant. **RESULTS:** Carinal FIO_2 results are illustrated in the Table below. The MD (±SD) between 100% FIO_2 baseline delivery and carinal FIO_2 was 23.7% (± 16.5%) ($p < 0.01$). **DISCUSSION:** Our results demonstrate a significant decrease in inspired oxygen concentration compared to the literature's claim that inspired HFNC meets or exceeds patient demand. This deficit was not neutralized within the flowrate range of this study's design. Caution is recommended when expecting high levels of oxygen delivery when faced with increasing minute volume.

Sponsored Research - None

VT x RR	A-15	B-40	C-20	C-30	C-40	C-50	C-60	D-20	D-30	D-40	D-50	D-60
220 x 14	97.4	100	95	96	95.1	93.9	92.7	99.6	99.6	99.7	99.6	100
220 x 20	98.1	98.6	94.9	95.8	95	94.5	92.7	99.6	99.9	99.7	99.6	100
350 x 14	68.4	100	71.3	76	89	94	92.9	75	97.1	97.9	99.8	99.6
350 x 20	66.7	97.1	64	69	80	89	92	70.6	80.7	91.3	98.8	99.6
500 x 14	53.8	80	54	60	67	75.8	81	60.5	69.5	77	86	94.2
500 x 20	52.9	78.8	53	60	62	71	76	60.6	68	73.6	82	88
600 x 14	47.2	71.9	49	54	58	67	71	53.6	62	71	78	84
680 x 20	47	68	49	63	66	64	68	54.8	59.8	70	75	82
820 x 14	43.8	66.2	50	51	58	64	70	54	59	68.4	74	82
820 x 20	42.2	65.6	48	51	55	63	67	53.2	57	69	74	79

TABLE-1. Cannula flowrate and tracheal FIO_2 with increasing VT and RR.

2517090

COMPARING BASELINE TO CARINAL $ETCO_2$ WITH INCREASING HFNC FLOWRATE AND MINUTE VOLUME.

William R. Howard; Respiratory Care, Brigham and Women's Hospital, Boston, MA

BACKGROUND: It is reported that patients managed with a high flow nasal cannula (HFNC) decrease $PaCO_2$ by washing out CO_2 from the anatomical dead space. We wanted to know if the amount of CO_2 removal was affected by differing HFNC flowrates and minute volume. **METHODS:** We evaluated HFNC performance for the removal of CO_2. The setup for the experiment included a LifeForm LF03699U adult airway trainer, (Nasco, Fort Atkinson, Wisconsin), connected to an ASL-5000 breathing simulator, (IngMar Medical Ltd, Pittsburgh, PA), programmed in a spontaneous breathing mode with VT = 300, 550, and 750 mL; RR = 12, 14, 16, and 20 BPM. A ResMed AcuCare HFNC, (ResMed Ltd, San Diego, CA) was attached to the airway trainer and 100% oxygen was delivered to the HFNC at flowrates of 20, 30, 40, 50, and 60 L/m for the 4 minute volumes. 100% CO_2 was delivered in line with the ASL-5000 and adjusted until establishing a baseline $EtCO_2$ between 70 and 100 mmHg. $EtCO_2$ was measured at the level of the carina with a Microstream N-85 sidestream capnograph, (Covidien, Mansfield, MA). Data were analyzed with Excel Data Analysis Tool-Pack for MD ±SD with comparisons made to baseline $EtCO_2$ using two-factor ANOVA. **RESULTS:** There was a significant decrease in $EtCO_2$ from baseline of 13.6 mmHg (± 6.6 mmHg) ($p < 0.01$) with the HFNC. There was no significant change in $EtCO_2$ with flowrate increases above 10 L/m, up to 60 L/m, with 2 of the 4 V_E profiles. **DISCUSSION:** HFNC effectively removed CO_2 in 2 of 4 breathing patterns in our test model. Increasing flowrate above 10 L/m had limited effect on CO_2 removal in 2 of these patterns with no statistically significant difference otherwise. It is not to be implied that HFNC should be restricted to 10 L/m. Limiting flowrate with a HFNC for CO2 removal, may have significant negative consequences on oxygenation. Further work is warranted in determining if CO_2 removal, as it relates to altering $PaCO_2$ and oxygenation, has the potential to be a predictably useful clinical tool. Caution is warranted in restricting the findings of this evaluation to the effect on CO_2 removal only.

Sponsored Research - None

2523054

MICROORGANISM GROWTH ON OXYGEN E-CYLINDERS IN A CHILDREN'S HOSPITAL: COMPARISON OF DIFFERENT CLEANING TECHNIQUES.

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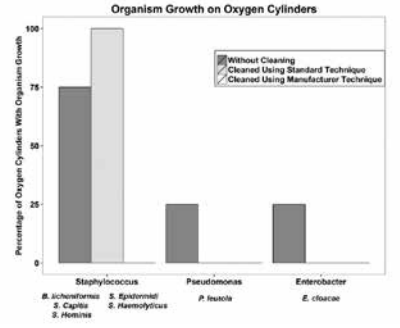
Background: A health-associated infection is a serious complication that can occur during hospitalization, and oxygen E-cylinders may be a vector for potentially harmful organisms that frequently come in close proximity with patients. We sought to explore whether or not oxygen cylinders could be a potential vector for microorganisms and if two different cleaning techniques that varied in contact time would sufficiently inhibit microbial growth. **Method:** Seven oxygen cylinders from different areas of the hospital, including ICUs and medical surgical floors, were cultured in standardized fashion via swab (Becton Dickinson CultureSwab) in 1 of 3 methods: without cleaning, cleaned using standard technique, or cleaned using manufacturer technique. Germicidal disposable wipes (Super Sani-Cloth) were used for both cleaning techniques. Standard technique was performed by a bedside respiratory therapist by wiping the entire surface of the cylinder with no instructions for duration of contact time. Manufacturer technique was performed by a member of the study team by wiping the entire surface of the cylinder and ensuring a contact time of two minutes. Culture analysis was done by the clinical microbiology laboratory using matrix-assisted laser desorption/ionization. **Results:** The percentage of oxygen cylinders that grew microorganisms stratified by cleaning technique and organism genus are shown in the Figure. The species of organisms stratified by genus are also shown. A large percentage of tanks that were not cleaned (75%), or only cleaned using standard technique (100%), grew organisms of the *Staphylococcus* genus with 6 different species. *Pseudomonas* and *Enterobacter* also grew on 25% of tanks that were not cleaned. One tank that was cleaned using standard technique grew *Aspergillus*. No microorganisms grew when cylinders were cleaned using the manufacturer's recommended technique. **Conclusions:** Oxygen cylinders can be a potential vector for microorganisms. Growth is sufficiently limited only when they are cleaned with the manufacturer technique using a contact time of two minutes. Further work is needed to develop practical ways that this can be incorporated into a staff members work flow.

Sponsored Research - None



2525225

OXYGEN CONCENTRATION DELIVERED BY TWO DIFFERENT NON-REBREATHER MASKS.

Brandon Burk, Aaron Light; Respiratory Care Program, Ozarks Technical Community College, Clever, MO

BACKGROUND: Intersurgical (Berkshire, UK) states that their high concentration mask will deliver F_{IO2}'s of 0.65, 0.74, and 0.88 at set oxygen flows of 5, 10, and 15 L/min respectively. The FLO2MAX (BLS Systems, Ontario, Canada) mask claims to be able to deliver a F_{IO2} range of 0.30-0.99 at a set oxygen flow of 15 L/min. The question this study sought to answer is what effect will mask design and oxygen flow have on the F_{IO2} delivered by these masks? We hypothesized that mask type and oxygen flow will have no statistically significant effect on the F_{IO2} delivered. **METHODS:** A model composed of an Ingmar ASL 5000 (IngMar Medical, Pittsburgh, Pennsylvania) breathing simulator and an Armstrong Medical Adult Intubation Manikin (Armstrong Medical Industries Inc., Lincolnshire, Illinois) were used, with tubing and adapters connecting the manikin's trachea and the outlet of the breathing simulator. The ASL5000 was set to simulate normal breathing, with a tidal volume of 500 mL, a frequency of 12 breaths/min, and an inspiratory time of one second, resulting in an inspiratory flow rate of 30 L/min. Each mask was placed on the manikin, with a tight fit, and three different oxygen flows (5, 10, and 15 L/min) were set on an oxygen flow meter (Precision Medical, Northampton, Pennsylvania). A Teledyne Analytical Instruments (Teledyne Technologies Inc., Industry, California) oxygen analyzer was placed in the trachea via a T-piece adapter, and after a period of stabilization, the highest F_{IO2} displayed was recorded. A two-way ANOVA was performed, and a *P* value of < .05 was considered significant. Data analysis was completed with statistical software (SPSS v22, IBM, Chicago, Illinois) **RESULTS:** There was a significant difference in the F_{IO2} delivered based on mask type (*P* = .001) and set oxygen flow (*P* = .001). The mean F_{IO2} delivered by the Intersurgical mask at oxygen flows of 5, 10, and 15 L/min was .536, .673, and .733 respectively. The FLO2MAX max delivered an F_{IO2} of .442, .586, and .641 at each oxygen flow. **CONCLUSION:** The Intersurgical mask delivered a higher F_{IO2} at all three oxygen flows when compared to the FLO2MAX mask. The Intersurgical mask was unable to reach the F_{IO2} stated by the manufacturer, however, the FLO2MAX mask was able to, although it did not reach the top-end F_{IO2} of 0.99. Care should be taken when deciding which oxygen mask to use at the bedside. Disclosures- None

Sponsored Research - None

2526250

HEAT AND HUMIDIFICATION EFFICIENCY OF 3 HIGH FLOW NASAL CANNULA SYSTEMS AT VARIABLE FLOW RATES: AN IN-VITRO STUDY.

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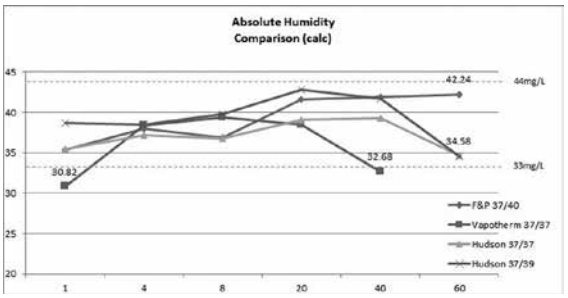
Background: For the past decade, the use of heated, humidified, high-flow nasal cannula (HFNC) has grown exponentially as well as the studies to define its safety and efficacy. PEEP reliability, indications, and patient populations have been popular topics surrounding HFNC. HFNC is defined by the ability to deliver consistent temperature and humidity, not just the increased flowrates.and relative, thus absolute humidity Proper heat and humidification allows the patient to tolerate therapy by decreasing reducing airway dryness. Recommendations of optimal settings are unavailable to date. This study evaluates three HFNC devices and their ability to deliver heated, humidified gas at different flowrates. Method: The study included measurements of temperature, relative humidity, and calculated absolute humidity of the Vapotherm Precision Flow®, Hudson Comfort Flo®, and F&P Optiflow™ devices at flows of 1, 4, 8, 20, 40, and 60 lpm. Room temperature and humidity were also measured to ensure stability of the room. A Sensirion SHT71T21 and 71 hygrometer was placed at the circuit outlets using a reservoir pointed downward as to not collect condensation. Data was recorded using EK-H4 software (Sensirion) after stabilization of temperature and humidity. Threshold references were made at 30mg/L, target at 33mg/L, and optimal at 44mg/L. Results: To be commensurable, the Husdon product was set to mimic the Vapotherm and F&P products with an outlet set temperature of 37C for Vapotherm 37C and 39C for F&P 40C. The Vapotherm product was not measured at 60 lpm as it is unable. The Vapotherm product also showed lower absolute humidity at 1 and 40 lpm, below target but meeting threshold. The Hudson (both settings) and the F&P product were both above target at all flows with a noticeable decline in the Hudson product at 60 lpm. See Chart. Conclusion: HFNC therapy has been used successfully due to its ability to deliver flows that meet and/or exceed the patient's inspiratory demand. To achieve this, the HFNC must adequately heat and humidify the delivered gas to allow for adherence and comfort. But comfort is in the "nose of the beholder". Further studies are required to determine optimal heat and humidification to improve comfort for all patient populations similar to recommendations for humidification of invasive and non-invasive ventilation (Restrepo & Walsh, (2012) *Respiratory Care*).

Sponsored Research - None



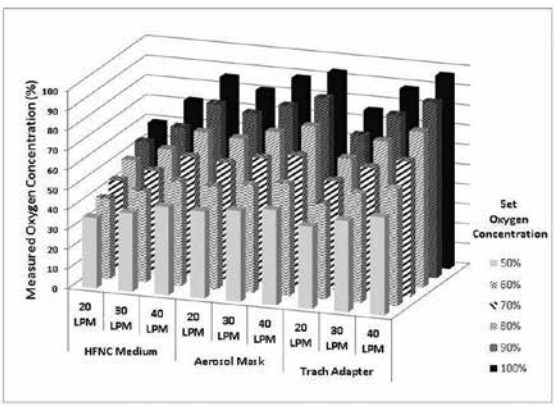
2527879

PERFORMANCE OF THE MAX VENTURI HIGH FLOW DEVICE– A SIMULATION STUDY.

Sherry A. Babic, Adrianne Kowalski, Robert L. Chatburn; Cleveland Clinic, Cleveland, OH

BACKGROUND The MaxVenturi (MaxV) device delivers a mixture of O_2 and air to the patient resulting in a total flow which may vary in clinical use depending on the patients' physiology, breathing rate, patient interface, and downstream resistance within the circuit. The MaxV manual states that flow is affected by downstream resistance which could potentially affect the delivered FiO_2. The purpose of this study was to measure the actual FiO_2 delivered to a breathing simulator for various settings of the MaxV FiO_2 using different patient interfaces. **METHODS** An ASL 5000 breathing simulator (IngMar Medical Inc.) modeled a COPD patient with these settings: f = 20 bpm. R_{in} = 12 $cmH_2O/L/sec$, R_{out} = 25 $cmH_2O/L/sec$, C = 66 mL/cmH_2O, V_T = 685 mL, Pmax = 24.5 cmH_2O, increase = 35%, release =23%, resulting in end expiratory flow = 15 L/min. A high flow nasal cannula, aerosol mask, and tracheostomy adapter were connected to the simulator. Each patient interface was tested at O_2 flows of 20, 30 and 40 L/min. FiO_2, on the MaxV, was set from 50% to 100% (10%increments) at each flow and each patient interface. FiO_2 measured by the MaxV was compared with FiO_2 measured in the simulated lungs. The experiment was repeated once with each patient interface and results were averaged. **RESULTS** Data are shown in the table. The difference in set FiO_2 vs delivered FiO_2 was lower with both the aerosol mask and trach adapter. The results also demonstrated the higher the flow the smaller the difference between set and delivered FiO_2 for all patient interfaces. **CONCLUSION** When providing high flow O_2 therapy to a patient, one must take into consideration that lung mechanics and patient interface have an effect on the actual FiO2 delivered. We speculate that increasing the resistance, within the patient interface, causes a decrease in the total flow from the MaxV resulting in a decreased FiO_2 delivered to the simulated patient. Clinicians should be aware that simply changing the patient interface may result in an improvement in the patients' oxygenation.

Sponsored Research - None



2528553

EVALUATION OF A COMPUTER DECISION SUPPORT SYSTEM FOR MANAGEMENT OF OXYGENATION IN VENTILATED PATIENTS.

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BACKGROUND: There are no standard algorithms for management of FiO_2 for patients requiring mechanical. Published data suggest that patients are commonly exposed to excessive levels of FiO_2. Unpublished data from our MICU showed only 21% of SpO_2 values were within our target range of 88% to 95%. More precise control of FiO_2 may avoid harms associated with excessive or inadequate oxygenation. We developed a decision support system (DSS) as an Excel spreadsheet based on standard physiology equations. It predicts the required FiO_2 based on the current SpO_2, current FiO_2, body temperature, and target SpO_2. The purpose of the study was to test the hypothesis that there is no difference in the success rate of FiO_2 changes between human and computer DSS. **METHODS**: We retrospectively examined 60 FiO_2 changes on critically ill mechanically ventilation patients in our MICU. Data included: body temperature, pre/post FiO_2 and pre/post SpO_2. From that we calculated $\Delta SpO_2/\Delta FiO_2$. The target SpO_2 was 91.5% (midpoint 88% -95%). The DSS calculated a suggested ΔFiO_2 as follows: (1) Calculate current PaO_2 from the SpO_2 from standard equations used in blood gas analyzers, (2) Calculate target PaO_2 from the target SpO_2, (3) Calculate suggested FiO_2 required for target PaO_2 using an equation (El-Khatib M, Chatburn R. Am J Respir Crit Care Med 2012;185:685-686) validated in patients (Hardman, Al-Otaibi. Am J Respir Crit Care Med 2010;182(3):435-436). The suggested ΔFiO_2 was multiplied by $\Delta SpO_2/\Delta FiO_2$ and added to pre SpO_2 to estimate new SpO_2 as if the DSS suggestion had been implemented. Actual and estimated SpO_2 values were compared and success was defined as percent that were within range. Percents were compared with Fisher Exact Test, P<0.05 indicated significance. **RESULTS:** Actual human decisions for ΔFiO_2 were successful 60% of the time, while the estimated DSS decisions were successful 58% of the time. Human decisions resulted in low SpO_2 for 2% of the time vs 10% with DSS. Human decisions resulted in high SpO_2 39% of the time vs 32% with DSS. None of the differences were significant. In this sample, therapists always decreased the FiO_2 until the saturation reached 93%. Therapists increased the FiO_2 until the saturation reached 93%. **CONCLUSION**: Based on data from this pilot study, the current form of the DSS is not different from human decision making capability. Further research is required to improve DSS performance.

Sponsored Research - None

2531361

TRACHEAL FIO2 MEASUREMENTS IN THREE DIFFERENT VENTURI MASKS DURING SIMULATED, NORMAL BREATHING.

Taylor Huffman, Doug Pursley, Elynn Hurtt, Tanner Kelley, Sara Rice; Ozarks Technical Community College, Springfield, MO

Background: Venturi masks (VM) are designed so that total flow from the device meets or exceeds the mean inspiratory flowrate of the patient. In order to accomplish this, VM manufacturers assign a recommended oxygen flowrate at each F_IO2 to assure the device performs as a high-flow system. The goal of this study is: 1) to determine if total flow produced by the combination of F_IO2 setting and recommended flow is sufficient to assure that tracheal F_IO2 (TF_IO2) remains unchanged from set F_IO2 during simulated, normal breathing and 2) to determine if TF_IO2 increases after the oxygen flowrate is increased to its chokepoint (CP), the maximum flowrate allowed by the flowmeter when connected to a VM. **Method:** A model was created by connecting an Ingmar ASL 5000 breathing simulator to an Armstrong Medical Adult Intubation Manikin. A Fluke VT Plus HF Gas Flow Analyzer served as the trachea and was placed between the simulator and manikin to measure TF_IO2. With the simulator programmed to deliver normal breathing (V_T 500 ml, f 15, T_I 1.0 second), VMs manufactured by AirLife$_{dual\ dial}$ (AL), Intersurgical (IS), and Salter Labs (SL) were placed on the manikin at F_IO2 settings of 0.28, 0.40, and 0.50. The TF_IO2 was then recorded at two oxygen flowrates – the manufacturer's recommended flowrate (MRF) and at the flowmeter's CP. Flowrates were verified using a TSI Certifier FA Plus pneumotachometer. Data analysis was completed with statistical software (SPSS v22, IBM, Chicago, IL). **Results:** At the MRF, the IS mask produced a mean TF_IO2 that was 3.8% higher than the set F_IO2. The AL and SL masks produced mean TF_IO2s that were lower, 1.9% and 5.1% respectively. At the CP, all three masks produced mean TF_IO2s that were higher than the set F_IO2 (IS +10.1%, AL +4.85%, and SL +0.6%). The mean CP across all three F_IO2s on the SL mask was 12 l/m, which was significantly lower than the mean CP of the AL at > 54 l/m and the mean CP of the IS at >71 l/m (P = .001). For all masks, we found that using the MRF resulted in a significantly lower TF_IO2 when compared to the chokepoint flowrate (P = .03). **Conclusions:** When placing patients on VMs, clinicians should be aware of masks' ability to produce a total flow greater than the mean inspiratory flowrate of the patient. Using the MRF may not produce enough total flow, allowing air entrainment and a reduction in TF_IO2. Oxygen flowrate may need to be increased beyond the recommended flow, especially in patients with increased work of breathing.

Sponsored Research - None

2531857

ARE WE KEEPING OUR NONINTUBATED PATIENTS ON OXYGEN THERAPY WAY TOO LONG? A RETROSPECTIVE CHART REVIEW.

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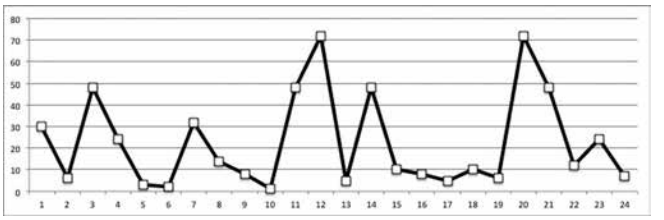
Background: An often overlooked but essential fact is that oxygen is a drug that can cause negative physical and cardiopulmonary effects if overused. Oxygen toxicity is suspected when high concentrations of oxygen (>60%) are used for substantially long periods of time (>48 h). Therefore, monitoring and adjustment of oxygen therapy should be considered essential in patient care. We have reported inconsistent use of oxygen protocols in intubated patients. The aim of this project was to determine if discontinuation of oxygen therapy occurs when indicated in nonintubated patients. **Methods:**Institutional IRB approved this study. Charts of non-intubated patients on O2 therapy were reviewed. Demographic information, indication for O2 therapy, minimum SpO2 parameter (per order), O2 device used, FIO2 used, avg time between changes in FIO2, and the duration of O2 therapy were analyzed. **Results:** Thirty charts of non-intubated patients were reviewed in two clinical areas (floor:80%l ICU:20%) between Feb and March of 2016 at a university-affiliated hospital. Almost half of the patients were between 56 and 65 years old. Two-thirds of the patients were placed on a nasal cannula. The average SpO2 upon initiation of O2 therapy was 94.3% (±5.5). "Keep SpO2 >92%" was the order for O2 tx in 76.7% of the patients in this study. Patients were weaned from oxygen therapy after meeting SpO2 criteria in 57% of the cases, taking an average of 22.6h (±22.1h) for the first FiO2 change. **Conclusion:** Our data indicates that the RT department protocol for weaning oxygen therapy was not closely followed. Despite meeting oxygen weaning parameters, more than half of the patients remained on oxygen therapy. A cost benefit study after of full implementation of the protocol and improvement on clinical outcomes need further evaluation.

Sponsored Research - None



2532053

EVALUATION OF THE DELIVERED FIO2 OF THE OXYTRACH MASK.

Abdulrahim Alalawi, Abdulrahman Alalwi, Michael Cauble, Aaron E. Light; Respiratory Therapy, Ozarks Technical Community College, Springfield, MO

Introduction: The OxyTrach mask (Southmedic Inc, Canada) is an open-designed oxygen mask that, according to the manufacturer's website, is capable of producing an FIO2 of 23%-83% on flows from 1 to 15+ L/min. The manufacturer supplies the user with a chart for delivered FiO2 for 9 different flowrates. This study will utilize a bench model to sample the delivered gas to a head model using the 9 different flowrates provided by the manufacture and compare the delivered FiO2 to the supplied chart. **Methods:** A Laerdal AirMan manikin (Wappingers Falls, NY) was adapted to a Hans-Rudolph series 1101 breathing simulator (Hans Rudolph Inc, Shawnee, KS). A TSI Certifier FA Plus ventilator tester (TSI Inc., Shoreview, MN) was connected to the simulator to assure tidal volumes and inspiratory flowrates. An oxygen analyzer was placed between the manikin and the simulator at the approximate location of the carina to measure the delivered FiO2. The simulator was set-up to mimic three different patient breathing patterns. Slow: VT 250, f 7, IT 20%, PIFR 13.6 L/m. Normal: VT 500, f 14, IT 20%, PIFR 32L/M. Fast: VT 750ml, f 28, IT 20%, PIFR 105L/M. Each breathing pattern was exposed to the 9 different flowrates and the highest FiO2 produced was recorded for each flowrate. **Results:** At the 1-3 L/min flowrates the delivered FiO2 fit the manufactures listed FiO2 ranges. However, at flowrates 4L/min and higher the FiO2 did not fit into the ranges supplied the manufacturer and the mask only demonstrated a maximum delivered FiO2 of 50%. **Conclusion:** The measured range for delivered FiO2 in this model was 23-50% on flowrates of 1L/m to flush. As the flowrate increased, the delivered FiO2 did increase but not to the values described by the manufacturer and by a limited amount. As the patients inspiratory flowrate increased the delivered FiO2 decreased. An additional finding during the study was that the mask had to be held away from the inner cannula during the experiment to prevent occlusion from the mask. In conclusion, the OxyTrach mask was not able to supply the delivered FiO2 as reported by the manuafacturer and additional studies need to be performed to assess the occlusion risk of this mask and the patients inner cannula.

Sponsored Research - OxyTrach masks were supplied by SouthMedic

Measured Tracheal FiO2

	1 L/M	2 L/M	3 L/M	4 L/M	5 L/M	6 L/M	8 L/M	10 L/M	12 L/M	15 L/M	>15 L/M
Slow	32	37	40	44	43	43	43	43	45	45	48
Normal	28	32	34	37	40	40	41	43	44	45	50
Fast	23	25	27	30	32	33	35	37	39	41	47
Average	27.67	31.33	33.67	37	38.33	38.67	39.67	41	42.67	43.67	48.33

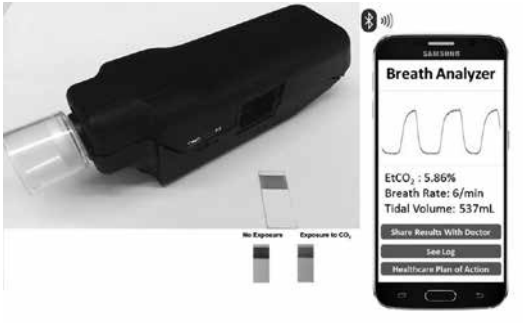
2530734

CLINICAL VALIDATION OF A SMARTPHONE BASED CAPNOMETER FOR PULMONARY DISEASE MONITORING IN FREE-LIVING CONDITIONS.

Devon Bridgeman[2], Erica S. Forzani[1]; [1]Chemical Engineering, Arizona State University, Tempe, AZ; [2]Chemical Engineering, Arizona State University, Tempe, AZ

Background: We are working to develop a CO_2 breath sensing device for home monitoring of pulmonary diseases. Our device has been previously demonstrated to be capable of measuring CO_2 and flows, but has not been tested as a clinical tool. Many studies have shown correlations between CO_2 breathing parameters and spirometry parameters, and we now are reporting our device's capability to act as a companion to spirometry testing for home-monitoring. **Method:** We have developed a colorimetric sensor and a measurement platform for measuring CO_2 in high resolution in breath (40 Hz, <100ms rise time). In addition, we have developed a new type of differential-pressure flow meter, the Confined Pitot Tube (CPT) capable of accurate measurement with low back-pressure. We demonstrate here the accuracy of the unit by comparing it to a commercially available CO_2 analyzer (Vacumed Silver CO_2 Analyzer) and by comparing the flow measurement to spirometry measurements. We gathered two groups of subjects, one with diagnosed obstructive disorders (n = 15) and one control group (n = 15), with approval from the IRB. Spirometry tests were performed on all subjects (with ATS criterion met) in order to measure tidal volume, PEF, FVC, FEV_1, and FEV_1/FVC. Participants were then asked to use our device. Subjects were asked to breath at a natural pace for 3 minutes through the device, with simultaneous measurements being taken from our new device and the commercial analyzer. **Results:** We found that end-tidal CO_2 and tidal volume were consistently within 0.1% CO_2 and 0.05L, respectively. We found that with our newly developed device, we can correlate the end-tidal CO_2, end-tidal volume, and other parameters with % predicted spirometry parameters (better than P<0.05 in discriminating between healthy and obstructed). **Conclusions:** We have demonstrated that our device is accurate enough to be a beneficial tool in home-monitoring of obstructive pulmonary diseases, such as COPD and Asthma. Our device has a high accuracy when compared to commercial CO_2 and flow devices, and can produce parameters that correlate well with spirometry parameters. Our device is inexpensive, robust, and user friendly, providing a potentially powerful new tool for pulmonary disease monitoring. **Disclosures:** We have no disclosures.

Sponsored Research - None



2574049

LONG-TERM OXYGEN DELIVERY DEVICES AFFECTS THE MOBILITY AND QUALITY OF LIFE OF OXYGEN-DEPENDENT COPD PATIENTS.

Constance C. Mussa, Laura Tonyan, David L. Vines; Rush University, Chicago, IL

Background: Physical activity for individuals with COPD is currently recommended in evidence based guidelines. However, due to inherent limitations of available oxygen delivery devices, engaging in regular physical activity may be a challenge for individuals with COPD who require long-term oxygen therapy (LTOT) to mitigate the deleterious effects of hypoxemia. A complicating issue is that current Medicare laws have limited the accessibility of oxygen delivery devices to Medicare recipients, often restricting these patients to oxygen cylinders. The aim of this study was to assess the impact of various oxygen delivery devices on the mobility and quality of life (QOL) of oxygen-dependent COPD patients. **Methods**: A survey was developed to determine perceived QOL, satisfaction with current oxygen delivery device, and mobility, which was assessed using the maximal life space component of the UAB Study of Aging Life-Space Assessment. The survey was deployed via a link posted on the COPD Foundation's COPD360SOCIAL social media site, which resulted in the recruitment of 529 participants. **Results:** Mobility scores were statistically significantly different between the different oxygen device groups, $\chi 2(5) = 21.12$, $p = .001$. Pairwise comparisons were made between the various oxygen delivery devices and revealed significant differences in mobility scores between oxygen cylinder (mean rank = 256.86) and liquid oxygen device (mean rank = 404.92) ($p = .016$) as well as between concentrator (mean rank = 293.22) and liquid oxygen device ($p = .001$). Device satisfaction scores were also statistically significantly different between the different oxygen device groups, $\chi 2(5) = 66.34$, $p<.001$. Scores for satisfaction with QOL were significantly different between the different oxygen device groups, $\chi 2(5) = 34.99$, $p < .001$. Mobility was also found to be a key determinant of satisfaction with oxygen delivery device (adjusted R2 = 0.13). Additionally, mobility and satisfaction with oxygen delivery device were found to impact overall QOL in individuals with COPD (adjusted R2 = 0.41) **Conclusions:** Liquid oxygen device significantly and positively affects mobility in individuals with moderate and severe COPD, and oxygen cylinder use significantly and negatively affects mobility and perceived QOL in these individuals. Additionally, mobility and satisfaction with oxygen delivery devices are key determinants of perceived QOL in individuals with COPD who require LTOT.

Sponsored Research - None

2439707

PERFORMANCE OF CLINICAL ESTIMATES OF DEAD SPACE IN MULTIPLE VENTILATION-PERFUSION RELATIONSHIPS WITHIN A COMPUTER MODEL.

Usra Naeem, Daniel J. Harvey, Jonathan G. Hardman; Division of Clinical Neuroscience, University of Nottingham, Nottingham, United Kingdom

Background: Dead space is increased in pulmonary diseases. Measurement of dead space is crucial as it reflects changes in ventilatory efficiency of critically ill patients. Measurement of dead space using Bohr's original method & equation is cumbersome; therefore researchers have proposed alternative methods for estimation of dead space. We analysed the performance of methods of estimating dead space in lungs with heterogeneous ventilation-perfusion (VQ) distributions in a validated *in silico* model. **Methods:** We created 6 pulmonary configurations using the Nottingham Physiology Simulator (NPS), each with a unique pattern of V/Q distribution (representing various types of dead space, such as "deep" and "shallow") but identical alveolar dead space fraction (VDalv/VTalv)$_{Bohr-Enghoff-Fowler}$ of 25%. (VDalv/VTalv)$_{Bohr-Enghoff-Fowler}$ was calculated from NPS output as ((1- ($PECO_2$ / $PaCO_2$) * VT_{exh}) – VD_{anat})/ (VT_{exh} – VD_{anat}), where $PECO_2$ is the mixed expired PCO_2, VD_{anat} is anatomical dead space and VT_{exh} is exhaled tidal volume. First, (VDalv/VTalv)$_{Bohr-Enghoff-Fowler}$ was determined by 5 proposed methods for the estimation of dead space (1-5). Second, the effects of variations in four physiological factors on the estimation of (VDalv/VTalv)$_{Bohr-Enghoff-Fowler}$ given by each method were examined as follows: VD_{anat} 30, 50, 80 ml; VCO_2 150, 200, 250 ml/min; VO_2 200, 250, 300 ml/min; extrapulmonary shunt fraction 0, 5, 10 % (of cardiac output). **Results:** The range of (VDalv/VTalv)$_{Bohr-Enghoff-Fowler}$ estimated by the methods of dead space estimation was 22-53% across 6 pulmonary configurations. From the data in table 1, it is apparent that Hardman, Jones and Siddiki methods performed well in estimating (VDalv/VTalv)$_{Bohr-Enghoff-Fowler}$ with median of 23, 22 and 23% respectively. The performance of the estimates of Vd/Vt was influenced by variations in the four physiological factors (table 1). The Siddiki method appeared especially prone to variation which was 200% upon varying VCO_2 and VO_2, whereas the average variation in (VDalv/VTalv)$_{Bohr-Enghoff-Fowler}$ was 16% and 21% respectively. **Conclusion:** Estimation of alveolar dead space ratio by the proposed methods of estimating dead space is influenced by pattern of VQ distribution and alterations in external physiological factors. The Hardman and the Jones methods appeared to produce the most accurate and reliable estimates.

Sponsored Research - None

Compares 5 methods with the standard method of measuring dead space. The variation in each method was calculated as (max-min)/mean, where max is maximum dead space upon varying a physiological factor.

Summary of the performance of the methods of dead space estimation in 6 pulmonary configurations.				The average variation in methods upon varying the factors			
Methods	Min	Max	Median	VDant	VCO2	VO2	Shunt
Bohr-Enghoff-Fowler	-	-	25%	7%	16%	21%	10%
Hardman	22%	24%	23%	7%	27%	31%	13%
Jones	22%	23%	22%	43%	29%	20%	0%
Frankenfield	52%	53%	52%	3%	14%	14%	3%
Kuwabara	26%	37%	33%	33%	6%	11%	5%
Siddiki	23%	23%	23%	49%	230%	198%	12%

2524280

PREDICTION OF ARTERIAL OXYGEN TENSION TO FRACTION OF INSPIRED OXYGEN RATIO IN PATIENTS FOLLOWING OPEN HEART SURGERY.

Mohamad El Khatib[1], Susan Gole[2], Farouk Elkhatib[3], Chakib Ayoub[1], Robert Chatburn[2]; [1]Anesthesiology, American University of Beirut, Beirut, Lebanon; [2]Cleveland Clinic Foundation, Cleveland, OH; [3]School of Medicine, Beirut, Lebanon

Background: Simple and accurate expressions that can describe the P_aO_2-F_iO_2 relationship in mechanically ventilated patients are lacking. The current study aims to validate a novel mathematical expression for accurate prediction of the fraction of inspired oxygen that will result in a targeted arterial oxygen tension and P_aO_2/F_iO_2 ratio in patients receiving mechanical ventilation following open heart surgeries. **Methods:** Two hundred P_aO_2-F_iO_2 data pairs were obtained from 50 mechanically ventilated patients following open heart surgeries. One data pair was collected at each of F_iO_2 of 40%, 60%, 80%, and 100% in each patient while maintaining same mechanical ventilation support settings. These data points are the actual or true values. The utility of a new mathematical expression: newF_iO_2 = ((oldF_iO_2–2) +)/2; where k = [(2 - oldF_iO_2)^2 + (8 x newP_aO_2 x oldF_iO_2) / (oldP_aO_2)] in accurately estimating the new P_aO_2-F_iO_2 data pairs based on known (old) P_aO_2-F_iO_2 data pairs was assessed by the Bland-Altman analysis. **Results:** Significant correlation was seen between the true and estimated P_aO_2/F_iO_2 values in all patients (r^2=0.9496). The Bland-Altman analysis revealed a tight bias (-16) between the true and estimated P_aO_2/F_iO_2 values and almost all estimated data points fell within the acceptable agreement range (Figure 1). **Conclusion:** The new mathematical expression for the description of the P_aO_2-F_iO_2 relationship is valid and accurate in predicting PaO2/FiO2 ratio in patients who are receiving mechanical ventilation for post cardiac surgery. Therefore, the equation has utility in predicting the required FiO2 change to achieve a target PaO2 rather than relying on guesses, resulting in more precise control of oxygenation in this patient population.

Sponsored Research - None

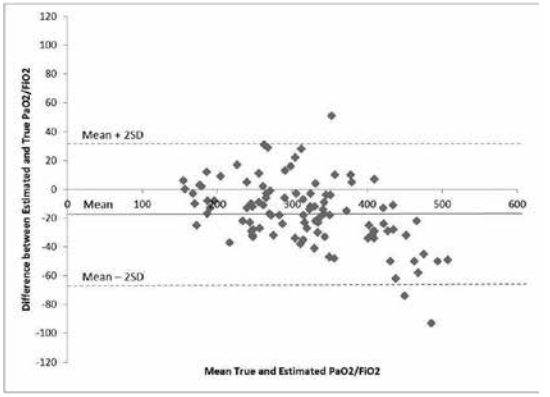


Figure 1: The Bland-Altman analysis between the true and estimated PaO2/FiO2

2526545

UTILIZATION OF A CLOSED CRITICAL CARE UNIT AND HIGH FIDELITY SIMULATIONS TO EVALUATE EQUIPMENT AND PERSONAL FOR DISASTER PREPERATION.

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INTRODUCTION: Simulations are conducted in clinical settings to improve an individual's critical thinking and preparation for the complex clinical environment. One clinical simulation that is rarely participated in is one that occurs byway of nature. In light of recent catastrophic weather related events i.e., tornadoes, hurricanes, etc. Mission Hospital's Laboratory Simulation team developed a catastrophic power/medical gas shutdown simulation to test and evaluate medical equipment and personnel in an intensive care unit.. **METHOD:** A five-bed critical care unit that had its own oxygen, medical air and vacuum zone, as well as an isolated power line, had been decommissioned. Using resources from our simulation laboratory, several patient simulations were developed. One room was used as neonatal intensive care unit for a neonatal scenario, while another room was used as a surgical intensive care unit for an adult scenario. A third room was used to evaluate several pieces of critical care equipment, and a fourth room was used to back feed the unit with medical gasses. The NICU room had two respiratory therapists and two nurses; the adult ICU had two nurses and one respiratory therapist. Each room had ventilators, gas delivery devices and monitors in correspondence to each given scenario. Power, medical air and vacuum were shut off after a report was given to clinicians and the equipment was in a steady state. **RESULTS:** Nurses and therapists were able to determine which equipment was functional although audible and visual alarms were misleading. In the adult scenario, the ventilator and IV pumps continued to operate on battery with the ventilator continuing at 100%. The bedside monitors failed in both scenarios nurses used transport or defibrillator monitors. The NICU scenario presented more challenges with the loss of the oscillator, radiant warmer and devices that use a blender. Combined with the detrimental effects of increased oxygen on neonates, the only reliable equipment for the patient was the transport Isolette.. **CONCLUSIONS:** The clinicians participating in the simulation were able to recognize patient needs and determine the appropriate equipment to satisfy those needs; however, the scope of the scenario was minor in comparison to our ICUs. Although many medical devices have reserved power supply, medical air and vacuum were dependent on the institution's primary power source. Study results were used to obtain resources for disaster preparation.

Sponsored Research - None

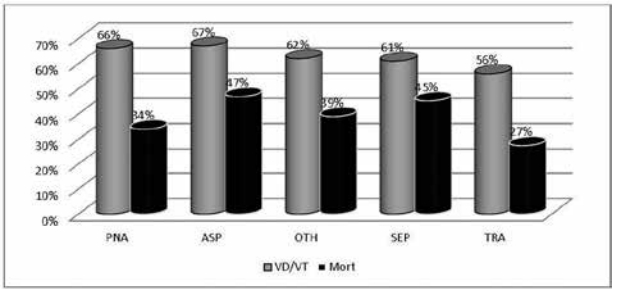
2527171

PULMONARY DEAD-SPACE FRACTION DIFFERES ACCORDING TO ETIOLOGY OF ACUTE RESPIRATORY DISTRESS SYNDROME.

Richard Kallet[1], Kelly Ho[1], Michael Lipnick[3], Antonio Gomez[2], Hanjing Zhou[4], Michael Matthay[4]; [1]Respiratory Care Services, San Francisco General Hospital, San Francisco, CA; [2]Pulmonary and Critical Care Medicine, San Francisco General Hospital, San Francisco, CA; [3]Anesthesia, San Francisco General Hospital, San Francisco, CA; [4]Cardiovascular Research Institute, University of California, San Francisco, San Francisco, CA

Background: Dead-space fraction (V_D/V_T) is elevated early in the course of ARDS and is predictive of mortality. Previous studies have lacked statistical power to determine if different risk factors for ARDS have the same degree of disturbance in CO_2 excretion and also whether this is reflected in mortality. Since 2010, measuring V_D/V_T has been incorporated into the NIH ARDS Net protocol used clinically to manage ARDS patients at SFGH. We used the hospital's ARDS quality assurance database to examine whether V_D/V_T is influenced by ARDS etiology. **Methods:** From 2010-2015, 685 patients meeting the Berlin definition for ARDS were managed with the ARDS Net protocol and had V_D/V_T measured within 12h of protocol initiation: 97% of measurements were made on the day of ARDS onset; 2% within 48h. V_D/V_T was measured using the Enghoff-Bohr equation. An arterial blood gas was drawn simultaneously with mixed expired CO_2 measured by volumetric capnography (NICO monitor, Philips/Respironics). V_D/V_T was analyzed according to 5 etiologies: Pneumonia (PNA) N=197, Aspiration (ASP) N = 128, Sepsis (SEP) N = 135, Trauma (TRA) N = 131, and other causes (OTH) N = 83. Statistical analysis included one-way ANOVA and Tukey post tests for V_D/V_T and Fisher Exact tests to assess mortality risk. Alpha was set at 0.05. **Results**: V_D/V_T was significantly lower in TRA-induced ARDS compared to PNA, ASP and SEP ($p<0.01$); was lower in SEP compared to PNA and ASP ($p < 0.01$), and less in OTH compared to ASP ($p<0.01$). Removing patients with sepsis as a secondary cause did not alter V_D/V_T results (e.g. PNA = 65%, ASP = 68%, TR = 56%, OTH = 61%). Mortality was significantly higher only when comparing ASP to either PNA ($p=0.02$) or TRA ($p = 0.002$) and higher in SEP compared to either TRA ($p = 0.006$) or PNA ($p=0.04$). Presence or absence of sepsis did not explain the unexpectedly lower mortality in PNA-associated ARDS (19% vs.15% respectively, $p = 0.37$) **Conclusion**: In the era of lung-protective ventilation, V_D/V_T is elevated uniformly early in ARDS among different etiologies. However, this did not necessarily translate into a consistent increase in mortality risk.

Sponsored Research - None



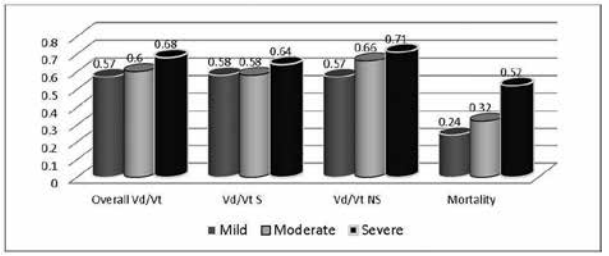
2527188

PULMONARY DEAD-SPACE FRACTION AND MORTALITY USING THE BERLIN DEFINITION OF ACUTE RESPIRATORY DISTRESS SYNDROME.

Richard Kallet[1], Kelly Ho[1], Michael Lipnick[2], Antonio Gomez[3], Hanjing Zhou[4], Michael Matthay[4]; [1]Respiratory Care Services, San Francisco General Hospital, San Francisco, CA; [2]Anesthesia, San Francisco General Hospital, San Francisco, CA; [3]Pulmonary and Critical Care Medicine, San Francisco General Hospital, San Francisco, CA; [4]Cardiovascular Research Institute, University of California, San Francisco, San Francisco, CA

Background: Pulmonary dead-space fraction (V_D/V_T) is elevated early in the course of ARDS and is predictive of mortality, but has yet to be analyzed using the Berlin Taskforce Definition.[1] Since 2010, measurement of V_D/V_T has been part of implementing the NIH ARDS Net protocol for clinical management at San Francisco General Hospital. We used our hospital's ARDS quality assurance database to examine whether V_D/V_T and its association with mortality is influenced by using the Berlin definition. **Methods:** Between 2010-2015, 685 patients meeting the Berlin definition for ARDS were managed with the ARDS Net protocol and had V_D/V_T measured within 12h of protocol initiation: 97% of measurements were made on the day of ARDS onset; 2% within 48h. V_D/V_T was measured using the Enghoff-Bohr equation. An arterial blood gas was drawn simultaneously with mixed expired CO_2 measured by volumetric capnography (NICO monitor, Philips/Respironics). V_D/V_T was analyzed according to ARDS categories of mild, moderate or severe. Continuous data was compared by one-way ANOVA and Kruskal-Wallis and Dunn's post-test; dichotomous data was compared using Fisher Exact Test. **Results**: V_D/V_T was lower in mild compared to moderate and severe ARDS ($p<0.01$). V_D/V_T did not distinguish survivors from non-survivors with mild ARDS, but was different among those with moderate and severe forms ($p < 0.01$). Mortality was higher in severe ARDS compared to mild (OR: 3.3, CI: 1.95-5.62, $p < 0.0001$), and moderate ARDS (OR: 2.3, CI: 1.64-3.21, $p < 0.0001$). Mortality risk was not significantly higher in moderate vs. mild ARDS (OR: 1.4, CI: 0.85-2.43, $p = 0.2$). **Conclusion**: Both V_D/V_T and mortality risk increase with ARDS severity using the Berlin definition. The mortality rates in our cohort of patients was similar to the mortality range reported by the ARDS Definition Taskforce for mild (24-30%), moderate (29-34%) and severe (42-48%). ARDS Definition Taskforce: Acute respiratory distress syndrome. JAMA 2012;307(23):2526-2355.

Sponsored Research - None



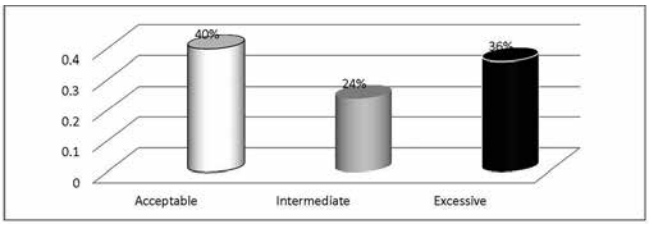
2527192

PULMONARY DEAD-SPACE FRACTION CANNOT BE ACCURATELY ESTIMATED USING THE UNADJUSTED HARRIS-BENEDICT EQUATION IN ACUTE RESPIRATORY DISTRESS SYNDROME.

Richard Kallet[1], Kelly Ho[1], Michael Lipnick[2], Antonio Gomez[3], Hanjing Zhou[4], Michael Matthay[4]; [1]Respiratory Care Services, San Francisco General Hospital, San Francisco, CA; [2]Anesthesia, San Francisco General Hospital, San Francisco, CA; [3]Pulmonary and Critical Care Medicine, San Francisco General Hospital, San Francisco, CA; [4]Cardiovascular Research Institute, University of California, San Francisco, San Francisco, CA

Background: Pulmonary dead-space fraction (V_D/V_T) is elevated early in ARDS and is independently predictive of mortality. Because V_D/V_T is not yet a standard measurement in ARDS, some pathophysiologic studies have used an indirect method for estimating V_D/V_T based on Harris-Benedict Equation (H-BE). However, in the presence of cardiopulmonary disease minute production of CO_2 (V_{CO2}) only represents CO_2 excretion. Consideration must also be given to the body's tremendous capacity to store CO_2, that creates uncertainty to the concept of a measurable "steady-state". We used our hospital's ARDS quality assurance database to examine the degree to which estimates using the H-BE reflect actual V_D/V_T. Methods: Between 2010-2015, 685 patients meeting the Berlin definition for ARDS had V_D/V_T measured; 528 also had VCO_2 height, weight, age and sex documented. V_D/V_T was measured using the Enghoff-Bohr equation. An arterial blood gas was drawn simultaneously with mixed expired CO_2 measured by volumetric capnography (NICO monitor, Philips/Respironics). Also, VCO_2 was derived from the Weir equation based on estimated resting energy expenditure (REE) using H-BE and the mean respiratory quotient based on metabolic data specific to our critically-ill patients (0.82). In the Weir equation VCO_2 = REE/ [(5.616/RQ)+1.584)]. Linear regression was used to assess correspondence between measurements. A *pre hoc* difference within ±0.05 was considered clinically-relevant based on our previous finding that mortality-risk increases 45% for every 0.05 increase in V_D/V_T.[1] Divergences greater than± 0.10 were considered excessive for either clinical management or pathophysiologic inquiry purposes; whereas those between 6-9% were considered to have intermediate value. Results: Estimated V_D/V_T by H-BE had only a moderate correlation to measured V_D/V_T ($r = 0.63$; $r^2 = 0.39$, $p< 0.0001$). This was similar to findings between estimated V_{CO2} and measured V_{CO2} ($r = 0.66$; $r^2 = 0.43$, $p< 0.0001$). **Conclusion**: There exists a substantial degree of divergence between estimated and measured V_D/V_T that greatly limits the clinical and academic value of using H-BE to estimate V_D/V_T. Only direct measurements of V_D/V_T should be used in ARDS. Nuckton TJ et al. Pulmonary dead-space fraction as a risk factor for death in the acute respiratory distress syndrome. N Engl J Med 2002;346(17):1281-86.

Sponsored Research - None



2527206

DEFECTS IN OXYGENATION HAVE ONLY A MINOR INFLUENCE ON PULMONARY DEAD-SPACE FRACTION IN ACUTE RESPIRATORY DISTRESS SYNDROME.

Richard Kallet[1], Kelly Ho[1], Michael Lipnick[2], Antonio Gomez[3], Hanjing Zhou[4], Michael Matthay[4]; [1]Respiratory Care Services, San Francisco General Hospital, San Francisco, CA; [2]Anesthesia, San Francisco General Hospital, San Francisco, CA; [3]Pulmonary and Critical Care Medicine, San Francisco General Hospital, San Francisco, CA; [4]Cardiovascular Research Institute, University of California, San Francisco, San Francisco, CA

Background: Two intriguing debates regarding V_D/V_T in ARDS are unresolved. First, the independent association between V_D/V_T and mortality [1] was interpreted as merely reflecting the effects of shunt and ventilation-perfusion disturbances.[2] Second, is whether the difference between arterial and end-tidal CO_2 (Pa_{CO2}-P_{ETCO2}) represents alveolar dead-space,[3] or the effects of shunt.[4] We used our hospital's ARDS quality assurance database to examine the association between 1.) V_D/V_T and shunt, and 2.) the association between Pa_{CO2}-P_{ETCO2} with both V_D/V_T and shunt. **Methods:** 685 paired comparisons were available to analyze the relationship between V_D/V_T and oxygenation. The arterial-to-alveolar ratio of oxygen tension (Pa/A_{O2}) was used as a signifier for intrapulmonary shunt. It also accounts for the impact of alveolar P_{CO2} on oxygenation. 562 V_D/V_T measurements also had P_{ETCO2} documented. V_D/V_T was measured using the Enghoff-Bohr equation. An arterial blood gas was drawn simultaneously with measured mixed expired CO_2 and P_{ETCO2} using volumetric capnography (NICO monitor, Philips). The strength of association was assessed by Pearson's correlation coefficient. Alpha was set at 0.05. **Results**: Assuming a cause-effect relationship (ie. r^2 is the coefficient of determination), variability in oxygenation explained only 12% of variability in V_D/V_T. Similarly, oxygenation defect could only account for 15% of variability in Pa_{CO2}-P_{ETCO2}. In contrast, 61% of P_{ETCO2}-Pa_{CO2} derangements could be explained by V_D/V_T. **Conclusion**: Our results disconfirm the notion that elevated V_D/V_T largely reflects intrapulmonary shunt and low ventilation:perfusion inequalities. Likewise, oxygenation defects had a minor impact on Pa_{CO2}-P_{ETCO2}, implying that the gradient more likely signifies alveolar dead-space. 1.Nuckton TJ, et al. Pulmonary dead-space fraction as a risk factor for death in the acute respiratory distress syndrome. N Engl J Med. 2002; 346 (17): 1281-1286. 2.Feihl F, et al. Pulmonary dead space and survival. N Engl J Med 2002;347(11):850-853. 3.Fletcher R. Deadspace invasive and non-invasive. Brit J Anaesthesia 1985;57(3):245-249. 4.Suter PM, et al. Optimum end-expiratory airway pressure in patients with acute pulmonary failure. N Engl J Med. 1975; 292(6):284-289.

Sponsored Research - None

X	Y	R	R2	P
Pa/AO2	Vd/Vt	-0.35	0.12	<0.0001
Pa/AO2	PaCO2-PETCO2	-0.39	0.15	<0.0001
Vd/Vt	PaCO2-PETCO2	0.78	0.61	<0.0001

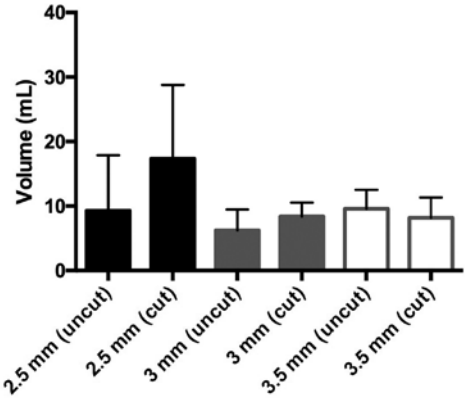
2528898

A COMPARISON OF UNCUT AND CUT ENDOTRACHEAL TUBES DURING HIGH FREQUENCY JET VENTILATION.

Amber Al-Abed, Craig Smallwood, Craig Wheeler; Boston Children's Hospital, Boston, MA

BACKGROUND: High-frequency jet ventilation (HFJV) is often applied to premature infants with respiratory failure. Excess length and small diameters of endotracheal tubes (ETT) have been shown to increase airway resistance, which could increase work of breathing. We hypothesized that reducing the ETT length during HFJV ventilation would effect tidal volume delivery. **METHODS:** We conducted a bench model designed to simulate HFJV (Bunnell Inc. Salt Lake City, UT) in a neonatal model in tandem with a conventional ventilator (SERVO-i ®, Maquet, Wayne, NJ). The ASL 5000 Breathing Simulator (Ingmar Medical, Pittsburgh, PA) was set using a compliance of 3 mL/cm H_2O and a resistance of 5 cm H_2O /L/s. The ETT sizes used were 2.5, 3.0 and 3.5 mm. HFJV was set to deliver a Ppeak of 42 cmH_2O, rate of 420 breaths/min, and inspiratory time of 0.02 seconds and the conventional ventilator was set PEEP of 5 cmH_2O and a Ppeak of 15 cmH_2O with a rate of 5 breaths/min. Data was recorded for the uncut and cut ETTs for five minutes each. The ETTs were then cut by two centimeters. A two-tailed unpaired t-test was used to compare significance of tidal volumes measured with the cut and uncut ETTs. Data was recorded in Microsoft Excel (v14.6.0, Microsoft, Redmond, WA) and GraphPad Prism (v6.0, GraphPad Software, La Jolla, CA). **RESULTS:** We observed a statistically significant increase in expired tidal volume with the cut ETTs versus the uncut ETTs. **CONCLUSION:** A reduction in ETT length was associated with an increase in expired tidal volumes during HFJV in an in vitro simulation of neonatal mechanical ventilation. Clinically, cutting ETTs can be applied to neonates in respiratory distress on HFJV who are difficult to ventilate. **DISCLOSURES:** Each author is affiliated with Boston Children's Hospital.

Sponsored Research - None



Tidal Volume (mL) Comparison with Standard Deviation

2528941

COMPARATIVE STUDY ON MEASURED COMPRESSIBLE VOLUMES FOR 2 ADULT VENTILATOR CIRCUITS.

Ben H. Downs[1], Gary R. Lowe[1], Randy Willis[1], Shirley Holt[1], Mark Heulitt[2]; [1]Respiratory Care Services, Arkansas Children's Hospital, Little Rock, AR; [2]Critical Care Medicine, University of Arkansas for Medical Sciences, Little Rock, AR

Introduction: Comparative studies are frequently used to determine if a product proposed for replacement functions similarly to a product currently in use. An in vitro study was undertaken to examine compression volumes and volume accuracy in 2 adult ventilator circuits, looking at differences in measured peak inspiratory pressure (PIP), and inspiratory and expiratory tidal volumes (V_{TI} and V_{TE}). **Methods:** Two adult ventilator circuits: Fisher/Paykel (F/P) and Intersurgical (I/S) were studied comparing compressible volume variances and the effect the different circuits had on PIP, V_{TI}, and V_{TE}. Four of each ventilator circuit types were used. The Servo *i* (PRVC, rate-20, PEEP-8, circuit compliance-on, I-time-0.75, and IRT-0.15) was used to ventilate a test lung in both a normal lung model (Resistance = 5 cmH_2O; Compliance = 20 mL/cmH_2O) and an "injured" lung model (Resistance = 20 cmH_2O; Compliance = 10 mL/cmH_2O) with set V_T of 100mL, 150mL, 300mL, and 400mL. Flow and pressure waveforms were acquired utilizing a pneumotachograph (PNT) and a computerized digital recorder over 30 seconds. Five breaths were analyzed for each circuit and PIP, V_{TI}, and V_{TE} for both normal and "injured" lung models. Results are shown as mean ± SD. The circuit types were compared using t-tests with significance set at $p < .05$. **Results:** The measured mean compressible volumes for each circuit type were different: F/P (1.97 ± 0.01 mL/cmH_2O) and I/S (1.80 ± 0.01 mL/cmH_2O); $p < .001$. These compare to manufacturers' specifications of 2.10 mL/cmH_2O for F/P and 1.95 mL/cmH2O for I/S. Overall, there were no differences in PNT measured PIP, V_{TI} and V_{TE} in either the normal lung model (p = >.99, .87, and .75; respectively) or the "injured" lung model (p = .86, .95, and .93; respectively). **Conclusion:** The compressible volumes for each circuit type were significantly different, although there would be a small difference clinically. Also, the manufacturer's stated compressible volumes were higher than what were measured by the Servo *i*. By utilizing the circuit compensation mode on the ventilator, no differences were noted in PIP, V_{TI}, or V_{TE} between the circuit types. This reinforces the practice of utilizing the circuit compensation mode and translates to accurate volumes being delivered even with small V_T targeted in the pediatric population. Although this in vitro study provides valuable information, clinical use in patients should also be performed to validate overall performance.

Sponsored Research - None

2529838

COMPARISON OF TWO HIGH FLOW NASAL CANNULAS FOR NON-INVASIVE VENTILATION USING A NEO/PEDS LUNG MODEL.

Nancy Johnson, Kathleen Deakins; Pediatric Respiratory Care, UHHS/Rainbow Babies & Children's, Medina, OH

Background Non-Invasive support is a treatment strategy offered for management of newborns with respiratory insufficiency. The RAM cannula (Neotech, Valaencia, CA) is often used as an interface to deliver non-invasive ventilation. The Vapotherm high-flow pediatric/adult cannula (Vapotherm, Exeter, MD) has similar physical attributes to the RAM cannula. The purpose of this study is to compare pressure delivery of comparable devices during non-invasive ventilation. **Methods** The Neotech Infant RAM (4mm) cannula and Vapotherm, Pediatric Adult (4mm) cannula were connected with pressure turing to a LS-20001 Infant Lung Simulator Lung model (BC Biomedical Smart Lung Infant) with set compliance of 1ml/mbar, resistance 5mbar/L/sec. The RAM cannula was connected directly to the ventilator and a 15mm-4.5mm ID adaptor was used to cconnect the Vapotherm cannla to a Drager XL (Telford, PA) in the pediatric, non-invasive PCV+ mode set to deliver Pinsp 25, PEEP 5, Rate 30, Tinsp 0.5 sec Pressure Support 0, Rise 0. Leaks were set comparable to that used in the clinical setting, on the lung model at 10%, 20%, 26% of the total flow observed. Inspiratory pressure (Pinsp) and PEEP readings were recorded from the Paux line of a GE Carestation (GE Madison, WI) positioned between the proximal end of the cannlas and the Smart Lung Infant model. Pressures were recorded in 30 second increments 10 times at each leak%. Mean and standard deviations for Pinsp and PEEP were compared using a paired t test. **Results** There was no statistically significant difference in delivery of Pinsp or PEEP between the RAM or Vapotherm nasal cannula at minimal leaks (≤25%). As imposed leaks increased >26% there was a 50% decrease in delivered Pinsp and PEEP. **Conclusion** In a bench model, when two frequently used high flow cannulas are exposed to similar conditions with intentional imposed leaks the RAM and Vapotherm nasal cannulas performed similarly for non-invasive respiratory support.

Sponsored Research - None

Pressures

Pinsp					PEEP				
	Set	10% Leak	20% Leak	26% Leak		Set	10% Leak	20% Leak	26% Leak
RAM	25	23	18	13	RAM	5	4	3	2
		92%	72%	52%			80%	60%	40%
Vapotherm	25	23	17	11	Vapotherm	5	4	3	2
		92%	68%	44%			80%	60%	40%

2530538

DISPLAYED TIDAL VOLUMES VS MEASURE TIDAL VOLUMES WHEN UTILIZING INHALED NITRIC OXIDE ON THE DRAGER VN500.

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Background: Inhaled nitric oxide (iNO) has been approved for use in neonates with persistent pulmonary hypertension. During administration, volume is removed from the ventilator circuit to provide feedback to the iNOmax DS_{ir} to maintain the desired iNO dosage. This can potentially impact the tidal volume (V_T) to the patient. The objective of this study was to determine the differences in ventilator displayed V_T and pneumotachograph (PNT) measured V_T associated with the sampling line used during iNO administration with the Drager VN500 ventilator. **Methods:** A test lung was connected to the VN500 and iNOmax DS_{ir} and ventilated using pressure control/assist control + volume guarantee (PC/AC+VG); PEEP-5 cmH_2O; V_T of 20, 30, 42, and 60 mL; rate-30 bpm. The test lung was set for normal compliance (0.003 L/cmH_2O) and resistance (Rp5 cmH_2O), and decreased compliance (0.001 L/cmH_2O) and increased resistance (Rp20 cmH_2O). Measurements with and without iNO (iNO set at 20 ppm); and with the sample line in place and with it disconnected and capped. For each test, data were collected for 30s. Flow waveforms obtained with the PNT were analyzed to measure inspiratory and expiratory V_T (V_{TI} and V_{TE} respectively). Values for V_{TI} and V_{TE} that were displayed by the ventilator were matched time-wise and compared to measurements obtained with the PNT. For each study, 5 consecutive breaths were analyzed. Percent error (%e) was used to compare displayed values to the measured values. A percent error <10% was considered acceptable. **Results:** When iNO was not in use, the sampling line had no significant effect on volume. With the sample line connected, V_{TI}% error was -6%±3 and V_{TE}% error was -13%±3. With the sample line disconnected, V_{TI}% error was -5%±6 and V_{TE}% error was -14%±2. When iNO was in use, there was a significant difference between displayed and measured V_{TE}% error (p=.019). With the sample line connected, V_{TI}% error was -6%±4 and V_{TE}% error was -9%±3. With the sample line disconnected, V_{TI}% error was -8%±5 and V_{TE}% error was -14%±4. Changes in compliance and resistance had no effect on V_{TE} difference. **Conclusion:** The VG software adjusts the peak inflating pressure for the next inflation based on measurement of the V_{TE} of the previous inflation. Based on these results, when volume is removed by the DS_{ir}, the VN500 adjusts to deliver the desired V_T. Also, the ventilator displayed V_{TE} is lower than that measured by the PNT which indicates there is little actual volume loss.

Sponsored Research - None

2530728

ACCURACY AND STABILITY OF PEDIATRIC AND ADULT SIZED ESOPHAGEAL BALLOONS ACROSS DIFFERENT INFLATION VOLUMES.

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Background: The accuracy of esophageal balloon catheters in estimating pleural pressure may be affected by a variety of factors including balloon and body position, thoracic pressure, esophageal elastance, and balloon inflation volume. We sought to explore the accuracy and stability of pediatric and adult sized esophageal balloon catheters over a range of positive pressure, both with and without a model esophagus (a 6mm ID Penrose drain). Method: A pressure generator was connected to a chamber to create positive pressure at 5,10,15,20, and 30 cmH_20. Within the chamber, 6Fr pediatric and 8Fr adult esophageal balloon catheters (SmartCath) were tested both with and without the model esophagus. The 6Fr catheter was inflated from 0.1-1.0ml in 0.1ml steps (manufacturer range: 0.5-1.25ml), and the 8Fr catheter was inflated from 0.2ml to 2.0ml in 0.2ml steps (manufacturer range: 0.5-2.5ml). The procedure was repeated with 2 new catheters. The pressure measured by the esophageal catheter at each condition was compared with the chamber pressure. The esophageal pressure (Pes) reading was considered accurate if it was within ± 1 cm H_2O of the chamber pressure. We derived a new metric, termed instability index, as the difference between the maximum and minimum Pes value across 3 ascending inflation volumes. Results: Across recommended inflation volumes, the 6Fr catheter accuracy ranged from 60-100% without the esophagus and 20-53% with the esophagus. For the 8Fr catheter it was 60-100% without the esophagus and 0-100% with the esophagus. If balloons are inflated well below manufacturer suggested ranges, chamber pressure is underestimated (Figure). If balloons are inflated within the manufacturer suggested range, chamber pressure becomes progressively more over-estimated as balloon inflation increases, particularly with the 6Fr catheter. However, there appears to be an inflation volume which results in accuracy within ± 1 cm H_2O for all chamber pressures and both catheters. This volume corresponds to the point at which the derived instability index was lowest. Conclusions: There is no standard inflation volume which will result in high levels of accuracy, particularly for the 6Fr pediatric catheter. However, accuracy can be high if balloon inflation is titrated to the point of optimal stability, which involves finding the range of inflation that results in minimal changes to measured esophageal pressure. This method should be confirmed in patients.

Sponsored Research - None

2531437

COMPARISON OF NASAL CANNULA INTERFACES FOR INTRAPULMONARY PERCUSSIVE VENTILATION: A BENCH MODEL.

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Background Intrapulmonary Percussive Ventilation (IPV) uses invasive and noninvasive interfaces to deliver high frequency, high flow bursts of gas to the airway to assist secretion mobilization. The purpose of this study is to determine if a nasal cannula interface can effectively deliver pressure for the during intermittent treatment. **Methods** Three RAM nasal cannulas (3.0mm, 3.5mm, 4.0mm) (Neotech, Valencia CA) a Pediatric Adult Vapotherm cannula(4.0mm) (Vapotherm, Exeter, MD) and Pressure Safe Comfort Soft Plus Nasal Cannula 3.5mm (Westmed, Tucson, AZ) were independently connected to the IPV manifold using a 15 mm connector and the NeoLung (Ingmar Medical Pittsburgh, PA). Pressure was measured by P_{aux} line positioned proximal to the Neolung and attached to the GE Engstrom Carestation Ventilator (GE Madison, WI) for monitoring. Pressure was measured at 0%, 30% and 50% leaks at two frequencies: moderate (200/min) and maximum (300/min) at a preset pressure of 20 cm H_20. 10 pressure measurements were recorded every 20 seconds for each cannula at each leak and frequency. Mean values for pressures are displayed in the table below. Pressure differences were compared using the Two-Way ANOVA with a statistical significance set at $p<0.05$. **Results** There was no statistically significant difference in Pinsp or PEEP delivered by IPV at different frequencies. Minimal change in pressures between types of nasal cannulas was seen except for the Pressure Safe Nasal Cannula. Pinsp dropped 30% and PEEPdropped 50% at both leak levels compared other cannulas. **Conclusion** Pressure delivered through selected nasal cannula interfaces achieves expectations in the face of leaks. Clinical relevance for using this interface is not yet established.

Sponsored Research - None

Mean Pressures cm H20

Setting	Cannula type	No Leak P insp	No Leak PEEP	30% Pinsp	30% PEEP	50% Pinsp	50% PEEP
f 200 p20 cm H20	Vapotherm	19.5	4	19	4	16	2
	RAM (4mm)	24	4	24	2	21	2
	Press Safe (3.5 mm)	15.8	6	13.7	6	10	2
	RAM (3.5mm)	25.5	5	25	5	22	2
	RAM (3mm)	18	4	18	4	14	4
f 300 p20 cm H20	Vapotherm	25	6	24.2	6	20	3
	RAM (4mm)	28	5	28.5	5	24	3
	Press Safe (3.5 mm)	15	7	15	7	11	3
	RAM (3.5mm)	29.3	7	29.2	7	11	3
	RAM (3mm)	20	6	20	6	15.8	3

2531800

POINT OF CARE TESTING: A COMPARISON OF TWO DEVICES IN THE INTENSIVE CARE UNIT.

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Background: Point of care (POC) testing of electrolytes and blood gases is an essential component of ICU care. POC testing promises fast bedside results to guide treatment. We compared gold standard laboratory testing to two POC devices—iSTAT (Abbott Laboratories, Abbott Park, IL) and EPOC (Epocal Inc., Ottawa, Ontario, Canada) in blood samples drawn from intensive care unit patients for various blood tests. **Methods:** The study was approved by the University of Cincinnati Medical Center IRB. Informed consent was obtained from all subjects or their surrogate. At the time of standard of care (SOC) blood draws, additional blood was drawn and simultaneously analyzed using the iSTAT and EPOC POC devices. Research personnel ran all samples and data were not used for clinical decision-making. Hospital personnel analyzed blood sent to the immediate response lab per SOC. Results from laboratory measurements were expressed as means ± standard deviation and compared to results from the POC devices using a t-test. Mean differences from laboratory values were calculated using SAS. **Results:** Preliminary data from 20 patients demonstrated that the iSTAT and EPOC devices were clinically no different compared to laboratory measurements. Selected data is shown in the Table. **Conclusion:** POC testing provides data quickly at the bedside to guide therapy. While there were small differences, none of the differences in measured POC values, compared to SOC care values would have resulted in a change in treatment. The EPOC device tested does not require refrigeration of cartridges, which may be a logistical advantage.

Sponsored Research - 711th HPW

Table 1:

	SOC	iSTAT	EPOC	Mean Difference SOC vs. iSTAT/SOC vs. EPOC
pH	7.36 ±0.07	7.33 ±0.06 (CG4)	7.34 ±0.06	-0.02±0.01 p < 0.01 /-0.03±0.01 p < 0.01
PaO2 (mm Hg)	81 ±16.8	79 ±22.7 (CG4)	77 ±21	-4.36±9.6 p = 0.36 / -2.6±10.7 p = 0.61
Hemoglobin (g/dL)	9.0 ±1.3	9.9 ±2.9 (CH8)	9.7 ±3.2	0.64±3.1 p = 0.37 / 0.83±2.8 p = 0.20
Glucose (mg/dL)	123± 25	124 ±25 (CH8)	122 ±27	-1.5±8.4 p = 0.49 / 1.2±5.5 p = 0.37
Na+ (mg)	136 ±4.9	137 ± 5.1 (CH8)	137 ± 5.8	1.0±1.6 p = 0.03 / 0.2±1.3 p = 0.55
Lactate (mmol)	2.1 ± 1.2	2.0 ±1.2 (CG4)	2.2 ±1.2	0.15±0.2 p = 0.16 / -0.04±0.03 p = 0.07

2531802

ACCURACY OF DELIVERED TIDAL VOLUME ON THE TRILOGY VENTILATOR.

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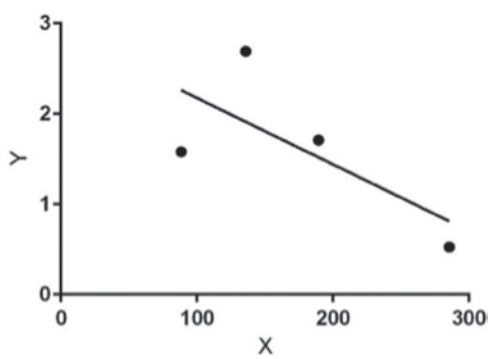
Background Infants and pediatric patients often transition to the Trilogy Ventilator for chronic respiratory support utilizing the Passive circuit for ease of use. Accuracy of tidal volume (Vt) delivery is important to maintain stable ventilation. The purpose of this study is to evaluate the differences in tidal volume delivery utilizing the passive circuit at frequently used tidal volumes for pediatric patients. **Methods** A Phillips Respironics (Andover, MA) 15 mm diameter, 1.8 m pediatric single limb heated wire circuit was connected to the Trilogy 202 ventilator with a Whisper Swivel II Valve. The circuit wye was connected to a BC Biomedical LS-20001 Infant Lung Simulator (BC Biomedical, St. Charles MO) with set lung compliance of 5 ml/cm H_2O and resistance at 5 L/sec, at settings: VC-SIMV, frequency 20/min, PEEP 4, Tinsp 0.6 sec and FiO_2 21%, 100, 150, 200 and 300 ml tidal volumes were evaluated. Tidal volumes were recorded from the Trilogy display and the NICO® respiratory mechanics monitor's pediatric/adult flow sensor (placed proximal to the patient wye), at one minute intervals for 10 minutes at each Vt setting. Mean values, standard deviations were calculated and a simple linear regression method was used to compare distal and proimally-measured tidal volumes. **Results** There was a statistically significant difference in ventilator (distal) versus NICU-measured (proximal) tidal volumes at each setting $p<0.0001$. Variability in Vt delivered increases at smaller tidal volumes. As volume increases the difference in measurements at each tidal volume decreases. **Conclusion** Using the Passive Circuit with the Trilogy ventilator, tidal volume accuracy decreases at low tidal volulmes and may represent a clinically important difference when used in small pediatric patients.

Sponsored Research - None



2531817

COMPARISON OF PROXIMAL AND DISTAL SENSOR PLACEMENT OF END-TIDAL CAPNOMETRY VALUES FROM THREE VENTILATORS.

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Background: End-tidal CO2 (E_{TCO2}) monitoring is a valuable tool when used during mechanical ventilation; however, the traditional placement of the mainstream sensor creates complications related to moisture and patient secretions. Given these complications, could the sensor be placed in a different location in the circuit while providing a valuable measurement? The purpose of this study is to determine if there is a significant difference between a traditional, proximal placement of the sensor versus a distal sensor placement located close to the expiratory valve of the ventilator. **Methods:** After IRB approval was obtained and informed consent was given, 20 volunteer subjects were enrolled. Subjects were placed on a Radiometer TCM4 Series transcutaneous monitor (Radiometer Medical, Bronshoj, Denmark), they were placed on nose clips, and asked to begin breathing on a ventilator circuit through a filter. Three mechanical ventilators were used: Hamilton G5 (Hamilton Medical, Bonaduz, Switzerland), Dräger V500 (Dräger, Lübeck, Germany), and the Servo-*i* (Maquet, Rastatt, Germany) and each ventilator was placed on a version of CPAP/PS mode, with a F_{IO2} = 0.21, a CPAP = 0, and a PS = 0. After a short period of acclimation, the sensor was placed in the traditional, proximal location and ETCO2 values were recorded for 20 consecutive breaths. The sensor was then placed in the distal location, and the same procedure was followed. This method was repeated for all three ventilators. Between each run, both the E_{TCO2}, and the transcutaneous CO_2 (T_{CCO2}) monitors were re-calibrated. Data were analyzed using statistical software (SPSS v22, Chicago, Illinois). **Results:** The distal sensor placement resulted in a significantly lower E_{TCO2} when compared to the traditional placement (P= .001). There was also a significant difference in E_{TCO2} between ventilators (P= .001), with the Hamilton G5 measuring a significantly higher E_{TCO2} than the other two ventilators (P= .001). There was no difference in E_{TCO2} measurements between the Dräger and Servo-*i* ventilators (P= .12). Additionally, there was a significant difference between T_{CCO2} values and E_{TCO2} values (P= .001). **Conclusion:** The distal location is not recommended due to questions related to its reliability. Also, the traditional capnographic waveform is not observed while the distal location is used, therefore it can be determined that the distal location is not truly measuring E_{TCO2}. Disclosures- none.

Sponsored Research - None

2531999

COMPARISONS BETWEEN DIFFERENT TECHNIQUES FOR INTERFACING CAPNOGRAPHY WITH ADULT SUPPLEMENTAL OXYGEN MASKS: A BENCH STUDY.

Justin Phillips, Lance Pangilinan, Earl Mangalindan, Joseph Booze, Richard Kallet; Respiratory Care Services, San Francisco General Hospital, San Francisco, CA

Background: Assessment of ventilatory adequacy is crucial during procedural sedation, recovery from general anesthesia, and may benefit non-intubated, critically-ill, patients. However, technical challenges surrounding accuracy remain; including expired CO_2 dilution at high O_2 flow rates and mask design that may cause CO_2 rebreathing, or inadequately captures expired CO_2. We evaluated these potential limitations in 2 specially designed capnographic O_2 masks: the Cap-ONE, Nihon-Kohden (main-stream) and the Oxy-Mask, SouthMedic (side-stream). Also, we compared these to a clinically-expedient tactic: using a standard O_2 mask with a flow-directed nasal cannula with side-stream capnography (CapnoLine, Oridion). These devices were tested in a lung model of a spontaneously breathing adult under conditions of normal, hypo- and hyperventilation. **Methods:** An ASL-5000 (Ingmar) simulator was attached to a manikin face with a catheter port, through which various CO_2/air mixtures were bled into the ASL to achieve end-tidal CO_2 (P_{ETCO2}) of 40, 65 and 30 mmHg. The corresponding breathing patterns for normal and hypoventilation were a V_T: 500 mL, *f*: 12, T_I/T_{TOT}: 0.33, V_E: 6L/m) and a rapid-shallow pattern for hyperventilation (V_T: 300 mL, *f*: 30, T_I/T_{TOT}: 0.45, V_E: 9L/m). The baseline P_{ETCO2} was set during spontaneous breathing with the mask on and no O_2 flow. Afterwards both P_{ETCO2} and inspired P_{CO2} were measured at O_2 flow rates of 5, 10, 15 and 20 L/min. The monitors used were the Nihon Kohden Cap-TEN 2800 (Cap-ONE Mask), Smith Medical Capnograph 8400 (Oxy-Mask) and both the Oridion Capnostream-20 and Philips MX-450 for testing the CapnoLine. Twenty breaths were analyzed for each device and condition. **Results**: During simulated normal ventilation both Cap-ONE and CapnoLine + CAP-20 monitor provided more stable P_{ETCO2} measurements. During hypoventilation the CapnoLine +CAP-20 provided more stable measurements than the Cap-ONE at the highest O_2 flow rates. The Cap-ONE provided the most stable P_{ETCO2} during hyperventilation. Yet, using a standard O_2 mask caused significant CO_2 rebreathing at O_2 flows of 5-10 L/min compared to the Cap-ONE (inspired P_{CO2} range 4-10 mm Hg vs. 2-3 mmHg respectively, $p < 0.001$ by One-Way ANOVA/Tukey-Kramer Post-Test). The 8400 lacked inspired P_{CO2}readings. Differences in P_{ETCO2} were not analyzed as the coefficient of variation was ≤ 0.02. **Conclusion:** The most stable P_{ETCO2} without significant CO_2 rebreathing was achieved using the Cap-ONE Mask.

Sponsored Research - The authors received an unrestricted gift, supplies (loan of a monitor and disposables, manikin faces) and technical support (assistance with programing the ASL-5000) for this study from Nihon Kohden.

Comparisons of Mean PETCO2 as Supplemental O2 Flow Increases

Normal	Device	F=0L/m	F=5L/m	F=10L/m	F=15L/m	F=20L/m
	Cap-ONE	39	38	36	35	34
	OxyMask	39	34	34	30	28
	CapnoLine/CAP-20	41	40	39	39	38
	CapnoLine/MX450	40	36	36	34	34
Hypovent	Cap-ONE	65	61	60	57	54
	OxyMask	65	59	56	48	41
	Capnoline/CAP-20	65	62	60	60	59
	CapnoLine/MX450	66	59	58	57	55
Hypervent	Cap-ONE	30	28	29	28	27
	OxyMask	30	29	29	24	20
	Capnoline/VCAP-20	29	29	26	24	23
	Capnoline/MX450	29	27	27	25	24

2532029

COMPARISONS OF DIFFERENT TECHNIQUES FOR INTERFACING CAPNOGRAPHY WITH PEDIATRIC SUPPLEMENTAL OXYGEN MASKS: A BENCH STUDY.

Lance Pangilinan, Justin Phillips, Earl Mangalindan, Joseph Booze, Richard Kallet; Respiratory Care Services, San Francisco General Hospital, San Francisco, CA

Background: Assessment of ventilatory adequacy is crucial during procedural sedation and recovery from general anesthesia. It also may be useful for monitoring non-intubated, critically-ill, children. We evaluated 2 specially designed capnographic O_2 masks for children: the Cap-ONE, Nihon-Kohden (main-stream) and the Oxy-Kid, SouthMedic (side-stream). Also, we compared these to a clinically-expedient tactic: using a standard O_2 mask with a flow-directed nasal cannula with side-stream capnography (Smart CapnoLine, Oridion). These devices were tested in a lung model of a spontaneously breathing 7 yo child under conditions of normal, hypo- and hyperventilation. **Methods:** An ASL-5000 (Ingmar) lung simulator was attached to a pediatric manikin face with a catheter port, through which various CO_2/compressed air mixtures were bled into the ASL to achieve end-tidal CO_2 (P_{ETCO2}) of 40, 65 and 30 mmHg. The corresponding breathing patterns for normal ventilation was V_T: 200 mL, *f*: 25, T_I/T_{TOT}: 0.33, V_E: 5L/m), hypoventilation (*f*: 18, V_E: 3.6Lm) and for hyperventilation a rapid-shallow pattern (V_T: 150 mL, *f*: 40, T_I/T_{TOT}: 0.45, V_E: 6 L/m). The baseline P_{ETCO2} was set during spontaneous breathing with the mask on and no O_2 flow. Afterwards both P_{ETCO2} and inspired P_{CO2} were measured at O_2 flow rates of 2, 4, 6, 8 and 10 L/min. The monitors used were the Nihon Kohden Cap-TEN 2800 (Cap-ONE Mask), Smith Medical Capnograph 8400 (Oxy-Kid) and both the Oridion Capnostream-20 and Philips MX-450 for testing the Smart CapnoLine. Twenty breaths were analyzed for each device and condition. **Results**: During simulated normal ventilation both Cap-ONE and Oxy-Kid provided more stable P_{ETCO2} measurements. During simulated hypoventilation the Smart CapnoLine +CAP-20 provided more stable measurements than the Cap-ONE at the highest O_2 flow rates. The Cap-ONE provided the most stable P_{ETCO2} measurements during simulated hyperventilation. However, a standard O_2 mask caused more CO_2 rebreathing compared to the Cap-ONE (83% incidence with inspired P_{CO2} range of 1-17 mmHg vs. 2-5 mm Hg respectively, $p < 0.001$ by One-Way ANOVA/Tukey-Kramer Post-test). The 8400 capnometer lacked inspired P_{CO2} readings. Differences in mean P_{ETCO2} were not tested as the coefficient of variation was ≤ 0.02. **Conclusion:** The most stable P_{ETCO2} without significant CO_2 rebreathing was achieved using the Cap-ONE Mask.

Sponsored Research - The authors received an unrestricted gift as well as material support in the form of equipment (monitor, disposables and manikin faces) and technical support with programing the ASL-5000.

	Device	F=0L/m	F=2L/m	F=4L/m	F=6L/m	F=8L/m	F=10L/m
Normal	Cap-ONE	40	39	38	38	38	36
	OxyKid	42	41	40	38	37	36
	CapnoLine/CAP-20	40	38	37	35	35	33
	CapnoLine/MX450	42	39	37	36	34	33
Hypovent	Cap-ONE	65	62	59	56	55	53
	OxyKid	67	56	52	46	42	39
	CapnoLine/CAP-20	65	62	58	56	54	53
	CapnoLine/MX450	65	60	57	55	54	52
Hypervent	Cap-ONE	29	26	24	22	21	19
	OxyKid	30	30	29	29	27	27
	CapnoLine/CAP-20	32	30	29	28	26	25
	CapnoLine/MX450	30	29	29	28	28	27

2525593

COMPARISON OF BRONCHODILATOR ADMINISTRATION WITH VIBRATING MESH WITH ADAPTER AND JET NEBULIZER IN THE EMERGENCY DEPARTMENT.

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INTRODUCTION: There are limited clinical outcome studies comparing aerosol devices in patients in respiratory distress in the Emergency Department (ED). Evidence suggests that vibrating mesh (Aerogen Ultra, Aerogen, Ireland) (VMN) with adapter provides 4-fold greater aerosol delivery as compared to jet nebulizer (JN). Aim of the study was to determine whether type of aerosol device would have an effect on admission rates, ED discharge rates and total albuterol dose in patients receiving aerosol treatments in the ED. **METHOD:** A retrospective chart review was done comparing all ED patients receiving aerosol bronchodilator treatments with the standard of practice JN (September 2015) to an equivalent period after implementation of the VMN with adapter (October 2015). Logistic regression was used to predict effect the device would have on discharge from ER and disposition. **RESULTS:** A total of 1576 patient charts were reviewed (854 JN and 722 VMN). The use of VMN was associated with a 33% reduction in admissions from the ED, coinciding with a 29% increase in discharges to home and a 75% reduction in the maximum albuterol dose administered (20 mg to 5 mg). Controlling for age and diagnosis, the VMN group was 1.5 times more likely to be discharged than the JN group (OR=1.5, $p < .001$), respectively) The JN group was 1.7 times more likely to be admitted than the VMN group (OR=1.77, $p < .001$). The VMN group used less total drug ($p < .05$). **CONCLUSIONS:** The VMN with adapter was associated with increased discharges to home with fewer admissions to the hospital from the ED with a substantial reduction in maximum albuterol dose required than the JN. The device type was a strong predictor of discharge, disposition and total amount of drug, regardless of age or diagnosis. Randomized controlled studies are needed to corroborate these findings.

Sponsored Research - Aerogen Ltd sponsored this study.

2526488

CLINICAL AND FINANCIAL IMPACT OF RESPIRATORY THERAPIST ASSUMING MDI AND DPI ADMINISTRATION FROM NURSING IN LUNG PARTNERS PATIENTS.

Russell A. Acevedo, Jennifer Pedley, Wendy Fascia, Linda Raut; Respiratory Care, Crouse Hospital, Syracuse, NY

Background: At our organization Nursing administers MDIs and DPIs while Respiratory Care administers liquid nebulization. Lung Partners is a Primary Respiratory Care model for inpatient COPD disease management. As of 1/1/2016 the Respiratory Therapy (RT) department voluntarily took over the administration of MDIs and DPIs for Lung Partner patients. This was done to assure that the patients we were managing in our disease management program were receiving the 'whole package' from us. We need to not only provide the education of the medication; of why they are taking it, when they need to take it, and how they will take it, but we need to also assure they are able to effectively self administer that medication for themselves. In addition, under Nursing, more canisters were being dispensed than what would be expected. This project evaluated the impact of RTs assuming delivery of MDIs and DPIs in Lung Partner patients both clinically and financially. **Methods**: Starting 1/1/16 the RT Department assumed administration of all MDIs and DPIs on Lung Partner patients. Errors from Nursing's administration were collected. Data on days of treatment and canisters dispensed on all patients receiving Levalbuterol and Mometasone/Formoterol from 4/1/2015 to 3/31/2016 were evaluated. These medications were chosen since they were administered by protocol and the delivery schedule was defined. The number of puffs needed for the hospital stay was calculated. The expected number of canisters needed was compared with the number dispensed. The canister dispensed/needed rates for Lung Partners 2016 patients were compared with Nursing 2015 baseline and Nursing 2016 rates. **Results:** Errors discovered included discarding spacers at discharge, incorrect MDI technique, not using spacers consistently, and improper rinsing post anti-inflammatory MDIs. Handihaler errors included inability to use due to physical limitations, patients swallowing the capsule, and improper extraction of drug from the capsule. The baseline canister dispensed/needed rate for Nursing 2015 was 1.387. Lung Partners (LP) 2016 rate was 1.292 and Nursing 2016 rate was 1.347. (LP vs.2015 p=0.17 Fisher's Exact Test). Annualized savings for just these two medications was $16,906. **Conclusion:** RTs are the experts on these medications and need to be delivering them. It is the whole package for success for our disease management patients. In addition to the clinical advantages canister usage and cost were improved.

Sponsored Research - None

	Canister Dispensed/Needed Rates			Savings
Medication	Nursing 2015	Lung Partners 2016	Nursing 2016	from LP
Levalbuterol	1.338	1.125	1.327	$2,076
Dulera	1.395	1.306	1.350	$14,831
Total	1.387	1.292	1.347	$16,906

2528536

DETERMINATION OF FILTER CHANGE SCHEDULES DURING CONTINUOUS NEBULIZATION OF EPOPRSTENOL.

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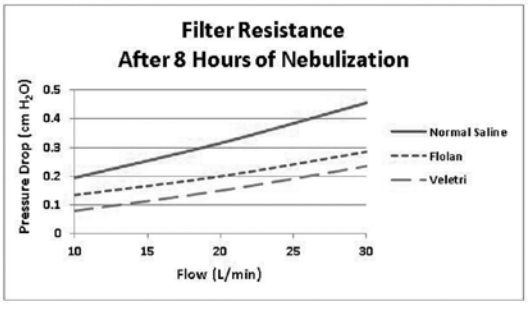
Continuous nebulization of medication during mechanical ventilation has been used for decades. There are informal recommendations regarding filter use in the expiratory limb of the ventilator circuit to protect the exhalation manifold and the need to change them regularly. However, while there are studies of the effects of humidification and nebulization on an expiratory filter, there appears to be no prior research on the specific timing of filter changes, particularly for nebulized Epoprostenol. The purpose of this study was to determine an appropriate filter replacement schedule for continuous nebulization of Epoprostenol during mechanical ventilation. Specifically, we sought to determine filter resistance and inadvertent PEEP (end expiratory airway pressure above set PEEP) and autoPEEP (end expiratory lung pressure above set PEEP) as a function of nebulization time during mechanical ventilation of a lung model. **METHODS**: A Puritan Bennett 840 ventilator was connected to a QuickLung (IngMar Medical Inc.) lung simulator with compliance = 50 mL / cmH_2O, resistance = 20 cmH_2O/(L/sec). Ventilator settings: mode = A/C volume control, frequency = 18/min, V_T = 450 mL, flow = 35 L/min, PEEP 5 cmH_2O. An Aerogen nebulizer was placed between the simulator and the exhalation manifold. Flow and pressure were measured with a Hans-Rudolph pneumotach and amplifier. Nebulized drugs: Flolan (epoprostenol 1.5 mg, in 50 mL diluent containing 3.76 mg glycine, 50 mg mannitol, 2.93 mg NaCl);Veletri (epoprostenol 1.5 mg, in 50 mL 0.9% NaCl diluent containing 100 mg sucrose, 50 mg arginine). Plain normal saline was also nebulized as a control. Measurements of pressure drop across filter (flow = 10, 20 and 30 L/min), lung pressure (P_L) and end expiratory pressure at airway opening (P_{AO}), were made at 2 hour intervals over 8 hours of nebulization. Experiments were repeated once. Changes in mean P_{AO} and P_L after 8 hours were compared with t-tests ($P < 0.05$ indicated significance). **RESULTS**: Summary data are shown in figure. All mean values for P_{AO} and P_L after 8 hours were < 0.5 cm H_2O and changes were insignificant. **CONCLUSION**: Continuous nebulization of epoprostenol for 8 hours results in clinically unimportant increases in filter resistance and therefore does not result in inadvertent airway PEEP or lung autoPEEP. There is no need for regular expiratory filter changes. Further study of longer nebulization times and drugs is indicated.

Sponsored Research - None



2529096

EVALUATION OF THE PERFORMANCE OF DIFFERENT TYPES OF NEBULIZERS –BY HEALTH SUBJECTS.

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Background: Nebulizers design influences efficiency of aerosol delivery. Performance of nebulizers is commonly tested by breathing simulators with static parameters. However, breathing patterns vary in adults. The purpose of this study was to evaluate drug deposition of different types of nebulizers testing with breathing patterns of healthy subjects. Methods: The study was approved by Chang Gung Memorial Foundation Institutional Review Broad and registered on ClinicalTrail database. Ten healthy subjects, aged 20.6±0.5 years, were recruited. Four nebulizers: 1) a constant jet nebulizer (Neb-easy, Galemed Corp., Taiwan); 2) a breath enhanced nebulizer (Pari LC plus, Pari Inc., Germany); 3) a manual-actuated nebulizer (A-T Neb, Atlantean Corp., Taiwan); and 4) a breath-actuated nebulizer (AeroElipes, Trudell Medical Inc, Canada) were evaluated. A unit-dose of salbutamol (5 mg/2.5 mL) was placed in the reservoir of each nebulizer powered by compressed air at 6 L/min for 10 minutes. Subject minute volumes and respiratory rates were measured by a respirometer (Haloscale, nSpire Health Inc, United Kingdom) during nebulization. Aerosolized drug inhaled and exhaled (collected in bacterial filters) and residual dose in neb were eluted and analyzed with spectrophotometery (276 nm). Statistical analyses with one-way ANOVA and Pearson correlation were performed with a significant level $p<0.05$. Results: Drug deposition (mean±SD) in the Table below. Inhaled dose with manual and breath actuated greater than other nebs. Inhaled dose and breathing patterns were not correlated (0.162 Pearson) Conclusion: Manual and breath actuated nebulizer designs provided greater inhaled dose and lower exhaled dose than simple and breath enhanced designs. Breathing pattern did not influence inhaled/exhaled drug dose.

Sponsored Research - This research is funded in-part by research grant from Aerogen Inc.

Drug deposition as % of dose (mean±SD) across 4 nebulizers

	EasyNeb	Pari LC	AeroEclipse	AT-Neb
Inhaled dose	15.0±1.9	17.7±. 2.7	29.2±2.3¥	29.6±5.0¥
Exhaled dose	15.0±2.2	5.4±1.6	1.4±0.8‡	3.5±1.5
Residual dose	62.3±2.9	66.2±2.5*	61.3±2.7	59.4±6.5

¥ Significant greater inhaled dose with AerpEclipse ($p<0.05$)

§ Significant lower residual dose with AerpEclipse ($p<0.05$)

* Significant greater residual dose with Pari LC ($p<0.05$)

Drug deposition as % of dose (mean±SD) across 4 nebulizers

2529745

COMPARISON OF AEROSOL DELIVERY WITH THREE HIGH FLOW NASAL CANNULA BRANDS AND SIZES.

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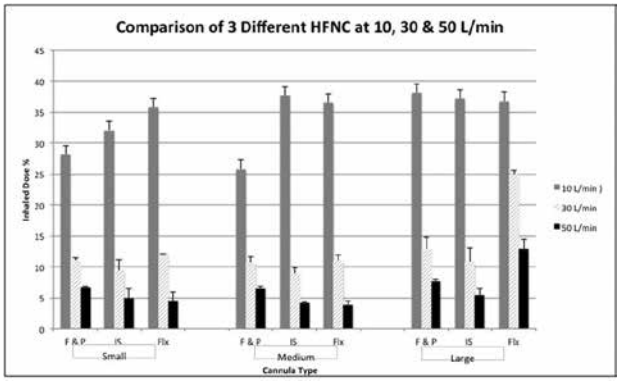
Introduction: The effect of flow on aerosol delivery through high flow nasal cannula (HFNC) has been described in the literature; however a comparison of brands and sizes of adult cannulas has not been reported. We hypothesize that cannula brand and size will affect aerosol delivery during HFNC use. **Method**: A vibrating mesh nebulizer (Aerogen Solo) was placed at the inlet (dry side) of the humidifier (Fisher & Paykel) and attached to a heated wire HFNC circuit with Fisher & Paykel (F&P), Intersurgical with Resmed (IS), and Flexicare (Flx) adult nasal cannulas in small, medium and large sizes. Cannulas were seated in a loose orifice (simulating nares) and attached to an absolute filter positioned above the circuit to collect aerosol and a T-shaped collection trap beneath. This apparatus was connected to a breath simulator (Harvard Apparatus, Holliston, MA) with adult settings (V_T: 500 mL, Respiratory Rate: 12 breaths/min, I:E Ratio: 1:2). Albuterol sulfate (0.083% 2.5 mg/3 mL) was administered via the vibrating mesh nebulizer with each nasal cannula size and type at 10, 30 and 50 L/min flow (n=3). Drug was eluted from filter and assayed (276 nm). One-way ANOVA (p <.05). **RESULTS**: Inhaled percent of dose (mean ±SD) in figure show differences between sizes and brands across the flows. At 30 and 50 L/min Flexicare large cannula delivered more drug than F&P and IS (p < 0.001). **Conclusions**: During HFNC, selection of the brand and size adult cannulas can impact aerosol delivery across all flow rates tested. Further studies are needed to assess impact of such aerosol deposition differences on clinical outcomes.

Sponsored Research - Aerogen provided funds for the research



2529801

EFFECT OF HME ON AEROSOL DRUG DELIVERY AND AIRWAY RESISTANCE IN SIMULATED VENTILATOR DEPENDENT ADULTS USING JET AND MESH NEBULIZERS.

Arzu Ari, Abdulrahman Alkhathami, Rowaida Qoutah, Ahmad Almamary, James Fink; Georgia State University, Atlanta, GA

BACKGROUND: Placement of a heat moisture exchanger (HME) between aerosol generator and patient has been associated with greatly reduced drug delivery and increased resistance of gas passing through the HME increasing work of breathing. The purpose of this study was to evaluate the effect of a specific HME placed between nebulizer and patient on aerosol deposition and airway resistance (Raw) in simulated ventilator dependent adults. **METHODS:** An in vitro lung model was developed to simulate a mechanically ventilated adult (Vt 500 ml, RR 15/min, PEEP 5 cmH2O and I:E ratio: 1:2) to an intubated adullt manikin with an endotracheal tube (8 mmID). The mainstem bronchi of the manikin was connected to a Y adapter through a collecting filter (Respirgard II) attached to a test lung through a heated cascade humidifier (37C producing 100% relative humidity) to simulate exhaled humidity. For treatment conditions, an HME (ThermoFlo™ 6070, ARC Medical) was placed between the ventilator circuit at the ETT and allowed to acclimate to the exhaled heat and humidity for 30 min prior to aerosol administration. The values on airway resistance (cm$H_2$0/l/s) was taken from the display on the ventilator monitor (Hamilton Galileo) at 0, 10, 20 and 30 min after HME placement and after each of 4 aerosol treatments. Albuterol sulfate (2.5 mg/3mL) was administered with jet (MistyMax10, Airlife) and mesh (Aerogen Solo, Aerogen) nebulizers positioned in the inspiratory limb 6 in from the Y adaptor and at the Y, respectively. Control consisted of nebulization with no HME. Drug was eluted from filter at the end of the trachea and measured using spectrophotometry (276 nm). **RESULTS:** The table shows mean±SD percent dose delivered and Raw. Greater than 60% of the control dose was delivered through the ThermoFlo™. No significant difference was found between the first four treatments given by the jet (p=0.825) and the mesh (p=0.753) nebulizer. There was a small but significant increase in Raw between pre- and post-4 treatments with the jet (p=0.001) and mesh (p=0.015) nebulizers. **CONCLUSION:** The ThermoFlo™ HME effectively passed the majority of aerosol on to the airway. Increases in Raw would likely not be outside of a tolerable range in ventilated patients. Further research with other HMEs and materials is warranted.

Sponsored Research - This study was funded with an unrestricted research grant from ARC Medical.

	Treatment Groups (With HME)		Control Groups (Without HME)	
Measuring Aerosol Deposition	Jet Nebulizer	Mesh Nebulizer	Jet Nebulizer	Mesh Nebulizer
1st treatment (%)	3.47 ± 0.40	6.61 ± 0.34	5.44 ± 0.17*	10.64 ± 0.53*
2nd treatment (%)	3.56 ± 0.52	6.54 ± 0.71		
3rd treatment (%)	3.38 ± 0.41	6.57 ± 0.84		
4th treatment (%)	3.64 ± 0.44	6.40 ± 0.66		
Measuring Raw (cmH20/l/s)				
Raw before treatment	15.50 ± 0.57	13.75 ± 0.50		
Raw after treatment	17.50 ± 0.57	16.75 ± 1.70		

* Delivered dose greater than treatment with same nebulizer (p=0.001)

2531597

COMPARISON OF INTERFACES ON AEROSOL DRUG DELIVERY TO A SIMULATED ADULT LUNG MODEL RECEIVING NONINVASIVE VENTILATION.

Arzu Ari, Rowaida Qoutah, Abdulrahman Alkhathami; Georgia State University, Atlanta, GA

BACKGROUND: Although aerosol therapy is commonly used for the treatment of patients receiving noninvasive ventilation (NIV), drug delivery with different interfaces during NIV is not known. The purpose of this study was to compare aerosol drug delivery with different interfaces used in a simulated adult lung model receiving noninvasive ventilation. **METHOD**: An in-vitro lung model consisted of the upper airway of an adult teaching manikin with a collecting filter at the level of the bronchi attached to a passive test lung. Using an unheated circuit (Phillips Respironics), four types of interfaces were tested in this study: (1) Nasal pillow (LN, AP111, Respironics), (2) Nasal mask (Performatrack Small, Respironics), (3) Oronasal mask (AF531, Respironics) and (4) Full face mask (Performax, Respironics). NIV settings included PIP/PEEP of 15/5 cmH_2O and respiratory rate 15 breaths/min. Nebulizers were placed between the leak port and the mask. Albuterol sulfate (2.5 mg/3 ml) was nebulized with a mesh nebulizer (Aeroneb Solo, Aerogen). Filters were eluted with 0.1 HCl and analyzed by spectrophotometer at 276 nm. Descriptive statistics, repeated measures analysis of variance were used for data analysis (p<0.05). **RESULTS**: Table below shows the inhaled mass (mg) and percent of dose delivered (mean ±SD) distal to the bronchi with each interface. Aerosol delivery with the nasal pillow was significantly lower than other interfaces during NIV (p<0.05). The nasal mask and the oronasal mask had a similar delivery efficiency in this simulated adult lung model receiving noninvasive ventilation (p=0.90). **CONCLUSION**: The type of interfaces used during NIV affects aerosol delivery in this simulated adult lung model. Delivery efficiency of the oronasal mask is greater than other interfaces tested in this study.

Sponsored Research - None

	Nasal Pillow	Nasal Mask	Oronasal Mask	Full Face Mask	P value
Inhaled Mass (mg)	0.082 ± 0.01	0.350 ± 0.01	0.374 ± 0.03	0.235 ± 0.01	0.001
Inhaled Mass Percent (%)	3.28 ± 0.14	14.0 ± 0.68	14.96 ± 1.53	9.40 ± 0.29	0.001

2530684

EVALUATING UPPER AND LOWER AIRWAY NEBULIZER-DELIVERY OF AN INHALED RELIEVER MEDICATION FOR BRONCHOCONSTRICTIVE DISEASE IN THE LABORATORY, SIMULATING ADULT TIDAL BREATHING AND USING AN ANATOMIC OROPHARYNGEAL MODEL.

Judy Schloss[1], Jolyon P. Mitchell[2]; [1]University of MN Medical Center, Minneapolis, MN; [2]Jolyon Mitchell Inhaler Consulting Services Inc, London, ON, Canada

Background: Delivery of inhaled medication for the treatment of bronchoconstrictive disease in the ED is complicated by the loss of some of the inhaled dose to the upper airway. This laboratory-based study mimicking adult use sought to evaluate the magnitude of such losses from different nebulizer types in relation to delivery to the lungs using a new anatomic upper airway model. **Methods**: Three different nebulizers (n=9 replicates/device type) were evaluated with albuterol sulfate solution (2.5 mg/3 ml). Nebulizer types included Solo*/ Ultra* vibrating mesh with Pro-X Controller, Aerogen Ltd. Ireland; Nebutech* HDN* continuous jet (Salter Labs, Arvin, CA), operated with 50 psig compressed air at 7 L/min; AeroEclipse*-II breath actuated (Monaghan Medical Corp., Plattsburgh, NY) operated with compressed air under similar conditions. The neb mouthpiece was attached to the mouth opening of the Aerosol Delivery to Anatomic Model (ADAM-III) adult upper airway model (Trudell Medical International, London, Canada), where a filter was located at the airway outlet, representing the carina. The filter was connected to a breathing simulator (ASL 5000, IngMar Medical, Pittsburgh, PA) simulating tidal breathing (V_T= 600 mL; 10 cycles/min; inspiratory: expiratory ratio 1:2). 5 breathing cycles were undertaken, following which the model was disconnected from the test apparatus and the mass of albuterol deposited in the model airway (O-P) and on the filter (CARINA) assayed by HPLC-UV spectrophotometry. **Results**: The table contains measurements of total mass albuterol (mg; mean ± SD) recovered from the model. All nebulizer types generated droplets that were large enough to deposit in the model oropharynx and would therefore be unavailable for delivery to the lungs. More importantly, there were differences between nebulizer types and the mass of medication that penetrated as far as the 'carina', with the breath-actuated nebulizer delivering significantly more albuterol than the other two devices (1-way ANOVA, p < 0.001). **Conclusions:** Nebulizer type is a consideration for the delivery of rescue medication where the goal is to deliver as much drug to the constricted airways rapidly. This *in vitro* study indicated that the breath-actuated nebulizer has the potential for optimizing medication delivery, but clinical studies would be required to confirm this finding. **Disclosure**: J Schloss participates in Monaghan Medical's (MMC) Speaker Bureau. J Mitchell is a consultant to MMC.

Sponsored Research - None

Table 1

Nebulizer/Type	O-P	CARINA
Aerogen Solo*-Ultra*/Vibrating Mesh	31.2 +- 5.6	22.1 +- 4.4
Nebutech* HDN*/Continuous Jet	32.8 +- 8.3	15.8 +- 2.2
AeroEclipse*-II/Breath-Actuated	20.3 +- 2.0	30.7 +- 1.9

2531861

CLINICAL OUTCOMES ASSOCIATED WITH VIBRATING MESH AND JET NEBULIZERS DURING MECHANICAL VENTILATION IN THE ACUTE CARE SETTING: A RANDOMIZED CONTROLLED TRIAL.

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Background: As evidence increases regarding aerosol delivery in mechanically ventilated patients, one piece of the puzzle remains unexplored; measurement of clinically relevant outcomes. The aim of this research was to compare clinical outcomes [ventilator associated events (VAEs), length of stay (LOS) in ICU, days on mechanical ventilation (DOV), and mortality] using a traditional jet nebulizer (JN) and a vibrating mesh nebulizer (VMN) during mechanical ventilation in the acute care setting. **Methods:** This was a randomized, controlled trial. After approval by the Institutional Review Board of a Midwest academic medical center, 120 mechanically ventilated, adult subjects with an endotracheal tube and a physician order for aerosol treatment were included. Subjects were randomized to either a JN with valved T-piece (Misty Max 10™, CareFusion, San Diego, California) or VMN (Aerogen® Solo, Aerogen, Galway, Ireland). Subjects were excluded if intubated for less than 24 hours, if tracheostomy present on admission, or if diagnosed with diaphragmatic paralysis, high spinal cord injury, or brain death. Respiratory care staff placed the randomized nebulization device in the ventilator circuit per hospital policy. JNs were placed into a spring loaded t-piece 15 cm from the wye and operated at 8 L/min, and replaced every 3 days. VMNs were placed on the dry side of the heater water chamber and changed at end of ventilation, up to 28 days. Cultures of the nebulizer, aerosol produced and ventilator circuit were performed q3 days and at end of mechanical ventilation. Clinical outcome data was obtained from the electronic medical record at the conclusion of study. Contingency tables, Chi-square test, t-test and Nonparametric Kruskal-Wallis test were used. **Results:** See Table 1. 120 subjects were enrolled. 30 subjects were excluded from analysis due to protocol deviations leaving 48 in the JN and 42 in the VMN groups. **Conclusions:** Use of a JN with q3d changes and VMN remaining in the ventilator circuit for up to 28 days resulted in no significant differences in VAE, LOS in ICU, and total DOV. Patients with a higher APACHE II score had a higher risk for in-hospital mortality.

Sponsored Research - Aerogen

2532048

COST EFFECTIVENESS OF USING INHALED EPOPROSTENOL AS AN ALTERNATIVE TO INHALED NITRIC OXIDE.

Eloisa R. Cutler; Respiratory Care, UCSD, San Diego, CA

Background: At UCSD Med. Center, an increasing trend in the use of Inhaled Nitric Oxide (INO) was observed, specifically in the immediate post-op period following CT surgery. INO costs were up nearly 200% from 2011 to 2013, and were forecasted to reach $1.8 million by 2015. In a hospital-wide initiative to reduce operating expenses, reduction of INO usage was identified. The intention was to develop protocols to identify thresholds for early discontinuance, and by using inhaled epoprostenol (iEPO) as an alternative. Policies, protocols, and delivery systems were developed and the impact on expenses reported. **Method:** Much literature has been published comparing iEPO and INO treatments for right heart dysfunction and other conditions, indicating that iEPO was comparably safe to INO. iEPO is also considerably less expensive than INO, without the need for specialized equipment. From these positive findings, a cross-functional team was assembled, reaching consensus on policies, protocols, and delivery systems. Tracking systems provided a data of the use of INO and iEPO, and payments to suppliers for them. An ICU coordinator identified patient candidates, conducted training, and maintained records of use. An Aerogen® Solo delivery system was selected, including continuous nebulizer infusion by an Alaris® Pump Module. An ICU Coordinator and trained RCP were available as the post CT surgery patients arrived in the ICU, applied approved protocols in discussions with the CT surgeon, and ensured timely and appropriate implementation of iEPO. **Results:** The UCSD team used the monthly iEPO data collection tracking sheet to track monthly progress, and by Q1-2015, it achieved the goal of reducing the usage of INO from 100% in 2012 to approximately 80% in 2013 to 50% in 2014 and to 40.6% in 2015. Annualized cost savings were $469K, a 59% reduction. In 2016, the team introduced iEPO via high-flow cannula/mask and via ventilator to further reduce cost. None of the patients transitioned from INO to iEPO experienced adverse side effects, complications, or changes in ICU length of stay because of the transition. **Conclusions:** iEPO is a cost effective alternative to INO. UCSD experienced a 59% in cost over a three year period in comparison to INO. iEPO has proven to be clinically effective, is less toxic, and is easier to administer. Successful implementation requires achieving both buy-in and support of key personnel and the application of evidence-based practice.

Sponsored Research - None

2525436

HIGH FIDELITY SIMULATION AN INNOVATIVE APPROACH TO TRAINING FAMILY CAREGIVERS OF CHILDREN REQUIRING LONG TERM MECHANICAL VENTILATION.

Joyce Baker, Jodi Thrasher, Roberta Cox, Jessica Dawnson; Children's Hospital Colorado, Aurora, CO

Background: Using high fidelity simulation as an innovative approach to enhancing the educational experience of family "caregivers" who are caring for medically complex child on long term mechanical ventilation (LTMV). The Ventilator Care Program (VCP) at our institution has an interdisciplinary care team for infants and children with chronic respiratory failure requiring LTMV. The primary intent of the VCP is to prepare patients and family caregivers to safely manage these children in the home environment. Each caregiver is provided in-depth education around how to provide day-to-day cares for the child. One of the biggest education limitations identified is the inability to replicate home emergency situations. It is hypothesized that implementation of high-fidelity simulation training for caregivers of children on LTMV would allow the caregiver to be placed in a controlled emergency situation and increase the caregivers self-reported comfort in managing emergency situations. **Method:** Through an institutionally supported quality improvement initiative, we developed a high-fidelity simulation program which emphasized emergency situations families may encounter in the home. One to three caregivers for each child are provided an opportunity to participated in the simulations facilitated in our tertiary care center simulation lab. Prior to the simulation, each caregiver was asked to complete a pre-simulation survey assessing their comfort in caring for the child at home. After each simulation, debriefing sessions included self observation of the simulation, evaluation of performance, and opportunity to identify additional learning needs. A post-simulation survey was completed. **Results:** Over a two year period, 42 children requiring LTMV at home had 81 caregivers participated in the high fidelity simulation. Caregivers reported that post-simulation debriefing was the most beneficial components of education compared to various other hands on educational sessions: tracheostomy-based cardiopulmonary resuscitation ($p=0.0005$), educational videos ($p<0.001$), and printed educational handouts ($p<0.001$). **Conclusion:** High-fidelity simulation is an effective teaching strategy when coupled with traditional methods for caregiver training of children requiring LTMV in the home.

Sponsored Research - None

2527111

DEVELOPMENT OF A COMPREHENSIVE PEIDATRIC RESPIRATORY RESIDENCY PROGRAM TO IMPROVE CLINICAL PRACTICE AND CRITICAL THINKING SKILLS.

Joyce Baker, Mary Walsh, David Musliner, Dana Coyle; Children's Hospital Colorado, Aurora, CO

Background: Developing a comprehensive pediatric residency program will provide new graduates and respiratory therapists with limited pediatric experience, the foundation to have a better understanding around pediatric disease management and feel more competent in caring for pediatric patients. Respiratory care schools tend to have a stronger emphasis on adult cardiopulmonary management since the majority of respiratory patients are adults; new graduates tend to seek employment at adult hospitals; and course curriculum is build around the Commission on Accreditation for Respiratory Care (CoARC) standards. **Methods:** Our respiratory care department developed a pediatric respiratory residency for new graduates and respiratory therapists with limited pediatric experience. The program is over a 12 week period to encompass classroom, didactics, and bedside clinical experience. Prior to each program each resident is to take a; pre-program quiz that has questions designed to focus on clinical practices of a complex pediatric medical/surgical patients, and pre-qualitative assessment using the likert scale to evaluate their comfort in caring for pediatric patients. Upon completion of the program each resident is to present a case study to their peer group, as well as, complete a post-program quiz and post qualitative assessment. **Results:** There have been a total of 9 residents to successfully complete the residency program over a 6 month period. There was significant difference in both how the residents improved on the program quiz (pre-quiz median 66%, post-quiz median 88%) and perceptions of feeling prepared to care for pediatric patients (pre-assessment median of 2, post-assessment median of 3.18). Unsolicited feedback was provided from physicians and nursing staff noting the difference in clinical assessments, critical thinking, and communication since the residency program. **Conclusion:** Developing a comprehensive pediatric residency program for new graduates and respiratory therapists with limited pediatric experience has been able to improve clinical and critical thinking skills in those whom attended our residency program, while improving the perception of the bedside health care team around the care provided by the respiratory therapists.

Sponsored Research - None

2527209

ASSESSING THE RESPIRATORY THERAPISTS' EFFECTIVNESS IN MANAGING A PRE-EXISTING SURGICAL AIRWAY EMERGENCY.

Phillip Stark, Kimberly Group, Mandy Harshberger, Ashley Grim, Janelle Reed, James Rudegeair, Emily Scicchitano; Respiratory Care, Penn State Hershey Medical Center, Hershey, PA

Background: Effectively managing a pre-existing surgical airway should be an essential skill for any respiratory therapist. We wanted to assess our own therapists' performance in managing such an airway in an emergent condition. We also wanted to ensure that situational awareness, critical thinking, and appropriate interventions in managing this situation were well understood and executed. ***Method:*** A high fidelity medical mannequin was altered for a surgical airway with a complete upper airway obstruction (i.e. laryngectomy). The mannequin was then placed in respiratory arrest. A simulation scenario was then enacted where the respiratory therapist was a first responder to manage this medical emergency. The participants had no prior knowledge as to the scenario. Ten clinical objectives for managing this situation were established and measured (see diagram). The scenario was video recorded for review during a detailed, individual debriefing. ***Results:*** In all, sixty-nine (69) therapists participated in this study. Response times for each objective were averaged for the study group. Standard deviations were also derived for each objective. ***Conclusion:*** Response times were longer than we anticipated with a large standard deviation. An opportunity clearly presented itself for individual, as well as departmental improvement. Simulation based education and the power of an effective debriefing gave the ability for any deficiencies of knowledge or skill to be addressed and corrected on an individual basis. We will continue to provide simulation based education and evaluation as a measure of individual and departmental effectiveness.

Sponsored Research - None

Assessments for Managing a Pre-existing Surgical Airway Emergency

Objective	Average Time (minutes)	Standard Deviation (minutes)
Checks for Respiration	1:12	(+/-) 0:54
Checks for a Pulse	1:24	(+/-) 1:10
Activates Emergency Response	3:29	(+/-) 2:44
Requests Code Cart	3:34	(+/-) 2:08
Attempts Upper Airway Ventilation	5:08	(+/-) 2:25
Applies Supplemental Oxygen	5:53	(+/-) 2:57
Performs Lower Airway Ventilation	7:28	(+/-) 3:18
Acquires Pulse Oximetry	7:45	(+/-) 3:55
Acquires End Tidal Carbon Dioxide	8:38	(+/-) 3:26
Correctly Identifies Airway	9:28	(+/-) 3:38

2527487

PERCEPTIONS OF CLINICAL INSTRUCTORS AND RESPIRATORY THERAPY STUDENTS ON EFFECTIVE TEACHING CHARACTERISTICS OF CLINICAL INSTRUCTORS IN SAUDI ARABIAN UNIVERSITIES.

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BACKGROUND: A crucial area of professional respiratory therapy (RT) education is clinical training. The aim of this study is to determine the perceptions of both clinical instructors (CIs) and baccalaureate degree RT students on the effective characteristics of CIs working at three universities in Saudi Arabia. **METHODS:** 141 RT students and 15 CIs in the Department of Respiratory Therapy at Prince Sultan Military College of Health Sciences, University of Dammam, King Saud University of Health Sciences in Saudi Arabia were surveyed in this study. The survey questions were composed of 18 teaching behaviors ranked on a five-point Likert scale (5: most important, 4: important, 3: neutral/uncertain, 2: less important and 1:unimportant). Descriptive statistics and independent sample t-test were used for data analysis. A significance level was set at 0.05. **RESULTS:** The response rate of this study was 71% for RT students and 72% for CIs, respectively. Sixty-eight percent of the students were male, while thirty-two percent were female students. Also, thirty-three percent (33%) of CIs were male, and sixty-seven percent consisted of female CIs. Although both RT students and CIs ranked "competency on demonstrating knowledge" as the most important teaching characteristic of CIs, the rest of their ranking showed differences. While the first 3 ranking of CIs included only teaching competencies of CIs, RT students ranked competency, evaluation skills and teaching ability of CIs as the most important teaching characteristics of CIs. According to RT students and CIs participated in this study, 4:1 is the best student:clinical instructor ratio for optimum clinical learning experience in respiratory therapy education in Saudi Arabia. Also, ranking obtained from junior and senior RT students were statistically different in seven out of the eighteen teaching characteristics of CIs ($p<0.05$). **CONCLUSION:** Competence on demonstrating knowledge was identified as the leading characteristics of CIs by RT students and CIs. However, their ranking on teaching characteristics of CIs differs. There are significant differences between the perceptions of junior and senior RT students on effective teaching characteristics of CIs. Further research is warranted.

Sponsored Research - None

2528516

THE PREVALENCE OF USE, AWARENESS AND BELIEFS OF ELECTRONIC CIGARETTES AMONG COLLEGE-BASED HEALTH CARE STUDENTS AT A SOUTHEASTERN URBAN UNIVERSITY.

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Background: Electronic cigarettes are used to deliver nicotine to consumers. E-cigarettes are claimed to be an alternative method for smoking cessation. The use of electronic cigarettes is increasing among young people, especially current and former smokers. It is unknown what the harm or benefit that result from e-cigarettes' use of the individuals on the well-being. **Purpose**: This study was conducted to explore the prevalence of e-cigarettes use and exposure among college-based health care students. Also to assess the awareness level and beliefs in regard to electronic cigarettes use among the health care students. **Methods**: 217 college-based health care undergraduate students from nursing, nutrition and respiratory therapy programs were surveyed in this study. The survey was composed of 17 questions in regards to the awareness, prevalence of e-cigarettes use and beliefs about e-cigarettes use. The data analysis included descriptive-statistics, independent sample t-test and one-way ANOVA. A significance level was set at 0.05. **Results**: The response rate was 98.1%, 87% of the respondents were female and 70% were between the ages of 19-25 years. Most of the respondents were nursing students (47.5%). Most of the respondents were non-smokers (83.4%); former smokers were 13.8%; and smokers were 2.8%. Almost all the respondents had heard of e-cigarettes (99.5%), and 21.2% had tried e-cigarettes. The mean awareness score was 5.1 (SD 0.11); smokers showed the highest mean awareness score of 6.0±2.28. There was a significant difference among male (5.71±1.51) and female (5.03±1.71) in regards to the e-cigarettes awareness level (p=0.047). The awareness level was significantly different among respondents who had previously used e-cigarettes (5.63±1.49) than participants who have not tried e-cigarettes at least once during their lifetime (4.98±1.72) (p=0.021) **Conclusion**: This study found that most of the students in the college of nursing and health professions were not e-cigarettes' users. People who have tried e-cigarettes, have friends who have tried e-cigarettes as well. E-cigarettes' awareness is high among smokers and e-cigarettes' users; older students seem to have higher awareness than younger students. There were general disagreements on the use of e-cigarettes as a less dangerous alternative to tobacco cigarettes to help smokers to quit. Finally, male and female participants showed significant differences in their awareness of e- cigarettes.

Sponsored Research - None

2529345

OBJECTIVE STRUCTURED CLINICAL EXAMINATION SCORE WAS IMPROVED THROUGH THE ENTRY LEVEL CLINICAL PRACTICE IN SECOND GRADE RESPIRATORY THERAPY STUDENT.

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Background: Objective Structured Clinical Examination (OSCE) is an objective way to evaluate the clinical ability, include both skills and attitude, for the medical assessment, interviews and medical examinations. OSCE has become a part of doctor's national licensure examination. The purpose of this study is to explore the skills and attitudes change of respiratory therapy students by the OSCE test, was performed in the pre- and post-clinical practice. **Method:** There were 10 three years program students (8 female) who are in second grade enrolled pre-clinical practice evaluation. After one week entry level clinical practice in the medical center hospital, only 9 students (7 female) took the post-clinical practice evaluation. We recruit 4 standardized patients and 4 examiner in 4 OSCE stations, included how to use the small volume nebulizer (SVN), patient education of meter dose inhaler (MDI), peri-operative respiratory care (PORC) and nonpharmacological dyspnea management (Oxygen). The process of each station included reviewing the medical history, patient assessment and interviews, education for the standardized patient, clinical situation solving and feedback. The evaluation score divide to complete met (2 point), partial met (1 point), and unmet (0 point) three grade. The final total score for the student in each station was the partial score met plus complete met score as the numerator, and the total complete met items as the denominator. The statistic method was the paired t test to evaluate each station the difference between pre- and post-clinical practice. **Results:** The four OSCE station score result was significantly improved after clinical practice except the SVN station (44.89±17.77 vs 49.33±15.73, P=0.234). There were significant improve in MDI station (54.22±15.57 vs 77.78±12.19, P<0.05), PORC station (44.22±19.04 vs 75.33±11.03, P<0.05) and Oxygen station (34.67± 23.69 vs 66.22±12.19, P<0.05). **Conclusions:** This study demonstrates that the clinical practice can improve respiratory therapy students' critical thinking and clinical skills. The result could be confirmed by the OSCE test. **Disclosures:** This study was supported by research grants from the China Medical University Hospital (CMUH-EDU10407). The authors have disclosed no conflicts of interest.

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2529354

PROCEDURES, GUIDELINES, AND EDUCATION IN THE PULMONARY FUNCTION LABORATORY.

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Background: The Pulmonary Function Testing (PFT) Laboratory at Cincinnati Children's Hospital Medical Center (CCHMC) performs over 10,000 procedures a year, supports multiple locations and patient populations. The increasing number of procedures and respiratory therapists (RTs), formal development and documentation for procedures is warranted and evident. The purpose of this study was to evaluate methods of measuring competencies and develop written documentation to provide expectations of knowledge and assessment. **Methods:** Different methods of measuring competency were evaluated. Guidelines, procedures and competencies were developed and implemented in the PFT lab. Rubrics and check-offs were developed, utilized, for initial and future documentation of the competency completed. Spirometry, Lung volumes, Diffusion capacity, Respiratory Muscle Strength, Methacholine and Exercise challenges were tests chosen. Rubrics were created over a standard check off as multiple levels are needed to quantify staff understanding and quality performance. Competency self-assessment model was used to identify baseline comfort level. A step-by-step process was developed to support the individual in each stage before progressing to the next. Introduction and implementation of material to the staff was final step. **Results:** Guidelines, procedures and detailed rubrics were developed for six primary PFT procedures and the RTs in the PFT lab were surveyed on their thoughts of each process. Their responses showed mixed results ranging from "no comment" to "not enough detail" to "this is great to set expectations" The first two procedures that the rubric was used completed, 75% of RTs performed at the highest level. Education was provided and within two months those RTs improve rubric scores. **Conclusion:** There is a need for on-going education, and documentation of specialized procedures performed by RTs in the PFT lab. Dearth amount of data is available linking documentation and development of these tasks with improved testing outcomes, however now we have a bridge connecting this specific field of study to patient testing outcomes. This study shows that rubrics provide RTs with a clear picture of knowledge of expectations providing a "step by step" educational process with immediate feedback which allows the RT to learn to perform the procedure proficiently.

Sponsored Research - None

2529393

PILOT PROJECT TO EVALUATE THE FEASIBILITY AND EFFECTIVENESS OF COMBINED TRAINING OF MEDICAL AND RESPIRATORY STUDENTS USING SIMULATION.

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Background: Simulation is invaluable for teaching critical thinking, beneficial improving interprofessional (IP) team performance, and can be instrumental evaluating competencies required for interprofessional collaborative practice (IPECP). A challenge to implementing activities that evaluate these competencies is scheduling curricula where learners with similar training can be brought together. We collaborated to provide ventilator lab exercises for fourth year med students (MD) and senior respiratory students (RT) in their clinical rotations. The number of learners in each course allowed the pairing of an MD and RT student as a team to participate in simulations. This project evaluated the feasibility and effectiveness of these simulations. **Method:** Fourth year MD students (14) participating in an elective were paired with senior RT students (14) enrolled in a clinical rotation. Randomly paired students participated in two scenarios (pedi right mainstem intubation and delivery of a 32 wk gestation infant requiring intubation). Students were evaluated on teamwork skills, communication, situational awareness, time to hands on patient, and technical skills. Afterwards, the students were debriefed on their performance, then proceeded to the second simulation scenario. Competencies were re-evaluated, students were again debriefed on performance, finally they were surveyed regarding their perception of the exercise and its value compared to a clinical rotation. **Results:** For the pedi scenario, average time to hands on (auscultation) was 77.4 +/- 86.2 and 78.6 +/- 48.2 secs for MD and RT students, respectively. For the neo scenario, average time to hands on (warming/stimulating) was 14.1 +/- 12.2 and 19.7 +/- 17.9 secs for MD and RT students, respectively. The exercise identified strengths and deficiencies in the domains of roles/responsibilities, IP communication, and teamwork. Post exercise surveys were completed by 25 respondents (MD students 78.5%; RT students 100%). **Conclusion:** It is feasible to organize and schedule IPE simulation activities with learners of similar skill sets and training. The simulation activity identified strengths and deficits, and can be effective in evaluating competencies required for IPECP. Overall comments from students were positive and they requested more simulation. This study demonstrates that educational programs should make efforts to incorporate evaluation of competencies essential for IPECP.

Sponsored Research - None

2529769

AN INNOVATIVE USE OF RESPIRATORY STUDENTS TO GAIN EXPERIENCE IN HIGH STAKES NEONATAL SIMULATIONS.

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Background- Respiratory Therapy students have limited opportunity to get hands on experience in acute situations in the Neonatal Intensive Care unit (NICU). Neonatal Nurse Practitioners (NNPs) are expected to complete multidimensional competencies annually. In addition, the Institute of Medicine has proposed a set of 5 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. Thus, an innovative strategy was conceived to utilize students to participate as actors in these simulations. **Method**- Respiratory Therapy (RT) students and undergraduate nursing (RN) students from 2 major universities in the Houston area as actors in simulations designed to evaluate NNPs at an academic children's hospital. Each student received an online pre-course presentation. The day of the course the students are verbally pre-briefed and divided up into 2 groups. The students are given hands-on training of neonatal resuscitation techniques, scenario specific activities and time to orient to the simulation theater. Next, students are pre-briefed on the scenario's important scripted information and roles, how to question the NNPs verbal orders, as well as use closed loop communication and SBAR techniques. Prior to the start of the simulations the students are taken to view the NNP participants performing procedures and are given the opportunity to ask questions. Once the simulations start each NNP is rotated through 2 separate simulation scenarios. Once each scenario is complete all the participants debrief and discuss not only the cognitive and technical aspects of the scenario but also the behavioral aspects such as communication, leadership, situational awareness, professionalism, and teamwork. **Results**-The RT students were given the opportunity gain hands on experience in a high acuity neonatal simulation with NNPs and RN students. The NNP participants reported simulations felt very real and were beneficial. The students reported a better understanding of teamwork, their roles within the team and the importance of good communication skills. **Conclusion**- Utilization of RT and RN students as actors in simulations is an excellent method to intensify behavioral competencies of both students and providers, and increases student exposure to high stakes situations, skills, and multidisciplinary practice in a controlled environment.

Sponsored Research - None

2530334

TEACH BACK FOCUS STUDY IN LUNG PARTNERS PATIENTS.

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Background: Lung Partner therapist incorporated Teach Back, a distinct survey of questions to confirm patients' knowledge of the disease management education we provide them. Often times patients intentionally or unintentionally conceal lack of knowledge behind yes/No questions. By asking open – ended questions patients can better engage with therapists to confirm all learned information in their own words. Allowing therapist an opportunity to evaluate appropriate comprehension and retention of education provided, fill in any gaps in information and answer patient questions. Standard materials are written at a 5th grade reading level in accordance with literacy and comprehension scores. Teach back uniquely allows therapist to cater reading levels on an individual basis, ensuring mutual understanding and maximum learning. Teach back results are then used on a grand scale to improve teaching methods across Lung Partners and strengthen patient – therapist relations. **Methods:** A one month focus study was done and all patient responses were reviewed and scored as understanding or not. For each question the percent understood and number of responses was tabulated. **Results:** The Teach Back questions that had the lowest scores were: 77.8% n=54 What would you like to know about COPD? 83.3% n=54 Can you name the medications you take for your COPD? 79.2% n=53 How often are you taking them? 88.6% n=35 Why is it important to watch for changes in your symptoms? **Conclusion:** Based on the results of the survey, we identified areas needing improvement. First, patients have good foundational knowledge of taking their medication, however, they always benefit from reminders on recognizing prescription names and dosage instructions. Additionally our patients demonstrated understanding of our COPD action plan emphasizing early warning sign recognition. These symptom changes need early treatment to prevent full exacerbation and emergency care, a fact often forgotten or undervalued by patients. We successfully recognized and reinforced the necessity in patients becoming more engaged with their care, understanding the importance in preventative care, follow up appointments and self-management at home. In regards to the lowest scores above, therapist were able to identify and reinforce areas of needed improvement at the time of the screening, which otherwise may have gone unidentified.

Sponsored Research - None

2530426

CONSIDERATION OF A STANDARDIZED PRE-ADMISSION EXAMINATION TO IDENTIFY PROBABLE SUCCESS ON THE RESPIRATORY THERAPIST CREDENTIALING EXAMINATIONS.

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BACKGROUND: RT Program Directors (RTP) need to recruit students who will succeed on NBRC exams as part of accreditation. This study considered using the mean score (MS) of a pre-admission exam for the RT (60% = 50th percentile rank) as a threshold to assess students' NBRC exam success. **METHODS:** Upon IRB approval, 51 students from two consecutive BS-level cohorts voluntarily took the Health Occupations Basic Entrance Test (HOBET V). Participation varied among these NBRC exams: CRT, WRE, and the CSE. The Pearson Chi-Square test X^2 was used to examine the association pass/fail for each of the three exams using the HOBET V (HV) with three conditions: (1) No Threshold, (2) HV-MS <60%, and (3) HV-MS =>60%). The Pearson product-moment correlation coefficient *r* was used to evaluate relationship strength between the overall HOBET V Score (HVS) and its subscales: Reading (Re), Math (Ma), Science (Sc), and English (En), under three conditions as stated above, with the exam scores on the CRT and WRE exams, and the pass/fail for the CSE exam (except for condition 3). Significance was accepted at $P < 0.05$. **RESULTS:** Although there were differences in the exams % pass rates with the three conditions, the association pass/fail (P/F) for each of the three exams showed: CRT P/F (1) 46/3, (2) 28/3, (3) 18/18, $X^2 = 1.86$, $P = .40$. WRE P/F (1) 38/7, (2) 20/7, (3) 18/18, $X^2 = 5.53$, $P = .06$; CSE P/F (1) 35/9, (2) 17/9, (3) 18/18, $X^2 = 7.83$, $P = .02$*. For some of the three conditions, medium and large significant correlations (* $P < .05$) were consistently found for the relationships of all three exams with HVS, and the HV Science scale. The following results include the above and the other HV scales: CRT and HVS .573*, .567*, .387; Re .438*, .313, .240; Ma .325*, .235, -.164; Sc .620*, .620*, .371; En .098, .217, .357; WRE and HVS .359*, .133, .040; Re .195, -.160, .071; Ma .206, .045, -.246; Sc .536*, .489*, .207; En .180, -.124, -.040; CSE and HVS -.409,*-.136, Re -.283, .080, Ma -.286, -.068, Sc -.523*, -.424*, En -.085, .186. **CONCLUSION:** Of 51 participants, a HOBET V mean score =>60% would have disqualified 33, leaving only 18 for admission. Emphasis on this admission criteria may be helpful in identifying candidates for admission having a high probability of success on the NBRC exams, but deny other capable candidates entry into a RTP. **DISCLOSURES:** The authors have no conflict of interest. Note that Assessment Technologies Institute (ATI) made the exams available, gratis.

Sponsored Research - None

2531401

KNOWLEDGE AND SKILL ASSESSMENT OF PORTABLE VENTILATOR USE DURING INTERFACILITY TRANSPORT SIMULATIONS.

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Background: The American Academy of Pediatrics Section on Transport recommends the use of portable ventilators to transport mechanically ventilated patients. Ventilator use for our pediatric patients decreased 23% below benchmark during inter-facility transport. We sought to identify knowledge gaps and assess competency of our transport staff with portable ventilator use. **Methods:** A process improvement filter identified patients requiring mechanical ventilator support during air or ground transport. We reviewed electronic health records (EHR) of all patients requiring ventilatory support to determine when manual ventilation was used in lieu of a portable ventilator. Simulations were constructed from the most frequently occurring scenarios. A written test assessed participant knowledge of ventilator function. As a quality improvement initiative, all registered respiratory therapists (RRT) trained in neonatal and pediatric air and ground critical care transports participated in this study. Participants individually completed a brief demographic survey, proctored 10-question multiple choice test and three facilitated simulated scenarios. The LTV-1200 was used for each scenario. A low fidelity full body pediatric mannequin was attached to an ASL 5000 to simulate active breathing. Each scenario evaluated the participant's ability to conduct pre-use checks, select/optimize ventilator settings, set alarms and complete safety checks. Assessment documents did not contain identifiers. Completed assessments were placed in an envelope and a unique identifier assigned upon completion of the assessment process. Descriptive statistics were used to report participant demographics, written test and simulated scenario results. **Results:** 172 EHR were reviewed. Manual ventilation was used more frequently in toddlers requiring pressure-control ventilation and when volume control ventilation was ordered. Non-invasive ventilation was rarely employed. 17 RRTs participated. Three (18%) were male. Most, 41% had between 6 and 9 years of longevity in the field and 5 years' experience on our transport team. Test scores ranged from 20% – 60%, mean (± SD) 40% (14.6%). Table 1 outlines the outcomes of each facilitated simulation. **Conclusions:** Quality data were useful in identifying areas requiring knowledge and competency assessment. Results from didactic and simulated assessment can be used to construct education and individualize performance improvement plans.

Sponsored Research - None

Table 1. Facilitated Simulation Outcomes

Scenario	Successfully completed pre-use procedures N (%)	Appropriately selected initial ventilator settings N (%)	Engaged alarms per policy N (%)	Completed all safety checks N (%)
2 month old male infant with respiratory distress requiring pressure control ventilation	10 (59)	8 (47)	1 (6)	11 (65)
10 year old male patient with status epileptic requiring volume control ventilation	13 (76)	14 (82)	4 (24)	13 (76)
16 year old female with severe cognitive deficiency and cerebral palsy requiring non-invasive ventilation	10 (59)	16 (94)	2 (12)	15 (88)

2531431

SURVEY OF ATTITUDES ABOUT WITHDRAWING LIFE SUPPORT AND COMPASSION FATIGUE AMONGST RESPIRATORY THERAPISTS.

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Background: Respiratory Therapists (RT) commonly assist in the process of withdrawing life sustaining treatment (WLST). This entails frequent communication with members of the patient's healthcare team and family. These conversations can be difficult for RTs; yet, there are no consensus guidelines nor policy standards that inform RT education on this topic. There are no published assessments of compassion fatigue, (i.e. burnout) among RTs. We sought to understand attitudes among RTs regarding their training pertaining to WLST, preferences on communication, and measure of compassion fatigue. **Methods:** We developed an internet-based 52-question survey to assess burnout that was modeled on the ProQOL 5 compassion fatigue sub scale. Five senior RT experts and leaders piloted and validated the tool. The revised survey was sent via email link to RT department staff at Harborview Medical Center, Rush University, Iowa Methodist Medical Center and the University of Virginia Medical Center. Questions assessed demographics, past training on WLST, departmental onboarding practices, preferences for communication, and compassion fatigue. Burnout was measured with the ProQOL 5 questionnaire. Data is reported as %(n) and mean(SD). Chi square and one-way ANOVA were used to measure differences. **Results:** The survey was available from 4/1/2016 to 4/28/2016. Response rate was 69% (253/369). Demographic data: Sex F 66%(n=166)/M 34%(n=87); Highest degree attained: AS 29%(n=106); BS 27% (n=100); MS 12%(n=43); and PhD 1%(n=4). Age: < 25, 7%(n=17); 25-30, 21%(n=54); 31-40, 28%(n=71); 41-50, 22%(n=56); 51-60, 15%(n=38); and >60, 6%(n=16). Mean years as a RT 13(12). The mean burnout score was 23(4). Respondents indicated their training was not adequate on communicating about WLST in their RT programs (P=0.01). RT department orientation education was not adequate for reviewing WLST process (P< 0.01) and communicating it with others (P< 0.01). There were no differences in burnout by place of employment (P=0.57), age (P= 0.49) and education level (P=0.75). **CONCLUSION**: A majority of respondents indicated that RT program training and department orientation education on WLST process and communication is inadequate. Burnout for RTs was categorized as "average" according to the ProQOL score and not impacted by age, education, or study site.

Sponsored Research - None

2495147

REDUCTION IN NICU UNPLANNED EXTUBATIONS THROUGH EDUCATION AND TEAM BASED INTERVENTION.

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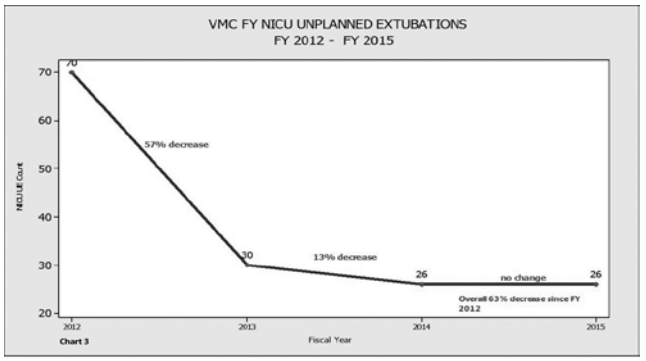
Purpose: A quality improvement project was undertaken to decrease unplanned extubations (UE) in our NICU with a goal to be below the national benchmark of 1/100 device days. **Methods:** A task force of RNs, RTs, and MDs was assembled in February 2012 to determine reasons for UEs in our NICU. Care protocols were reviewed and staff education was undertaken, specifically on NeoBar® application and proper positioning and movement of the intubated patient. A database tool was created and used to record structured information of any unplanned extubation. Each event was independently reviewed and NICU staff received feedback on these reviews. Further education was implemented for ET tube position in growing very low birthweight infants (VLBW) when UE rate increased slightly. **Results:** For fiscal year (FY) 2012, UEs totaled 70 events that decreased in FY 2013 by 57% to 30 events. A decrease of 13% for FYs 2014, 2015 with 26 events per FY with an overall significant decrease of 63%. We had a re-intubation rate of 60% in 2013, 70% in 2013, 68% in 2014 and 46% in 2015. Our unplanned extubation rate decreased from 2.83 in 2012 to 1.47 in 2013 and had decreased to 0.95 in 2014. A slight uptick in UE rate occurred in FY 2015 to 1.24, but for FY 2016 to date, we have a decrease in UE of 0.79. A run chart (chart 1) shows device days in the bar graphs compared to unplanned extubations in the line graphs. Even with consistent device days, a decreased number of UE's was seen. A control chart (chart 2) shows the process over time with annotations of event monitoring and continuing education. The overall significant decrease (63%) in the number of unplanned extubations is shown in chart 3. **Conclusion:** Creating a task force and education process led to a decreased number of unplanned extubations despite the same number of device days. We found that many of our infants required re-intubation and were not ready for extubation. Ongoing education is crucial to maintain staff education and prevention of unplanned extubations.

Sponsored Research - None



2507822

USING RESPIRATORY THERAPIST AND NURSE ASSESSMENTS TO IMPROVE ASTHMA TREATMENT AND OUTCOMES IN A PEDIATRIC EMERGENCY DEPARTMENT.

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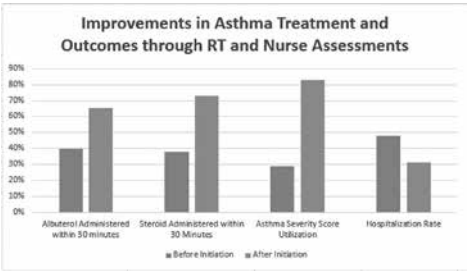
Background: Hospitalization of children with acute asthma can be avoided by Emergency Department (ED) treatment. Reliable identification and categorization of acute asthma severity is necessary for timely and effective treatment. We found delayed treatment and high hospitalization rates for children with asthma in our ED, unexplained by patient factors. To maximize timeliness of treatment delivery and the effect of treatment on hospitalization, we developed and implemented a new care process to better utilize Respiratory Therapist and Nurse assessments to initiate and drive care delivery. **Objective:** To determine if a care process for acute asthma utilizing Respiratory Therapist and Nurse assessments would improve exacerbation recognition, decrease time to initiation of treatment, and decrease hospitalization rate. **Design/ Methods:** Using quality improvement methods we developed a standardized care process for children with asthma including a clinical decision-support tool to drive treatment by standing order. This tool combined a new screening tool with two evidence-based assessments already in use, the Emergency Severity Index (ESI) and Clinical Asthma Score (CAS). First, the triage Nurse uses the screening tool to identify patients with acute asthma for treatment. Then Respiratory Therapists and Nurses initiate treatment by standing order, tailored to patient acuity using the ESI. Respiratory Therapists and Nurses then use the CAS to assess response, adjust treatment, and coordinate care delivery and disposition with the ED physician. Training on all assessments was provided to Respiratory Therapists and Nurses. The tool was implemented into clinical practice in June 2015. **Results:** Over 85% of all intended patients (338/396) were identified and treated using the new decision-support tool June-December 2015. The percent of patients who received treatment within 30 minutes of albuterol improved from 40% to 65% and steroid from 38% to 73% (both p<0.0001). Documented improvement in acute asthma severity using the CAS improved from 29% to 83% (p<0.0001). The percentage of children hospitalized after ED treatment decreased from 48% to 31% (p<0.0001). **Conclusions:** By incorporating Respiratory Therapist and Nurse assessments into the identification, treatment, and assessment of children with acute asthma, we decreased time to treatment, increased documented improvement during treatment and reduced the percentage of children hospitalized.

Disclosures: None

Sponsored Research - None



2518545

BEST PRACTICES FOR ENHANCING SAFETY DURING HIGH RISK BEDSIDE AIRWAY PROCEDURES IN NEONATES.

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Background: Invasive bedside airway procedures such as nasopharyngeal laryngoscopy, (NPL), in neonates and infants with underlying airway or respiratory disorders have become commonplace at large referral Children's Hospitals. Strict protocols involving sterility, defined staff roles, bedside presence, notification and communication have lagged behind practice. Airway safety is critical during these procedures. **Objective:** To improve nursing awareness, notification, patient safety, equipment integrity, team presence and direct communication between neonatology and ENT during all NPL bedside procedures. **Design/ Methods:** Pre-intervention survey was given to 20 nurses and 20 neonatologists to evaluate satisfaction of current bedside airway procedures. Before this project was initiated, no organized pathway existed for nursing, physicians, respiratory therapist to coordinate this procedure with each other; nor was the medical status of the patient considered. Targeted interventions such as focused education, reminder "in-person" meetings and frequent email reminders outlined the guidelines for a change in practice. The addition of a 10 question NPL data collection sheet was filled out and collected by the RT after each bedside procedure done by the ENT physician. Communication, safety issues, documentation and notification were the metrics evaluated. An 80% improvement in compliance with both adherence to metrics and data collection was used as a target. **Results:** There was 100% compliance with filling out the checklist. After the interventions, there was a significant improvement in all of the targeted interventions questioned. All aspects of communication, notification, bedside attendance, documentation and review of procedural complications were improved to over the 80 % target goal. **Conclusions:** A formal organized multidisplinary collaboration during bedside invasive airway procedures is essential for determining notification, timing, safety and team communication. Quality improvement metrics should be transparent and expected of all personnel involved. A checklist should be utilized for all high risk bedside airway procedures such as nasopharyngeal larygoscopy.

Sponsored Research - None

2521933

REDUCTION OF MINUTE VENTILATION DURING INHALED NITRIC OXIDE: IN AN IN VITRO ASSESSMENT OF NEONATAL VENTILATION.

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BACKGROUND: Inhaled nitric oxide (iNO) is often administered to mechanically ventilated neonates to treat pulmonary hypertension and ventilation-perfusion mismatch. The side-stream sample rate may cause a reduction in delivered minute ventilation. However, there are limited data demonstrating the specific effect of sample rate on minute ventilation. Therefore, we sought to demonstrate the effect of the sample rate during iNO administration in an in vitro simulation. **METHODS:** Following manufacturer recommended calibration, the SERVO-i ® ventilator (Maquet, Wayne, NJ), and INOmax DSIR® (Mallinckrodt, Dublin, Ireland) were connected to a high-fidelity lung simulator ASL 5000 (Ingmar Medical, Pittsburgh, PA). Three different subject sizes were simulated that corresponded roughly with 1.5, 2.5 and 5 kg subjects; compliance and resistance were set to 0.8, 1.3, 2.5 mL/cm H_2O and 80, 70, 60 cm H_2O/L/sec respectively. Pressure Regulated Volume Controlled (PRVC) mode was used, with a fixed rate of 33 breaths/min, set tidal volumes of 9, 15, 30 mL and PEEP of 5 cm H_20. For each iteration, volumes were recorded with the sample line off vs. on and inspiratory fractions of 0.3 and 0.4. In total, 12 different experiments were conducted. Peak inspiratory pressure, inspiratory and expiratory tidal volumes and expiratory minute volume were recorded. Paired t-tests were used to compare groups and an alpha of 0.05 was used for significance. The reduction was modeled using nonlinear regression power series. **RESULTS:** There was a statistically significant difference in expiratory tidal volume when the sample line is off vs. on (P<0.001); minute ventilation was reduced by 19-56%. We also observed differences in expiratory tidal volume when the inspiratory fraction was 0.3 vs. 0.4 in the 1.5 and 2.5 kg subject sizes (P<0.001), but not in the 5 kg simulation (P=1). This effect was most pronounced as minute ventilation was decreased and inspiratory fraction was increased. The greatest loss was observed when the inspiratory fraction was 0.4 in the 1.5 subject group (56%). The model yielded and R^2 of 0.9928, (0.3) and 0.9963, (0.4). Details shown in Figure 1. **CONCLUSION**: We found a difference in minute ventilation in all subject sizes; a smaller inspiratory time in smaller subject sizes yielded a reduction in lost minute ventilation. Prospectively, increasing ventilator settings may be warranted in unison with starting nitric oxide to prevent changes in ventilation.

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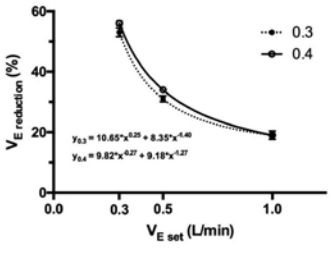

Figure 1.

2524600

IMPACT OF INTRAPULMONARY PERCUSSIVE VENTILATION ON PACO2 AND LACTATE IN A SURFACTANT DEPLETED NEONATAL PIG MODEL.

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Background: Intrapulmonary percussive ventilation (IPV) is frequently used to mobilize secretions. A lack of spontaneous breathing was noted in some patients following IPV. This study evaluated the impact of IPV on P_aCO_2 and Lactate (LAC) at baseline, during, and after IPV in surfactant depleted neonatal pigs. **Methods:** This study was approved by the local Animal Review Committee. Seven neonatal sized pigs were studied. Pigs were sedated and maintained in a light sleep, breathing spontaneously. Arterial access was placed for arterial blood gas (ABG)/blood pressure monitoring. Heart rate, blood pressure, oxygen saturation and temperature were monitored. Pigs were subjected to a saline washout to produce a partially injured/recovering lung model with lung compliance noted to be 50-70% of normal values. To establish a baseline, pigs were ventilated utilizing the Servo *i*® with Pressure Regulated Volume Control, rate of 15 bpm, V_T of 8-10 mL/kg, and F_iO_2 of 1.0. Median (range) set PEEP was 5 (4-8) cmH_2O. An ABG was obtained following an initial stabilization period of 5 minutes on baseline settings. Following department procedure for IPV, pigs were removed from the Servo *i*® and administered IPV. The nebulizer was filled with 15 mL of normal saline, the operational pressure was set to 20 cmH_2O, and F_iO_2 was 1.0 for all studies. The percussion control knob was turned to easy, medium, and hard settings. Pigs were ventilated for 7 minutes at each setting. An ABG was obtained after each of the 7 minute periods. Pigs were then returned to baseline ventilator settings and ABG samples were obtained to document P_aCO_2 and LAC at 15 and 30 minutes post IPV. **Results:** Seven neonatal sized (2 [1.8-2.4] kg) pigs completed the study. P_aCO_2 and LAC results are presented in Table 1. There were significant reductions in P_aCO_2 compared to baseline while receiving IPV. P_aCO_2 recovered to baseline values by 15 minutes post IPV. There were significant increases in LAC during the medium and hard settings while receiving IPV, which recovered to baseline values by 30 minutes post IPV. **Conclusion:** This study showed that a significant reduction in P_aCO_2 occurred during IPV with recovery to baseline levels by 15 minutes post IPV. Also, LAC levels significantly increased during IPV with recovery to baseline levels by 30 minutes post IPV. Risks vs benefits of IPV should be considered due to the rapid reductions in P_aCO_2 during IPV treatment.

Sponsored Research - None

Table 1: Comparisons of PaCO2 and LAC between IPV therapy set at easy, medium and hard settings. Median (range).

	PaCO2 [mmHg] Median (Range)	p value	LAC [mmol/L] Median (Range)	p value
Baseline	36 (31-55)	Reference	2.6 (1.6-5.1)	Reference
IPV Easy	31 (23-37)	0.018	3.0 (1.9-4.9)	0.176
IPV Medium	25 (17-36)	0.018	3.6 (1.6-5.4)	0.018
IPV Hard	18 (13-27)	0.018	3.7 (2.9-5.5)	0.018
15 Minutes Post IPV	37 (32-41)	0.917	3.2 (2.1-5.2)	0.018
30 Minutes Post IPV	36 (35-40)	0.612	2.6 (2.0-4.9)	0.237

2525090

IMPACT OF INTRAPULMONARY PERCUSSIVE VENTILATION ON HEMODYNAMICS, VOLUMES AND PRESSURES IN A SURFACTANT DEPLETED NEONATAL PIG MODEL.

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Background: Intrapulmonary percussive ventilation (IPV) is used to mobilize secretions. This study evaluated the effects of IPV on hemodynamics and lung measurements in surfactant depleted neonatal pigs. **Methods:** This study was approved by the local Animal Review Committee. Seven neonatal sized pigs were studied. Pigs were sedated and maintained in a light sleep, breathing spontaneously. Heart rate (HR), mean arterial pressure (MAP) and S_pO_2 were monitored. Pigs underwent a saline washout to produce a partially injured/recovering lung model with lung compliance noted to be 50-70% of normal values. To establish a baseline, pigs were ventilated with the Servo *i*® with PRVC, rate of 15 bpm, V_T of 8-10 mL/kg and F_iO_2 of 1.0. Median (range) set PEEP was 5 (4-8) cmH_2O. Pigs were removed from the Servo *i*® and administered IPV. Following department procedure, the nebulizer was filled with 15 mL of normal saline, operational pressure was set to 20 cmH_2O and F_iO_2 was 1.0 for all studies. The percussion control knob was turned to easy, medium and hard settings. Pigs were ventilated for 7 minutes at each setting. Flow and pressure waveforms during IPV were obtained via pneumotachograph and flow was integrated for volume. Waveforms were analyzed for inspiratory tidal volume (V_{TI}), expiratory tidal volume (V_{TE}), and peak inspiratory pressure (PIP). Five breaths were analyzed for each pig and IPV setting. **Results:** Seven neonatal sized pigs (2 [1.8-2.4] kg) completed the study. There were no differences in HR for baseline compared to IPV therapy settings (easy, medium and hard) or at 15 and 30 minutes post IPV therapy. There were also no differences in MAP for baseline compared to IPV therapy at easy and medium settings or 15 minutes post IPV. However, there was a decrease in median MAP (67 [51-93] mmHg) for the IPV hard setting and at 30 minutes post IPV (72 [60-99]) compared to baseline (82 [61-98] mmHg), p=.02 and .03; respectively. There were no significant differences in V_{TI}, V_{TE}, and PIP for comparisons of IPV easy to medium or medium to hard settings. There were significant differences in V_{TI}, V_{TE}, and PIP for comparisons of IPV easy to hard settings (p=.001). **Conclusion:** Measured V_{TI}, V_{TE} and PIP were appropriate in this injured lung pig model for easy and medium IPV settings. However, for the hard setting, measured V_{TI}, V_{TE} and PIP were significantly higher. It would be of benefit to be able to monitor actual pressures and volumes in real time during therapy.

Sponsored Research - None

Table 1: Comparisons between intrapulmonary percussive ventilation (IPV) therapy set at easy, medium and hard. Median (range)..

	VTI [mL]	VTE [mL]	PIP [cmH2O]
IPV Easy	6 (4-8)*	6 (5-9)*	21 (20-25)*
IPV Medium	9 (5-19)	9 (5-18)	28 (27-32)
IPV Hard	20 (16-28)*	23 (16-28)*	40 (39-44)*
*p=0.001			

2525893

IMPLEMENTATION OF A BETA-AGONIST/AIRWAY CLEARANCE PROTOCOL IN A PEDIATRIC CARDIOVASCULAR CARE UNIT.

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Background: A therapist driven beta agonist/airway clearance protocol (BA/ACP) was successfully implemented in our Pediatric ICU in August, 2013. The BA/ACP was then initiated in our Cardiovascular ICU (CVICU) in May, 2014. This study compared physician driven orders to therapist driven protocols to investigate the impact on outcomes. **Methods:** The project was exempt from review by the local IRB. Data for CVICU subjects were obtained for Jan-Mar 2014 (physician driven orders [PRE]) and Jan-Mar 2015 (BA/ACP [POST]). There were 52 subjects in 2014 and 64 subjects in 2015 that met inclusion criteria. Records were only reviewed if the entire CVICU stay was inclusive of the Jan-Mar time periods. Variables collected included age, gender, mean Daily Acuity, mean weighted Daily Acuity, number of BA and AC interventions, ventilator days, and length of stay (LOS). Parameter estimates, 95% confidence intervals (CI), and p-values are presented for each outcome following a Poisson regressions model. **Results:** There were no significant differences in mean age (90.5m vs 83m; p=.94); gender (p=.46); mean Daily Acuities (2.8 vs 2.8; p=.69), or mean weighted Daily Acuities (3.1 vs 3.0; p=.44) between the PRE and POST groups respectively. When comparing subjects of the same gender, age, and weighted average daily acuity, the LOS for the POST group was 0.72 days (95% CI: 0.65–0.79) compared to every 1 day of LOS for the PRE group, and represents a reduction in LOS by 28%. When adjusted for gender, age, and weighted average daily acuity, BA interventions were 0.29 times less frequent (95% CI: 0.25–0.35) and AC interventions were 0.9 times less frequent (95% CI: 0.84–0.95) for the POST group. The number of ventilator days were 0.72 days (95% CI: 0.58–0.9) for the POST group compared to every 1 ventilator day for the PRE group. These comparisons represent reductions of 71%, 10%, and 28% in the number of BA interventions, AC interventions, and ventilation days respectively. Overall, comparing POST group to PRE group, all outcome measures (LOS, BA and AC interventions, and ventilator days) showed significant reductions adjusting for subject characteristics (p<.05). **Conclusion:** This data suggest the BA/ACP reduced the number of interventions, ventilator days, and LOS while subject characteristics were comparable between the two time periods. This study adds further evidence that therapist driven protocols can promote appropriate interventions without negatively impacting outcomes.

Sponsored Research - None

2526543

VALIDATION OF A SIMULATED TRACHEOMALACIA/BRONCHOMALACIA AIRWAY MODEL.

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BACKGROUND: Airway obstruction can be simulated in test lungs, but the physical resolution of obstruction/collapse via stenting of airways by the application of increased mean airway pressure or PEEP cannot. To simulate the physical behavior or collapsibility of airways in infants with tracheomalacia/bronchomalacia during ventilator performance testing or as a teaching tool we created a model. Intraluminal closing pressures of infants with tracheomalacia/bronchomalacia has previously been reported to close at pressures ranging from -8 to -27 cmH_20. To validate whether the elastic tubing used in our starling resistor had similar elastic or closing pressures as infants with tracheomalacia/bronchomalacia we reproduced a previously reported method to measure closing pressures of infant bronchi. **METHODS**: To simulate a collapsible airway a starling resistor model was constructed consisting of a segment of ¼" latex Penrose drainage tubing mounted between two metal fittings protruding from inside an air-tight box constructed of acrylic/Plexiglas. To measure the negative intraluminal pressure required to close the elastic tubing an apparatus was constructed with a manometer connected to one end of the airway model lumen and a 60 ml syringe to the other. The lid of the starling resistor box was removed and filled with water. A valve at one end of the apparatus allowed for the flushing of water from a reservoir into the airway model lumen. With the valve closed, intraluminal pressure and volume were reduced by withdrawing water from the airway model lumen with the syringe. Volume was reduced until the elastic tubing in the airway model between the syringe and manometer closed, at that point the pressure no longer changed with additional reductions in volume. The pressure at which this occurred was recorded as the internal closing pressure. **RESULTS**: The intraluminal closing pressure of the elastic tubing used in our airway model was measured at -12 cmH20. **CONCLUSION**: The closing pressure of our simulated tracheomalacia/bronchomalacia airway model fell within the range of previously reported closing pressures of -8 to -27 cmH20 in infants with tracheomalacia/bronchomalacia.

Sponsored Research - None

2527170

OPTIMAL NIV-NAVA LEVEL FOR APNEA OF PREMATURITY: A COMPARISON OF DIFFERENT NAVA STARTING LEVELS.

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Introduction-The use of Non-Invasive Ventilation Neurally Adjusted Ventilator Assist (NIV-NAVA) has been a treatment strategy for apnea of prematurity (AOP) for 18 months at our facility. It was hypothesized and observed that the use of NIV-NAVA for synchrony and the capability of back-up settings for apnea reduced intubation rates by 35% compared to historical treatment of synchronized inspiratory positive airway pressure (SiPAP). This study had 22 patients in the historical treatment and 18 in the NIV-NAVA treatment with a p-value=.0313. This study will identify an optimal NAVA level for infants suffering from AOP while utilizing best practice guidelines. **Methods**-Implementation of NIV-NAVA for those neonates demonstrating AOP, with failure on Bubble Continuous Positive Airway Pressure (BCPAP). The starting Nava Level was 0.1cmH2O/uV. It was hypothesized that increasing the starting NAVA level to 1.5 cmH2O/uV the intubation rates would decrease to 30%. Inquiries were made to other facilities whom had more time vested in this new mode, for best practice methods and settings used for the best success rates. A decision was made in collaboration with our multi-disciplinary medical team to increase the initial NAVA level to 1.5cmH2O/uV. To insure compliance to our protocol and outcomes, chart audits were completed of the patients enrolled until discontinuation. **Results**-The key metric used was intubation rates. The first NIV-NAVA setting of 0.1 cmH2O/uV included 21 patients with 8 requiring intubation, an intubation rate of 38%. The second NIV-NAVA setting of 1.5 cmH2O/uV included 57 patients with 11 requiring intubation, an intubation rate of 19%. By increasing our initial NAVA levels to 1.5 cmH2O/uV, we reduced intubation rates by 19% compared to the initial NAVA level of 0.1 cmH2O/uV. **Conclusion**- Using the increased NAVA level of 1.5 cmH2O/uV a decrease in our intubation rates were noted. There were 57 total patients in this study with 11 intubated, this gives us a p-value =.0001 using the Chi-squared test. Comparing the rates of NAVA level 0.1 and no NAVA with a p-value=.0313 using the chi-squared test. We have made a huge impact at our facility implementing NIV-NAVA to our patients suffering from AOP requiring intubation. These results clearly prove that using a starting NAVA level of 1.5 cmH2O/uV demonstrates a higher success rate. We will follow our impact on BPD and CLD rates for a long term outcome measure.

Sponsored Research - None

2527540

RESPIRATORY THERAPIST STAFFING IMPACT ON EARLY EXTUBATION STUDY IN A PEDIATRIC CARDIAC INTENSIVE CARE UNIT POST SURGICAL REPAIR.

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Background: In 2014 the Cardiac Intensive Care Unit (CICU) at Children's Healthcare of Atlanta (CHOA) began a multi hospital research project for the early extubation post –operatively of two cardiac defects during a 12 month period. The goal was to determine if patients undergoing surgical repair of Tetralogy of Fallot (TOF) and Coarctation of the Aorta (COA) could be extubated within six hours of arrival to the CICU from the operating room (OR). With this change in practice, the RT's were concerned with the impact on the workflow and staffing of the CICU. In order to determine this, a quality review of these patients was initiated. **Method**: CICU Respiratory Therapists (RT) created a collection tool that included questions pertaining to time the RT spent at the bedside on admission and if assistance was needed from another RT. Other data included the requirement of racemic epinephrine, escalation of care or reintubation. IRB was submitted and deemed a quality project not in need of IRB approval. **Eligibility Criteria:** Age < 12 months Diagnosis: TOF or COA (isolated) Planned complete repair **Ineligibility Criteria:** < 36 weeks Primary lung disease or airway anomalies Mechanically ventilated pre-operatively Known neurologic injury Chromosome abnormality likely to impact airway The RT was notified prior to admission from the OR. The RT data collection sheet was placed at the bedside to complete. **Results:** During the study period, 60 patients were screened and of those, 44 were deemed eligible and enrolled in the early extubation protocol with collection of RT data on 36 of these. Of the 36, 64% did meet the qualifications of early extubation within 6 hours and were successfully extubated with only 1 requiring reintubation for arrhythmias. One did self extubate and four (11%) required some sort of escalation of care (i.e. HFNC, NPPV, or Heliox). Two required the use of racemic epinephrine for stridor post extubation. **Conclusion:** Our findings at CHOA were that patients could be successfully extubated during this time frame and not change our staffing model for therapists. Although it required more time to work with these patients due to fast weaning, extubation, clean up and set up of equipment, it was not enough to need more staff. This was a team approach from all disciplines to make this time frame happen. We are continuing to push toward early extubation in many of our other surgical repairs which reduces the ventilator and ICU time. **Disclosures**: None

Sponsored Research - None

2527913

SUCCESSFUL EX-UTERO INTRAPARDEM TREATMENT, (EXIT), PROCEDURE IN A PATIENT WITH CONGENITAL HIGH AIRWAY OBSTRUCTION SYNDROME.

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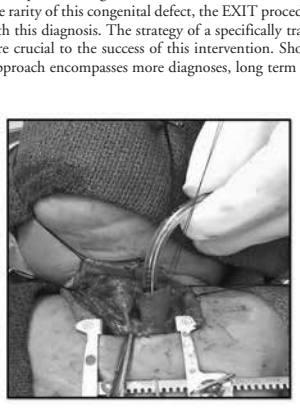
Background: The ex-utero intrapartum treatment,(EXIT), procedure is a controlled, systematic approach to delivery in which placental circulation is maintained during a variety of surgical interventions to ensure hemodynamic stability of the newborn. It was initially developed for tracheal plug removal in patients with congenital diaphragmatic hernia, (CDH), but its use has been expanded to include a variety of high risk diagnoses. This procedure often converts a potentially emergent situation into a controlled one, thereby increasing the chances of survival. **Case Presentation:** A 30yr old African American female was found to have oligohydramnios on a routine fetal ultrasound. A fetal MRI was done which demonstrated findings consistent with congenital high airway obstruction syndrome, (CHAOS), with tracheal stenosis approximately 2cm above the carina. The fetus developed signs of distress at 34 weeks gestation and an EXIT procedure was performed. Both mother and baby were anesthtized to maintain uterine relaxation and preserve adequate placental blood flow. The infants head was delivered through a hysterotomy. Bronchoscopy confirmed the diagnosis of CHAOS and a 3.0 cuffed endotracheal tube was placed directly into the trachea just below the tracheal obstruction. The infant was then delivered, stabilized and transfered to CHOA for further management. Upon arrival the patient was placed on HFOV for severe respiratory acidosis. He subsequently transitioned to CMV but required heavy sedation and paralyzation to maintain proper placement of the endotracheal tube and avoid lung collapse. At DOL 5 the baby was taken to the operating room and a slide tracheoplasty was performed. He was successfully extubated to CPAP 11 days later and required racemic epinephrine intermittently for mild stridor. The baby required multiple balloon dilations as well as a supraglottoplasty and a fundoplication for gastroesophageal reflux but was ultimately discharged home on room air. **Discussion:** Even with prenatal diagnosis CHAOS can be life threatening and often fatal. While there is limited data due to the rarity of this congenital defect, the EXIT procedure offers reduced morbidity and mortality for patients with this diagnosis. The strategy of a specifically trained multidisciplinary team, planning and coordination are crucial to the success of this intervention. Short term outcomes have been good and as the use of this approach encompasses more diagnoses, long term outcomes may be evaluated.

Sponsored Research - None



2528166

ARTERIAL AND TRANSCUTANEOUS CARBON DIOXIDE MEASUREMENTS IN PREMATURE NEONATES < 32 WEEKS GESTATIONAL AGE: A VALIDATION STUDY.

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Background: It has been recommended that all critically ill ventilated neonates receive transcutaneous PCO_2 ($TcPCO_2$) monitoring to prevent serious adverse outcomes from significant variations in $PaCO_2$. We sought to determine if there is significant correlation between $PaCO_2$ and $TcPCO_2$ measurements in premature neonates < 32 weeks GA and to evaluate the effect of hypotension, birth weight, and probe site. The limits of agreement were analyzed to determine if they fell within a clinically useful range. **Methods:** A retrospective analysis was performed on 150 infants < 32 weeks GA, without congenital anomalies, who were part of a delayed cord clamping clinical trial between August 2014 and October 2015. Three infants without ABGs were excluded. All $PaCO_2$ values obtained from ABGs in the first 72 hours of life with simultaneous $TcPCO_2$ data were analyzed. Paired values were correlated with Pearson's coefficient (r), and linear regression (r^2), $p< 0.05$ was considered statistically significant. An acceptable $PaCO_2$ – $TcPCO_2$ difference was set at 5 mmHg or 7.5 mmHg. Hypotension was defined as MABP< GA. Probe site was analyzed by region (Trunk, Buttocks/Thighs, Feet). The study was reviewed by the Sharp IRB. **Results:** 1086-paired samples were analyzed from 147 subjects. GA was mean (SD) 28 (2) weeks, BW was 1206 (394) grams. Correlation between $TcPCO_2$ and $PaCO_2$ was significant (r=0.693, r^2 0.480, p< 0.001). Hypotension had a significant effect on correlation (r=.565, r^2 0.309, p= 0.012) and increased the $TcPCO_2$ value β= 6.65 (95 %CI 1.460, 11.840,). BW had a significant effect on correlation. (r= .556, r^2 0.309, p= 0.036) and decreased the $TcPCO_2$ value β= -.007 (BW grams) (95 % CI -.013, .000). Probe location (p= 0.125) did not have a significant effect. 52% of the samples had an absolute difference of ≤ 5mmHg, 67.9% of the samples ≤ 7.5 mmHg. Bias and limits of agreement are illustrated in the figure as described by Bland Altman. **Conclusions:** $TcPCO_2$ and $PaCO_2$ paired values correlated significantly; hypotension and BW significantly affected correlation. Hypotension increased $TcPCO_2$ values and increasing BW decreased $TcPCO_2$ values. Almost half of the paired samples did not meet both established definitions of clinical utility and close to a third did not meet either. Disclosures: Wade Rich is a paid consultant with Windtree Therapeutics. Sponsored Research-None

Sponsored Research - None

2529386

A COMPARISON OF INTRAPULMONARY PERCUSSIVE VENTILATION DEVICES INLINE WITH PEDIATRIC VENTILATORS.

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Background: Intrapulmonary Percussive Ventilation (IPV) is pneumatically powered; high frequency short bursts of gas applied at the airway opening[1]. Hill-Rom© Metaneb® and Percussionaire© IPV-1C® are IPV devices used in the pediatric population. Pediatric patients are frequently transitioned from one ventilator to another. A bench evaluation was conducted to assess the performance of each device in a pediatric model using three ventilators commonly used for pediatric patients. **Method:** Three ventilators were compared: Maquet© Servo-i®, CareFusion© (BD©) LTV™ 1200 Ventilator Series, and Philips© Respironics Trilogy 202 (passive circuit w/ whisper swivel). Standardized ventilator settings were used: VC, RR 30, VT 85, Ti 0.5, Fi02 21%, PEEP 5. The high pressure alarm was set at 60 cmH_20 and all other alarms at min/max. A Michigan Test Lung was utilized with a compliance of 0.04 and a resistor of RP20. The Metaneb was set in CHFO mode and high frequency. The Percussionaire was set with a driving pressure of 30 cmH_20, percussion rate of 12 (full easy), and pop off set at 60 cmH_20. A Philips© Respironics NM3 monitor with pediatric flow sensor was used to capture data. Control values were obtained prior to the connection of the IPV device. **Results:** The total PEEP for all three ventilators increased by 41% for the Metaneb and 213% for the Percussionaire. PIP increased 123% for the Metaneb and 396% for the Percussionaire. Minute Volume increased 389% for the Metaneb and 556% for the Percussionaire. Results for each ventilator type are detailed in the data comparison table. **Conclusion:** All measured parameters for both the Metaneb and the Percussionaire were increased from control values. These increases were not as great with the Metaneb as compared to the Percussionaire. These differences could significantly impact clinical outcomes. Further studies related to the efficacy and side effects of treatment with these devices should be performed in the pediatric population. **References:** Strickland, S., Rubin, B., Drescher, G., *et al.* **AARC Clinical Practice Guideline: Effectiveness of Nonpharmacologic Airway Clearance Therapies in Hospitalized Patients**. *Respiratory Care,* 2013.58**(12): 2187-2193.**

Sponsored Research - None

	Total PEEP (cmH20)	PIP (cmH20)	MV (L/min)	Vti (mL)	Vte (mL)
Servo-i Control	5	7	2	74.33	66
Servo-i & Metaneb	10	20	11.66	48.66	47
Servo-i & Percussionaire	17.33	41.66	15.66	245.66	530
Trilogy Control	4	7	2.5	83	89
Trilogy & Metaneb	4.66	9.33	8.4	38.66	40.66
Trilogy & Percussionaire	14.33	29.33	15.3	120	504.66
LTV Control	5	8	2.6	96.3	89.6
LTV & Metaneb	5.33	20	14.26	55.33	185
LTV & Percussionaire	11.66	38	14.96	250.66	334.33

2496932

READINESS TO WORK AND THE KNOWLEDGE, SKILLS AND ATTITUDES OF RESPIRATORY THERAPISTS WORKING IN SAUDI ARABIA DURING THE MIDDLE EASTERN RESPIRATORY SYNDROME-CORONAVIRUS EPIDEMIC.

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Background: In spite of previous lessons learned from other influenza outbreaks (SARS and H1N1), the Middle Eastern Respiratory Syndrome-Coronavirus (MERS-CoV) resulted in a high level of psychological stress among Respiratory Therapists (RTs) in the Middle East. This may have resulted from direct contact and/or exposure of many healthcare workers to the virus when treating the ill. The **purpose** of this study was to assess RTs knowledge, skills and attitudes, in conjunction to their readiness level to work and training status during the MERS-CoV occurrence. **Methods**: A survey was created from questions used in two previous published studies. This modified instrument consisted of two parts: the knowledge, skills and attitudes; and the readiness to come to work assessment. After IRB approval, a web-link survey was emailed to all Saudi Society for Respiratory Care (SSRC) members, (N=750). Data were analyzed using SPSS 23.0. **Results:** Response rate was 25% (n = 187). Respondents who previously attended MERS-CoV training programs had higher mean *Skills* and *Knowledge* scores than those who had not attended training programs. There was no significant effect between training level and *Attitude* scores. With the set p value @ 0.05, there were significant differences found between the various work positions (p = 0.03); and gender and work position (p = 0.01) in terms of readiness level to come to work. Moderate correlations were seen between readiness to work and MERS-CoV knowledge (r = .41, p < 0.001), and between S*kills* and K*nowledge* (r = .52, p < 0.001) with a weak correlation between readiness to work and Skills (r = 0.26, p = .001). **Conclusions:** This was the first known study investigating Saudi RT's reaction towards global epidemic influenza challenges, and the association between the RTs' readiness to work and their K*nowledge*, S*kills* and A*ttitudes* during a MERS-CoV epidemic. These findings can provide the opportunity for health policy makers to rethink emergency policies, coordination efforts, and to form a more flexible bureaucracy. For Saudi RT's as emergency responders, there is an urgent need for emergency mitigation, preparedness, and planning to respond effectively for future pandemic disasters.

Sponsored Research - None

2525877

A SURVEY OF COMPASSION FATIGUE AND BURNOUT IN RESPIRATORY THERAPISTS IN A TERTIARY PEDIATRIC HOSPITAL.

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Background: Compassion fatigue and burnout (BO) can exact a heavy toll on healthcare personnel, and can result in poor morale and turnover. As part of a hospital wide initiative to quantify perceptions of compassion fatigue, an anonymous survey was conducted among allied health professionals' (AHP), including Respiratory Therapists (RT), at a tertiary pediatric hospital. **Methods:** The project was exempt from review by the local IRB. Using a cross-sectional web-based survey, Compassion Satisfaction (CS), BO, and Secondary Traumatic Stress (STS) were assessed using the Professional Quality of Life Scale©[1] (ProQOL). Life stress was assessed using the Holmes-Rahe Life Stress Inventory©[2] (Social Readjustment Rating Scale [SRRS]). A link to SurveyMonkey® was emailed to all eligible AHPs. Responses from ineligible participants (non-licensed RT personnel and licensed RT working off the main hospital campus) were removed in the data analysis stage. All responses were blinded to the investigators to maintain anonymity. Results are summarized and presented as mean ± SD. Compassion fatigue data were compared among categories using ANOVA or linear regression methods. **Results:** Of all RT survey recipients (N=162), a majority had > 10 years of service (52% [84/162]), and 63% (102/162]) had bachelor's degrees. Based on professional license, RT response rate was 17% (28/162). RT scores for BO were 21.6 ± 4.0, CS was 40.2 ± 5.2, STS was 22.0 ± 4.6, and SRRS was 132.5 ± 78.2. This compares to normative rankings of low for BO, average for CS, low for STS, and a low amount of life change and low susceptibility to stress induced illness. There was a significant association between STS and highest education degree (p=.039). Subjects with bachelor's degrees had STS scores that were on average 4.4 points higher (p=.036) than those with other educational degrees. Other pairwise comparisons for higher degrees did not achieve statistical significance. Also, there was a significant linear association between life stress scores and years practicing as an AHP (p=.026). On average, SRRS scores decreased by 1.59 (SE=0.71) points for each additional year of practice. **Conclusion:** Based on the survey results from this institution, RT appear to have low BO, STS, and life stress; and average CS. This indicates that this group is resilient and has a positive work/life balance.

Sponsored Research - None

2525887

INCREASING ARTERIAL PUNCTURE SUCCESS RATE THROUGH STANDARDIZATION.

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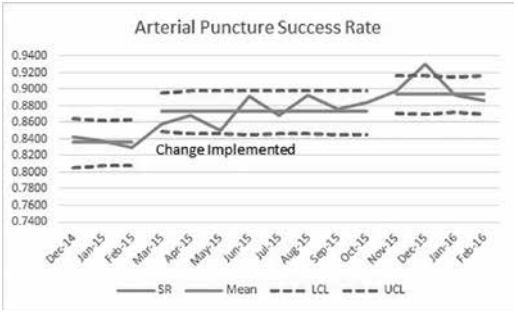
Background: Arterial puncture for blood gas analysis is a common procedure and often ordered at times of critical need. Few, if any, studies have been done to evaluate the standardization of technique on the puncture success rate of arterial specimen collection. Studies that compare use of analgesics or compare arterial cannulation with and without ultrasound guidance offer a glimpse at baseline success rates (ranging from 63% to 90%) but are often localized to a single department (i.e. study done in the ED or pulmonary function laboratory). This study shows the impact of standardization among a specialized group of lab technicians through the full scope of a 500+ bed academic medical center. The aim of the study was to determine if standardizing technique elements of the arterial puncture process for the purposes of blood gas analysis could improve the success rate. **Methods:** The study was conducted by the blood gas laboratory at the University of Utah Hospital and Huntsman Cancer Hospital. Blood gas technicians were asked to tally whether arterial puncture attempts were successful or unsuccessful from December 2014-February 2015. A core group of experienced technicians were assembled and consensus surrounding standardization of site selection and proper positioning techniques was made. The group was then assigned individuals within the lab to whom they would serve as a trainer of these techniques and as a mentor for the project. Beginning in March 2015 technicians were trained individually and continued to tally successful and failed attempts. **Results:** During the baseline period of December 2014 through February 2015 a total of 2007 arterial puncture attempts were performed. 1678 of these were considered successful, meaning the success rate was 83.6% or 1.196 punctures per viable specimen. From March 2015 through February 2016 a total of 7996 arterial puncture attempts were performed. 7063 of these were considered successful meaning the success rate is 88.3% or 1.13 punctures per viable specimen. **Conclusion:** Standardization of the site selection and positioning techniques resulted in an increase in the success rate of arterial puncture. The difference between the baseline and current success rates represents 453 arterial puncture attempts from March 2015 through February 2016 that were not made. Disclosures: None

Sponsored Research - None



2527132

THE ACCEPTANCE FACTORS THAT AFFECT THE CONCEPT OF HPC IN THE PMV PATIENTS' MAJOR CAREGIVERS.

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Background: In 1990, The National Institute of Health of Taiwan set up the Step-down care model for the prolonged mechanical ventilation (PMV) patients by four stages of care, Intensive Care unit for 21 days, Respiratory Care Center for 42 days and then the Respiratory Care Ward (institute care) or Home Care. Due to care quality improved, the number of patients were accumulated and the cost expenditure increased. The Government want to reduce the cost, so began to promote the concept of hospice palliative care (HPC) for these unconsciousness PMV patients since 2013. The purpose of this study was to determine the acceptance factors that affect the concept of HPC in the PMV patients' major caregivers in Taiwan. Method: The survey method and quota sampling by using a structured questionnaire to collect the information. After developing the questionnaire, the content was rated by seven experts, resulting in a mean content validity index (CVI) of 0.96. The data for this study were collected from four care stages by using a predesigned questionnaire, and 601 of the 687 valid questionnaires were returned. (The valid response rate was 87.5%). The collected data were analyzed using a descriptive statistics test, Fisher's exact test and multiple regression models with generalized estimating equations. This study was approved by the Institutional Review Board of the study organizations. **Results:** In terms of the basic characteristics of major caregivers, there are 49.25% male and 50.75% female, mostly families identity mainly adult children (54.74%) and spouse (18.47%). The key element of acceptance factors in the PMV patients' major caregivers that affect the concept of HPC, after controlling for patient characteristics, include the care stage of PMV patient used, daily ventilator used time, sex and identity of caregiver, ever heard the HPC from medical staff introduction during hospitalization, and the cognition toward the HPC. **Conclusions:** This study not to show positive relationship to the cognitive and acceptance of HPC. Facing the correlated problems of HPC, the frank attitude and communication among the patients and their family members might help the appropriate decision-making and afford the good HPC. This study can provide the government a reference when promoting the HPC.

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2527472

A QUALITY REVIEW OF A HUMAN RESOURCE EMPLOYEE SELECTION SURVEY USED IN THE EMPLOYMENT OF RESPIRATORY THERAPISTS.

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BACKGROUND: The University of Virginia (UVA) Health System Human Resource Department uses a behavioral based, pre-employment assessment survey as part of the employment process. We conducted a review of survey data to determine if the three indices (Job Performance, Retention, and Service Excellence), or nine variables (Work Ethic/Attendance, Energy, Team Work, Customer Focus, Compassion, Flexibility/Adaptability, Multi-Tasking, Valuing Diversity, and Openness to Learning), can be used to differentiate Respiratory Therapist candidates employed versus not employed, and the two year retention of those employed. Null hypotheses were: (1) Pre-employment survey scores do not differentiate candidates who are employed from those not employed, and (2) Pre-employment survey scores do not differentiate candidates employed who have been retained for ≥ 2 years. UVA's IRB approved the research protocol. **METHODS:** UVA Respiratory Therapist candidates are required to complete a survey for Technical/Professional positions as part of the application process. When a candidate is selected for interview, the company responsible for the survey scores the survey. Scores for each of the three indices and nine variables (scale=0-10) on the assessment for each candidate are provided. Scores for candidates interviewed by UVA Medical Center [n=136; Female = 62% (n=84)] from March 2012 to March 2016 were entered into a data base. Data was reviewed to identify candidates employed (n=73) versus not employed (n=63), and those with the opportunity to be employed ≥ 2 years (n=36). The data was de-identified. Data was analyzed using the Mann-Whitney U test and reported as median (IQR). Alpha (2-tailed) set at $P \leq 0.05$. **RESULTS:** Median Service Excellence score was significantly higher for employed versus not employed candidates (P=0.039). Median Customer Focus score for candidates employed was significantly higher for employed versus not employed (P=0.041). Median Compassion score for employed versus not employed was also significantly higher (P=0.040). Median Work Ethic/Attendance score was significantly higher for respiratory therapists who remained employed for a minimum of two years when compared to those who were not (P = 0.039). **CONCLUSIONS:** We reject the null hypotheses that pre-employment assessment survey response scores (1) do not differentiate candidates who are employed from those not employed, and (2) do not differentiate candidates employed who have been retained for ≥ 2 years.

Sponsored Research - None

2528707

CREATION AND USE OF AN INTERACTIVE ANNOTATED BIBLIOGRAPHY AS A DETERRENT TO UNSAFE RESPIRATORY CARE PRACTITIONER STAFFING.

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Introduction: Extended-care facilities commonly assign patients with pulmonary disorders, inclusive of those requiring mechanical ventilation, to caregivers other than Respiratory Care Practitioners (RCPs). We suggest that a staffing model non inclusive of RCPs is not merely sub-optimal but can place patients at considerable risk. In order to acquaint administrators with the hazards of unsafe staffing we sought to identify sources of peer review data documenting adverse outcomes resulting from unsafe staffing practices and create a tool in which such information could be easily accessed. **Methods:** A team of experts was assembled and vetting criteria applied to generate a comprehensive safe staffing bibliography. Subsequently, we chose to annotate the bibliography with significant findings to better facililtate the communication of the most pertinent information. In addition, we provided the ability for readers to access the full text. This functionality was achieved by converting the document into a web-accessible interactive file, with hyperlinks distributed liberally throughout. **Results:** The product of these efforts is an on-line eight-page Interactive Annotated Bibliography (IAB), written as an Adobe® Portable Document Format (PDF) file. It can be downloaded at http://www.csrc.org/resources/Documents/Annotated%20Bib.pdf. The product enables those who access the IAB to: 1) inspect the full-text version of an open-access paper in real-time; 2) download it; and/or 3) print it out at the stroke of a key. **Conclusions:** If we wish to maximize our credibility in the eyes of nontherapists, we are well advised to create persuasive, comprehensive, and authoritative tools targeted to administrators/managers, across the care continuum, who might be predisposed to dispute the adverse results of unsafe staffing. We designed our IAB to serve as a potent deterrent to the practice of assigning a non-RCP to a patient who may have been diagnosed with a respiratory disorder that requires the unique skillset that RCPs possess. Because we have not yet launched the coordinated Safe Staffing initiative (of which the IAB is an integral component) in California, the effectiveness of the IAB is yet to be quantified. But we were prompted to describe this strategy at this time, in order to assist Respiratory Care Societies in other states where safe staffing is emerging as an issue. This could facilitate their efforts to be proactive in their advocacy of safe staffing.

Sponsored Research - None

2529475

PROFESSIONAL LADDER PROGRAM CREATES CAREER DEVELOPMENT OPPORTUNITIES IN RESPIRATORY CARE DEPARTMENT.

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Background: The respiratory therapy management team at the University of Utah Hospital desired to create a program to reward, retain and develop staff. Professional ladder is an incentive program where staff can voluntarily participate for an annual bonus by completing additional education, advanced credentials and professional activities. **Method:** Beginning in February 2014 a shared governance committee, consisting of staff and management, was formed to create this program. The policy and procedure was finalized in December 2015 following an external analysis of similar programs. The purpose of the professional ladder is to 1) Provide the respiratory therapist with the opportunity to develop professionally through further education, credentialing, and participating in various hospital, departmental, and professional organization activities; 2) Enhance recruitment and retention of highly skilled respiratory therapists; 3) Demonstrate improved quality outcomes due to greater knowledge, skills and engagement. Eligibility requirements include full time staff with no disciplinary action. Plan year is defined as May 1 through April 30. Program requirements include RRT, NBRC specialty credential, BS degree, plus the participation in hospital/departmental and educational activities. **Results:** The University of Utah Hospital respiratory therapy department has 94 full time therapists. For the plan year 2015 there were 36 applicants, which is 38% of eligible employees. 63% of applicants completed their portfolio, 5 applicants achieved Tier II and 18 achieved Tier III. The number of staff with specialty credentials doubled due to this process with 12 new credentials obtained, totaling 21% of all staff with specialty credentials. In addition, through this program 397 CEUs and 136 educational activities were completed by the 23 recipients. Utah does not have a CEU requirement to maintain current licensure. Quality outcomes and retention are ongoing measurements as this is our first year, but preliminary data is promising. Plan year 2016 will soon be completed and should demonstrate increased participation and completion of additional credentials. **Conclusion:** The professional ladder program has been successful in increasing the level of education and credentialing of our staff. The plan is to continue to raise the bar and promote further professional educational activities thus improving the career path of staff and improving the respiratory care of our patients.

Sponsored Research - None

Professional Ladder Results and Impact Summary

	Initial Results				Ongoing Impact	
	Full Time Staff	Obtained Advanced Credential	CEU's per RT	Additional Educational Activities per RT	RT Error Rate with Protocol Assessments	Full Time Staff Retention
PL (Professional Ladder Participants)	23	12	17.3	5.9	4.0%	96%
NonPL (Full time staff who did not participate)	71	0	6	0	6.4%	90%

2529981

TRANSFORMATION OF A DOCUMENTATION CULTURE INCREASES GROSS REVENUE WHILE REDUCING ERRORS.

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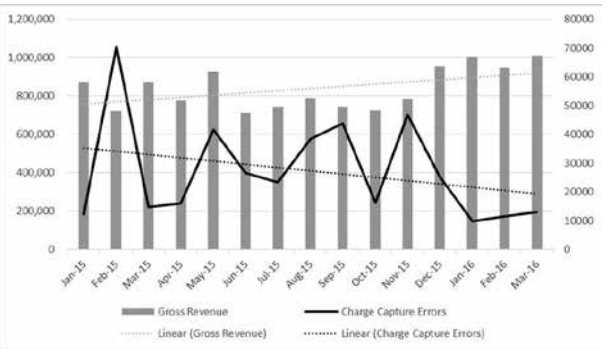
Background: With the introduction of a new leader in an acute care hospital respiratory department, substantial documentation errors and omissions facilitated the need for immediate action. The urgent introduction of a change management imperative yielded a 20% increase in gross revenue and a 61% decrease in charge capture errors in the first quarter following implementation. The new director reasoned the primary causes of these errors centered on process variance, inconsistency in communication, unnecessary rules, and a lack of accountability. Given the demand for demonstrating value-added productivity; this department had to adapt through a rapid change management practice design. **Methods:** In tandem with the revenue cycle department we applied backend edit rules for charge corrections. A standardized process for the staff documentation workflow was put into place. Staff was educated on documentation processes. Charge capture for this department is a built in component of electronic chart documentation. Ongoing manual charge audits had been conducted to determine errors in documentation including the charge capture component and notices distributed to the staff member with the error(s) for correction. Each missed charge is compiled and reported each month as the total charge capture error. The audit process remained unchanged however, an accountability process was put into place to track individual trends. Charge entry errors reflect the charge omissions found in chart audits and gross revenue data was pulled directly from the cost center financial report. **Results**: With the changes that were made to our documentation process, we observed a volume increase of 20% in gross revenue and 61% reduction in charge capture errors in the first quarter of implementation compared to the previous quarter. Likewise when we looked at the same time period one year prior we observed a volume increase of 20% in gross revenue and a 65% reduction in charge capture errors (Q1-16 vs Q1-15). **Conclusions**: The urgent introduction of a change management imperative can enhance the documentation culture of a department and produce improved accuracy, charge capture. productivity and value-added metrics. **Disclosures**: None

Sponsored Research - None



2530345

LUNG PARTNERS IMPACT ON REDUCTION IN 30-DAY COPD READMISSION RATES.

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Background: Lung Partners Primary Respiratory Care is a unique primary respiratory care model for in-patient COPD disease management. There is a great need to improve management of COPD in the hospital setting. In the hospital, care is mostly delivered by hospital-based physicians aided by extenders. There are delays in care due to communication issues. The plan at discharge may not be carried out at home. In a hospitalist model, a patient's care team is frequently different on each readmission. With the growing number of patients and the flat or decreasing number of physicians, the Respiratory Therapist (RT) is the logical choice for COPD disease management. If the RT has a primary relationship with a COPD patient for all hospital admissions and is actively involved in transition to home, the fragmentation of care can be reduced. Patients enrolled in Lung Partners will have a Primary RT for the initial and all subsequent hospitalizations and will have Lung Partner RTs as a resource when they are not in the hospital. The Primary RT is positioned as the major physician partner in the management of COPD patients. The Primary RT educates the patient on their disease and coaches disease management skills. The Primary RT screens their patient for co-morbidities. These co-morbidities are poorly addressed in the hospital setting. Anxiety and Depression are major co-morbidities. Protocols are in place for patients to receive services based on the Primary RT's assessments. The impact of this program on 30-day readmissions was evaluated. **Methods:** Since November, 2014 we have enrolled 251 patients, which is about 10% of our COPD population. Through our Quality Improvement Department we measure the 30-day readmission rates for respiratory diseases on Lung Partner patients, which we can directly influence. Hospital-wide CMS 30-day all cause COPD readmissions was also evaluated. **Results:** For Lung Partners patients we saw a significant reduction in 30 day readmissions due to respiratory diseases by 28% (p= 0.0176). We also saw a significant reduction in total COPD CMS readmissions by 24% (p= 0.045). **Conclusion:** By placing our RTs in a Primary Respiratory Care model we were able to reduce 30-day readmission rates. The RT department has moved from a task oriented to disease management focus and utilizes RTs to the full extent of their licensure. RTs can be very successful in this role.

Sponsored Research - None

2531356

BUILDING A STRONG FOUNDATION TO LEAD YOUR TEAM THROUGH TRANSFORMATIONAL CHANGE.

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Background: Healthcare reform has created an immediate demand for leaders to transition away from utilizing outdated performance improvement strategies to solve complex, multi-factorial issues. Leaders are now expected to be tranformative by engaging in sophisticated problem solving techniques to achieve sustainable and meaningful change. In order for Respiratory Therapy leaders to build successful programs that are rooted in transforming care a solid infrastructure must be in place to support rapid change in clinical practice and thought. Can the foundation for transformational change be built by redesigning a department's hierarchy to allow for greater operational efficiencies and the creation of viable strategies to improve clinical outcomes? **Method:** A strengths, weaknesses, opportunities, and threats (SWOT) analysis was conducted of three, diverse Respiratory Care departments within a large healthcare system to determine if creating a divisional leadership organizational structure would eliminate silos and create sustainable operational efficiencies. A cost analysis followed to determine the impact to the budget. A three phase, two year implementation strategy was developed to help the teammates understand and adjust to the transition as well as the newly created roles within the new leadership hierarchy. It was implemented after receiving approval from the Executive team. **Results:** A cross-functional leadership team was created by aligning three separate leadership models into a single Central Division organization structure. A robust cross-training program and a Central Division PRN Pool were created to assist the division in achieving its 3% YTD overtime goal. Overtime goals were achieved and sustained for 2014 and 2015. Premier poductivity index percentages stablized from 118% to 105% by 2015. Premier labor expense index percentages stablized from 124% to 112% by 2015. The Central Division FTE budget allowed for the use of 175 FTE's to flex to volume and support facility specific staffing needs. Press Ganey teammate engagement scores improved from a Tier 3 score to Tier 2 during the implementation period. **Conclusion:**The Central Division Respiratory Care Department has realized its goal of gaining operational efficiencies and has a strong foundation built to support the demands of healthcare reform.

Sponsored Research - None

2531464

IMPLEMENTATION OF A NEWLY DEVELOPED PATIENT AND FAMILY SATISFACTION SURVEY FOR RESPIRATORY CARE – A PILOT STUDY.

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Background: Patient and family satisfaction surveys are often utilized by organizations to measure quality and satisfaction with nursing and physician care. These surveys most often do not include questions regarding respiratory therapists (RT) therefore information on satisfaction with RT care is often unavailable. A quality project targeting patient family satisfaction of RT care was initiated and a RT based survey developed. A pilot study was conducted to assess process methods (delivery/return), survey questions, and preliminary satisfaction scores. **Methods:** A paper based survey was developed using modified questions from a validated nursing tool. Five questions using a four point Likert scale (never to always) measuring communication practices, consistency of care, courtesy and respect, information sharing, and ability to voice concerns were included as well as one open-ended question. Questionnaires were randomly given out on two units, pediatric intensive care unit (ICU) and an acute care unit (ACU), to patients and families who received respiratory care services. A standardized dialogue was provided for consistency in communication. Surveys were hand delivered and retrieved by staff. **Results:** 55 surveys (n=55) were completed and returned. The chart provides the results for questions 1 to 5. 44/55 (80%) of the open-ended question were answered with positive feedback and/or areas of concern. No patients or families (0%) reported difficulty in understanding, needed support, or refused to complete the survey. Delivery/return proved to be most challenging for staff, comments included timing of patient/parent approach for initial delivery (ICU) and ability to return to pick up (ACU) as their chief problems. **Conclusion:** Patient and family satisfaction surveys for respiratory care departments can be successfully implemented in the ICU and ACU. There are challenges to administering a paper based tool in the hospital setting. While the preliminary overall scores where good, communication and consistency in care are potential area of improvement work. It is important to note, these results may be skewed due to RT driven patient selection. Future work will include expansion of survey use to all patients receiving RT services, finding more efficient means for delivery and return, and to track response rate.

Sponsored Research - None

2531549

REDUCING NON-CLINICALLY INDICATED BRONCHODILATOR THERAPY ON NON-ICU FLOORS AT UPHS USING A THERAPIST DRIVEN PROTOCOL.

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Introduction: Respiratory Therapist driven protocols vs. physician-directed RT orders have demonstrated cost savings to hospitals and improved RT resource utilization in multiple studies. The University of Pennsylvania Health System RT departments piloted a multi-hospital bronchodilator protocol in an effort to reduce variability of bronchodilator orders, improve quality of care and RT resource utilization. **Methods:** Our multi-hospital team used PI methodology to assess root causes of non-clinically indicated bronchodilator orders. A TDP assessment form was developed to standardize the assessment process. Phase 1: RT's at HUP, PAH, and PPMC used the assessment form for a 2-week data collection period to assess appropriateness of physician ordered respiratory therapy. During the following 8 weeks the RT used the TDP form on a pilot medical unit and intervened with recommendations for order changes based on the assessment findings. Phase 2 included Chester County Hospital, and added a second medical unit to the original pilot units. Phase 3 added surgical units at HUP and PPMC while CCH and PAH sustained the pilot on medical units. **Results:** Pre-intervention data showed an average of 20% ordered bronchodilators were not clinically indicated (range 5-33%). During Phase 1, non-clinically indicated bronchodilators were reduced to 10%. During Phase 2, the provider order screen was redesigned to improve accuracy when selecting frequency of bronchodilators. Phase 3 included the addition of 2 surgical units. HUP reduced non-clinically indicated bronchodilator orders to 5% and PPMC to less than 8%. UPHS RT departments calculated savings of $82,500 in supply and medication costs during the pilot. Providers reported improved communication, improved quality of care, and that RT recommendations were clinically appropriate. **Conclusions:** The UPHS project demonstrated Therapist Driven Protocols reduce unnecessary therapy and improves quality of care by ensure patients receive the appropriate respiratory therapy. By redesigning the provider order screen, overnight therapy was reduced and frequency of treatments was more appropriately ordered. RT patient assessments increased and a trend toward lower median cost per patient was identified. Ordering providers and RT's reported positive feedback of the pilot. UPHS results are inline with previous observations from 2 RCT's. UPHS RT departments are seeking medical board approval for hospital-wide RT driven bronchodilator protocol.

Sponsored Research - None

2531787

A RESPIRATORY THERAPIST QUALITY IMPROVEMENT IN MICU IMPROVES COMMUNICATION USING ESCALATION PROTOCOL AND TEAM BASE NIGHT ROUNDS.

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Introduction: National University Hospital, Singapore, Medical Intensive Care Unit (MICU) and Division of Critical Care-Respiratory Therapy has expanded bed capacity from 20 beds to 24 beds excluding overflows since February 2013 with increased high complexity patient case-mix. The objective is to develop and implement a quality improvement (QI) intervention to improve communication in escalating deteriorating patients in MICU. **Method:** A group of Senior of Respiratory Therapist work together to conduct a pre staff survey to 25 Respiratory Therapist. Result showed 67.7% perceived that there have been times when escalation or treatments for a deteriorating patient were delayed. From the survey result, Senior Respiratory Therapist came up with target state 1.) to create an escalation intervention protocol 2.) to create and implement a team base night rounds 3.) to reduce % of staff's perception of delayed escalation of deteriorating patients from 67.7% to 35% for patient safety. The implementation of intervention took place for over six months in a 24 bedded MICU. **Results:** Following six months of monitoring and implementation of intervention to the three target state, escalation intervention protocol and team base night rounds significantly improved communications among doctors, nurses and respiratory therapist. A post survey of staff's perception in delayed escalation of deteriorating patients was achieved, a significant reduction from 67.7% to 35%. **Conclusion:** Implementation of Respiratory Therapist led Quality Improvement significantly impacted positive behavioral change for team based night rounds and improved inter-professional communication via active collaboration of MICU team to optimize patient care and improve patient safety outcome in early recognition of deteriorating patients.

Sponsored Research - None

2532044

INHALED NITRIC OXIDE FOR REFRACTORY HYPOXEMIA: EVIDENCE-BASED PROTOCOL DEVELOPMENT AND COST EFFECTIVENESS.

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Background: Inhaled nitric oxide (iNO) is often used in the adult population for the treatment of refractory hypoxemia. However, the use of iNO for refractory hypoxemia in adult patients often occurs in a non-standardized manner and at high cost to the institution. The objective of this study was to develop an Evidence-Based Protocol (EBP) for the initiation, titration and discontinuation of iNO treatment of refractory hypoxemia and describe current utilization (baseline) for future comparison. **Methods:** An EBP for iNO use in patients with refractory hypoxemia was developed following a literature review. All patients who received iNO from April 2013 through July 2015 were retrospectively reviewed. The study was approved by the institutional IRB. Variables of actual iNO use during this time frame were recorded and compared to estimated use applying the proposed EBP criteria for termination. Descriptive statistics and t-tests were performed for data analysis. **Results:** A total of 133 cases were reviewed; 46 determined to be used for refractory hypoxemia. The majority of cases (80.4%) also received epoprostenol. Twenty-five (54.3%) patients were found to have a response to iNO and 21 cases were categorized as not exhibiting a response. Average iNO wean time was approximately 58.78 hours (SD= 70.96). Significant cost savings were calculated ($p<0.001$)between the actual iNO cost compared to savings should the EBP have been applied (iNO terminated for non-response). **CONCLUSIONS:** The review revealed practice variation in: starting iNO dose, method of weaning, and termination when not clinically effective. Trends displayed a decrease in iNO use over time, but variations in practice illustrated the use of iNO for this subset of patients is not standardized, which supports the utility of implementing the EBP. The statistically significant savings on non-responsive patients perpetuates the potential contribution of an EBP to increasing cost effectiveness. Future prospective studies are needed to determine effectiveness of applying the EBP to iNO use, to evaluate the standardization of care, and to determine cost effectiveness. **DISCLOSURES:** Georgianna Sergakis has been funded by Pfizer.

Sponsored Research - None

2532111

HOW THE MULTIDISCIPLINARY TEAM IMPACTS OVERALL COST SAVINGS.

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Background: There are approximately 11,000 Spinal Cord Injuries (SCI), and 2.5 million Traumatic Brain Injuries (TBI) per year in the U.S. SCI approximate cost is 9.7 billion and TBI is approximately 31.7 billion per year. This group of patients is coded as diagnosis related group (DRG) 3, 4. A "Lean Team" was formed with a multidisciplinary approach to evaluate and reduce hospital cost in this group of patients. The initial project in 2015 lasted 11 weeks. It was reported to have an impacted cost savings of 1.5 million. Due to the initial project's success it was decided to re implement the "Lean Team" for 6 months to evaluate the sustainability. **Method:** The "Lean Team" was made. Included were an MD, ACP, RT, RN, PT, OT, Pharm D, Speech Therapist, Case Management, and Palliative Care. The Team took all SCI and TBI patients admitted into the ICU. Multidiscipline rounds were done 5 days a week on these patients. All procedures were done by this team, and most were done at the bedside. These consisted of but were not limited to percutaneous tracheostomies, bronchoscopies, and pegs. We followed these patients from admission thru discharge. A rounding tool was developed and used to ensure consistent communication across all disciplines daily. Every Tuesday, leadership and administration were included in "Lean huddle". Important metrics were discussed including up to date cost savings, issues delaying patient discharge, and new tools being implemented. The team also connected to the true purpose, better care for the patients they served. **Results:** The historical measurement of cost (October 2012 - September 2013) for SCI and TBI patients to the hospital was estimated at 4.5 million. The 2015 "Lean Team" had a cost savings of $255,000.00 during the 6 week trial. After completing just half of the 2016 trial with the LEAN Team, we have observed an approximate cost savings of $1 million dollars. Another positive impact is the increasing patient satisfaction scores. **Conclusion:** The multidisciplinary approach allowed us to significantly decrease overall hospital cost by standardization of care; which in turn decreased LOS and VLOS. The combination of cost savings and patient satisfaction scores makes the sustainability and effectiveness evident. We hypothesize that all ICU patients can benefit from this outstanding care model and the value that a respiratory therapist can provide.

Sponsored Research - None

2532379

CARDIOPULMONARY COLLABORATIVE TO REDUCE 30-DAY ADMISSIONS.

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Introduction: Pulmonary related complications are a leading cause of admission and readmission to medical facilities for Medicare and other patients worldwide, with costs exceeding $44 billion per year spent by Medicare. Leaders across the healthcare continuum are motivated to implement innovative strategies to reduce readmissions and optimize patient outcomes. The objective of this collaborative program was to lower the 30 day readmission rate of cardiopulmonary patients discharged from a major urban teaching hospital to a skilled nursing facility (SNF) through an innovative community partnership. **Case Summary:** The program was created through a collaboration between three community partners: a major teaching hospital, a SNF, and third-party respiratory company in an effort to reduce costly readmissions. Patients in the Cardiopulmonary Collaborative were evaluated and treated by a respiratory therapist (provided as an on-site contracted clinician) for one hour per day; five days per week. The respiratory therapist administered individualized disease management plans that included education, medication management, oxygen management, and breathing techniques. Each patient in the Cardiopulmonary Collaborative met daily with the in-house physical therapist to ambulate and assess activities of daily living (ADLs). All patients in the Cardiopulmonary Collaborative program were seen once a week by the attending pulmonologist. Throughout this process a multidisciplinary team including the hospital respiratory therapy representative(s); SNF Nursing Director/Nurse Liaison, Administrator, and Rehab Director; third-party contract Division Director; and, the attending pulmonologist, met regularly to review the program and identify trends to improve outcomes. In the meeting, the group discussed all readmissions and reiterated the commitment to employ an innovative mindset toward providing quality, cost-effective care. **Discussion:** The results show that incorporating this program into the SNF care plan demonstrates a downward trend in the 30 day readmission rate. The Cardiopulmonary Collaborative demonstrated a 13% 30-day readmission rate, cutting the rate of the national average (23%-26%) by nearly half. The results suggest that implementing this type of collaboartive healthcare model on a larger scale can have a beneficial impact on the health of our community, while also increasing the quality of care we provide.

Sponsored Research - None

2511582

GAPS IN COMFORT WITH ROUTINE TRACHEOTOMY CARE AMONG EXPERIENCED NURSES AND RESPIRATORY THERAPISTS.

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Background: Tracheotomy is among the most commonly performed procedures in critically ill patients and has significant advantages over prolonged intubation. Unfortunately, short- and long-term complications can be common, and many are felt to be associated with tracheotomy care and potentially avoidable. Despite this, there is tremendous variation in tracheotomy care training between providers and institutions. We sought to determine how the comfort level of nurses providing bedside tracheotomy care compares with that of respiratory therapists in our institution. **Methods:** An anonymous electronic survey of respiratory therapists was distributed in two hospitals in our institution after receiving internal review board approval. The survey collected demographic information and information about training, comfort level, and challenging experiences associated with tracheotomy care. Descriptive statistical analysis was applied. **Results:** A total of 148 surveys were returned from 589 possible respondents, of which 118 were from nurses and the balance from respiratory therapists. The 60.2% of nurses and 70% of RTs reported greater than 5 years of experience with tracheotomy care, and 59.9% of nurses and 93.3% of RTs felt they had adequate training prior to performing tracheotomy care tasks. Most were comfortable with tasks such as suctioning (77.1% of nurses; 100% of RTs), and cleaning the tracheotomy site (71.2% of nurses, 100% of RTs). However, 8.5%, 37.1 and 32.3% of nurses were not at all comfortable with changing trach ties, managing mucus and changing the inner cannula of the tracheotomy appliance respectively. In contrast, as expected, none of the RT respondents were uncomfortable with any of these tasks. Challenging experiences reported in the free text portion of the survey involved themes of bleeding from the tracheotomy, managing mucus, accidental decannulation, and issues involving tracheotomy ties. **Conclusions:** Despite reporting satisfaction with training and similar reported experience with tracheotomy care, nurses and RT report disparate levels of comfort with several routine tracheotomy care tasks. This implies an opportunity for improving educational programs around tracheotomy care for medical providers. Disclosures: The authors have no financial affiliations to report.

Sponsored Research - None

2524986

DISPOSBALE BRONCHOSCOPE- SAFE AND COST EFFECTIVE TOOL IN DIFFICULT AIRWAYS, PERCUTANEOUS TRACHEOSTOMIES AND DIGANOSTIC/ THERAPEUTIC BRONCHOSCOPY.

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BACKGROUND: Bronchoscopy is an important tool used in the intensive care units. Successfully managing and securing a difficult airway is key in improving patient outcome. For a large academic medical center, easy accessibility to emergency equipment can be challenging. Reported incidences of nosocomial infections linked to contaminated endoscopes are of great concern. Initial cost of coventional bronchoscope, combined with the cost of repairs and need for sterile scopes, all led to the trial of a single patient use disposable endoscope. **METHOD**: From December 2015 to April 2016, we trialed the single patient use videoscope manufactured by Ambu as the aScope. It was used for difficult airways, percutaneous tracheostomies, and diagnostic as well as therapeutic bronchoscopic procedures. It was utilized in the intensive care units as well as general floors for difficult airways to operating rooms and interventional radiology. While conventional bronchoscopes are useful for intubating with an endotracheal tube (ET) tube size 7.0 mm and above, the disposable endoscope can be used for intubating ET tube as small as 5.0 mm. RESULTS: The disposable bronchoscope allowed us to be more responsive to our large footprint with sterile scopes readily available. Quick delivery of services was a great factor. Becasue of the light weight, it is portable through any locations in emergent airway situations. Having the ability to check ET tube placement and also to inspect airway post intubation, often eliminated the need for a post intubation chext x-ray. We were able to safely perform therapeutic bronchoscopies every four hours on a critically ill patient waiting for donor lungs for lung transplant surgery. Another patient was diagnosed with squamous cell carcinoma of the lungs from a biopsy using the dispoable scope, changing the entire treatment plan for this patient with better outcome. Eliminating the need for reprocessing of the non-disposable scopes not only saved money, but also valuable RT time and repair costs of conventional scopes. Our conventional scopes require bedside cleaning immediately after the procedure, stoarge in special humidity control packages, delivery and pick up from processing. The disposable scope fully eliminated all of these. **CONCLUSION**: Our data from trials suggest that the disposable scope provides fast, safe and most efficient tool for difficult airways, in addition to diagnostic and therapeutic use, as well as for percutaneous tracheostomies.

Sponsored Research - None

2531035

A BENCH MODEL EVALUATION OF CUFF PRESSURE MEASUREMENT TECHNIQUE USING THREE DIFFERENT MEASURING DEVICES.

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Background: Cuff pressure management of artificial airways has been a subject of controversy in recent years. Current literature suggests that the intra-cuff pressure (CP) may deflate to unsafe levels (<20 cm H_2O) between CP measurements creating a need for continuous, as opposed to intermittent monitoring. A review of this literature reveals limited information regarding the technique used for measuring CP. **Purpose:** To demonstrate the effect of a standardized intermittent CP monitoring technique on sequential CP measurements using three different CP measuring devices. **Materials and Methods:** We evaluated the change in set CP over time on three adult endotracheal tubes (ETT) of each size, 7.0 mm ID and 8.5 mm ID, inserted into adult intubation manikins. Measurements were made at 2 hour time intervals over an 8 hour time course. In a separate test, all ETT cuffs were inflated to 26 cm H_2O followed by a measurement at 40 hours. CP was measured with three devices: aneroid manometer & syringe (AM), AG Cuffill (AG), and Posey Cufflator (P). CP was initially set at 26 cm H_2O at time zero. For the control condition, each device was attached to the ETT pilot baloon at ambient pressure. The control ETTs were compared against an investigational technique intended to standardize the CP measurement. We added a 3-way stop cock to each device to allow pre-pressurization of the device and "dead volume" to the previous CP prior to all measurements after time zero. **Results:** All CP in the control condition deflated to unsafe levels beyond time zero. In the investigational group, none of the (AG) CP deflated to unsafe levels at any time. One of six CP measurements (17%) with both the AM and P devices dropped to unsafe levels. All CPs using the investigational technique remained safely inflated at the 40 hour interval. **Conclusion:** CP technique, in and of itself, can be a cause of cuff deflation to unsafe levels. Future research regarding CP measurement should include a more clear description of the CP technique utilized. Routine CP measurements without the use of a stop-cock for pre-pressurization were unsafe with all devices at all times beyond time zero in this bench model and should be abandoned. CP measurement technique should be standardized to incorporate a stop-cock and pre-pressurization regardless of sampling frequency or measurement device. Further investigation is necessary to determine if these bench model results transfer to the clinical setting.

Sponsored Research - None

2531465

PERFORMANCE EVALUATION OF AUTOMATED ENDOTRACHEAL TUBE CUFF PRESSURE REGULATORS.

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Background: Endotracheal tube (ETT) cuff pressures are dynamic and can change with fluctuations in mean airway pressure. Consequently, unregulated cuff pressures can result in tracheal mucosal damage or aspiration of supra-cuff secretions. The purpose of this bench study was to evaluate the performance of PressureEasy®, CuffSentry™, and IntelliCuff® devices to a sudden drop in mean airway pressure (MAP), as simulated by ventilator disconnect. Our group hypothesized that all three automatic cuff pressure regulating and monitoring systems would outperform the experimental control of setting the cuff pressure (Pcuff) with a standard cuff manometer when challenged with a circuit disconnection. **Method:** Mean airway pressures (mPaw) of 6, 12, and 24 cmH2O were applied to an adult airway tracheal model (20 cc syringe), test lung and water collection reservoir. Three tapered cuff ETTs with internal diameters of 7.0 mm, 7.5 mm, and 8.0 mm were tested. The ETTs were connected to a ventilator and APRV mode was used to lessen tidal variations. For the control group of Pcuff settings, a handheld manometer was used. The control, CuffSentry™ (1 L flow), and IntelliCuff® were tested at ETT Pcuff of 25, 30, and 35 cm H2O. For the PressureEasy®, we set the green bar at the lower, middle and upper points of the 20-30 cmH20 window. For each ETT size, the three automated devices and control were challenged with a circuit disconnection during the combination of all mPaw and ETT cuff settings. After circuit disconnection all combinations were observed for 15 seconds for fluid passage past the ETT cuff, totaling 108 measurements. **Results:** Observed events were classified as a non-event (0 drops), minor event (1-2 drops), and a major aspiration event (≥ 3 drops) during the 15 second observation period after circuit disconnect. There was no observable indication that any of the automated Pcuff regulation devices outperformed the control. The only trends associated to prevention of aspiration were cuff pressure related [Table 1]. **Conclusions:** Our results reinforce the notion that the prevention of aspiration past the ETT cuff is multifactorial. These factors can include: ETT size, patient trachea diameter, channeling of the ETT cuff, fluctuations in mPaw secondary to circuit disconnect, and variability of the devices used to maintain ETT Pcuff. Our results also support the contention that circuit disconnects can cause aspiration events despite automated Pcuff regulation and monitoring.

Sponsored Research - None

Table 1. Upper table displays predictable trend related to ETT cuff pressures. Lower table displays events according to devices and control.

	Non-Event	Minor Event	Major Event
25 cm H2O/low	6	21	9
30 cm H2O/middle	9	24	3
35 cm H2O/high	13	22	1
	Non-Event	Minor Event	Major Event
Control	12	9	6
Pressure Easy	4	22	1
Cuff Sentry	5	16	6
IntelliCuff	7	20	0

2531666

ENDOTRACHEAL OBSTRUCTION IN THE ICU: HOW BAD IS IT AND WHY? A PILOT STUDY.

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Introduction: Accumulation of secretions in the ETT occurs in almost every patient in the ICU, which can lead to adverse changes in pulmonary mechanics and gas exchange. Although factors such as fluid balance, humidification, duration of ventilation, may play an important role in ETT obstruction (ETTO), this information is poorly documented in the literature. This pilot study aimed to determine the degree of intraluminal ETTO from patients who are extubated in the ICU and to identify potential risk factors. **Methods:** Cohort study at an University-affiliated ICU in March of 2016. Patients ≥18 y, orally intubated (ETT 7.0 to 8.0 mm) and mechanically ventilated were selected for the study, which was approved by the institutional IRB. Baseline patency was established in the laboratory on 6 unused ETTs (control ETT; 2 of each size). ETT length was measured from proximal to distal opening. Each of the ETTs was filled with saline (NS) using prefilled graduated syringes and volume needed to fill the entire length of the ETT was measured (100% patency). Prior to extubation, ventilator and patient parameters (table 1) were obtained. ETTs from patients with different length of intubation times were obtained (<24 h, 24-48 h, >48 h). Right after extubation, each ETT (experimental ETT) was collected. The distal opening and murphy's eye were sealed with waterproof duct tape. The degree of ETTO was determined by following the same protocol used for the control ETT. The measurements were performed at the bedside to prevent cross contamination. A mark on the experimental ETT was made halfway to separate proximal from distal halves. **Results:** 17 patients admitted to ICUs were included in the pilot study. The mean degree of ETT obstruction in this group of patients was 10.37% (±10.2%; range 0.8% to 43.8%). There was poor correlation between degree of ETT obstruction and humidification temperature (r=-0.21) Ppeak (r=-0.12), TI (r=0.25), 24h-fluid balance (r=-0.03), ETT size (r=0.02), and length of intubation (r=-0.16). Obstruction in the distal half of the ETT was significantly higher than proximal (P=0.01). **Conclusion:** ETTO was not associated with significant changes in pulmonary mechanics in this group of patients and not significantly correlated with any of the variables considered in this pilot study. A significant larger group of patients is necessary to further evaluate degree of ETTO and identify important risk factors.

Sponsored Research - None

Demographic and Ventilatory Data

AGE	MV DURATION (h)	FLUID BALANCE	TEMP HUMID (C)	Ppeak	TI (sec)
50.1 (+/-15.5)	61.3 (+/-138.4)	181.8 (+/-1323)	19 (+/-5)	19 (+/-5)	1.4 (+/-0.5)

2531816

EVALUATION OF MINIMUM PRESSURE THRESHOLD FOR MAINTAINING A SEAL AND PREVENTION OF ASPIRATION OF FLUID ACROSS ENDOTRACHEAL TUBE CUFFS.

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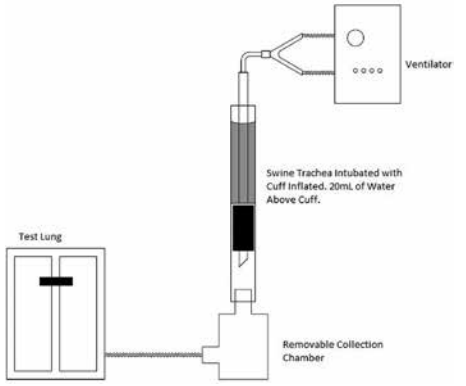
Introduction: Proper cuff management ensures set tidal volume (VT) delivery and helps to prevent aspiration which may lead to pneumonia. Since the trachea inside diameter cannot be determined prior to intubation, choice of ETT size is done by average size and sex of the adult patient. This study was done to compare the minimum ETT cuff pressure required to maintain a sealed airway in three different sized ETT tubes (7.0, 7.5 and 8.0 Mallincrodt Hi-Lo Oral/Nasal Tracheal Tube Cuff®) within an average adult animal model during positive pressure ventilation (PPV). **Methods**: Two tracheas were obtained from an adult swine and used along with a test lung during PPV. The two swine trachea averaging 20 millimeters inside diameter was suspended vertically, intubated, with cuff inflated. 20mL of water was added above the ETT cuff. The test lung was then mechanically ventilated for two minute intervals at cuff pressures starting at 30cm H_2O and decreasing in increments of 5cm H2O until gross leak was reached. The collection chamber below the cuff was weighed before and after each two minute interval while noting the presence of audible leaks. A manometer, stopcock and 20 mL syringe was used to set and monitor pressure in the cuff. **Results:** The 7.0 ETT demonstrated a gross leak at 10cm H_2O. The 7.5 ETT, gross leak occurred at 5cm H_2O. A discrepancy was noted with the 8.0 ETT, with gross leaks occurring at 5cm H_2O and at 10cm H_2O. **Conclusion:** Regardless of the typical adult ETT size range in an adult animal model, this brand of ETT seals from gross leak at pressure > 10 cmH_2O during positive pressure ventilation. This sits well below the recommended 20-30cm H_2O range. Further study is needed to discover exact minimum pressures needed to form a satisfactory seal in the patients' airway.

Sponsored Research - None



2531844

HOW DEEP CAN WE GO? FOLLOWING THE ENDOTRACHEAL SUCTIONING CLINICAL PRACTICE GUIDELINES.

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Background: Endotracheal suctioning (ETS) is a procedure routinely performed in the ICU. The AARC updated the CPG for endotracheal suction 6 years ago in order to standardized the procedure and minimize its side effects. It recommends a shallow technique lasting <15 seconds, discourages the routine use of normal saline and does not recommend routine preoxygenation. The primary goal of this study was to investigate whether or not the AARC CPG is followed and determine if ETS was associated with any adverse events. **Methods:**Prospective observational study at a university-affiliated hospital, in San Antonio, TX during the month of March in 2015 and 2016. Data was collected during observation of suction events in patients admitted to the MICU. Baseline vital signs and SpO2 were obtained prior to ETS. Patients were monitored during the suction event and 1, 5, and 10 minutes after the procedure for complications. SPSS 22.0 (IBM, Chicago, 2013) was used to analyze the descriptive data. **Results:** Eighty-two patients admitted to a medical ICU were used for analysis. Any patient with either an endotracheal tube (ETT) or tracheostomy tube (TT) was included in the analysis. The average suction pressure used for suctioning was -199.5 mm Hg (±3.12). Deep suction was performed in 78 patients (95.1%). Preoxygenation with FiO2 of 1.0 was used in almost half of the patients (n=37; 45.1%). Two suction events were performed in 35.4% of the observations while only 14 patients (17.1%) required 3 or more suction events. Normal saline was used in only 5 patients (6.1%). The duration of the first and subsequent suction events was less than 15 seconds in 92.6% of the patients. The overall rate of adverse effects was 31.6%. Cough was elicited in 67.1% of the suction passes and bleeding was observed in 19.5% of the events. Twenty patients experienced a 15% change in HR after suctioning (tachycardia 65%). Only 4 patients (4.9%) took ≥ 5 minutes to be placed back at the pre-suction FiO2 level. **Conclusions:** In this group of patients, there was trend to avoid routine use of normal saline and preoxygenation with 100% oxygen. The suction event was also limited to less than 15 seconds as recommended. However, the practice of deep suction and use of excessive negative pressure indicate lack of adherence to the AARC CPG. Promotion of the CPG via education and changes in policy and procedure could standardize the procedure and significantly reduce the complications associated with suctioning.

Sponsored Research - None

2532025

TRACHEOSTOMY CARE PROVIDED BY BEDSIDE NURSING VERSUS A DEDICATED TEAM OF RESPIRATORY THERAPISTS – ARE OUTCOMES DIFFERENT?

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BACKGROUND: Routine tracheostomy care has traditionally been a shared responsibility between respiratory therapy, and nursing. Our large tertiary teaching medical center has a team of respiratory therapists whose primary responsibility is to round on tracheostomized patients admitted to the general floors, and to ensure the most appropriate and timely patient care. Trach care in our ICU has historically been provided by critical care nurses with no formal guidelines. In 2014 the respiratory department implemented new guidelines that shifted tracheostomy care responsibility from the ICU nurses to respiratory therapists. These guidelines included bedside trach care and formal communications with the multidisciplinary team regarding suture removal, trach down-sizing and other issues pertaining to transition to the general floors. Our group wanted to investigate whether these changes impacted outcomes. **METHOD:** After obtaining approval from our institutional review board, our team evaluated 112 tracheostomized patients. Data points collected included ICU days, hospital days, days till formal rehab, ventilator days, days till suture removal, days till first speaking valve trial, days till speech therapy consult, days till first tracheostomy mask trial and days till first ambulation. **RESULTS:** There were 56 patients in the pre-implementation group and 56 in the post. Median ICU days were 18.5 and 16.0 (-2.5) (p=0.18), hospital days 27 and 24.5 (-2.5) (p=0.06), Rehab days 19.0 and 17.0 (-2.0) (p=0.12), ventilator days 15.0 and 15.0 (no difference) (p=0.69), days till de- cannulation 17.0 and 22.0 (+5.0) (p=0.07), days till suture removal 7.0 and 6.0 (-1.0) (p = 0.91, days till first speaking valve trial 10.0 and 10.00 (no difference) (p=0.93), days till tracheostomy down-size 10.5 and 10.0 (-0.5) (p=1.0), days till speech therapy consult 6.0 and 5.5 (-0.5) (p=0.58), days till first tracheostomy mask trial 2.0 and 3.5 (+1.5) (p=0.39) and days till first ambulation 18.0 and 14.5 (-3.5) (p=0.11). All groups were evaluated using Analyse-it statistical analysis software (UK) and two tailed t-test's. **CONCLUSIONS:** several parameters demonstrated positive changes that reached clinical significance but not statistical significance. (p < .05, 95% CI). These included ICU days, hospital days, days till suture removal, rehab days, days till down-size, days till speech consult, and days till first ambulation. Further study will be needed to prove statistical significance.

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Total n=112	Pre-Implementation	Post-Implementation	Difference	P
ICU Days (n) (median)	(56) (18)	(56) (16)	-2	0.18
Hospital Days (n) (median)	(56) (27)	(56) (24.5)	-2.5	0.06
Ventilator Days (n) (median)	(56) (15)	(53) (15)	0	0.69
Days till suture removal (n) (median)	(11) (7)	(27) (6)	-1.0	0.91
Days till first speaking valve trials (n) (median)	(20) (10)	(19) (10)	0	0.93
Rehabilitation Days (n) (median)	(19) (19)	(9) (17)	-2.0	0.12
Days till de-cannulation (n) (median)	(13) (17)	(13) (22)	+5	0.07
Days till speaking valve trials (n) (median)	(20) (10)	(19) (10)	0	0.93
Days till first down-size (n) (median)	(12) (10.5)	(13) (10)	-0.5	1.0
Days till speech consult (n) (median)	(21) (6.0)	(30) (5.5)	-0.5	0.58
Days till first trach mask trial (n) (median)	(51) (2.0)	(43) (3.5)	+1.5	0.39
Days till first ambulation (n) (median)	(19) (18)	(14) (14.5)	-3.5	0.11

2532103

COMPARING THE COST OF TRACHEOSTOMY PROCEDURES: BEDSIDE VERSUS OPERATING ROOM.

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Background: There are approximately 100,000 tracheostomies performed annually. Tracheostomy patients are coded as diagnosis related group (DRG) 3,4 because of their potential for increased length of stay. Our theory was to see which would be more cost effective, preforming percutaneous tracheostomies at bedside or preforming them traditionally in the operating room. We also looked at traching patients with a #6 vs. #8 trach. We utilized a RT clinical specialist for their already established clinical expertise in both assisting with tracheotomy procedures and caring for the patients with a tracheostomy. **Method:** Daily Trauma rounds were used to identify this population. Patient demographics, mechanical ventilator support and surgical history were assessed to determine if there were any barriers to performing a bedside percutaneous tracheotomy. The RT clinical specialist owned and developed a bedside procedure cart and a checklist with inventory for the tracheostomy procedure. The Respiratory Therapist was utilized in the set-up process of the procedure and assisted at bedside. During the bedside procedure a #6 trach was used on all patients unless otherwise specified by referring physician. We used the process of choosing #6 for early phonation, delirium, decreasing the amount of downsizing procedures and to aid in dietary/swallow evaluation. **Results:** In a three month period we had 47 total tracheostomies performed. 36 tracheostomies were done at the bedside and 11 were done in the OR. There were 2 cases included in this total that had complications. On average the cost for an OR trach is $4600.00 and beside approximate cost is $500.00. We had a cost savings of approximately $150,000.00. We trached 27 people with #6 trach and 20 people with a #8. There were no complications noted from using the #6 vs. #8. **Conclusion:** After comparing the cost of bedside vs. OR trach, we concluded that it is more cost effective to perform bedside tracheostomies. The #6 trach functioned with no adverse side effects and therefore it would be beneficial to our patient population to utilize a #6 vs. #8. The RT specialist was an integral part of this process and its success. We will continue to look for ways to expand and utilize the role of the Respiratory Care Practitioner.

Sponsored Research - None

2526117

SAFETY AND EFFICACY OF INTRAPULMONARY PERCUSSIVE VENTILATION IN CHILDREN WITH CHRONIC RESPIRATORY ILLNESS TREATED AT HOME.

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Background: Children with Chronic respiratory illness (CRI) are at a high risk of morbidity and mortality related to respiratory failure. Intrapulmonary percussive ventilation (IPV®) is a novel mechanical assists approach defined as an airway clearance modality to enhance mucociliary clearance and to treat persistent patchy atelectasis, as well as to improve oxygenation and ventilation. IPV is administered with the Impulsator "IMP" (Percussionaire corp., Sandpoint, Idaho). The device delivers a small volumes of gas at high frequency positive-pressure breaths in the range of 100 to 300 cycles/minute through a sliding venturi in conjunction to a continuous aerosol generator. The use of IPV has improved many patients with CRI, however a complete characterization of the device, the outcome of continuing the therapy have not been carried out, and the lack of studies reduce its utilization for clinical home practice and its effective implementation especially in the home of special need children with CRI. **Methods**: We retrospectively evaluated the medical history of 55 pediatric patients with CRI in whom IPV was initiated at home by Wave Healthcare between November, 2008, and February, 2013, by analyzing their medical records and through a short questionnaire sent to the parents. The authors asked for the degree of respiratory morbidity, estimated by the frequency of hospitalizations, emergency room and doctor visits as well as the occurrence of pneumonia, caused by respiratory distress. **Results**: IPV was initiated electively in 55 patients with chronic respiratory illness, among them, 78% have chronic lung disease, 22% have neuromuscular disorders, 53% were tracheotomized. All the parents answered to the questionnaire. At time of follow-up, the mean time of use of IPV at home was 3.04 ± 1.4 years. 82% reported a significant reduction in the frequency of hospitalization, for 80% and 60% of them, there are evident decrease in emergency room and doctor visits, respectively. In 74% of the studied group, the occurrence of pneumonia was significantly reduced since the implementation of IPV. Adverse effects such as pneumothorax and airways obstructions were not seen. **Conclusions**: Our findings indicate that IPV at home, was effective and safe, and may reduce short and long term respiratory morbidities in children with chronic respiratory illness.

Sponsored Research - None

2527181

OPTIMIZATION OF STAFFING TO PATIENT CENSUS AND ACUITY INCREASES VOLUME WHILE REDUCING COST IN A UNIVERSITY BASED SLEEP LAB.

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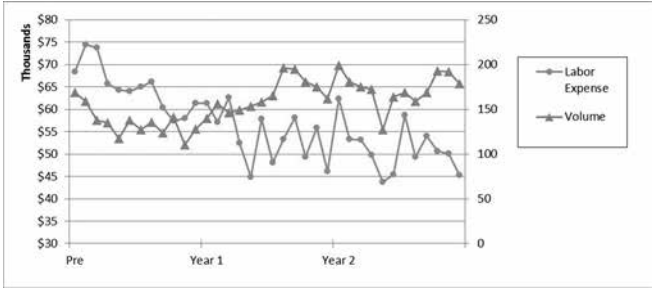
Background: With the introduction of a new leadership team in an established University health system sleep lab the finding of negative financial metrics was a catalyst for immediate action. The implementation of a rapidly deployed management imperative yielded an increased sleep study volume of 22% in year one and a 28% in year two and decreased labor expense of 17% in year one and 23% in year two. Upon review by the new manager it was determined that a primary cause of the initial negative balance centered on subtle inconsistencies in staffing patterns. The American Academy of Sleep Medicine, (AASM), recommends a 2:1 patient to staff ratio as a general guideline for sleep lab staffing under normal circumstances. No clear statement of staffing expectations existed in current policies nor was there an employee accountability instrument in place. Heretofore, staffing was based on subjective opinions of individual staff concerning patient need. This subjective and highly erratic opinion based method centered on advance chart review or upon patient appearance upon arrival to the lab. Given the demand for greater efficiency and productivity this system had to change through a rapid process management design. **Methods:** A standard staffing pattern of 2:1 patient to staff was implemented with an acuity exception for a 1:1 or 2:3 staffing pattern. Higher acuity patients were defined as requiring more than standard care or when specified by the ordering physician. An indicator was added to the EMR order set requiring physicians to acknowledge greater than normal care needs. When selected, the manager reviewed to determine appropriate staffing. Sleep lab volume measured by study volume billed and labor expense was pulled directly from cost center payroll. **Results**: With the changes that were made to our staffing model, we observed a volume increase of 22% in year one and 28% in year two. Additionally, we saw a decrease in labor expense of 17% in year one and 23% in year two. **Conclusions**: Using more consistent and defined indicators for staffing can lead to increased efficiency both in increased volume and decreased cost. We found decreased wait times for studies while patient satisfaction scores remained >90% with no change in incident reporting in the lab. This imperative yielded a net increase in revenue of approximately $1.1M and a net decrease in salary expense of approximately $300K, for an increase in margin of approx. $1.4M by the end of year two. **Disclosures**: None

Sponsored Research - None



2528400

INSTANTANEOUS IMPROVEMENTS IN PULMONARY FUNCTION INDUCED BY THE PASSIVE PELVIS SUSPENSION AT SUPINE POSITION.

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Background We reported that pelvis-suspended conditions (PS) using sling cords shifted diaphragm more cranially by 6 mm than resting posture, leading to the effective diaphragm excursion to bring about easiness in quiet breathing, deep and slow respiration (9th ISPRM Congress). Here we precisely investigate instantaneous effects of PS on spirometry indice to see the improvement of pulmonary function. **Method** Subjects with informed consent were 25 healthy men (24.9±2.3 yo) at supine position. Using redcord®, hip and knee joints were flexed at 90° (rest posture: Rest) and the pelvis was suspended as slightly lifted the first lumber spinous process (pelvis-suspended posture: PS). Using a spirometer pulmonary function was measured: vital capacity (VC), expiratory reserve volume (ERV), inspiratory capacity (IC), and forced expiratory volume in one second ($FEV_{1.0}$). Parameters were compared between Rest and PS using paired *t*-test or Wilcoxon signed-rank test. Pearson product-moment correlation coefficient was estimated for relationships among parameters. Approved by the Ethnic Committee of Bunkyo Gakuin University. **Results** PS increased mean VC by 0.1 l ($p<0.001$), reduced mean ERV by 0.07 l ($p<0.05$) and increased mean IC by 0.17 l ($p<0.001$), as compared with those at Rest. $FEV_{1.0}$ at PS was significantly greater than that at Rest. PS induced the negative correlation between changes in IC and ERV ($r=-0.68$, $p<0.001$), but the positive correlation between changes in ERV and VC ($r=0.63$, $p<0.001$). While, the changes in IC was not well correlated to those of VC. **Conclusions** The space volume equivalent to 6 mm cranial disposition of diaphragm is calculated to be around 0.1-0.4 l. These PS-induced volume changes may contribute most to the reduced ERV. On the other hand, the PS-induced increase in volumes of VC and IC may be achieved by the increased diaphragm excursion due to the increased muscle force depended on the length-tension relationship. Accordingly, $FEV_{1.0}$ may be increased by PS. Corroboratively, PS-induced changes in ERV was negatively correlated to those in IC, but positively to VC. Thus the reduction in ERV may be a principal factor to improve the forced breathing. All results on normal and forced respiration states suggest that PS provides the easiness in respiration. PS might be a new intervention to instantly improve the pulmonary disorders as dyspnea and COPD. **Disclosures** All authors declare that there are no conflict of interests regarding this study.

Sponsored Research - None

2531745

EFFECTS OF DIFFERENT SITTING POSTURE ON LATERAL DEVIATION OF THORACIC SHAPE AND RESPIRATORY FUNCTION.

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Background: Our current investigation suggests that tidal volume (TV) decreases when the lower thorax shape is laterally deviated rightwards, resulting in the restriction of respiration. Even in patients, the thorax shape seems to be altered depending on the difference in posture. We notice which posture is good or bad for respiration. The physical intervention considering the thoracic shape-posture relation might be advantageous to treatments of respiratory disorder like COPD. Here we investigate effects of the lateral deviation in upper and lower segments of thorax on respiratory function at different sitting postures. **Method:** Subjects with informed consent were 21 healthy men (24±3.1 yo), and took 4 sitting postures of right forwards, left forwards, right backwards and left backwards by using the inclined (5) seating surface, with normal respiration. Using VICON MX 3D-analysis system with reflection markers, thoracic shape was monitored at the 3rd costovertebral joint level (upper thorax) and xiphoid process level (lower thorax). Differences between left and right anteroposterior diameters at upper and lower thorax levels were measured with combined bilateral comparison of forward or backward sitting postures. Using a gas analyzer, respiratory function (TV and respiration rate, RR) was measured. Data were analyzed by paired t-test using SPSS. Approved by the Ethnic Committee of Bunkyo Gakuin University. **Results:** At all postures, the anteroposterior diameter was bigger by a few mm in the left than the right at the upper thorax, but in the right than the left at the lower thorax ($p<0.01$). The left forward and left backward sitting postures augmented the lateral differences in the upper and lower thoraxes ($p<0.05$), reduced TV ($p<0.01$) and increased RR ($p<0.01$). **Conclusions:** These results suggest that leftward sitting posture induces unfavorable conditions for respiration, reducing TV and increasing RR, via asymmetric lateral distortion of thoracic shape. Apparently, it is worthwhile that the clinical intervention for respiratory disorder could be achieved with considering the asymmetry in thoracic shape and body posture. **Disclosures:** All authors declare that there are no conflict of interests regarding this investigation. The investigation was totally supported by official fund of Bunkyo Gakuin University.

Sponsored Research - None

2532079

THE RELATIONSHIP BETWEEN TONGUE STRENGTH, OBESITY & OBSTRUCTIVE SLEEP APNEA.

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Background: The primary purpose of the study is to obtain normative data on the tongue strength of persons who are obese and may provide insight into the relationship between tongue strength and obstructive sleep apnea (OSA). The tongue force in persons who are obese and may have OSA, as well as swallowing difficulties have not been explored. **Methods:** The study sample was selected from participants attending a university wellness center. Testing took place during 2015. Institutional Review Board approved the study protocol, and each participant provided written informed consent. Tongue strength and endurance measures was collected and recorded according to the standard procedures set forth by the Iowa Oral Pressure Instrument manual (IOPI). *Participants*: 21 healthy subjects (16 males, mean age 57.8 yrs; 5 females, mean age 65.6 yrs). Mean BMI for males and females was 30.1 and 26.2, respectively. Independent-samples *t* tests were used to compare demographic and body composition parameters. A coefficient of association was calculated to examine the differences between tongue strength parameters. Level of statistical significance was set at P _ .05. Data analysis was conducted using Stata 10.1 (StataCorp, College Station, Texas). Exclusion criteria included diagnosis of sleep apnea, history of stroke or respiratory disease, etc. **Procedure:** Following calibration of the IOPI device with each subject, mean maximum anterior tongue pressure (3 trials), mean maximum posterior tongue pressure (3 trials), endurance (50% of max pressure), mean tongue pressure during swallow (5 trials anterior tongue placement), mean pressure during speech (6 trials–anterior tongue placement). A dual-energy x-ray absorptiometry (DXA) measured: lean mass, bone mass, fat mass, total head/neck fat percent, and total body fat percent. **Results:** There were significant correlations between mean max anterior and mean max posterior tongue pressures, as well as other parameters. The tongue strength max anterior was 55.35; max tongue posterior was 30.06. **Conclusion:** Tongue strength measures are relatively consistent with similar previous research (e.g., Clark & Soloman, 2011; Crow & Ship, 1996; Neel & Palmer, 2012; Vanderwegen et al., 2012). Overall results suggest a moderate-strong relationship between tongue strength total head-neck fat percent and total body fat percent. Further studies need to be conducted to determine the relationship between obesity, tongue strength and OSA.

Sponsored Research - None

2532118

DIFFERENCES IN SLEEP PARAMETERS BASED ON THE RECOMMENDED AND ALTERNATIVE ELECTRODE PLACEMENTS ACCORDING TO THE AASM SCORING MANUAL.

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Background: Currently, there are two methods available when polysomnography technologists are placing electroencephalogram (EEG) and electrooculogram (EOG) electrodes: the recommended and alternative lead placements. This study focuses on the EEG and EOG data collected from sleep studies and the difference that may exist between the two methods. The research question asks whether the recommended and alternative American Academy of Sleep Medicine electrode placement methods differ in the assessment of sleep and associated calculations. The null hypothesis states there is no significant difference sleep parameters between the two electrode placement methods. **Methods**: IRB approval was obtained for this study. Six volunteer research subjects were fitted with both electrode placement methods simultaneously. Data was analyzed for each electrode placement method using an ANOVA test with Bonferroni post-hoc with an alpha level of 0.05, Paired Samples T-Test, and Intraclass Correlation testing between research subjects. **Results**: The one-way ANOVA test results showed no significant difference for all values except stage 1 non-REM sleep: $F(3,15) = 6.418$, $p = 0.005$. Bonferroni post hoc analysis results were also statistically different only for stage 1 non-REM sleep for auto scored – acceptable and RPSGT scored – acceptable ($p=0.018$) and the auto scored – recommended and RPSGT scored – recommended ($p=0.019$). Paired Samples T-Test was used to assess the difference between subjects based on each scoring method used (auto-scored and RPSGT-scored). The acceptable and recommended method results were not statistically different for all six research subjects. Intraclass Correlation between research subjects showed an average measure of 0.979 indicating a very strong inter-rater reliability between scorers ($F(10,180)=47.808$, $p<0.0001$). **Conclusion**: The null hypothesis was partially rejected due to a statistical difference when scoring non-REM stage 1 sleep only; the majority of data showed no significant difference between the two electrode placement methods. The ICC results indicated very strong inter-rater reliability between the scoring methods used for this study. This study is important to the medical community because it indicates that the recommended and alternative electrode placement methods can be used interchangeably. **Disclosures:** The authors have no conflicts of interest to disclose and nor do they have any relationships with industry related to this project.

Sponsored Research - None

2530382

UTILITY OF ICU LEVEL VENTILATORS IN AUSTERE ENVIRONMENTS.

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Background: Despite safeguarding procedures set in place by the U.S. military regarding airworthiness and safety, caregivers may forgo this process in an attempt to use critical assets such as mechanical ventilators with a waiver for one-time use in extenuating circumstances. These devices may be safe for use in the aircraft, but may not have been validated for clinical accuracy when operated at altitude. **Methods:** We evaluated one device each of two intensive care unit (ICU) level ventilators, Evita XL (Dräger Medical, Telford, PA) and Puritan Bennett (PB) 840 (Covidien, Mansfield, MA), in an altitude chamber at sea level and simulated altitudes of 8,000 and 16,000 feet. At sea level and each altitude, ventilators were connected to a test lung and evaluated using a range of settings using normal, restrictive, and obstructive lung models. Airway pressure, flow, and volume were recorded on a breath-to-breath basis for 1 minute after 1 minute of stabilization. **Results:** In volume-controlled ventilation mode, 75% of the tidal volumes (VTs) were outside the < 10% of set VT ASTM standard with the PB 840 at both altitudes and also at sea level, but the differences were not so great to be considered clinically important. None of the settings delivered with the PB 840 in pressure control ventilation and pressure-regulated volume control modes were adversely affected by altitude. Delivered VT was affected by operation at altitude with the Dräger XL (Fig. 1), but no other ventilator settings were affected. Changes in PEEP or lung compliance had no significant effect on delivered VT with either ventilator. Sixty-seven percent of the VTs at all ventilator/lung compliance settings and both altitudes were outside the ASTM standard of ± 10% of set VT with the Dräger XL. Additionally, 54% of delivered VTs at altitude were more than 10% larger than delivered VTs at sea level with this device, with 62% of these VT differences being clinically important. **Conclusions:** Ventilators used in this environment must maintain desired settings, especially VT. The PB 840 did not deliver VTs that were larger than the ASTM standard up to an altitude of 16,000 feet, while the majority of the delivered VTs with the Dräger XL were greater than the ASTM standard and were often > 50% larger than set VT at 16,000 feet. This could present a patient safety issue. Caregivers must be aware of the limitations of ICU ventilators when utilized in a hypobaric environment in order to provide safe care.

Sponsored Research - None

2530499

EFFECT OF CIRCUIT SIZE ON DELIVERED VOLUME IN A SIMULATED PEDIATRIC PATIENT WITH POOR LUNG COMPLIANCE DURING PRESSURE CONTROL VENTILATION.

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Background: Our institution currently utilizes three types of ventilator circuits for our intubated pediatric patients, the Air Life Pediatric and the Evaqua 2 Pediatric/Adult and Infant circuit. The Evaqua 2 circuit only comes in two sizes, Pediatric/Adult and Infant. We sought to explore the feasibility of replacing the Air Life Pediatric circuit with the Evaqua 2 Pediatric/Adult circuit, but we had concerns that changes in circuit compliance may impact delivered tidal volume. We conducted a bench experiment to compare measured exhaled tidal volume differences in a simulated 10kg pediatric patient with poor lung compliance. **Method:** SERVO-i and AVEA ventilators were set-up and calibrated with both the Air Life and Evaqua 2 circuits. The circuits were connected to Mallinckrodt 4.0 endotracheal tube. The Endotracheal tube's distal end was attached to a calibrated Respironics NICO NM3 monitor. The NM3 monitor was then attached to a Michigan Instruments Infant Test Lung set for a compliance of 3ml/cmH_2O. Tests were conducted with both the lung passive and configured for spontaneous breathing via coupling with a driving test lung. Testing was performed on Pressure Control - SIMV, Rate=20, PIP=25, PEEP=5, Pressure Support=10, Insp. Time= 0.7 seconds, FIO2=0.50. Measurement locations for exhaled tidal volume were at the ventilator, at the proximal end of the ETT with a flow sensor, and at the distal tip of the ETT where it enters the test lung using a NICO monitor. Paired-t tests were performed to look at differences in-between circuits, stratified by lung, and ventilator condition. **Results:** Mean and SD values for measured exhaled tidal volume across the different ventilation conditions and measurement positions are reported in the Figure. There were no statistically significant differences between the Pediatric and Adult/Pediatric Circuit in any condition or measurement location. The largest difference between circuits delivered to the test lung occurred with the SERVO-i in the active lung, mean Vte of 79ml with the Pediatric circuit and 73ml with the Pediatric/Adult circuit (P = 0.10). **Conclusions:** There does not appear to be significant compressible volume differences between the Air Life Pediatric and the Evaqua-2 Adult/Pediatric circuits when simulating passive and active breathing for a pediatric patient with poor lung compliance with either the AVEA or SERVO-i during Pressure Control ventilation.

Sponsored Research - None

2530907

PATIENT VENTILATOR INTERACTION DURING APRV/BIPAP MODES AMONG THREE VENTILATORS IN ARDS PATIENTS: A MODEL LUNG STUDY.

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Background: Airway pressure release ventilation (APRV) and biphasic positive airway pressure (BIPAP) modes can effectively improve ventilation/perfusion and oxygenation in ARDS patients but not widely used clinically. The reasons for that include frequent asynchrony occurring between patient and ventilator and lack of standard setting protocols. The purposes of the study were to find the most suitable settings for APRV/BIPAP modes in PB840, G5 and Servo-*i* ventilators and to assess which ventilator has better performance. **Method:** The ASL5000 was used to simulate the lungs of ARDS patients. The APRV/BIPAP mode with pressure high/low settings were 20/8 cmH_2O, FiO_2 100%, flow trigger 1 LPM (or 5 in Servo *i*). Three different augmented spontaneous breathing (ASB): none, pressure support 16 cmH_2O and 100% automatic tube compensation (ATC), combined with 5 different I/E time ratio: 1:5, 2:4, 3:3, 4:2 and 5:1 to formulate 15 test conditions were set on each ventilator. The computer was connected to the ASL 5000 to collect and analyze data gained after 10 min run of each conditions. **Results:** In G5 and Servo-*i* APRV/BIPAP modes with different ASB, both the best patient-ventilator interaction (represented as smallest values of TI delay and Ptrig) and the least work of breathing (represented as WOBtrig and PTP) were with pressure support. In the contrast, the worst and highest of each respectively were with none. However, the highest Ptrig and largest PTP with ATC but the lowest with pressure support have been found in PB 840. In the same ASB with different I/E settings, the increased WOBtrig, PTP, Ptrig and TI delay have been found with increased inspiration time, which was possibly due to the spontaneous breathing occurred at high pressure period. The respiratory waveform analysis demonstrated that there is no expiratory asynchrony in PB840 and Servo-*i* has the worst interaction. **Conclusions:** PB840 has better interaction due to longer synchronized interval and being able to adjust inspiration/expiration time. Expiratory asynchrony occurred in Servo-*i* and G5 due to shorter synchronized interval. Servo-*i* could not automatically adjust its inspiration/expiration time to cooperate with the simulated lung and has the worst interaction. In the same ventilator, using pressure support as ASB provides the best interaction and the least trigger work but without ASB or increase inspiration time settings would cause poorer patient-ventilator interaction and increased trigger work.

Sponsored Research - None

2531469

A QUEST TO FINDING THE OPTIMAL MECHANICAL BREATH PROFILE FOR THE MANAGEMENT OF ARDS: A PILOT ANIMAL STUDY.

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Background: Although ARDS mortality has been reduced significantly since 1967, there has been no further decrease in mortality since 1998, and remains >40%. Early application of low volume ventilation and open lung approach have been promoted as the best strategies to manage ARDS. Identification of the optimal mechanical breath profile (MBp) to obtain lung protection has proven more difficult than anticipated. The purpose of this animal study was to evaluate three different approaches to optimize mechanical ventilation after induction of lung injury. **Methods:** Three Yorkshire pigs were anesthetized, surgically instrumented and placed on mechanical ventilation with a tidal volume (Vt) of 10mL/kg, PEEP of 5cmH2O, and FiO2 1.0. Following lung injury by Tween instillation they were separated into 3 groups: ARDSnet low tidal volume and High PEEP (LVt/High PEEP), LVt plus recruitment maneuvers (LVt+RM), and airway pressure release ventilation (APRV). A group of 14 clinicians (LVt/High PEEP=5; LVt+RM= 5; APRV=4) from different centers in the US and Canada were responsible for the ventilator management of each animal for 5h. Ventilator changes during the study were made after reaching consensus. ABGs were obtained at baseline, after lung injury, and every hour. Driving pressures (Driving P), Vt, lung compliance (Cst), mean arterial pressure (MAP), and P/F ratios were recorded every hour. Necropsy was performed after 5h of MV. The lungs were extracted and re-inflated with 25 cm H2O pressure to appreciate gross changes. No statistical comparisons were made between variables as limited extrapolation of results can be achieved from a single subject on each group. **Results:** After injury, P/F ratio decreased (LVt/High PEEP=168; LVt+RM=174; APRV=84). Table 1 shows the mean values (SD) for variables recorded during the 5h of MV post lung injury. On the gross anatomy, all lungs showed areas of atelectasis that uniformly resolved upon reexpansion. **Conclusions**: The MBp used by teams varied considerably; reflecting the current approach to ventilate patients with ARDS. The application of different MBp resulted in acceptable pulmonary mechanics, hemodynamic, and gas exchange. Even under similar circumstances and using different approaches to MV, identifying the optimal MBp has to be individualized. Future study should extend the duration of lung protective ventilation MBp strategies to determine if there is a difference in clinically important markers of lung injury progression.

Sponsored Research - Dräger Medical funded travel for all study participants and covered the cost of animals and supplies for the pilot study. No honorariums were paid and Dräger Medical had no input on the content of the summit lectures or the observational pilot study, nor did they comment during the group discussions.

2531519

FREQUENCY AND PRIORITY LEVEL OF VENTILATOR ALARMS IN THE INTENSIVE CARE UNIT: A PRELIMINARY QUALITY ASSURANCE STUDY.

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Background: Alarm fatigue is a growing concern in the health care arena. It has been reported that 80 – 90% of alarms are considered nonactionable. Alarms add to the noise pollution in the ICU causing desensitization and decreased response rates. The FDA reported 500 alarm-related deaths over a 5-year period. Recently The Joint Commission published the need for alarm management as a Hospital National Patient Safety Goal. The purpose of our study was to determine which alarms trigger most often, whether they are adjustable, and their level of priority. **Methods:** The 7-day files for alarm history, trends and logbooks were downloaded from 41 Draeger V-500 ventilators. From these files the alarm type, frequency and priority level were determined, as well as the number of hours logged. The ICU that the ventilator was used in was also captured. Data was collected and summarized in Excel and processed using SPSS. **Results:** Data from 41 ventilators in 7 adult ICUs were collected. A total of 41 different alarms were identified; 8 (20%) of the alarm types were user adjustable, 33 (80%) were not. A total of 7480 alarms were logged; 2221 (30%) were user adjustable, 5259 (70%) were not. For all patients combined, an average of 76 alarms were logged per day (3.1/h); 38 (1.6/h) were high priority, 12 (0.5/h) medium and 26 (1.1/h) low priority alarms. Almost 60% of the alarms were triggered by 5 alarms: airway pressure high (1193 alarms, 16% of total, adjustable), pressure limited, VT not reached (1193, 16%, not), high PEEP (844, 11.3%, not), leakage (662, 8.9%, not), and VT high (508, 6.8%, adjustable). **Limitations**: Limitations include a small sample size, use of a single brand of ventilator, not accounting for different ICU's if moved between areas, and inability to assess if the alarm was triggered while the alarm silence was activated during patient care i.e. suctioning, bathing etc. or a patient condition. **Conclusions:** A majority of alarms that occurred were not able to be set by the bedside clinician. There is a need to find a balance of safe settings and nonactionable alarms, knowing that the majority of alarms are not adjustable. We plan to drill down into the most frequently occurring alarms to determine whether changes in management strategies might help to reduce the incidence of alarm occurrence. A closer examination of alarm management is necessary to identify guidelines that might reduce alarms. **Disclosures:** We have no conflicts of interest to disclose.

Sponsored Research - None

2531548

USE OF NONINVASIVE VENTILATION IN PEDIATRIC PATIENTS WITH PLEURAL EFFUSION ASSOCIATED WITH DENGUE VIRUS INFECTION: A RETROSPECTIVE REVIEW.

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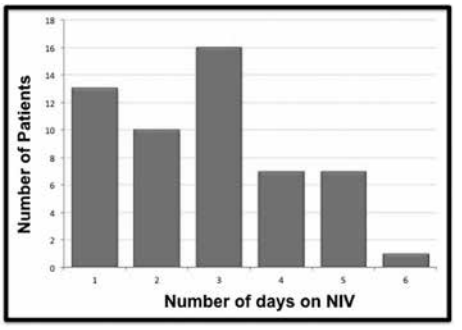
Background: More than one-third of the world's population lives in areas at risk for infection by dengue virus. Dengue is the most important mosquitoborne viral disease affecting humans. As many as 400 million people in over 100 countries are infected yearly and causes 19,000 deaths according to the WHO. Most cases of severe dengue occur in children under 15 years, and if associated with acute respiratory failure (ARF) and pleural effusion, mortality can be as high as 70%. Use of CPAP has been succesful in the managment of pleural effusion associated with other infectious diseases as it may play an important role on fluid absorption. Use of Noninvasive ventilation (NIV) has not been documented in patients with dengue and pleural effusion as a therapeutic alternative (1). **Methods**: A retrospective descriptive non-experimental study was conducted in a pediatric ICU from December 2011 to July 2013 in Cali, Colombia. Patients admitted to the ICU aged 1 to 15 years old with pleural effusion associated with dengue virus infection who received NIV were included in ths study. Age, ventilatory mode/settings, time on NIV and mortality were analyzed. SPSS 17.0 (Chicago, IL) was used for descriptive analysis. **Results**: Out of 113 patients admitted to the ICU for diagnosis of dengue, 54 had pleural effusion and respiratory distress and were placed on NIV. Sixty-one percent of the patients were between 7 to 12 years of age. The majority of patients (70.4%) required FiO2 <0.40 and most (81.5%) were placed on CPAP + PS. The mean level of CPAP used was ≤ 8 cm H2O (94.4%). Duration of NIV ranged from 1 to 8 days, but most patients (72.2%) were successfully weaned from NIV in less than 3 days (Figure 1). Only two patients required endotracheal intubation and died from multiple organ failure. **Conclusion**: Our results indicate that application of NIV, particularly CPAP may have accelerated the absorption of pleural fluid in this group of patients. CPAP may be considered as a therapeutic alternative for pediatric patients with pleural effusion associated with dengue. (1) Oliveira JT et al. Rev Bras Fisioter. 2010 Mar-Apr;14(2):127-32.

Sponsored Research - None



2531682

"IDENTIFYING THE OPTIMAL MECHANICAL BREATH PROFILE: AN ANIMAL CASE STUDY IN VENTILATION APPROACHES TO THE ARDS LUNG MODEL" A CONSENSUS BY THE INDIVENT WORK GROUP.

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Introduction: ARDS continues to be associated with high mortality since early recognition and institution of lung protective ventilation remains a significant challenge in the ICU. Recent literature suggests that mechanical ventilation (MV) should be individualized. Identifying the optimal mechanical breath profile (MBp) could theoretically decrease the incidence of ARDS. Our **Indi**vidualized Mechanical **Vent**ilation (IndiVent) Work Group convened to discuss current concepts and trends in ARDS mechanical ventilation (MV) management. **Methods:** Our group consisted of 14 respiratory care professionals from the US and Canada. Over two days, the group discussed concepts related to the optimal MBp and conducted an animal case study in ARDS. Three Yorkshire pigs, instilled with Tween for induction of ARDS, were used as a case study for three approaches to MV management (ARDSnet with High PEEP, ARDSnet with recruitment maneuvers, and Airway Pressure Release Ventilation). Teams discussed how the strategy was used to protect the lung, advantages and disadvantages, and questions related to its use. Perceived barriers to the implementation of lung protective ventilation and the concept of preventing ARDS with a personalized MBp were deliberated. The work group developed consensus statements and responses to key questions for optimizing the MBp, ARDS prevention and MV management. **Discussion:** Consensus statements coalesced into three broad concepts: **1. Preemptive protective ventilation should be implemented early.** Patients at risk for developing ARDS should be prospectively identified and known protective MV strategies instituted earlier**. 2) Macro-ventilation is not the same as micro-ventilation.** Conventionally monitored parameters are not necessarily reflective of processes taking place at the alveolar level. **3) The MBp for each patient should be individualized.** The specific components of a MBp, customized to be protective for each individual patient, may prevent ARDS onset but are not yet fully elucidated. **Conclusion:** The development of more reflective and clinically feasible monitoring tools is warranted. An early preventive approach to ARDS management deserves much more consideration.

Sponsored Research - Dräger Medical funded the travel and housing for all out of town members of the Individualized Mechanical Ventilation (IndiVent) Study Group and covered the cost of animals and supplies for the pilot study. No honorariums were paid and Dräger Medical had no input on the content of the summit lectures or the pilot study, nor did they comment during the group discussions.

2531712

THE EFFECT OF INCREASING AMPLITUDE AND PERCENT SUPPORT ON TIDAL VOLUME AND PEAK PRESSURE DURING PROPORTIONAL ASSIST VENTILATION.

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Background: There is increasing emphasis in preventing patient-ventilator asynchrony. Asynchrony may increase ventilator induced lung injury. Proportional Assist Ventilation (PAV) is a mode allowing the patient's effort to impact the support delivered by the ventilator. This patient-ventilator interaction might better acclimate to the patient's change in resistance, compliance and work of breathing. Recent publications show that PAV reduces patient-ventilator asynchrony. This mode is available on the Puritan Bennett 840 and 980 as PAV+. This bench study evaluated changes in peak pressure and tidal volume, at different time constants, as Percent Support and Amplitude (simulating patient effort) increased using an electronic lung simulator. **Methods:** The Hans Rudolph HR 1101 Electronic Lung Simulator was interfaced, using a size 7.5 ETT, to the PB 840. HR 1101 settings: Resistance 12 cm H_20/L/sec, Compliance 20 mL/cm H_20, Rate 15/minute, Amplitude 10, Load Effort Normal. The PB 840 was placed in PAV+ with PEEP of 3 cm H_20 and Percent Support of 20%. After stabilization, tidal volume and peak pressure were recorded; the average over five consecutive breaths is listed in the table. Percent support was then increased to 40%, 60% and 80%, with data gathered at each setting. Next, the Amplitude (patient effort) on the HR 1101 was increased to 15, 20 and 25. Data were gathered, as before, at Percent Support of 20%, 40%, 60% and 80%. Settings on HR 1101 were then changed to Resistance 18 cm H_20/L/sec and Compliance 35 mL/cm H_20, and data were gathered as detailed above. Finally, the same measurements were taken at Resistance 25 cm H_20/L/sec and Compliance 50 mL/cm H_20. **Results:** The data showed that as Percent Support was increased, tidal volume and peak pressure increased, at each time constant and at each Amplitude. Also, as Amplitude was increased, tidal volume and peak pressure increased, at each time constant and at each Percent Support. Please see the attached Table. **Conclusions:** This bench study confirmed that during PAV+, tidal volume and peak pressure are proportional to effort and to the Percent Support. Future studies are needed to confirm these findings in patients and to determine when to use PAV+, and what settings are appropriate for various patient situations. **Disclosures:** No authors have a conflict of interest related to this research or have received research funding, sponsorship or financial support from companies related to this research.

Sponsored Research - None

Resistance 18 cm H_2O/L/sec; Compliance 35 mL/cm H_2O; Time Constant 0.63 second

	Amplitude 10		Amplitude 15		Amplitude 20		Amplitude 25	
% Support	Vte (mL)	PIP (cm H_2O)	Vte (mL)	PIP (cm H_2O)	Vte (mL)	PIP (cm H_2O)	Vte (mL)	PIP (cm H_2O)
20	241	5.2	346	5.5	454	6.6	551	7.5
40	257	5.9	387	7.3	503	9.5	650	12.0
60	308	8.0	483	11.6	619	14.8	769	18.6
80	496	12.8	586	17.8	775	24.8	949	30.0

2531796

BUNNELL JET VENTILATOR PIP AND DELTA P ATTENUATION: ACROSS THE LENGTH OF FIVE SEPARATE ENDOTRACHEAL TUBE SIZES, AND USING FOUR DIFFERENT ON TIMES.

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Introduction: This bench study is a look at the attenuation of the JET PIP and DELTA P across the length of an ETT when exposed to varied ventilator settings. The study looked at the effects on PIP's with various ETT sizes, and what effects there would be on delivered PIP and DELTA P with increasing On Times (OT). **Method:** A performance checked Bunnell Jet ventilation was connected to a 0.5cc cm/H2O compliant test lung with uncut ETTs. The ETT sizes were; 2.0, 2.5, 3.0, 3.5, and 4.0. An appropriate Bunnell Life Port Adaptor (LP) was used for each ETT. The test lung pressures were measured with a TSI Certifier FA. The lung PIP's and Delta P's were recorded after each ventilatory change once the values had stabilized. The Jet ventilatory Delta P's were recorded, also. The PIP's used; 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, and 40. The OT's used were; 0.020sec, 0.026sec, 0.030sec, and 0.034sec. **Results/ Conclusions:** The attenuation across the ETT's was widely varied depending upon the ETT size, OT, and PIP (see charts). With lower PIP setting there was a larger delivered percent valve to the lung when compared to the more dynamic PIP's. Lengthening of the OT increased the delivered PIP and DEPTA P. The 2.0 ETT delivered 40% of the set PIP with an OT of 0.02sec. For each increase in 0.001sec of OT there was about 1% increase in the delivered PIP and Delta P. The 2.0 ETT delivered Delta P with an OT of 0.020sec was on average 27%. The 2.5 ETT produced an average delivered PIP of 55%, and Delta P average of 50% with the 0.020sec OT. There were steady increases in delivered PIPs and Delta Ps as the OT's were increased. When the OT of 0.034sec was employed the averaged delivered PIP was 73% and the Delta P was 71%. With the 3.0 ETT a convergence in the delivered values occurred. The 0.020sec OT produced a PIP of 64% and a Delta P of 62%. The remaining 3 OT's rendered identical values for the PIP and Delta P; 0.026sec was 80%, 0.030sec was 83%, and the 0.034sec was 85%. The 3.5 ETT had an average delivered PIP was 93% and Delta P was 98% with a 0.020sec OT. When the OT's were set to 0.026sec or more the delivered PIP's and Delta P's were 100%, or more of set values. The 4.0 ETT delivered values were; PIP 94% and Delta P 98% on a 0.020sec OT. OT's of 0.026sec and larger yielded values greater than 100%. The phenomenon of measured values being larger than the set parameters will require further investigation to explain.

Sponsored Research - None

2531801

AT WHAT POINT DO EXPIRATORY CO2'S ENTER THE INSPIRATORY LIMB OF THE HIGH FREQUENCY OSCILLATORY VENTILATOR?

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Introduction: Wilford Hall, San Antonio, Texas has reported finding exhaled CO_2 in the inspiratory limb of the High Frequency Oscillatory Ventilator (HFOV) 3100B. This study is to determine at what MAP vs Amplitude ratio (M:A) exhaled CO_2 begin to enter the inspiratory limb while using a HFOV 3100A. The M:A values will be discribed as a product of the Amplitude÷MAP. **Method:** A performance checked HFOV 3100A was connected to a 0.67ml compliant semi-ridged ported test lung with endotracheal tubes (ETT) (2.5mm, 3.0mm, 3.5mm). Blended Air/CO2 was injected at 0.25 Lpm to maintain a $PLungCO_2$ at 40-60 mmHg. Gas sampling to analyze the $PLungCO_2$ was sampled at 0.25 Lpm. The goal was to balance gas exchange within the test lung. The inspiratory limb of the HFOV circuit had a sample line inserted at the distal end of the inspiratory limb at the temperature probe port provimal to the patient Y to monitor for presence of CO_2. The HFOV parameters tested were: bias flows of 15 and 20 Lpm, MAPs(10, 12, 14 and 16, Hertz 6, 7, 8, 9, 10, and ETT sizes 2.5, 3.0, 3.5. **Findings:** CO_2 were measured in the inspiratory limb of the HFOV circuit. It was found that as the MAP increased the M:A decreased. As bias flows were increased, a larger M:A was needed to measure CO_2 in the inspiratory limb. The average M:A using 15 Lpm bias flow were 3.0 with the 2.5 ETT, 2.6 with the 3.0 ETT and 2.5 with the 3.5 ETT. At 20 Lpm bias flow the average MA ratio was 3.2 with the 2.5 ETT, 3.0 with the 3.0 ETT and 2.8 with the 3.5 ETT (see graphs 1,2,3,4,5, and 6). The overall MA ratio was 2.8 (see graph 7). **Conclusion:** Expire CO_2 does enter the inspiratory limb as the Amplitude increases. M:A ranged from 1.9 to 3.5 in this lung model. CO_2 will likely be noted in the inspiratory limb of the HFOV 3100A when the M:A averages 2.4 or greater(capture of 95% of the data collected). These results may impact clinical manage of HFOV 3100A when the M:A of 2.4 or greater. Increasing bias flows may reduce the incidence of CO_2 s in the inspiratory limb with M:A's ≥ 2.4. Further research is needed to determine if this occurs at the bedside and the potential clinical impact.

Sponsored Research - None

2531914

DISCERNING EXPIRATORY TIME VS. PRESSURE IN PREVENTING IN VIVO ALVEOLAR COLLAPSE.

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Background: ARDS pathology can be exacerbated through a secondary ventilator induced lung injury. One mechanism is alveolar collapse and reopening causing dynamic strain on alveolar walls with each breath. PEEP is commonly used to minimize alveolar collapse during expiration; however, with long expiratory durations alveoli collapse at any set PEEP. We hypothesized a brief expiratory duration would minimize alveolar collapse as compared with a longer expiratory duration at the same PEEP in a rat model of ARDS. **Methods**: In full accordance with SUNY Upstate IACUC guidelines, Sprague Dawley rats were euthanized and their excised lungs mechanically ventilated. Surfactant was deactivated with 5% Tween 20. APRV was used to control expiratory duration (T Low). In the Time-Controlled PEEP group (TC-PEEP), T Low was set so the breath terminated with end expiratory flow (EEF) to peak expiratory flow (PEF) ratio of 75% and a set expiratory pressure (P Low) of 0 cmH_2O. In the conventional PEEP group (C-PEEP), P Low was adjusted to correspond with the total PEEP (T-PEEP) value and T Low was extended until the flow reached zero. High-resolution images were captured with an *in-vivo* microscope. T-PEEP was measured by creating a no flow state to derive lung pressure during the expiratory phase. Alveoli during the expiratory phase were filmed in the same microscopic field. Alveolar surface area from end inspiration through expiration in each field was quantified using computer image analysis and expressed as the percent (%) alveolar occupancy of the entire microscopic field to determine timing and degree of alveolar collapse during expiration. **Results**: % Alveolar occupancy was greater in all fields in the TC-PEEP group vs the C-PEEP group demonstrating reduced alveolar collapse at expiration (p=0.003; Fig 1A). A shortened T Low prevented alveolar collapse (Fig 1B, solid line) whereas the same alveolus collapsed if subsequent T Low was extended at the same PEEP (Fig1B, Dotted Line). **Conclusion**: Alveolar collapse was prevented using a short T Low as compared with a longer T Low at the same level of PEEP. To our knowledge this is the first study to directly measure the role of time and pressure on alveolar collapse. These data suggest using a short expiratory duration may reduce alveolar dynamic strain and prevent lung collapse at a lower PEEP than when using conventional ventilation.

Sponsored Research - None

2531928

A BENCH STUDY OF INHALED NITRIC OXIDE DELIVERY DURING HIGH FREQUENCY PERCUSSIVE VENTILATION.

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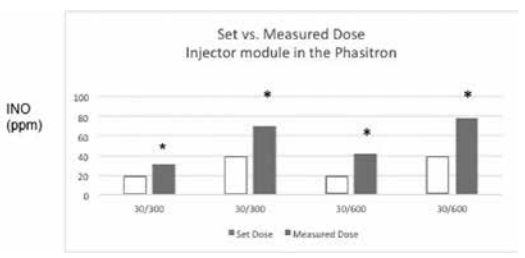
Background: Safe and effective delivery of inhaled nitric oxide (NO) requires the appropriate interface of ventilator and INO delivery device. **Methods:** We compared nitric oxide (NO) delivery using 4 configurations with the Sinusidal Bronchotron ® and INOmax DSIR Plus ® in a lung model. In two configurations a supplemental continuous gas flow of 5 and 10 L/min was directed through the injector module (IM) of the INOmax DSIR and delivered distal to the sliding venturi (Phasitron ®). In two configurations the IM was added in the drive-line of the sliding venturi or distal to the sliding venturi in the inspiratory/expiratory gas flow. Ventilator settings were held constant at an amplitude of 40 cm H_2O, PEEP of 10 cm H_2O, respiratory rate of 30 bpm, inspiratory time of 0.7 secs and expiratory time of 1.3 seconds. Pulse frequency was varied between 300 and 600 cycles per minute. An infant lung model was used with lung compliance held constant at 0.003 L/cm H_2O and resistance at 40 cm H_2O/L/s. Delivered NO, NO_2 and inspired oxygen (FIO_2) were measured using electrochemical and galvanic analyzers. The mean difference between set and measured NO was calculated and compared between configurations using ANOVA. **Results:** Placement of the IM in the drive-line of the sliding venturi resulted in a fall in amplitude by 75% and testing was halted. With both continuous flow techniques there was no appreciable NO_2 generated but the mean difference between set NO and measured NO was 83% (set NO 20 ppm measured NO at 5 lpm was 3.5 ppm and at 10 lpm NO was 7.1 ppm ($p<0.001$). Doubling flow resulted in an increase in mean NO dose of two-fold. Placement of the IM between the sliding venturi and lung model resulted in an increase of NO_2 to a peak of 2.4 ppm (mean 2.33 ± .06) and a mean difference between set and measured NO of 55% and 75% (Figure 1) at 20 and 40 ppm. NO2 was 1.22 and 0.94, at 20 and 40 ppm, 600 cpm). None of the test configurations delivered measured concentrations within 50% of set concentrations, no alarms or interruption of NO delivery occurred during the testing **Conclusions:** The dual gas delivery system of the Bronchotron ventilator complicates accurate NO delivery. Both over and under delivery may occur. None of the configurations tested delivered a monitored dose within 50% of the set NO dose. The combination of these two devices should be accomplished with caution and vigilance to enhance patient safety.

Sponsored Research - Study was sponsored by Mallinckrodt. RB and JG designed the experiment. RB and JG were present for all the testing. RB and DR conducted the data analysis and wrote the abstract.



Set NO dose (white) and measure NO dose (black) with the injector module in line with the phasitron. Horizontal axis is amplitude and frequency setting. * p<0.001 set vs measured.

2532065

CLAMPING THE ENDOTRACHAEL TUBE USING OPTIMAL CLAMPING TECHNIQUE PRIOR TO DISCONNECTION MAINTAINS AIRWAY PRESSURE REDUCING RISK OF DERECRUITMENT.

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BACKGROUD: Planned or inadvertent disconnection of the ventilator circuit has been associated with a decrease in functional residual capacity (58%) in a lung injured porcine model. Some have proposed during mechanical ventilation to clamp the endotracheal tube (ETT) in patients with high mean airway pressure (Paw) when disconnecting from the ventilator to minimize derecruitment. A previous abstract concluded that clamping the ETT might not be an effective method because the airway pressure was not maintained during the clamping procedure. We hypothesize that the method used would be critical in maintaining pressure loss and minimize derecruitment. **METHODS:** Using a Michigan Instruments Adult/Infant TTL Training/Test lung model 2601i with PneuView Interface Module (Michigan Instruments, Grand Rapids, MI) a fixed compliance of .035 L/cmH_2O with no resistor was set and connected to a laptop computer with PneuView software. A 60 cm, 22.0 mm ID silicone smooth bore ventilator circuit tube was used as an artificial airway and "intubated" with 7.0 and 8.0 mm ID endotracheal tubes (Mallinckrodt, Dublin Ireland). The ETTs were connected to a Dräger Evita Infinity V500 ventilator (Dräger Medical Luebeck Germany) in the Pressure Control – Assist Control (PC-AC) mode with a respiratory rate 10 breaths/minute, inspiratory pressure (Pinsp) 35 cmH_2O, PEEP 20 cmH_2O, inspiratory time 2.20 seconds and slope of 0 seconds. A non-sharded surgical hemostat was used to clamp the ETT utilizing optimal clamping techniques while taking care to protect the ETT. The ETTs were clamped during the end inspiratory phase and disconnected from the ventilator. The ETT remained clamped for 10 seconds and Pneu-View data recorded. After 10 seconds, the ETT was reconnected to the ventilator circuit and the clamp was released. This procedure was repeated at PEEP with same data recorded. Each test at both pressure levels was repeated five times. **RESULTS:** Clamping 7.0 and 8.0 ETTs during Pinsp 35 cmH_2O resulted in an average peak inspiratory pressure (PIP) of 34.76 cmH_2O and 33.53 cmH_2O and average Paw of 31.86 cmH_2O and 29.76 cmH_2O respectively. Clamping 7.0 and 8.0 ETT during expiration with a set PEEP of 20 cmH_2O resulted in an average PIP of 20.60 cmH_2O and 20.84 cmH_2O and average Paw of 21.11 cmH_2O and 21.02 cmH_2O respectively. CONCLUSION: This data suggest that derecruitment can be minimized with proper ETT clamping technique prior to disconnection from the ventilator.
Sponsored Research - None

2532075

COMPARISON OF TIDAL VOLUME DELIVERED FROM TWO CIRCUITS WITH THE VDR-4 CRITICAL CARE VENTILATOR - A BENCH MODEL.

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Background: High frequency percussive ventilation is a modality that combines the benefits of high frequency with conventional mechanical ventilation. The VDR-4 uses a Phasitron as a sliding venturi manifold to deliver percussive breaths to get behind secretions and propel them to the mainstem airways providing continuous bronchial hygiene and adequate ventilation. There are two available circuit configurations; however, neither has been identified as superior. The VDR-4 is pressure-targeted with the inability to measure tidal volume, thus we rely heavily on transcutaneous CO_2 monitoring, arterial blood gas analysis, and chest radiography to optimize the ventilator patient relationship. Lung mechanics can change rapidly and lung protective ventilator strategies may be lost. Differences in the properties of the Traditional versus HUB circuits may influence tidal volume delivery. We hypothesize that the position of the Phasitron farther from the patient wye allows for consistently lower and more stable tidal volume, pressure, and flow delivery to the lungs, lowering the risk for adverse outcomes that are associated with all forms of mechanical ventilation. **Methods:** A bench study using the ASL 5000 Active Servo Lung Precision Breathing Simulator programmed as an 18 kilogram five-year-old patient with a lung resistance of 50 cmH_2O/L/s, compliance of 15 mL/cmH_2O, and FRC of 0.3 L. Flow measurements were collected using a Fleisch pneumotachometer and tidal volumes were calculated in conjunction with the PowerLab software. Tidal volume, flow, and airway pressure data was collected and compared between the HUB and Traditional circuits at six different VDR-4 settings. Data was analyzed by descriptive statistics and an unpaired, two-sided, two sample t-test. **Results:** See table 1. Conclusion: Total flow and delivered tidal volume over a convective breath was significantly larger ($p < 0.001$) via the HUB versus the traditional circuit when all conditions were equivalent. Tidal volume delivery ranged from 12.09 to 53.80 mL/kg at various settings, neither of which are lung protective regardless of circuit. Volume delivered by the HUB was over four times that of the traditional circuit, making the HUB circuit more efficient at CO_2 removal at the expense of lung protection. This may be due to increased compliance of the traditional circuit resulting in more volume lost to mechanical deadspace in combination with the filling phenomenon that is possible with use of the HUB.
Sponsored Research - None

2532131

CHANGES IN NATIONAL HEALTHCARE SAFETY NETWORK (NHSN) CRITERIA RESULTED IN AN INCREASE IN VENTILATOR-ASSOCIATED EVENT (VAE) AND INFECTION-RELATED VENTILATOR-ASSOCIATED COMPLICATION (IVAC) RATES AT OUR MEDICAL CENTER.

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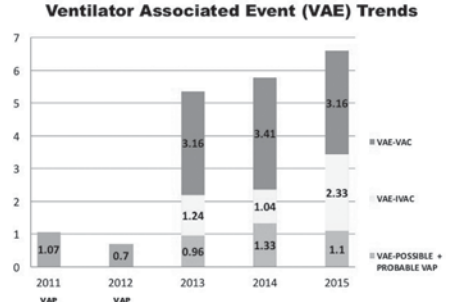
BACKGROUND – In 2013, the CDC's NHSN ventilator-associated event (VAE) surveillance protocol for adults was implemented at our 530 bed community hospital with 68 ICU beds. In 2015, our multidisciplinary VAE team promoted VAE prevention strategies, incorporated 2015 NHSN revisions to the VAE surveillance criteria, monitored outcomes, and communicated results to hospital staff and committees. **METHODS –** We reviewed VAE data from the hospital surveillance program on consecutive patients initiated on ventilators from 2013-2015 and compared it to ventilator - associated pneumonia (VAP) rates from 2011-2012. **RESULTS –** Prior to 2013, our VAP rate for 2011-2012 was 0.85 cases per 1,000 ventilator days (12 cases per 14,138 ventilator days) while the new VAE combined possible and probable VAP rate in 2013-2014 was 1.14 cases per 1,000 ventilator days (16 cases per 14,040 ventilator days, with 15 possible and 1 probable VAP). The difference in VAP and PVAP rate was not significant (p=0.447. From 2013-2015, a total of 5,946 patients were initiated on ventilators. The annual total of VAEs increased from 39 to 48 with rates increasing from 5.4 to 6.6 cases/1,000 ventilator days. This was not a significant change, p-value of 0.339. A review of the 2015 PVAP cases identified that six of the eight cases were trauma patients. The most significant finding in 2015 was an increase in IVACs, 7 in 2014 and 17 in 2015. The difference was not statistically significant, p-value of 0.177. Increase in cases meeting VAC criteria was noted due to the NHSN clarification that required including the lowest ventilator settings of less than one hour duration in patients intubated during the last hour of the day. **CONCLUSION –** NHSN modification of lowest ventilator setting criteria contributed to an increase in cases meeting the VAE and IVAC definitions. The increase in total VAEs and IVACs did not increase the number of PVAPs. Establishing national benchmarks for VAE results would be helpful to guide VAE surveillance and prevention efforts. (no table selected)
Sponsored Research - None



2529489

PRESSURE RELIEF VALVE INFLUENCE ON WESTMED HIGH FLOW NASAL CANNULA FLOW DELIVERY.

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Background: The neonatal nasal cannula (NC) has high resistance to flow which may result in increased circuit pressures during Humidified High Flow NC administration. The Westmed Pressure Safe neonatal NC™ (Westmed, Inc, Tucson, AZ) has a variable pressure relief valve (PRV; 16-21 cmH_2O) and was tested with three circuit configurations containing two different PRVs. We hypothesized that presence of a PRV incorporated in either the NC or circuit would limit pressure with consequent reduction in flow delivered distal to the NC. **Methods:** The NC was first attached to an infant circuit containing a 40 +/- 5 cmH_2O PRV (RT329; Fisher & Paykel Healthcare, Ltd, Auckland, New Zealand). Gas was supplied to the circuit via a standard flowmeter at flows of 1–10 L/min. Four sets of the following measurements were obtained via the FlowAnalyzer™ PF 300 (intmedical, Buchs, Switzerland): 1) flow from the NC (delivered flow) and circuit (set flow) and 2) pressure of the NC and circuit. These measurements were then obtained with the PRV removed from the RT329 circuit at flows of 2, 4, 6, 8 and 10 L/min and with the Hudson RCI® Comfort Flo® circuit incorporating a 352 cmH_2O PRV (Teleflex Medical, Wayne, PA). The proportion of flow lost (set flow – delivered flow / set flow) was modeled using a single-way ANOVA with circuit type, set flow and the interaction between the two. Analyses were performed using R 3.1.0 software (R Core team, The R Foundation for Statistical Computing, Vienna, Austria). **Results:** Flow loss was significantly associated with circuit type ($p<0.001$) and set flow ($p<0.001$). The Pressure Safe™ NC combined with the circuit including a 40 +/-5 $5cmH_2O$ PRV was associated with greater flow loss as compared to the other circuits ($p<0.001$), reaching a loss of 40.1% at 10 L/min (Fig. 1). During maximal flow loss, pressure measured at the NC approached 8 cmH_2O, while the pressure in the RT329 circuit proximal to the PRV reached a mean of 40 cmH_2O. **Conclusions:** As circuit pressures reached the RT329 PRV setting, delivered flow through the Westmed NC was significantly reduced. Flow was unaffected when the PRV was taken out or when connected to the Hudson RCI® circuit containing a higher PRV. The pressure within the Pressure Safe™ NC never reached its integrated PRV level. Clinicians should understand the impact of a PRV on delivered flow when using a neonatal High Flow NC in order to assure delivery of intended flow.

Sponsored Research - Circuits were obtained from both Fisher & Paykel Healthcare and Teleflex Medical.

2530247

INTRAPULMONARY PERCUSSIVE VENTILATION ASSIST IN WEANING PEDIATRIC PATIENTS FROM EXTRACORPOREAL MEMBRANE OXYGENATION.

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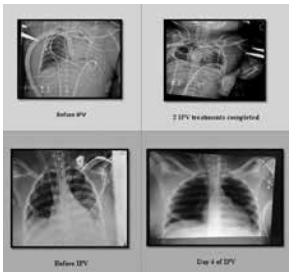
Veno-Arterial (VA) and Veno-Veno (VV) extracorporeal membranous oxygenation (ECMO) utilized as a salvage technique during in-hospital cardiac arrests with adequate but unsuccessful advanced life support. Pediatric patients requiring VA -ECMO are centrally cannulated through the chest and remain with an open chest throughout their ECMO therapy. An open chest makes it a challenge for standard secretion clearance modalities including patient positioning and manual chest physiotherapy. Cannulation sites for VV-ECMO vary according to patient size. Intrapulmonary Percussive Ventilation (IPV) has been used as a method for delivering bronchodilators, secretion clearance, and to provide positive pressure to decrease atelectasis, but has not be documented to be used with VA-ECMO patient with an open chest or on a VV-ECMO patient. CASE SUMMARY A 36-week neonate was born Left Ventricle Hypoplastic Heart Complex. The patient was placed on ECMO due to cardiac arrest. The patient had a sternotomy leaving the patient's chest open during the ECMO therapy courset. On day 10 of ECMO, the patient's chest x-ray demonstrated diffuse edema and atelectasis of the left lower lobe. IPV was connected directly to the endotracheal tube with a pressure of 25 mmHg for a good chest wiggle in the patient. After two treatments a CXR demonstrated significant improvement in atelectasis and aeration.. During and after therapy copious thick yellow secretions were suctioned from the patient. A 16-year-old patient status post ruptured appendix was admitted for V/V ECMO for the management of ARDS. Escalation of ECMO settings continued in the next five days despite the use of prone positioning and mucolytic treatment. Late on day 5, IPV Q4 hours was initiated. At this time, sweep gas flow was set at 4.5 liters per minute (L/Min) and the tidal volume was minimum. Day 2 of IPV the tidal volumes doubled, sweep gas flow was decreased to 3.5 l/min. On day four, the patient was decannulated from ECMO. Day 7 the patient was extubated and ventilator-free. DISCUSSION: The purpose of this abstract is to publish that IPV and ECMO in pediatric cases are beneficial. There is currently no published data to support it. CONCLUSION: These two cases demonstrate the safe utilization of IPV in pediatric patients on ECMO with an open chest to aid in secretion management and lung recruitment with VV and VA-ECMO. IPV should be considered a treatment modality on all ECMO patients.

Sponsored Research - None



2530528

DEAD SPACE AND RESISTANCE CHANGES BETWEEN CUT AND UNCUT PEDIATRIC ENDOTRACHEAL TUBES IN A BENCH MODEL.

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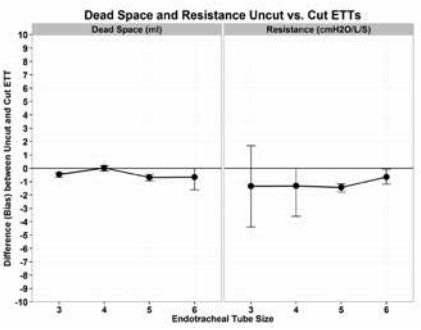
Background: Pediatric and neonatal endotracheal tubes (ETTs) are often cut in an effort to reduce resistance and dead space, but it is unclear whether or not this practice is necessary. The objective of this bench experiment was to quantify the change in dead space and resistance when decreasing the length of ETTs. **Method:** Uncuffed Mallinckrodt ETTs size 3,4,5, and 6mm ID were tested at full length, at 4/5th total length (commonly used cut length in our ICUs), and just using the adapter by itself. Experiments were repeated with a new tube each time, in triplicate. To measure ETT (or adapter) volume, we suspended the ETT upright and connected a small blunt tip needle and 3 way stop-cock to the distal tip of the ETT, and filled it with water until full. ETT resistance was calculated on all 3 conditions by delivering an ETT size appropriate constant flow rate of 4, 6, 10, and 18 LPM for size 3, 4, 5, and 6 ETTs respectively, and measuring both flow and pressure to calculate resistance. Flow rates used for the resistance calculations were derived from the median peak inspiratory flow rates per ETT size from an *in-vivo* data set of 409 intubated children on CPAP. [1] **Results:** Mean and range values for the difference between uncut and cut ETT dead space and resistance are reported in the Figure. After cutting the ETTs, mean dead space reduction was 0-0.7ml, and the mean resistance reduction was 0.7-1.4 $cmH_2O/L/S$ (0-6.3%). The ETT adapter alone contributed 22-57% of the total measured dead space and 56-80% of the total measured resistance in uncut ETTs. **Conclusions:** The changes to dead space and resistance are minimal (< 1ml and < 1.5 $cm/H_2O/L/S$ respectively) when cutting ETTs by 20%, with a large percentage being attributed to the ETT adapter alone. While there may be other reasons to not cut ETTs (unplanned extubation, kinking), there is virtually no benefit for dead space or resistance. **Reference:** 1. Khemani RG, Hotz J, Morzov R, et al. Evaluating Risk Factors for Pediatric Post-extubation Upper Airway Obstruction Using a Physiology-based Tool. *Am J Respir Crit Care Med.* 2016;193(2):198-209

Sponsored Research - None



2530741

ARTERIAL BLOOD GAS ABNORMALITIES AND THE RISK OF INTRAVENTRICULAR HEMORRHAGE OR NECROTIZING ENTERCOLITIS IN PRETERM NEONATES.

Melissa K. Brown, Kasim Hassen, Debra Poeltler, Vanessa Brown, Brianna Pierce, Dhruv Patel, Wade Rich, Anup Katheria; Neonatal Research Institute, Sharp Mary Birch Hospital for Women & Newborns, San Diego, CA

Background: Changes in arterial carbon dioxide levels affect cerebral blood flow. Hypercapnia, hypocapnia, and acidosis have been linked with intraventricular hemorrhage (IVH) risk in preterm neonates. The objective of this analysis was to test the hypothesis that extremes of $PaCO_2$ and acidosis during the first 3 days after birth are associated with adverse events such as intraventricular hemorrhage (IVH) and necrotizing enterocolitis (NEC) in preterm neonates. **Methods:** A retrospective analysis was performed on 150 infants < 32 weeks GA, without congenital anomalies, who were part of a delayed cord clamping clinical trial between August 2014 and October 2015. Three infants without ABGs were excluded. All ABGs in the first 72 hours of life were included in the analysis. The means of the variables $PaCO_2$, $PaCO_2$ maximum, $PaCO_2$ minimum, $PaCO_2$ fluctuation ($PaCO_2$ maximum-minimum & $PaCO_2$ Standard Deviation), pH minimum, and Base Excess were analyzed with an unpaired student T-Test and logistic regression. Level of significance was set to < 0.01 to protect against false positives due to multiple comparisons. The study was reviewed by the Sharp IRB. **Results:** A total of 1341 samples were analyzed from 147 subjects, 9.3 ± 4.9 samples per subject. GA was 28 ± 2 weeks, BW was 1206 ± 394 grams. Minimum $PaCO_2$ was not significant for any of the variables. The results are displayed in the table below. **Conclusions**: Infants with severe IVH had significantly lower mean values for minimum pH. Infants with the compound outcome of death/IVH had significantly higher values for mean and fluctuations in $PaCO_2$. **Disclosures:** Wade Rich is a paid consultant with Windtree Therapeutics. Sponsored Research-None

Sponsored Research - None

Outcome	Predictor Variable	Mean (SD) Outcome= Yes	Mean (SD) Outcome= No	P-Value
IVH 3,4/ Death n=10	BE	-6.7 (3.3)	-4.4 (2.8)	.013
	pH min	7.03 (.25)	7.23 (.09)	.036
	Max PaCO2	75.0 (24.9)	58.6 (15.7)	.035
	Mean PaCO2	52.3 (11)	44.7 (5.8)	.002*
	SD PaCO2	12.6 (8.7)	7.8 (4.5)	.010
	Δ PaCO2	37.1 (23.9)	22.9 (15.3)	.008*
IVH 3,4 n=5	BE	-6.4 (2.8)	-4.6 (3.0)	.191
	pH min	7.05 (.21)	7.22 (.11)	.002*
	Max PaCO2	69.7 (11.9)	59.8(17.7)	.219
	Mean PaCO2	50 (5.7)	45 (6.5)	.096
	SD PaCO2	11.0 (4.2)	8.0 (5.0)	.188
	Δ PaCO2	31.0 (11.9)	24.1 (17.2)	.377
IVH any n=19	BE	-4.7 (3.5)	-4.6 (2.9)	.984
	pH min	7.13 (.15)	7.22 (.11)	.029
	Max PaCO2	69.2 (16)	58.8 (17.4)	.016
	Mean PaCO2	48.7 (6.5)	44.7 (6.3)	.011
	SD PaCO2	10.3 (3.4)	7.8 (5.1)	.046
	Δ PaCO2	32.4 (15.9)	23.1 (16.9)	.026
NEC n=4	BE	-7.7 (4.4)	-4.6 (2.9)	.040

*Significant at p<.01

2531835

THE INCIDENCE OF HYPOCAPNIA AND HYPERCAPNIA IN VENTILATED AND NON-VENTILATED PREMATURE NEONATES< 32 WEEKS GESTATIONAL AGE.

Melissa K. Brown, Kasim Hassen, Stephanie Freeman, Danielle Lazarus, Sarah Gonzales, Debra Poeltler, Wade Rich, Anup Katheria; Neonatal Research Institute, Sharp Mary Birch Hospital for Women & Newborns, San Diego, CA

Background: Hypercapnia and hypocapnia have been recognized to be a risk factor for intraventricular hemorrhage, periventricular leukomalacia, and poor neurological outcomes. Studies have questioned the safe ranges of permissive hypercapnia and the role pH plays in the relationship. Our goal was to determine the incidence of hypocapnia, hypercapnia, and an arterial pH of < 7.20 in a cohort of premature infants < 32 weeks. **Methods:** A retrospective analysis was performed on 150 infants < 32 weeks GA, without congenital anomalies, who were part of a delayed cord clamping clinical trial between August 2014 and October 2015. Three infants without ABGs were excluded. All $PaCO_2$ and pH values were analyzed from ABGs during the first 72 hours of life. Subjects were sub-analyzed by GA < 28 weeks and by mode of respiratory support. The data were analyzed with an unpaired student T-Test with significance set at p< 0.05. The study was reviewed by the Sharp IRB. **Results:** A total of 1316 samples were evaluated. The mean (SD) GA was 28 (2) weeks and the BW was 1206 (394) grams. The table provides the mean (SD) $PaCO_2$ and the $PaCO_2$ range by percent of the values for that category. The mean $PaCO_2$ for subjects < 28 weeks was not significantly greater than subjects ≥ 28 weeks p= .094. The mean $PaCO_2$ on high frequency ventilation (HFV) was significantly greater than conventional ventilation (CV) p< 0.001. Of the total samples 10% had a pH < 7.20. The mean pH for subjects < 28 weeks was not significantly less than subjects ≥ 28 weeks p= 0.717. The mean pH for subjects on HFV was 7.20 (0.12) compared to the mean pH for subjects on CV 7.29 (0.09) p< 0.001. **Conclusion:** Hypocapnia was relatively uncommon in our cohort. Hypercapnia was more common in all modes, and most frequent during HFV. The pH was more acidotic during HFV. The non-ventilated neonates had primarily normal $PaCO_2$ of 35-45 mmHg. Disclosures: Wade Rich is a paid consultant with Windtree Therapeutics.
Sponsored Research-None
Sponsored Research - None

Subject Type Mode of Respiratory Support	Number of Samples	Mean $PaCO_2$	Standard Deviation	$PaCO_2$ ≤ 30 %	$PaCO_2$ 35-45 %	$PaCO_2$ 45-55 %	$PaCO_2$ 55-65 %	$PaCO_2$ ≥ 65 %
All Subjects	1316	46.7	11.9	1.7	47.0	26.5	13.0	6.5
GA < 28 Weeks	584	48.7	11.9	0.9	41.6	25.5	18.5	8.2
High Frequency Ventilation	116	58.4	14.4	0.9	7.8	35.3	37.1	18.1
Conventional Ventilation	458	48.0	13.5	2.0	39.7	27.5	15.7	8.1
Non-Invasive Ventilation	12	48.9	15.3	0.0	50.0	16.7	8.3	16.7
CPAP	690	44.0	8.8	1.9	55.2	24.3	7.8	3.5
HFNC	37	40.5	4.9	0.0	70.3	16.2	0.0	0.0
Room Air	3	38.5	4.7	0.0	66.7	0.0	0.0	0.0

2531314

BRONCHIOLITIS OPTIMAL CARE: AN ENTERPRISE EFFORT TO REDUCE VARIATION IN BRONCHIOLITIS MANAGEMENT ACROSS THE CARE CONTINUUM.

Lisa V. Wright[1], Jeffrey Bennett[1], Craig Carter[2], Landon Jones[2], Susan Robbins[3], Suzanne Springate[1], Charles Lush[4], Daniel Cotter[5]; [1]UK HealthCare, Kentucky Children's Hospital, Lexington, KY; [2]Emergency Medicine, UK HealthCare, Lexington, KY; [3]Pediatrics, UK HealthCare, Lexington, KY; [4]Finance, UK HealthCare, Lexington, KY; [5]Information Technology, UK HealthCare, Lexington, KY

Background: UK HealthCare sought to implement 2014 AAP practice guidelines for bronchiolitis across the care continuum in order to reduce variation in practice and reduce the use of low value interventions. Nasopharyngeal suctioning, family education, and better communication during care transitions were identified as pillars of care optimization. **Method:** Stakeholders from the inpatient, outpatient and emergency room areas adopted a shared approach to clinical management of bronchiolitis that emphasized suctioning and deemphasized routine use of bronchodilators, steroids, antibiotics, x-rays, and viral testing. Tools were built to align discharge education and improve transition communication. Pediatric clinics were given suction equipment and trained in its use. Respiratory therapists working in the emergency room were trained to suction pediatric patients. Retrospective (2011-2015) utilization data and outcome trends (LOS, ED admission rate, variable cost, and readmission rates) were collected. Achievable benchmarks of care (ABCs) were established for the utilization of interventions deemed to be often of low value in bronchiolitis management. IRB application was submitted and a waiver letter was received. **Results:** Preliminary data show a drop in utilization for all low value interventions in the ED and inpatient areas (see table). The ED achieved the benchmark rate for all five low value interventions. The inpatient area achieved the benchmark rate for two of the five low value interventions. Preliminary data from 2016 also demonstrate a decline in ED admissions. **Conclusions:** UK HealthCare demonstrated that reducing low value interventions for bronchiolitis across the care continuum is possible when teams from various care areas work together to implement evidence based guidelines. Low value interventions were replaced by the use of higher value interventions (suctioning, education, communication). Pediatric respiratory therapists were critical in training nursing and ED respiratory therapists to successfully transition to using nasopharyngeal suction as a first line intervention instead of bronchodilators. More study is needed to determine if reduction in ED admissions correlates with receiving optimal care. More review is needed to understand why the ED was more successful than the inpatient areas in achieving the benchmark rates. **Disclosures: None**
Sponsored Research - None

2531792

LESSONS LEARNED FROM BEDSIDE SMOKING COUNSELING PILOT PROGRAM DURING 2016 RSV SEASON.

Belinda Huffman, Priyanka Vora, Susan M. Ciarlariello; Respiratory Care, Dayton Children's Hospital, Dayton, OH

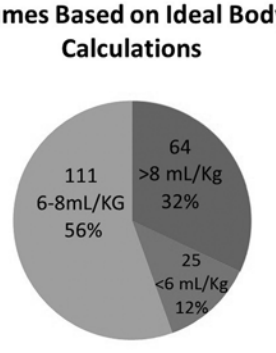
Background: The AAP 2014 Clinical Practice Guidelines for the Diagnosis and Treatment of RSV Bronchiolitis recommends bedside smoking counseling for parents of hospitalized infants. In 2015, the respiratory care department at Dayton Children's Hospital proposed a bedside smoking cessation pilot program using the 3 A's (ask, advise and assess willingness to quit) and R (refer) of the US DHHS "Treating Tobacco Use and Dependence" CPG. An offer of free nicotine replacement therapy (NRT) was added to encourage quitting. **Methods:** Smoking cessation counseling orders were added to our bronchiolitis order set. The Pulmonary Health Coordinator (PHC) scripted a document for staff use with parents at the bedside. Pharmacy placed NRT (lozenges, gum and patches) in Pyxis for staff to dispense to willing parents. Dosing guidelines and contraindications were defined. Staff were trained, but the intensity of the RSV season diverted them to acute care. The bulk of the counseling then fell on the PHC to complete. With one expert using each encounter as a learning opportunity, we employed the "small tests of change and PDSA methodology" to adapt our approach. **Results:** The PHC attempted 155 bedside interviews with parents. Eighteen (12%) were not available at bedside. Overall, eighty-six (65%) admitted that a smoker lived in the home or cared for their child. Of note, 33 of the 86 bedside parents had said "no" to the nursing admission screen question "Does anyone smoke in your home?" However when the question was rephrased as "Does anyone in the home or who cares for the child smoke?" the answer was "yes." Sixty-nine (80%) of the parents who admitted smokers were in the home were accepting of the advice on second and third-hand smoke. When assessed for their willingness to not smoke during their infant's hospitalization, 40 of 57 smoking parents at the bedside (70%) were willing; three only wanted stress kits and 37 (65%) agreed to a trial of NRT. Seven were not given NRT due to contraindications; thirty smoking parents (53%) trialed at least one form of NRT with no adverse effects reported. **Conclusion:** Asking the right question was key to accurately assessing the infant's exposure to second hand smoke. With a non-judgmental approach, parents admitted to smoking and the majority of parents were receptive, not resistant, to the counseling received. The majority of smoking parents approached at the bedside were willing to try free NRT during their infant's stay.
Sponsored Research - None

2531810

SINGLE HOSPITAL RETROSPECTIVE DATA ANALYSIS OF THERAPIST CALCULATED IDEAL BODY WEIGHTS VS. CENTERS FOR DISEASE CONTROL AND PREVENTION WEIGHT-FOR-STATURE GROWTH CHARTS.

Brian Walsh[1], David Schulze[2], Michael Bley[2]; [1]Department of Anesthesiology, Division of Critical Care Medicine, Boston Childrens Hospital, Boston, MA; [2]Respiratory Care, St. Louis, MO

Introduction: In the world of healthcare, the calculation of pediatric Ideal Body Weight (IBW) varies upon the formula used and the potential of human error during calculation is always present. Over the past half-century, numerous attempts have been made to refine the equation for IBW and automate the calculation. While multiple ways exist to calculate IBW in children, no single method has been proven most accurate. **Methods:** We retrospectively compared the electronic medical record (EMR) manually calculated and recorded values of IBW in pediatric patients, ages 2-19, by Registered Respiratory Therapists (RRT) to the IBW calculated by an anthropometric calculator based on the US Centers for Disease Control and Prevention (CDC) growth charts. Assuming the heights are correct and a target tidal volume (VT) of 7 mL/kg, the safe therapeutic range (6-8ml/kg) is within ± 14.2%. **Results:** Of the 980 charts reviewed, 200 (20%) contained RRT calculated IBW. 154 patients had a measured height but no calculated IBW. The mean EMR IBW was 11% higher than the CDC calculated IBW. Eighty-nine (44%) patients were found to have RRT calculated IBW that would have resulted in tidal volumes outside of the safe therapeutic range. There was a tendency for the RRTs to overestimate IBW as Sixty-four (72%) of the eighty-nine would have resulted in tidal volume targets > 8 mL/Kg. **Conclusion:** Variability exists in in the calculation of pediatric IBW. Multiple factors could contribute to this variability. Not only could the method used to calculate IBW put the patient at risk for incorrect ventilation, but human error during calculation could further increase the risk. A standardized and automated calculation of pediatric IBW is needed to ensure the safe mechanical ventilation.
Sponsored Research - None



2531820

PHYSIOLOGIC EFFECTS OF VOLUME-TARGETED MODES AND ENDOTRACHEAL TUBE LEAK IN SURFACTANT-DEFICIENT JUVENILE RABBITS.

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BACKGROUND: Neonatal volume-targeted modes adjust peak inspiratory pressure (PIP) in response to a measured tidal volume (V_T). Several ventilator manufacturers offer these modes but there are differences per brand about location of V_T monitoring and whether the PIP is adjusted based on measured inspiratory, expiratory, or a leak compensated V_T. We hypothesized that there would be no differences in PIP, PEEP, mean airway pressure, inspiratory work of breathing, and gas exchange in surfactant-deficient, spontaneously breathing juvenile rabbits (with and without ET tube leak) between modes that regulate PIP based on inspiratory, expiratory, or leak corrected V_T measurements. **METHODS**: Rabbits (1.61 ± 0.20 kg, n=12) were sedated, anesthetized, intubated, and lavaged, and then stabilized on mechanical ventilation. The trachea was dissected and umbilical tape was used to adjust the size of the ET tube leak. An esophageal balloon was placed to estimate pleural pressure. Animals were randomized and in a crossover design to be supported by AVEA (Carefusion, Yorba Linda, CA), VN500 (Draeger, Lubeck, Germany), and Servo I (Maquet, Solna, Sweden) with and without an induced ET tube leak (50% at PIP 20 cmH_2O). These ventilators use expiratory V_T (proximal), leak-corrected V_T (proximal) and inspiratory V_T (at ventilator) measurements, respectively to guide PIP adjustment. After 20 min, ABG, pressure rate product, V_T, and pressures were recorded at each condition. **RESULTS:** When an ET Tube leak was not present, the AVEA had lower PEEP than the VN500 and Servo I ($P<0.05$) and lower PIP and V_T than the Servo-I ($P<0.05$). There were no other differences in the other physiologic parameters. When a mpderate tube leak was implemented, the AVEA and VN500 ventilators modes increased PIP; whereas the Servo I reduced PIP by ~4 cmH_2O. V_T and pH were greater with the AVEA and VN500 and pressure rate product lower with the VN500 than the Servo-I ($P<0.05$) with an ET Tube leak. **DISCUSSION/CONCLUSION:** A major finding from this study is that all subjects were able to be supported similarly without an ET tube leak. Modes that allow V_T monitoring using a proximal flow sensor placed at the airway to guide PIP adjustments during volume-targeted ventilation may be more effective in providing ventilation when ET Tube leaks exist. Studies in human infants need to be conducted to validate these findings and guide development in future ventilator mode designs.

Sponsored Research - Draeger provided the research funding but had no input into study design, equipment, lab space, or writing of this abstract.

2531829

PHYSIOLOGIC EFFECTS OF INHALED NITRIC OXIDE (INO) IN PIGLETS WITH PULMONARY HYPERTENSION DURING VENO-VENOUS EXTRACORPOREAL LIFE SUPPORT (VV-ECLS).

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BACKGROUND: Infants with hypoxic lung disease and pulmonary hypertension may require VV-ECLS to support gas exchange. In the clinical setting, iNO therapy is commonly discontinued once a neonate is placed on VV-ECLS. Depending on the severity of lung disease and degree of lung inflation, gas exchange may still occur at the alveolar-capillary membrane. As such, there is potential for iNO to be an effective treatment option. We hypothesized that iNO therapy at 20 ppm would result in no differences in gas exchange and hemodynamic parameters in juvenile piglets with thromboxane-induced pulmonary hypertension supported by VV-ECLS. **METHODS**: Sedated piglets (n=4) were tracheotomized, supported by a mechanical ventilator, and instrumented with hemodynamic catheters to monitor mean arterial pressure (MAP), central venous pressure (CVP), pulmonary arterial pressure (PAP), and arterial gas exchange. Piglets were then cannulated for VV-ECLS using a catheter placed into the IVC and right atrium. ECLS support was initiated and V_T was maintained at 5 mL/kg (~40% of a piglet's resting spontaneous V_T). Thromboxane was administered to induce pulmonary hypertension by doubling the mean pulmonary artery pressure (MPAP) from baseline. The iNOvent (Ikaria, Hampton, NJ) was placed inline with the ventilator. Following a 30 min stabilization period, hemodynamic parameters and blood gases were obtained without iNO therapy. The iNO therapy was initiated at 20 ppm and physiologic measurements were obtained after 15 minutes. **RESULTS:** The use of iNO at 20 ppm during VV ECLS resulted in lower PAP and greater PaO_2 ($p<0.05$) than when no iNO was administered. There were no differences in HR (p=0.44), MAP (p=0.56), CVP (p=0.26), pH (p=0.97) and PaCO2 (p=0.98). **DISCUSSION/CONCLUSION:** Lung-injured piglets from the current study experienced a 40% reduction in MPAP which resulted in a modest improvement in oxygenation with iNO therapy. Based on these findings, iNO therapy coupled with VV-ECLS maybe a useful adjunct in pediatric patients experiencing severe pulmonary hypertension. It is unclear if these findings could be translated into improved outcomes or appreciable reduction in ECLS duration at this time. These findings should guide future studies that would be required in order to suggest that this costly inhaled drug should be used in infants with different forms of ECLS. Disclosure: Mallinkrodt provided study drug and no other funding

Sponsored Research - Nitric Oxide gas was donated by Mallinckrodt.

2531935

GROWTH IN UTLIZATION OF HFNC IN A PEDIATRIC HOSPITAL.

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BACKGROUND: Anecdotal evidence indicates that demand for HFNC therapy is growing at a rate that does not appear to be related to the known benefits of HFNC. We sought to quantify this growth in utilization. **METHODS:** We combined retrospective data from multiple sources to study HFNC use; 1) a Pt. safety dashboard (Tableau Software, Seattle WA) which was connected to our Enterprise Data Warehouse (EDW), which derives data from our 2) electronic medical record (Cerner, Kansas), and 3) administrative database (Epic Systems, Madison WI). The Pt. safety dashboard data range from Feb-2012 through Apr-2015. From the dashboard we obtained the proportion (%) of HFNC patient days to all in-patient days (excluding psych). This metric is part of the routine daily assessment of risk for our inpatient populations. HFNC procedural billing was obtained from the EDW for 2010-2015. Data were then treated to yield: 1) total number of billed HFNC procedures per year, 2) HFNC days as a proportion (%) of all in-patient days, and 3) total HFNC charges per year. Growth rates were calculated. Pricing (charge) data were inflation adjusted to keep constant 2010 dollars. **RESULTS:** The ratio of HFNC Pt. days to all Pt. days ranged from 2.1% in 2012 to 11.6% in 2015. There was a 110% increase in HFNC days as a proportion of all patient days comparing 2012 to 2015. Total HFNC days increased 290% from 2010 to 2015 (72% growth per year). Total HFNC charges increased 206% from 2010 to 2015 (52% growth per year). **Conclusion:** Utilization of HFNC has grown dramatically. Growth of this magnitude strains logistic and staffing systems and increases costs. We know of other pediatric hospitals that use almost no HFNC. We speculate that some of this utilization may be inappropriate. It is also possible that the increase in HFNC days has resulted in a decrease in the utilization of other forms of invasive and non-invasive respiratory support. The authors recommend a value-directed method of reducing unwarranted utilization of HFNC. Next steps include the use of our EDW to create a Tableau dashboard for studying and managing HFNC utilization.

Sponsored Research - None

2531961

PRELIMINARY RESULTS OF A PROTOCOL TO IMPROVE UTILIZATION OF CHEST PHYSIOTHERAPY (CPT) AND OTHER AIRWAY CLEARANCE (ACT) TECHNIQUES IN PEDIATRICS.

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BACKGROUND: CPT (defined as postural drainage and percussion/vibration) has a history of overutilization in pediatrics. There are alternatives to CPT, some of which are less expensive and intrusive, such as positive airway pressure with vibrations, cough-assist, and external chest wall oscillation. We hypothesized that a hospital-wide structured treatment protocol would improve utilization of CPT/ACT and reduce charges to patients and payers. We created such a protocol as part of our CPI process improvement work. **METHODS**: A multidisciplinary team of Medicine, Respiratory Therapy (RT), Information Services and Enterprise Analytics developed a treatment protocol using evidence based medicine (EBM) methods. These included literature search, guidelines creation, and computerized order sets. The principle feature of the order set redirected all MD's ordering CPT to order an RT consult for CPT. The RT's then administered the guidelines, which included options to give CPT, ACT or no treatment. CF Pts were excluded. The study period was from 2/5/12 -1/31/16. The protocol went live 7/1/15. Data were divided into pre-protocol (2/5/2012 to 6/30/2015) and post protocol (7/1/2015-1/31/16). Data were extracted from the Enterprise Data Warehouse and included any Pts billed for CPT/ACT during the study. Variables calculated included; Tx's per Pt day and revenue per Pt day. Revenues were inflation adjusted to 2012 dollars. We also studied the rates of sudden clinical deterioration (SCD) in the pre- and post- protocol study periods for Pts included in the study, which is carefully tracked by our Patient Safety Department. **RESULTS**: Mean CPT Tx's per Pt day decreased from 0.17 to 0.10 (44%). Mean ACT Tx's per Pt day increased from 0.108 to 0.112 (4%). Mean CPT revenue per Pt day decreased from $36 to $22 (39%). Mean ACT revenue per Pt day increased from $21 to $24 (17%). Overall, total CPT/ACT revenue combined decreased by 34% per Pts day. There was no statistically significant differences found in PRE (4.6%) and POST (3.3%) rates of SCD among CPT Pts (P=0.26, Chi-Square). **CONCLUSION**: The implementation of this protocol appears to have improved utilization and reduced airway clearance charges to patients. One limitation of this study is the relatively short period of time the protocol has been in place and we plan to continue to monitor utlization to evaluate whether these changes are sustained.

Sponsored Research - None

2532080

OUTCOMES AND COMPLICATIONS ASSOCIATED WITH SYNCHRONIZED NASAL PRESSURE CONTROL VENTILATION IN NON-INTUBATED PRETERM INFANTS.

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Background: Noninvasive ventilation (NIV) in neonates is routinely used in an unsynchronized and intermittent format. With advancement of ventilator technology, the ventilator's ability to learn and compensate baseline leaks allows neonatal NIV to be applied nasally in an assist-control or synchronized intermittent mandatory ventilation pattern using pressure controlled ventilation. The primary aim of this retrospective review was to determine if nasal pressure control ventilation (nPCV) prevented preterm infants from requiring invasive mechanical ventilation. The secondary aim was to identify complications associated with nPCV. **Methods**: This retrospective review of the use of nPCV in preterm infants with respiratory distress occurred at an academic medical center's level 3 NICU between October, 2012 and August, 2014. Data collected from medical records included; maternal history, delivery room management, gestational age (GA), gender, birth weight in grams (BW), diagnoses, respiratory support prior to nPCV, maximum nPCV settings per day, duration of nPCV, blood gases prior to and after initiation of nPCV, outcome (intubation vs. no intubation), and complications including gastric distention, necrotizing enterocolitis (NEC), pneumothorax, and skin breakdown. Mean and standard deviations were calculated for the scaled data, and percentages were calculated for the nominal data. Mann Whitney was used to assess if significant differences existed between infants that remained on nPCV versus those that required intubation. **Results**: nPCV was placed on 25 infants in respiratory distress. Treatment prior to nPCV included CPAP (76%), nasal cannula (4%), and room air (20%). Twenty-eight percent of these infants required intubated. There were no significant differences in mean ventilator settings or blood gases. See Table 1. Post initiation pH did trend towards significance (p=0.076). The following complications were observed; gastric distention occurred in 15 (60%) subjects, NEC occurred in 1 (4%) subject, no infant experienced a pneumothorax and nasal breakdown occurred in 5 (20%) subjects. **Conclusion**: nPCV may be an effective strategy for preventing endotracheal intubation in preterm infants with respiratory distress. Gastric distention and nasal breakdown are associated side effects. Further research is needed to validate the efficacy of nPCV in preterm infants and methods of preventing/minimizing side effects such as gastric distension and nasal breakdown.

Sponsored Research - None

Mean(SD) Data Observed Between Infants that Remained on nPCV and Those that Required Intubation

Data	Remained on nPCV	Intubated	p Value
Gestational Age (weeks)	28.2 (2.3)	27 (1.7)	.297
Birth Weight (gms)	1056 (263)	967 (243)	.458
PIP during nPCV (cm H2O)	21 (2.4)	21 (2)	.745
PEEP during nPCV (cm H2O)	7.1 (1.3)	7.6 (1.4)	.458
Pre pH	7.31 (0.07)	7.30 (0.10)	.671
Pre PaCO2 (mmHg)	51 (13.9)	44 (7.3)	.222
Post pH	7.36 (0.05)	7.28 (0.11)	.076
Post PaCO2 (mmHg)	47 (15.3)	53 (5.5)	.720
Duration of nPCV (hours)	199 (203)	129 (145)	

EVALUATING NICOTINE DEPENDENCE AMONG COLLEGE STUDENTS WHO USE TOBACCO AND ELECTRONIC CIGARETTE PRODUCTS.

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Background: The addition of electronic cigarettes/vapor (e-cig) to the market has altered society's smoking characteristics. The purpose of this study is to evaluate the nicotine dependence and characteristics among college students who use tobacco products. The null hypothesis states there is no difference in the nicotine dependence among consumers who use tobacco products only, tobacco products and e-cig products, and e-cig products only. **Methods:** Following IRB exemption, Texas State University students who are at least 18-years old and who identified themselves as tobacco and/or e-cig consumers were recruited to complete a 28-item questionnaire regarding their smoking habits. The questionnaire contained questions from the Fagerstrom Test for Nicotine Dependence to determine student's actual nicotine dependence. One-Way ANOVA at an alpha level of 0.05 and descriptive statistics were used to analyze data. Results: Forty-three students completed the questionnaire composed of 30 males and 13 females. Twenty-seven students stated they used only tobacco products, 12 students stated they used e-cig and tobacco products and four students stated they used only e-cig products. Mean±SD nicotine dependence among tobacco consumers was 2.37±1.94, the mean±SD nicotine dependence among tobacco and e-cig consumers was 2.83±1.89 and the mean±SD nicotine dependence among e-cig only consumers was 1.5±0.58. A p-value of 0.46 was obtained comparing actual nicotine dependence among all studied groups. Thirty students stated they attempted to quit smoking within the last 12 months by using e-cigs as the most common method (n=11) followed by no method used (n=9). Seventeen students stated they believe e-cig products are a safer alternative to conventional cigarettes compared to eight students who believed e-cigs are not. **Conclusions:** No difference was found in nicotine dependence among tobacco only, tobacco and e-cig, and e-cig only consumers. Due to this, the null hypothesis was rejected. A majority of students stated they use both e-cig and tobacco products, which implies students are using a variety of products to fulfill their nicotine dependence especially in smoke-free designated areas such as college campuses. The use of e-cig products as a means to quit smoking is a popular method and more education is needed on college campuses regarding established smoking cessation methods. **Disclosures:** The authors have no conflicts of interest with this unfunded research.

Sponsored Research - None

2531605

ASSESSMENT OF MECHANICAL VENTILATION KNOWLEDGE OF NEWLY HIRED RESPIRATORY THERAPISTS AT AN ACADEMIC HOSPITAL.

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BACKGROUND A fundamental problem in respiratory care (RC) education is the lack of a universally accepted curriculum for teaching mechanical ventilation (MV). Until recently, there has not even been a standardized vocabulary for MV. Although current editions of major RC textbooks address these concerns, there are no data regarding their dissemination and adoption. As a result, respiratory therapists (RTs) may have widely varying levels of understanding of basic MV principles. The purpose of this study was to assess whether an MV knowledge gap exists among newly hired ICU respiratory therapists. **METHODS** We created a 21 question survey pre- and post-test. It was given to RTs newly employed in the Respiratory Institute at Cleveland Clinic. We designed a self-study, timed educational intervention to address what we considered to be the key MV concepts. The intervention is based on the 10 fundamental maxims of mechanical ventilation as described in Chatburn et al. Respir Care 2014;59(11):1747-1763. **RESULTS** The pre- and post-tests were completed by 24 RTs. The mean score on the pre-test was 58.1%. The most commonly misunderstood concepts on the pre-test involved the following: defining ventilatory assistance (23.8%), patient vs. machine trigger/cycle events (38.1%), interpreting graphics (38.1%), and pressure vs. volume control (42.9%). No one received a score of 100%. After the educational intervention, the mean score on the post-test was 92.1% which is an increase of 34% ($P < 0.001$ by paired t-test). Eight people achieved a score of 100% and six a score > 95%. The most commonly misunderstood concepts on the pre-test that improved on the post-test: defining ventilatory assistance (90.5%), patient vs. machine trigger/cycle events (95.2%), interpreting graphics (88.1%), and pressure vs. volume control (92.9%). **CONCLUSION** The average score of the pre-test was low enough to suggest that the average newly hired respiratory therapist going into our ICU environment does not fully understand basic concepts of MV. An educational intervention based on published guidelines results in learning. Further research is required to determine if learning is being translated into altered behavior and ultimately, improved patient outcomes.

Sponsored Research - None

2531843

USE OF STANDARDIZED PATIENTS IN RESPIRATORY CARE: PRECLINICAL EXPERIENCE IN A BACCALAUREATE PROGRAM.

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Background: Standardized patients (SPs) are routinely used across the US to prepare medical students (MDS) for their US Medical License Examination (USMLE) Step 2-Clinical Simulation and evaluate their clinical assessment skills. These SPs are given scripted scenarios that are "played" during the patient encounter in a mock examination room. We have reported results of the SP interaction on a small group of RT students (RTS). **Methods:** RT faculty (RTF) revised a previously validated 13-item Likert type-scoring instrument used to gauge interviewing skills for the USMLE. After consensus 8 items deemed most relevant to the role of a RT (proper introduction, appearance, organization, types of questions, listening, nonverbal facilitation, comfort during physical, and closure of the interview) were selected for analysis. A "cough and shortness of breath" scenario was selected and RTS utilized material learned from the Patient Assessment course to obtain a history and physical examination of the chest. **Results:** A total of 99 BSRC RTS were evaluated by 6 RTF between 2011 and 2014 during five different SP interactions. The overall score for the five areas evaluated was 89.6% (±7.65%; range 67%-100%). Only 11.1% (n=11) of the students evaluated scored a 75% or lower. The highest scores were obtained in the areas of creating a good first impression *(Interviewer greets patient in a personable and professional manner. Interviewer uses good eye contact and establishes an initial connection)* and the appearance and presentation (*The interviewer always speaks in a clear, easily understood voice. Well groomed, dress and adornment professional and in keeping with the clinical setting. Wears an identification badge. Presents self in a professional manner)*. The lowest scores were reported in the areas of clarity of questions *(Questions are asked in a clear, unambiguous manner. There are no leading questions or multiple part questions. The patient is never in doubt how to answer)* and the closure of the interview *(At the end of the encounter, the interviewer presents learner level appropriate closure to the patient. (e.g., thanks the patient for their time, summarizes the information obtained, discusses possible diagnoses, and/or specifies future plans)* (Table 1). **Conclusions:** RTS demonstrated good clinical assessment skills during this preclinical experience. How this experience is reflected in good documentation and future clinical experience evaluations needs to be evaluated.

Sponsored Research - None

PATIENT ENCOUNTER ASSESMENT SKILLS

ITEM	Introduction	First Impression	Appearance	Question Clarity	Ability to Listen	Non-Verbal Facilitation	Comfort During PE	Interview Closure
SCORE (SD)	89.9% (+/-17.1%)	92.9% (+/-14.7%)	94.9% (+/-12.7%)	81.8% (+/-22.7%)	88.9% (+/-18.6%)	89.2% (+/-19.1%)	90.0% (+/-18%)	87.9% (+/-22.6%)

2532093

IS A SIMULATED PATIENT ENCOUNTER A VALUABLE PRECLINICAL EXPERIENCE FOR BSRC STUDENTS? RESULTS OF A POST-SIMULATION SURVEY.

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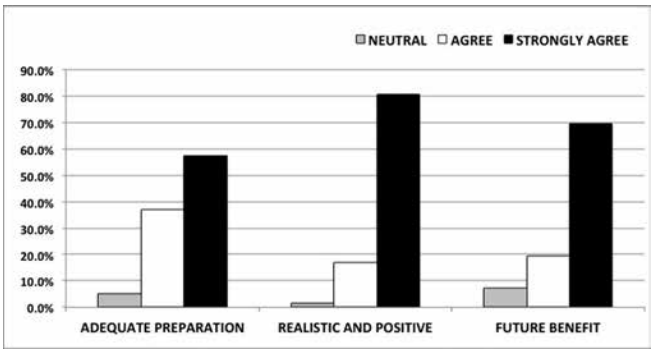
Background: Standardized patients (SPs) are routinely used to evaluate clinical assessment skills. The UTHSCSA has been using SP to simulate patient encounters as a preclinical experience for first-year BSRC students (RTS) for the last 5 years. Preparation for the encounter includes a series of web-based modules with sample videos of the encounter, face-to-face instructions on how to perform the physical exam of the chest, and a tour of the simulation center rooms where the experience would be conducted. The aim of this study was to assess the students' evaluation of the overall preclinical experience and determine their perception of how well prepared they felt for the patient encounter. **Methods:** A survey was designed to evaluate the overall perception of the patient encounter experience. After completion of the exercise, students were asked to score on a scale from 1 to 5 (1: strongly disagree; 5: strongly agree) preparation from faculty, self-preparation, practice with a peer, experience realism and value, belief of improvement in future patient interactions, and opinion of the experience to be required as a mandatory component of the preclinical check off and the patient assessment course. **Results:** A total of 65 of the 99 RTS returned the survey, for a response rate of 65.7%. Most students (84.6%) strongly agreed that the patient encounter was a positive experience. Although only 47.7% strongly agreed on receiving enough preparation for the encounter, 52.3% of the students strongly agreed that they adequately prepared for the encounter (Figure 1). **Conclusions:** Most RTS considered the preclinical simulation experience of great value and realism and consider that it would help with future encounters with real patients. Similar clinical simulations should be considered in academic programs as preclinical competencies.

Sponsored Research - None



2531855

DO RESPIRATORY THERAPIST STUDENTS APPLY THE SKILLS TO BECOME ADVANCED PRACTITIONERS? RESULTS OF PRECLINICAL SIMULATION EXPERIENCE.

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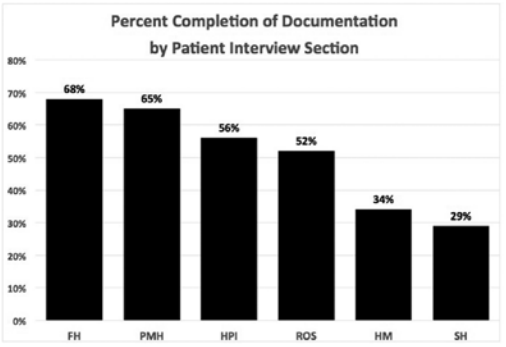
Background: The role of the RT as advanced practitioner expects performing a thorough patient interview, complete a physical exam of the chest, and document findings in the medical history. The interview should include the chief complaint (CC), history of present illness (HPI), review of systems (ROS), past medical history (PMH), family history (FH), social history (SH) and health maintenance (HM). All respiratory care programs teach these skills to RT students (RTS). However, the student notes is limited to progress notes in the clinical setting. This study aimed to evaluate the level of competence of RTS in documenting the interview of a patient with respiratory symptoms. To the best of our knowledge, this is the first study evaluating interviewing skills and the use of standardized patients (SP) interaction on RT students (RTS) prior to their first clinical rotation. **Methods:** RTS and SPs were given "cough and shortness of breath" scenario that was "played" during a preclinical patient encounter in a mock examination room. One RT faculty (RTF) revised the notes transferred to a computer after the patient encounter and evaluated competence against the original script on a total of 36 items. **Results:** Transcripts of 24 first-year BSRC RTS were evaluated. The overall competence in documenting the interview was 43.8% (±26.4%; range 4%-96%). The areas where RTS had the best documentation was FH, followed by PMH, HPI, and ROS. The worst area of documentation was SH, followed by HM (figure 1). Specific questions regarding what improves the CC, weight changes, health screening, drug allergies, diet, stress level, and marital status were documented by less than 20% of participants. **Conclusions:** This study showed that overall documentation of the patient interview by RTS was suboptimal. Faculty should implement evaluation of the RTS's ability to document a full interview and physical exam. The performance of advanced practitioners as a physician extender may greatly depend on the competency exhibited by RTs to perform a patient interview, a thorough physical exam, and detailed documentation of the patient encounter.

Sponsored Research - None



2531859

EFFECT OF CLINICIAN TRAINING ON TOBACCO DEPENDENCE FOR RESPIRATORY THERAPISTS.

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Background: A limited number of respiratory therapists (RTs) have training in tobacco dependence treatment. Approximately 14% of RTs are trained for these conversations, and only 84 of approximately 50,000 AARC members indicate they have earned the Certified Tobacco Treatment Specialist credential. RTs that have completed the AARC's Clinician's Guide to Treating Tobacco Dependence indicated a desire for an expanded course with accompanying video to further prepare for brief interventions. **Methods:** Training was developed for the currently practicing RT to develop knowledge, skills and to improve self-efficacy for providing brief tobacco cessation interventions in a variety of common practice environments. It includes interactive, behaviorally focused video examples demonstrating evidence-based interactions with a diverse population of tobacco users. The effectiveness of the training was evaluated with pre and post intervention evaluation measures to determine perceived level of knowledge as well as self-reported behaviors and self-efficacy in providing counseling. They study was IRB approved. **Results:** Sixteen of 48 participants completed both the pre and post evaluation measures. Fifteen of 16 indicated the course would increase the number of tobacco cessation counseling sessions they conducted with patients, and all participants indicated that the course would increase the quality of these counseling sessions. From pre to post, there was a 53.9% increase in the number of patients the participants asked about smoking behaviors, a 64.5% increase in the number of patients they advised to quit, a 136.6% increase in the number of patients they referred to smoking cessation counseling, and a 267.6% increase in the number of patients they referred to the national tobacco quit-line. **Conclusions:** The RT training improved knowledge, self-efficacy and self-reported counseling behaviors. This pilot data suggests that RTs trained in brief tobacco dependence interventions can contribute to a reduction in tobacco use through increased evidence-based advice and referral, thereby possibly effecting cessation rates.

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2531862

THE PERCEIVED IMPACT OF INTERNATIONAL EDUCATIONAL EXPERIENCE IN THE UNITED STATES ON SAUDI RESPIRATORY THERAPISTS.

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BACKGROUND: Rapid changes in healthcare and science have enhanced the need for international educational experiences (IEE). Despite the importance of IEE in healthcare, there is a lack of literature in this area of research specifically relating to respiratory therapy. Therefore, it is important to assess the perceived impact of IEE in the United States on RT students in order to evaluate the need for developing international educational opportunities in the field of respiratory therapy. **PURPOSE:** The aim of this study was to assess Saudi RT international students' perception of the impact of IEE on their lives experiences. **METHODS:** Data were collected through a descriptive survey using a modified version of the international education survey (IES). The survey was emailed to all RT members of the Saudi Society for Respiratory Care (SSRC). Four main dimensions were assessed: Professional RT role, global understanding, personal development, and intellectual development. Excluded from the study were non-Saudi RTs and RTs with no IEE from the United States. **RESULTS:** The total adjusted number of participants was sixty-two (n=62) out of (N=534) emailed surveys. The study response rate was 15.17%. Just over half of participants hold a graduate degree in RT while 48.4% hold an undergraduate degree in RT. Female participants accounted for 12.9% of all participants while male participants accounted for 87.1%. The study revealed that "professional RT role" was the most impacted area of IEE for RT undergraduate students (M 5.48, ± 1.4). The study showed that "global understanding" was the most impacted area of IEE for graduate RT students (M 5.4, SD of ± 0.84). The study findings showed that there is a moderately significant positive correlation between the duration of IEEs and the impact of RT professional role (r=0.426; p=0.001). Moreover, the study findings indicated that IEEs had a higher but insignificant influence on former international RT students' perceptions of impact than current students. **Conclusion:** IEE had a large overall impact on participant's lives experiences. The study findings support the value of promoting IEEs in the United States for RT students due to its perceived positive impact on internationalization of healthcare. Further studies with higher number of participants, different cultural backgrounds, and different IEE destinations are recommended.

Sponsored Research - None

2531984

QUALITATIVE ASSESSMENT OF THE ATTITUDES, BELIEFS, AND INTENTIONS OF RESPIRATORY THERAPY FACULTY TOWARDS INTERPROFESSIONAL EDUCATION.

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Background: Interprofessional education (IPE) improves collaboration and patient care through joint education between health professions. We designed a survey to evaluate the knowledge, beliefs, attitudes, and intentions of respiratory therapy (RT) faculty towards interprofessional education. We explored current IPE offering among faculty from different types programs and evaluated reported opportunities and barriers to IPE inclusion within respiratory therapy education. **Methods**: We developed an online survey based on interprofessional education literature and questions modified for the RT discipline. The survey was distributed by email to 874 faculty from CoARC accredited programs. Tag Crowd ™ was used to initially review the qualitative data for QA purposes and thematic responses. Two independent reviews examined responses to "What do you see as a barrier(s) to implement IPE within your program?" and " What are the opportunities for implementing IPE within your program?" for common responses and themes. The reviews were then collated, and the top three responses agreed upon. Institutional Review Board approval was attained from Augusta University. **Results**: Response rate was 31.35% (n = 287). Faculty identified IPE as an important component of RT education (n = 207, 80% of responses), but reported challenges in integrating IPE into current curriculum. Significant differences between Associates and Bachelor/Master's degree program faculty were found on the following topics ($p < 0.05$): institutional resources for IPE, faculty availability, curriculum availability for IPE, and importance of including IPE at academic health center campuses. For the qualitative responses, 188 (65.6%) of faculty responded to barriers, and 168 (58.5%) to opportunities. Utilizing TagCrowd, the top three barriers were related the overall program, scheduling difficulties, and faculty related concerns, the top three opportunities reported were to increase simulation opportunities, provide interdisciplinary training with students, and collaborating with nursing programs. **Conclusions**: IPE is recognized as an important component for RT education. Bachelor and Masters degree faculty responded significantly higher on knowledge and beliefs about IPE than Associates degree faculty. Responses indicate barriers related to schedule and faculty attitudes; perceived opportunities included collaboration with nursing programs and increasing simulation training opportunities.

Sponsored Research - None

2532006

THE LIVED EXPERIENCE OF RESPIRATORY THERAPISTS DURING WITHDRAWAL OF ADVANCED LIFE SUPPORT IN THE ICU: A PHENOMENOLOGICAL APPROACH.

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Background: Close to half of all Americans that die in a hospital spend time in a critical care unit within the last few days of their life. It is estimated that up to one in five Americans die in the ICU. Of these deaths, as many as 60% are related to withdrawal of aggressive care or advanced life support. Cessation of mechanical ventilation, known as compassionate extubation (CE), is one of the most pronounced and frequent aspects of withdrawing advanced life support. Integral to quality CE is the role of the RT, the healthcare provider most often tasked with the work of physically carrying out the order to "pull the tube". **Methodology:** An interpretive hermeneutical phenomenology approach using Colaizzi's seven-step process was used with purposive sampling of RTs at UCSD. Participants were recruited until data saturation was achieved (n=9). Participants were recorded while being interviewed with open-ended questions about their experiences in performing CE. IRB Approval was obtained in advance of the study. **Results:** Three overarching themes emerged from the analysis: 1. The impact of power relations surrounding the CE process 2. The need for tools to assist with coping 3. The deep ties with certain patients Within the power relations theme there were two important and strong sub-themes: a. RTs reported being taken for granted, being caught off guard and unprepared when walking in the patient's room to perform a CE at the "last moment", and feeling disrespected in their role during CE b. RTs reported not having a voice yet wanting to be heard on many levels throughout the process of CE **Conclusions:** Understanding RTs' lived experience in performing CE underscores the need for quality education and mentoring for RTs. The CE experiences described by many of the participants were either their initial CE, or occurred during their first year of practice. These vivid memories during their nascent practice indicate the need for measures to mitigate emotional trauma during this stage, including: 1. On-the-job mentoring for the first year, particularly with initial CE experience 2. Providing education for the dying process and in finding closure and meaning related to participation in CE may improve coping with the process for clinicians as well as for the patient and families 3. Pre-CE huddles with the medical team 4. Increased RT involvement in family conferences, particularly when involving a chronic patient that may have a long-standing relationship with the RT

Sponsored Research - None

2532021

EVALUATION OF TECHNOLOGY-ENHANCED EDUCATION AND DEBRIEFING SESSIONS FOR TEACHING HIGH FREQUENCY OSCILLATORY VENTILATION (HFOV) TO PHYSICIANS AND RESPIRATORY THERAPISTS FOR USE AS A RESCUE INTERVENTION IN ADULT PATIENTS.

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BACKGROUND: Ongoing clinical education is necessary to ensure the delivery of safe and effective patient care. This is especially true for lesser used modalities that are employed in critical settings. The authors investigated the effectiveness of technology-enhanced education with hands-on debriefing in improving participants' confidence level, cognitive knowledge, and psychomotor skills in using HFOV. **METHODS:** A quasi-experimental research study with pre and post-tests was conducted in a large university hospital in the Midwest. The educational strategy involved scenario–based simulation with hands-on debriefing for critical care physicians and respiratory therapists (RTs). The contents of the technology-enhanced, web-based teaching module were audio/visual presentations and selected reading of HFOV protocol/evidence-based articles. This educational material was available for the participant on a learning management system (Blackboard Inc, Washington D.C.) and sent via email two weeks prior to the study. Participants completed a cognitive test, affective survey, and psychomotor checklist before and after attending a debriefing session. The debriefing session was conducted individually, where participants discussed their thoughts and get feedback from trainers about their overall performance. Descriptive statistics, paired t-test, McNamara's test, Wilcoxon matched-pairs test and Mann-Whitney rank sum test for non-parametric statistics were used for data analysis. **RESULT:** 26 participants were included in data analysis; 12 RTs and 14 critical care physicians; 54% female and 46% male. The mean pre-test cognitive knowledge score was 19.46 ± 4.17 compared to the mean post-test score, 22.00 ± 2.88, out of 30 questions. The improvement was statistically significant ($p = .001$). The mean pre-test psychomotor skills score (2.35 ± 1.10) was also significantly improved (3.15 ± 0.88, $p = .000$) following our educational intervention, out of a maximum score of 4. See table 1 for affective survey scores. There were no statistically significant differences between gender and profession in cognitive knowledge or psychomotor scores. **CONCLUSION:** Our research demonstrates that hands-on experience and debriefing enhances the educational value of technology-enhanced education in training healthcare providers. More research is needed to understand how this educational method impacts the clinical utilization of HFOV and leaner knowledge retention.

Sponsored Research - None

2532028

COLLEGE STUDENT PERCEPTION ON MEDICAL TV SHOWS.

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Background: There are over a dozen medical shows airing on TV, many of which are during prime time. There is increasing wonder about the role this has on awareness of cardiopulmonary resuscitation (CPR) and the appropriate actions to take in the event of cardiac arrest. Several studies reported the increased rate of cardiac arrest survival in medical shows compared to reality and how this might affect the viewer negatively. Several cases have been reported where a lay person resuscitated a family member using medical TV show knowledge. The purpose of this study is to examine and evaluate college student perception on CPR and when to shock when using an Automated External Defibrillator (AED) based on there experience with medical TV shows. **Methods**: This study was approved by the Institutional Review Board at Loma Linda University. We surveyed college students in southern California 18 years of age and older, in a non-medical college program, whom have been exposed to medical TV shows. Survey was distributed electronically to three 4 year private institutions after obtaining agreement from each institution. **Results**: A total of 164 subjects answered the survey (21 male and 127 female; rest decline to state). 62% of them were graduate students and 39% undergraduate. 81% of them do not hold a CPR card; 14% of the non-CPR holders encountered/witnessed a cardiac arrest. 43% watch medical TV shows occasionally with an approximate of 2-3 times per month. 73% of the non-CPR holders believe that a person should be defibrillated when the heart rhythm shows asystole. At the same time, there was a significant direct correlation between watching medical TV shows frequently and willingness in being a lay rescuer (Pearson correlation= .172; p=.035). There was also a significant direct relationship between being certified in CPR and the likeliness/willingness in being a lay rescuer (p=<.001). **Conclusion**: From our survey sample we found that non-CPR card holders are willing to initiate CPR in an OHCA situation, however have a poor understanding of when to attempt defibrillation. With the high percentage of college students believing that a shock should be delivered in asystole, this perception is believed to be depicted from medical TV shows. We thus recommend more monitoring from healthcare organization and individuals such as medical technical advisors to the TV show producers to present accurate information regarding CPR and AED.

Sponsored Research - None

2532092

AN ASSESSMENT OF THE CLINICAL LEARNING ENVIRONMENT FROM RESPIRATORY CARE STUDENTS DURING INTERNSHIP ROTATIONS: A PILOT STUDY.

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Background: Respiratory Care internship rotations represent the final clinical requirement prior to graduation. Intern students generally work independently from the program faculty as they interact with healthcare personnel in a variety of areas. Since program faculty are not present during these internship experiences, the student perception of the clinical environment is especially important to assess. The Clinical Learning Environment, Supervision and Teacher (CLES+T) survey evaluates student perception of the hospital environment. Our research question was, what are the perceptions of the clinical environment among respiratory care senior students following completion of internship rotation? **Methods:** Thirty-four senior Respiratory Care students were recruited to participate in the research study. Each student received a CLES+T survey at the end of their adult ICU internship and a second survey at the end of their specialty internship. The survey consists of 6 sub-dimensions and 38 total items. Once surveys were submitted, data was entered into Excel. Data was assessed using descriptive statistics. Cronbach's alpha and Spearman Correlation. An alpha level of 0.05 was used to determine statistical significance. IRB approval was obtained for this research project prior to recruitment of subjects. **Results:** Twenty-eight students returned completed surveys. The descriptive analysis of survey items demonstrated most of the items had a mean value greater than 4.0. Cronbach's alpha was 0.857. A Spearman's correlation was run to determine the relationship between all items and sub-dimensions of the CLES+T. There was a very strong, positive correlation (Rho=0.4 to .75) between the sub-dimensions of the CLES+T. **Conclusions:** The mean values for the survey indicate respiratory care students completing internship rotations have a positive perception of the clinical learning environment when assessed using the CLES+T survey. There appears to be a high internal consistency with the survey when distributed to the respiratory care seniors recruited for this project. Correlation results demonstrated a strong, positive relationship between sub-dimensions and many of the individual items. Additional research is needed on respiratory care student perceptions of the clinical environment. **Disclosures:** The authors have no conflicts of interest to disclose and nor do they have any relationships with industry related to this project.

Sponsored Research - None

2527153

HOSPITAL UTILIZATION FOR COPD PATIENTS ENROLLED IN A HOME BASED PULMONARY POPULATION HEALTH PROGRAM USING RESPIRATORY THERAPIST IN PARTNERSHIP WITH A MEDICARE ADVANTAGE PLAN. - A.H. GREENE, RRT.

Alan H. Greene; Population Health, Alana Healthcare, Carrboro, NC

Purpose: To Measure the impact of a home based Respiratory Therapist led health management program on hospit utilization among patients living with Chronic Obstructive Pulmoaty Disease. **Methods:** The Pulmonary Population Health Management (PPHM, Alana Healthcare) program was implemented for patients with a diagnosis ofCOPD afterafter a Hospital admission, ED visit or Observation visit for COPD. The program consists of face to face visits by a Respiratory Therapist who performs clinical assesments, intensive education, behavior modification, skill training, smoking cessation and exacerbation mitigation / management training. Patients are staged and put into acuity groups using a combination of Gold Indwex, Gold Classification, BODEC (BMI, Obstruction, Dyspnea, Exertion and Co-Morbidities). Home visits are supplemented with scheduled and unscheduled respiratory therapist phone interviews. VSRQ was done on all patients initially and then every 6 months. **Results:** 878 patients were inrolled in the program over a 12 month period. In the prior comparable period (PCP) before the start of the PPHM program this cohort of patients had a total of 1784 hospital admissions. After the start of the PPHM program this population had 458 hospital sadmissions compared to the PCP or a 70% reduction in admissions. This reduction in admissions resulted in an estimated net savings to the Medicare Advantage plan of $8.1M or $9.2K / patient. The resultant improvement in Quality of Life Score as measured by VSRQ was an average of 18% improvement from initial assesment until 12 month assesment. **Conclusions:** The use of Respiratory Therapist led population health management program resulted in a decrease in hospital utilization among patients living with COPD as defined by ED visits, Observation visits and Hospital admissions. **Clinical Implications:** Nationally, hospital utilization for patients with COPD is amomg the highest in the USA. This Respiratory Therapist led Pulmonary Population Health program helped to significantly reduce admissions (70%). Continued significant reductions in hospital related expenditures can thus be expected with an associated improvment in Quality of Life.

Sponsored Research - None

2527392

KNOWLEDGE OF ASTHMA AND THE UTILIZATION OF CERTIFIED ASTHMA EDUCATORS IN A HEALTH LAW PARTERNSHIP LEGAL SERVICE CLINIC.

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Background: At Georgia State University, the Health Law Partnership (HeLP) Legal Services Clinic is part of the Health Law Partnership, which is a medical-legal collaboration among Georgia State Law, Children's Healthcare of Atlanta (CHOA), Emory University School of Medicine, Morehouse School of Medicine and the Atlanta Legal Aid Society. HeLP clinic law students learn alongside residents and medical students. Law students work on cases involving childhood asthma, housing conditions, education, and access to healthcare. Clients are low income residents of the metro Atlanta area, whose children are receiving care at Children's Healthcare of Atlanta. **Methods:** following IRB approval, the collaboration of law students, medical students and residents serving in the HeLP clinic, a short two-part survey was distributed to assess the knowledge and understanding of the National Asthma Education Prevention Program (NAEPP) guidelines. Two sections: 1. the knowledge level of law students, medical students and residents serving in the HeLP clinic for effective asthma management; and 2. the use of an AE-C as credentialed by the NAECB. Data obtained was analyzed using SPSS, version 23. Descriptive analysis (frequency tables), and t-tests of significance were utilized. **Results:** 34 HeLP clinic members, 44% medical residents and 32% law students completed the survey. 64% of the HeLP clinic members have 1 year or less than 1 year of experience serving in the clinic. Current data suggests that 85% of HeLP clinic members, law students and medical residents alike, would utilize the resources of an AE-C if available within the clinic. Our results revealed no significant difference of the knowledge of asthma management between law students and medical residents. Medical resident responses to the NAEPP guidelines were higher than the law students. When reviewing individual answers of the asthma self-management guidelines, law students answered more correctly than medical residents. **Discussion:** this study was to determine the knowledge of asthma and the use of AE-C's within the HeLP clinic amongst law and medical students, and residents. No known studies have compared the knowledge of asthma and use of an AE-C. Further education and needs-awareness is needed for physicians and those who advocate for individuals with this incurable, yet, manageable pulmonary disease. The utilization as well as awareness of AE-Cs is also strongly suggested.

Sponsored Research - None

2529854

EFFECTIVENESS OF RESPIRATORY RISK SCORING TOOL USED IN CONJUNCTION WITH A BRONCHIAL HYGIENE TREATMENT FLOWCHART BASED ON NEW CLINICAL PRACTICE GUIDELINES.

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Background: In 2013 CPGs were published regarding use of non-pharmacologic airway clearance techniques (titled: Non-pharmacologic Airway Clearance Therapies in Hospitalized Patients). This department sought to utilize the evidence to update our Bronchial Hygiene (BH) Protocol into a more robust protoco to be used in conjunction with a validated Respiratory Risk Scoring tool. **Methods:** Key changes to the department's protocol included: 1. Changing standard frequency for most BH procedures to TID from QID, 2. Use of a Risk Assessment tool in conjunction with the BH treatment algorithm, 3. New practice of discontinuance of therapy for stable patients that do not show improvement (effectiveness of therapy) following a 24 to 48 hour trial of use. The updated protocol/algorithm was implemented in January, 2015. Findings: Compared duration of BH therapy ordered in Dec. 2014 as compared to Feb. 2015. 136 patients were treated in December, 2014 (177 varying bronchial hygiene modalities). 153 patients were treated in January, 2015 (211 bronchial hygiene therapies administered). Results: Mann-Whitney Test and CI: pre, post N Median pre 177 2.1229 post 211 0.9660 Point estimate for $\eta 1 - \eta 2$ is 0.8563 95.0 Percent CI for $\eta 1 - \eta 2$ is (0.5096,1.2279) W = 40187.5 Test of $\eta 1 = \eta 2$ vs $\eta 1 \neq \eta 2$ is significant at 0.0000 The test is significant at 0.0000 (adjusted for ties) Discussion: Results showed a statistically significant difference (p=0.00) with decreased duration of therapy in January, 2015 as compared to December, 2014. The statistically significant decrease is due to the combined effect of therapies discontinued immediately upon assessment (patients were transitioned to DB&C, IS per nursing); as well as an overall shorter therapy duration due to the application of the treatment flowchart/risk tool. **Conclusions:** Successful implementation was facilitated by achieving buy-in from the medical director of Respiratory Care Services as well as medical leadership in all areas (surgery, medicine, neuroscience). This was facilitated by conducting one on one meetings with medical directors of each area prior to implementation. Other lessons learned included: 1. Importance of communicating with physicians in ICU prior to changing therapy on patients with higher Respiratory Risk scores and 2. Vigilant monitoring of staff adherence to protocol requirements (implementation and documentation).

2531236

LUNG CANCER AND IMPLICIT BIAS IN RESPIRATORY THERAPISTS.

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Background: While a causal link between smoking and lung cancer (LCA) has been established, there are also many other causes not associated with smoking behaviors. Due to the negative stigma against smoking and LCA patients have not always received appropriate care. Respiratory therapists (RTs) regularly interact with LCA patients and those at risk for LCA. The purpose of the project was to explore the presence and impact of implicit bias (IB) among respiratory therapists related to LCA. **Methods:** The sample of convenience of RTs from three large hospitals were asked to respond to questions about how LCA patients were treated and the effects of IB on the care of LCA patients. In addition, they were asked to complete and report the results of the Harvard Implicit Association Test (IAT) for LCA. Data analysis included descriptive statistics. **Results:** 89.5% (n=44) of RTs believed LCA patients were rarely or never treated differently than other cancer patients. RTs also self-reported a strong to moderate association between LCA and negative words. In addition, 43.2% (n=44) of RTs believed that IB had a slight effect on patient care interactions with LCA patients. RTs indicated that knowledge of their IAT results would slightly or not at all affect their future care of patients with LCA, despite indicating that they would increase LCA screening recommendations in the future. **Conclusions:** Opportunities exist to both increase awareness of IB and its negative effect on patient care and to disseminate successful strategies to minimize the effect of IB on patient care interactions. **Disclosures:** None.

Sponsored Research - None

2531849

ALPHA 1 - NOT RARE, JUST RARELY DIAGNOSED.

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Alpha-1 Antitrypsin Deficiency (AATD) is the under-diagnosed genetic COPD disease. In the United States it is estimated that fewer than 10% of the patients who have COPD have been tested for AATD. In 2003, both the American Thoracic Society and the European Respiratory Society released a joint statement for the standards for diagnosing and managing individuals with Alpha-1 Antitrypsin Deficiency. The American Thoracic Society and the European Respiratory Society statement calls for testing when the patient's post bronchodilator spirometry FEV1/FVC results remain at or less than 70% of predicted. In order to identify AATD patients, a targeted testing day for AATD was done at a southwest Virginia Adult Pulmonary Practice for patients with diagnosis of COPD, Emphysema or Chronic Bronchitis. The patients to be tested were randomly selected from the practice and had never been tested for AATD. Only 158 patients were invited due to limited time. There was a 76% show rate of the patients for testing. Seventeen percent of the patients tested were positive for AATD. These patients were of both sexes and found in three of the five ethnic subgroups in the United States; Caucasians, Africans American and Hispanic Americans. The results of the study show that there is a higher incidence of AATD in the COPD population than previously believed.

Sponsored Research - None

2531863

IS THERE A MAGIC FORMLA FOR DECREASING COPD READMISSION RATES?

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Background: In October 2014 the US Center for Medicare and Medicaid expanded their readmission penalties to include COPD. Hospitals with a high 30 day readmission rate for all cause COPD readmissions, started to receive penalties. These penalties are 1%-3% reduction of reimbursements for the treatment of Medicare beneficiaries. Developing a Respiratory Therapy driven COPD Readmission Program can not only decrease readmissions, but also improve the quality of life for the patients while reducing costs to the hospital and the health care system. A COPD Case Manager position was initiated in 2012 and staffed by a Respiratory Therapist to develop and manage a novel COPD readmissions program. **Methods:** All COPD patients admitted for all cause admissions were screened and assessed for their need for medication management for their COPD using GOLD Standards, Polysomnograms using an Epworth Sleepiness Scale, Pulmonary Function Tests were recommended at least yearly, and Outpatient Pulmonary Rehabilitation was utilized whenever possible. Assessment of the adequacy of the pulmonary medications was also preformed using an In-Check Dial and teach back education. Recommendations were made for device changes while maintaining medication class that were consistent with GOLD Standards, were made to the physicians to maintain compliance with all medications at home. **Results:** The Readmission rates were reduced from 19% in 2012 to 8.19% in 2015. This resulted in a savings of $132,000 annually or $20,500 per month. This also resulted in 65 more referrals to the sleep lab. The sleep lab referrals and the PAP setups accounted for an additional $186,680 in revenue for the hospital system. This also resulted in 104 referrals to Outpatient Pulmonary Rehab. **Conclusion:** The implementation of a Respiratory Therapy Case Manager can reduce readmissions and save costs to the hospital system in access of $109,000 per year.

Sponsored Research - None

2531979

COMPUTERIZED APPLICATIONS FOR TOBACCO DEPENDENCE: ATTITUDES AND PREFERENCES.

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Background: Smoking and related diseases contribute to a mortality rate three times higher than non-smokers. One out of five deaths in the United States each year is attributed to cigarette smoking. Combinations of evidence-based cessation strategies, especially pharmaceuticals and behavioral strategies have potential for a synergistic effect, but are underutilized in treatment regimens. Mobile devices and personal computers offer an opportunity to impact behavior change strategies. Many types of smoking cessation mobile applications exist, yet few are evidence-based. Development of an evidence-based smoking cessation smart phone application would increase the accessibility of these regimens. The purpose of this study was to determine the evidence-based components and application features preferred by users to contribute to a quit attempt or to maintain cessation in a smoking cessation mobile application for 18-30 year old smartphone users. **Methods:** This was a descriptive using an online survey. Recruitment was conducted through the Ohio College Student Wellness Initiative through Drug Free Action Alliance and advertisement on social media. **Results:** There were 45 total responses. 15 met inclusion criteria. The mean age of particpants was 22 years (range 18-26); 53% were male and 47% were female. 60% of participants currently smoke, 33% quit less than one year ago, and 7% quit over one year ago. The mean cigarettes smoked per day was 12 (range 2- 22.5). The mean age participants started smoking was 17 years (range 12-23). The mean time before smoking the first cigarette was 57 min (range 5-300 minutes). 40% had used a computerized health application and of those, 53% said they were very comfortable with use. 54% were in the preparation phase of cessation. The features ranked most useful were the daily cigarette use tracker, diary/mood tracker, savings calculator, information on benefits on smoking cessation, resources for smoking cessation, information on medication, and information on guidelines for smoking cessation. **Conclusion:** Information on pharmacotherapy was the most preferred evidence-based option and should be included in a smoking cessation application. More studies are needed to determine if motivational messages tailored to diary/mood tracker entries can be helpful in a quit attempt. More research is needed to explore if these types of support can be helpful for smokers who are in the action phase of quitting, rather than the preparation phase.

Sponsored Research - None

2527415

FORTY PERCENT HELIOX AS AN ADJUNCTIVE THERAPY TO MECHANICALLY VENTILATE A CHILD WITH RHINOVIRUS/ENTEROVIRUS RELATED RESPIRATORY FAILURE.

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Introduction: Respiratory syndromes have a huge effect on morbidity and mortality globally. They are identified as the etiology of viral influenza-like (IL) respiratory failure (RF) in children. Viruses such as Rhinovirus / Enterovirus (RE) are implicated as the source of bronchoconstriction related RF. Chest radiography indicate airway wall structure changes; peri-bronchial wall thickening is the possible root cause of non-asthma related air-flow obstruction, that is refractory to beta agonist medication treatment. Viruses are documented to appear in multiple viral structures and different combinations, and often masqurades as asthma. Helium-oxygen (heliox) mixtures has been used for more than a century to treat pulmonary disease, though little evidence exists regarding the efficacy for the treatment of viral related pulmonary exacerbations. **Case Report**: A four year old white female with no prior documented history of asthma was transferred to our pediatric intensive care for management of hypercarbic RF. Management included; continuous aerosolized beta-agonist, intravenous corticosteroids, multiple intravenous & meter dose beta agonist, mechanical ventilation as well as deep sedation and paralytic. Twenty four hours after admission, PaCO2 was 107 mmHg (table). She was placed on a heliox-compatible ventilator set in the PRVC + SIMV mode (table). Her respiratory viral panel was positive for RE, verified by polymerase chain reaction (PMR). Chest radiography was notable for moderate peri-bronchial wall structure thickening. Three hours after ventilation with heliox, ABG's demonstrated improved ventilation (table). Heliox was discontinued after 3 days. Eight days after transfer, she was extubated, with RF resolved. Her course was complicated by acute post sedation delirium. **Summary**: Influenza-like RF is a life threatening complication associated with bronchoconstriction. Current clinical treatment plans; ventilation, proning, isoflurane, nitic oxide, oscillator > ECMO. Heliox may be useful to ameliorate air-flow and reduce the risk of progression to severe acute respiratory syndrome (SARS). Heliox concentration was low (40%) but was stable enough to exert a positive clinical effect on alveolar gas distribution that was indicated by follow-up PaCO2 (T-2). More clinical study is needed to understand, recognize and treat viral bronchiolitis related RF and define the role of heliox in the armamentarium against IL respiratory failure.

Sponsored Research - None

Table 1: Arterial Blood gases & Ventilator Settings

	T-1	T-2	Day 2
Arterial Blood Gases	pH-6.99 PaCO2 - 107 mmHg PaO2 - 73	pH - 7.11 PaCO2 - 77 mmHg PaO2 - 97 mmHg	pH - 7.45 PaCO2 - 49 mmHg PaO2 - 58 mmHg
Ventilator Settings	Vt - 140 mL; RR - 18; PEEP +5: FiO2 - 0.6; IT - 0.55, Paw-36 cm H2O, Pplateau-22 cm H2O	VT - 140;RR-18;PEEP +5; Heliox 40/60;IT-.55, Paw - 30 cm H2O	VT-140; RR-18; PEEP +5; Heliox 40/60;IT-.90, Paw- 27 cm H2O

2530736

THE IMPACT OF USING NON-BIRTH SEX ON THE INTERPRETATION OF SPIROMETRY DATA IN SUBJECTS WITH AIRFLOW OBSTRUCTION.

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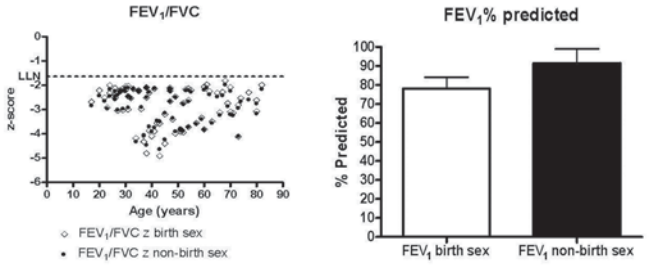
Background: Sex is an important determinant of lung capacity and function. There are differences of opinion amongst clinicians on which sex should be used for spirometry testing in transgender subjects: birth sex or non-birth sex. This study examines the impact of using non-birth sex on the interpretation of spirometry data in born male subjects with airflow obstruction. **Methods:** Retrospective analysis of anonymous, publicly available spirometry data (LungXplorer, www.spirxpert.com). Eighty male subjects with airflow obstruction were chosen from the database via quota sampling. FVC, FEV_1, and FEV_1/FVC were collected and analyzed using the Global Lungs Initiative reference equations. Each subject had their spirometry values analyzed using the male sex and female sex. Differences in % of predicted, z-scores, classification of disease severity, and the incidence of a value migrating above or below the LLN (z-score -1.64) between the sex assignments were examined. Median differences were examined with the Wilcoxon signed rank test. **Results:** The median % predicted for FVC and FEV_1 were higher when the female sex was used: 100.5% vs. 118.5%; 78% vs. 91.5%, respectively ($p < 0.001$). The median FEV_1/FVC z-score was-2.53 for male sex and -2.65 for female sex ($p = 0.004$); however, the gap was affected by age. In all comparisons the presence of obstruction (FEV_1/FVC z-score < 1.64) was not affected by sex assignment. Use of non-birth sex moved some FVC and FEV_1 data above the LLN: FVC 2/80 (2.5%); FEV_1 17/80 (21.2%). In the data that remained < LLN, severity classification was improved (less severe) in many subjects: FVC 5/78 (6.4%); FEV_1 23/63 (36.5%). In total, 55% of subjects had spirometry classification improved by using the non-birth sex. **Conclusions:** Using non-birth sex in transgender females with airflow obstruction has a significant impact on spirometry interpretation and puts these subjects at risk for misdiagnosis and suboptimal treatment.

Sponsored Research - None



2532109

A COMPARISON OF RESPIRATORY MUSCLE STRENGTH MEASUREMENTS WHEN USING THE MEDGRAPHICS SYSTEM, PRESSURE MANOMETER SETUP AND MICRORPM.

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Background: Patients that suffer from neuromuscular disease or chronic respiratory insufficiency may have impaired respiratory muscle strength. There are diagnostic tests available to assess respiratory muscle strength using noninvasive devices. This study was designed to evaluate the similarity of three different noninvasive respiratory muscle strength testing systems. The research question for this study was, is there a measureable difference between the MedGraphics system, the pressure manometer setup, and the MicroRPM when completing MIP and MEP measurements. The null hypothesis states there is no statistical difference in MIP and MEP measurements between the three devices. **Methods**: IRB approval was given prior to conducting this study. Subjects were recruited from the Respiratory Care student body at Texas State University. Consent forms were signed and researchers demonstrated and coached the subjects on how to properly perform MIP and MEP maneuvers on all devices. Each subject performed MIP and MEP tests on each of the three devices in random sequence. Testing followed ATS guidelines. The repeated measures ANOVA in SPSS with post hoc analysis using Bonferroni statistic with alpha level $p < 0.05$ was used to analyze data. **Results**: Thirty healthy Texas State Respiratory Care students agreed to participate in the study. Both the MIP and the MEP data demonstrated a statistically significant difference ($p<0.05$). Pairwise comparisons of the data demonstrated significant differences between devices for MIP and MEP ($p<0.05$). Specifically, for MIP measurements there was a significant difference between the pressure manometer and MicroRPM, and between the pressure manometer and MedGraphics system. For MEP there was a significant difference between the MedGraphics system and both pressure manometer and the MicroRPM. **Conclusion**: Based on the findings there is a significant difference between testing devices when assessing respiratory muscle strength. Based on our results we accepted the alternative hypothesis and reject the null hypothesis. This study offers important information to the medical community when completing respiratory muscle testing procedures. Specifically, the testing device should not vary when completing trending measurements for respiratory muscle strength. Additional research on other pulmonary function devices is needed. **Disclosure:** The authors have nothing to disclose. No funding was provided for the conduction of this research study.

Sponsored Research - None

2483208

STATUS OF RESPIRATORY HOME CARE IN SAUDI ARABIA: THE CURRENT STATUS, ABSTICLES AND FUTURE DIRECTIONS.

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Background: Home health care (HHC) is considered a multidisciplinary service that offers a variety of diagnostic, therapeutic, and supportive procedures for specific groups of patients. These professionals include Respiratory therapists. Respiratory home care (RHC) is crucial element HHC services and defined as "those specific forms of respiratory care (RC) provided in the patient's place of residence by professionals trained in RC working under direct and indirect medical supervision". **Objectives:** This national survey was conducted to assess the current status RHC services in the eastern province of Saudi Arabia and to identify obstacles that HHC programs face, precluding the establishment of this service and future direction. **Materials and Methods:** A phone call to the medical directors of 48 general hospitals in eastern province and asked if they offered HHC services. The specialist hospitals such as psychiatric, and eye hospitals were excluded. Data was only gathered from eastern province hospitals in which HHC services are provided. An explanation of the study objectives and the interview was conducted via phone call to the HHC directors of 18 hospitals which HHC services are provided to collect information regarding General information regarding each Program Information regarding RHC services The number of professionals who provide RHC services Types of RHC services provided The number of patients with respiratory disorders The number of professionals required to provide RHC services to solve the shortage of services The Main obstacles to implementation of RHC services **Results:** Currently, only eighteen (37.5%) hospitals provide their HHC services. The majority of HHC programs (77.8%) are governmental hospitals (14) belong to Ministry of Health (MOH), two non-MOH governmental hospital, and two private hospitals in the eastern province of Saudi Arabia. Only seven (38.9%) HHC programs have an RC professionals. Understaffing of RC professionals required to provide RHC services with shortage of RHC services and was the two main obstacles to implementation of RHC services. **Conclusion:** The use of RHC services in Saudi Arabia remains underdeveloped in compared to developed countries. Developing RHC is one of the opportunities for improved efficiency in the health care system. Organized efforts are needed to overcome the identified obstacles and challenges facing the progress of RHC.

Sponsored Research - None

2495395

THE EFFECTS OF NONINVASIVE VENTILATION ON ICU VENTILATORS DURING RESPIRATORY THERAPISTS REQUIRE TIME TO TROUBLESHOOTING: EXPERIENCE FROM A MEDICAL CENTER IN TAIWAN.

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BACKGROUND: Noninvasive ventilation (NIV) is often applied with intensive care unit (ICU) ventilators. The use of NIV outside of rcommended guidelines is common. It may also be used in recently extubated patients in ICUs, especially in post-extubation patients with respiratioy failure, and it may be used to reduce the re-intubation rate. However, the benefit of NIV after planned extubation has not been elucidated from the perspective of Respiratory Therapists (RTs) who must spent time for troubleshooting. The purpose of this study was to investigate how much time RTs spend working with ICU ventilators when NIV is used for planned extubation patients at risk of respiratory failure. **METHODS:** One hundred-and sixteen patients were enrolled in this study. All patients had been admitted to medical ICUs in medical centers in Taiwan and had received ventilation support for more than 24 hr. For all patients, extubation was initially planned, but they developed postextubation respiratory failure when NIV was used. The study was approved by an institutional ethics committee and informed written consent was obtained from the patients or their next of kin. The primary outcome was the time required for the RTs to perform troubleshooting of various types of ICU ventilators for NIV. The secondary outcomes were the different types of ICU ventilator, the mean of number of troubleshooting, and the duration which NIV used. It may also be used in recently extubated patients in ICUs, especially in post-extubation patients with respiratioy failure, and it may be used to reduce the re-intubation rate. However, the benefit of NIV after planned extubation has not been elucidated from the perspective of Respiratory Therapists (RTs) who must spent time for troubleshooting. The purpose of this study was to investigate how much time RTs spend working with ICU ventilators when NIV is used for planned extubation patients at risk of respiratory failure. **RESULTS:** No significant differences ed in analysis of variance and chi-squared test among 4 types ventilator, regardless of the troubleshooting time (p=0.573) or the mean of number of troubleshooting (p=0.394). **CONCLUSION:** NIV is convenient for post-extubation patients who experience respiratory failure in ICUs. General RTs require less than 5 min and about the same number for troubleshooting and should be aware of being more specific when applying NIV with an ICU ventilators.

Sponsored Research - None

2497074

IMPLEMENTATION OF A COPD INPATIENT CLINICAL PATHWAY WITH A DEDICATED RESPIRATORY THERAPIST TEAM.

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Background: In 2014 our facility admitted 325 patients diagnosed with acute exacerbation of COPD (AE COPD), 14% of which required readmission within 30 days. Although below the Centers for Medicare and Medicaid penalty threshold, we hypothesized that significant variations in care in our system resulted in inefficient care, suboptimal clinical outcomes, and increased cost. We created a COPD clinical pathway and a dedicated respiratory therapist (RT) team to provide patient and family education and medication management. Baseline metrics showed an average LOS of 3.76 days, and patient satisfaction scores of 53% regarding care transitions, 84% for discharge medications, and 80% for communication about medications. **Method**: A multidisciplinary task force, led by a pulmonologist and a hospitalist, created a COPD inpatient pathway. The Acute Exacerbation COPD order set was revised to include standardized medication and consultation orders. A new policy allows the RTs to modify and enter inhaled medications based on the COPD gold guidelines. With our parent health system, Maine Health, COPD educational materials where created to be shared throughout the system. RTs on the education team were trained with gold guidelines and attended the AARC's Chronic Disease Educator program. The COPD program provides daily evaluation, patient and family education, and communication with the primary team and case managers. Discharge teaching and patient instructions regarding inhaled medications, airway clearance, and oxygen conserving techniques are all provided by the RT. **Results**: The program was initiated January 2016. A 10 week evaluation of the program reveals that the order set has been used 61 times, 22 of which were for non-AE COPD patients. The RTs saw 98% of those patients on the pathway, with average LOS of 4 days and a 15% readmission rate. Patient satisfaction data is unavailable at this time. **Conclusions**: Review of order set usage identifies a culture of unwillingness of the primary medical team to order specialty service consults. Evaluation of readmission data indicates that along with barriers to best practice care identified in the area of medication access and patient compliance, patients felt they were discharged too early from a previous admission. The RTs on the team will be instituting use of the IHI State Action on Avoidable Hospital Admissions (STARR) tool to evaluate discrete readmission data.

Sponsored Research - None

2501039

RESPIRATORY THERAPIST DRIVEN FAST TRACK MECHANICAL VENTILATION WEANING AFTER CARDIAC SURGERY - EXPERIENCE AT A COMMUNITY HOSPITAL. A RETROSPECTIVE STUDY.

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Background: Between 5-10% patients undergoing cardiac surgery remain intubated for an extended period of time. Prolonged intubation is associated with longer hospital stays, higher health care cost and increased morbidity. Recently efforts have been directed to expedite mechanical ventilation discontinuation (fast track weaning) and even extubate patients in the operating room immediately after the surgery. Use of strict weaning protocols has shown to reduce the mean duration of ventilation, accelerate weaning process and decrease the total length of intensive care unit stay. Data on utilization of non-physician health care staff in such protocols is scarce. We report success of a Respiratory Therapist (RT) driven fast track ventilator weaning protocol in patients undergoing coronary artery bypass graft (CABG) surgery. **Method:** After getting the local IRB approval we conducted a retrospective study at Midland Memorial Hospital. Patients with only CABG surgery and who were more than 18 years of age were included. All patients undergoing CABG surgery between February 2015 and February 2016 were extubated using RT driven protocol. Those who had CABG surgery between January 2013 and January 2015 were extubated by physician driven conventional method and served as controls. Primary end point of this study was the mean extubation time between the two groups. For statistical comparison of the extubation times a t-test was used. **Results**: 47 patients were extubated using the RT driven protocol and 112 by conventional method. The mean difference in intubation time was 0.96 hours (8.12±4.46 vs. 7.16±3.96, p=0.206). The percentage of patients extubated in less than 6 hours (ultra-fast weaning) was comparable between the two groups (45.5% vs. 48.9%, p=0.695), with a corresponding odds ratio of 1.14 (95% CI: 0.60-2.27). Subsequent analysis of the Spearman rank correlation showed that female gender (r=0.348, p < .0001) and IABP use (r=0.216, p=0.006) were significantly correlated with prolonged intubation. 1 patient had to be re-intubated in the conventional weaning protocol and none in RT driven protocol. **Conclusions**: RT driven ventilator weaning protocols are equally as effective as conventional weaning protocols in modern day fast track ventilator weaning. Our study provides reassurance that RT driven initiatives like ours helps bridge the gap between the need and availability of critical care physicians around in community based hospitals.

Sponsored Research - None

2513327

CHRONIC OBSTRUCTIVE PULMONARY DISEASE IS ASSOCIATED WITH AN INCREASED RISK OF BENIGN PROSTATIC HYPERPLASIA: A NATIONWIDE COHORT STUDY.

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Background: Chronic obstructive pulmonary disease (COPD) is a predominantly male disorder. However, the association between COPD and benign prostatic hyperplasia (BPH) has never been explored. This study investigated whether patients with COPD are at a higher risk of BPH. **Methods:** We conducted this retrospective, nationwide, population-based cohort study using data retrieved from the Taiwan National Health Insurance Research Database. A total of 12470 male patients aged 40 and older and diagnosed with COPD between 2000 and 2006 were included as the COPD group, and 12470 sex- and age-matched participants without COPD were included as the comparison group. Both groups were followed until the end of 2011. Cox proportional hazard regression was used to compute the risk of BPH in patients with COPD compared with those without COPD. The comorbidities considered were diabetes, dyslipidemia, hypertension, and heart failure. **Results:** The overall incidence rate of BPH was 1.53-fold higher in the COPD group than in the comparison group (68.6 vs. 45.3 per 1,000 person years, 95% confidence interval [CI] = 1.46-1.60) after adjustment for comorbidities. Additional stratified analyses demonstrated that COPD patients aged 40–54 years had the highest hazard ratio [HR] of BPH development (HR = 2.09, 95% CI = 1.73-2.52), followed by patients aged 55–69 years (HR = 1.57, 95% CI = 1.45-1.69) and older than 70 years (HR = 1.45, 95% CI = 1.37-1.54). **Conclusion:** Male patients with COPD have a significantly higher risk of developing BPH compared with the general population. **Disclosure:** All authors report no conflict of interest.

Sponsored Research - None

2513921

EFFECTS OF CLINICAL ENGINEERS AS A PART OF A TEAM APPROACH IN RESPIRATORY CARE IN JAPAN.

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Background In Japan, there is a national license, "Clinical Engineer" (CE) license for maintaining medical devices and operating life sustaining devices, such as dialysis machines, ECMO devices and mechanical ventilators. There are approximately 35,000 CEs, and according to the statistics from Japanese clinical engineering society Japan association for clinical engineers, 52.7% are working for maintenance of mechanical ventilators. Recently roles are changing in Japan and a certain numbers of CEs take care of patients on ventilators, as well as provide maintenance for mechanical ventilators. We assessed the effect on the weaning process of CEs monitoring and managing patients during Spontaneous Breathing Trials (SBT). **Method** From April, 2010 to March 2016, 488 patients monitored by CEs during an SBT were enrolled in a single center study. SBTs were conducted in CPAP with PSV 3 cm H_2O, PEEP 3 cm H_2O and F_1O_2 < 0.3. All ventilator settings and all patient assessments for breathing were the responsibility of the CEs. The total duration of mechanical ventilation was a primary endpoint. **Results** 395 patients (80.9%) successfully completed the SBT and were extubated; 71patients (14.5%) did not successfully complete the SBTs and gave up wean from mechanical ventilation. There were incidence of reintubation in 11 patients, and NPPVs were started in 11 patients. The duration of mechanical ventilation was reduced from 13.9 days to 8.9 days. **Conclusion** SBTs conducted by CEs reduced the days need for receiving mechanical ventilation. Respiratory Care by CEs, as part of the team approach, is effective because of their familiarity with mechanical ventilators, such as the effects of settings and monitoring parameters, including graphics and respiratory mechanics.

Sponsored Research - None

2514794

THE EFFECT OF STATIN THERAPY ON COPD EXACERBATION: AN INTEGRATIVE REVIEW.

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Background: Chronic Obstructive Pulmonary Disease (COPD) is the third leading cause of death and a major cause of disability in the United States. It has also become a problem in the economy of the United Sates, with COPD exacerbations accounting for the greatest proportion of the total COPD burden on the health care system. Despite current medication management guided by the Global Initiative for Chronic Obstructive Lung Disease (GOLD), the rate of exacerbations remains high. Therefore, other medications must be researched to improve and reduce the number of exacerbations experienced by COPD patients. Given the inflammatory component in the COPD pathophysiology, medications with anti-inflammatory properties may be beneficial in the management of this disease. One such medication is 3-hydroxy 3-methylglutaryl coenzyme A (HMG-CoA) reductase inhibitors, also known as statins. Even though this class of medication is primarily used for its cholesterol-lowering properties, several studies have demonstrated anti-inflammatory effects. Consequently, the aim of this integrative review is to analyze the current evidence on whether or not statin therapy lowers the risk of exacerbation in COPD patients. Methods: Ten research studies published from 2010 to 2015 and from peer-reviewed journals were chosen for analysis. Studies included are randomized controlled trials (RCTs), a controlled pilot study, case-control studies, and cohort studies. Also, studies from different countries are included and one study conducted on rats is discussed. Results: While some findings from the multiple research studies demonstrated that statin use improves systemic inflammation and decreases rates of exacerbation in COPD patients, others demonstrated no effect on statin use in the rates of COPD exacerbations. Conclusions: The current evidence of statin use in lowering rates of COPD exacerbation is limited and conflicting. Due to the unavailability of concrete evidence, the conclusion that statin therapy lowers COPD exacerbations cannot be made. In addition, the recommendation for health providers to add statins to the current COPD management or to use statins as an alternative treatment for COPD cannot be made. However, there is strong evidence on the improvement of systemic inflammation in COPD patients taking statins. Hence, more research is needed on the effect of statin use on the rate and severity of COPD exacerbations in patients who have elevated inflammatory markers.

Sponsored Research - None

2516827

ASSOCIATION OF TYPE 1 DIABETES MELLITUS WITH PULMONARY EMBOILISM AND DEEP-VEIN THROMBOSIS: A ANTIONWIDE COHORT STUDY.

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Backgrounds: Evidence indicates that patients with type 1 diabetes mellitus (DM type1) are associated with a higher risk of cardiovascular disease such as myocardial infarction, stroke, and peripheral artery disease. However, whether patients with DM type1 are at a higher risk of venous thromboembolism has not been explored. **Objectives:** We investigated the risk of pulmonary embolism (PE) and deep-vein thrombosis (DVT) in patients diagnosed with DM type 1, compared with age- and sex-matched unaffected people. **Patients and Methods:** In this longitudinal nationwide population-based study, data were retrieved from the Taiwan National Health Insurance Research Database (NHIRD). A total of 4967 patients diagnosed with DM type 1 before January 1, 2003 were selected as the DM type 1 group, and 19 868 age- and sex-matched patients without DM type 1 were selected as the comparison group. Cox proportional hazard regression models were applied to measure the risk of PE and DVT in the DM type 1 group, compared with that of the comparison group. The comorbidities considered were malignancy, hyperlipidemia, hypertension, atrial fibrillation, heart failure, stroke, and lower-leg fracture. **Results:** The risk of PE and DVT in the DM type 1 group was 5.37-fold higher (95% confidence interval [CI] = 3.60–8.02) than that in the comparison group after adjustment for sex, age, and comorbidities. An additional stratified analysis indicated that patients aged between 20 and 39 y had the highest hazard ratio (HR) for PE and DVT (HR = 16.23, CI = 7.66–34.39), followed by patients aged under 20 y (HR = 4.23, CI = 1.22–14.72) and patients aged between 40 and 59 y (HR = 3.24, CI = 1.47–7.15). **Conclusion:** This retrospective nationwide population-based study indicates that patients with DM type 1 exhibit a higher risk of PE and DVT. **Disclosure:** All authors report no conflict of interest.

Sponsored Research - None

2516949

EVALUATION OF CLINICAL FACILITIES IN TERMS OF CLINICAL LEARNING ENVIRONMENT, SUPERVISORY REALTIONSHIP AND ROLE OF CLINICAL INSTRUCTOR IN RESPIRATORY THERAPY EDUCATION.

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BACKGROUND: Clinical facilities are essential components not only for health care delivery systems but also for healthcare education programs. The clinical learning environment (CLE) is important in training the future workforce in healthcare. Respiratory therapy (RT) education programs face several issues with the need to prepare a proper CLE in different clinical settings. The purpose of this study was to determine the perceptions of RT students on the CLE of clinical facilities affiliated with a RT program at an urban university. **METHODS**: This study used an exploratory research design to evaluate the essential aspects of a CLE in RT education. A self-reporting survey was utilized to gather data from 34 RT students regarding their perception about clinical facilities in RT education. The researcher utilized The Clinical Learning Environment, Supervision and Nurse Teacher (CLES+T) evaluation scale that was developed by Sarrikoski et al. (2008). The CLES+T evaluation scale was adapted and modified after a written agreement from the author. The survey included three main domains, which are the CLE (18 items), the supervision relationship (15 items), and the role of clinical instructors (9 items). Thirty-two students participated in the survey with a response rate of 94.1%. **RESULTS**: Responses included two groups of students: the second year undergraduate(68.8%) and graduate students(31.3%), with 75% being female participants. The results obtained from the study indicated that both graduate and undergraduate RT students gave high mean scores to the CLE, supervisory relationship and the roles of clinical instructors. A statistically significant data was obtained pertaining to the difference of perceptions regarding the multi-dimensional learning between both groups(p=0.03). The graduate students rated the learning situation of CLE as more multi-dimensional than the undergraduate students. The results stating, the presence of a significant percentage of the students with lack of successful private supervision and high percentage of failed supervisory relationship, are in contrast with the fact that CLE plays a vital role in the RT education. It is also stating that majority of the students experienced team supervision more than individual supervision. **CONCLUSION**: Since RT is a practice-based profession, it is essential to integrate clinical education to RT education. Gender and education level may impact students' perceptions about the CLE of clinical facilities.

Sponsored Research - None

2519388

COMPARISON OF SOUND LEVELS OF HEATED HIGH-FLOW NASAL CANNULA (HFNC) IN OXYGEN THERAPY.

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INTRODUCTION: We reported on how we digitized the sound level of a venturi effect-typed HFNC (Max Venturi; Maxtec, USA) and reduced the noise with an intake filter (figure1.B) at the AARC meeting in 2015. As the noises in a hospital have increased steadily over the past 50 years and may cause such bad effects as miscommunications, unsteady sleep patterns, and annoyances among patients and staff, they need to be reduced by any means. PURPOSE: Digitizing the sound level of an air-oxygen blender-typed HFNC (OptiflowTM; Fisher&Paykel, New Zealand) and comparing it with that of Max Venturi without a filter. METHOD: We located an OptiflowTM at the center of our hospital room. We measured the sound level with the distance of 1.0m from the front of OptiflowTM while alternating the total flow and FiO2. Firstly, we measured the sound level in the room. Secondly, we measured the sound level at each alternated parameter. Thirdly, we measured the sound level of OptiflowTM with a filter (electrostatic filter 350/5865Z; Medtronic, USA) attached as an outlet filter while alternating each parameter. Lastly, we compared the measured values in Man-Whitney U test. RESULTS: With OptiflowTM, although the sound level was high when the total flow increased, it didn't change when FiO2 was increased. In addition, the sound level didn't increase much when it was without the filter. In the group without the filter, it became 55.3dB when FiO2 was 0.4 and the total flow was 30LPM. It became 55.2dB when FiO2 was 0.9 with the total flow of 30LPM, 61.0dB when FiO2 was 0.4 with the total flow of 60LPM, and 60.9dB when FiO2 was 0.9 with the total flow of 60LPM. In the group with the filter, the sound level became 55.3dB when FiO2 was 0.4 with the total flow of 30LPM, 55.4dB when FiO2 was 0.9 with the total flow of 30LPM, 60.1dB when FiO2 was 0.4 with the total flow of 60LPM, and 60.3dB when FiO2 was 0.9 with the total flow of 60LPM (figure1.A). The sound level significantly went down in the group with OptiflowTM compared with Max Venturi without the filter. The noise decreased to 11.6dB at the maximum in the former. Interestingly enough, the sound level of Max Venturi with the filter was equal to or lower than that of OptiflowTM. CONCLUSION: Our study proved that the sound level of OptiflowTM didn't change significantly as compared with that of when a filter was attached. However, the sound level of OptiflowTM decreased in comparison with Max Venturi without a filter. Sponsored research: None

Sponsored Research - None

2524259

MIGRAINE IS ASSOCIATED WITH AN INCREASED RISK OF ADULT-ONSET ASTHMA: A NATIONWIDE COHORT STUDY.

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Background: Both migraine and asthma are common health problems in the general population. However, whether migraine patients are associated with an increased risk of asthma is unknown. **Objective:** We examined whether adult migraine patients have a higher risk of developing asthma. **Methods:** We used data retrieved from the National Health Insurance Research Database of Taiwan to conduct this nationwide, population-based cohort study. We identified 8238 patients, aged 20–60 years, with newly diagnosed migraine between 2000 and 2005 as the migraine group and 32 952 participants without migraine as the nonmigraine group. The comorbidities considered were rhinitis, chronic sinusitis, atopic dermatitis, and chronic obstructive pulmonary disease. Both groups were followed-up until the end of 2011 to examine the incidence of asthma. Cox proportional hazard regression analysis was used to measure the hazard ratio (HR) of asthma in the migraine group relative to that in the nonmigraine group. **Results:** Compared with the nonmigraine group, the HR of asthma development was 1.92 (95% confidence interval = 1.72-2.15) for the migraine group after adjustment for age, sex, and comorbidities. Additional stratified analysis revealed that this risk was significantly higher for both sexes and in all age groups between 20 and 60 years. **Conclusion:** Migraine patients have a higher risk of developing asthma.

Sponsored Research - None

2525112

STAFFING TO WORKLOAD - RESPIRATORY CARE.

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Background: The Respiratory Care Department uses a minimum number approach to staffing the hospital with twelve hour shifts broken into 4 hour blocks. During 2012, a significant number of shifts started with staffing above the minimum target level while productivity metrics indicated a gradual decline in demand for services. Our baseline measure for staffing showed 20% of 4 hour shifts with levels above the recommended minimum during 2012 and no shifts needing to activate our on-call personnel as emergency back-up. **Method:** 2196 four hours shifts of administrative data were collected. Analysis of the data identified several factors contributing to the number of shifts with staffing above the minimum target even though the workload didn't demand it. The factors identified included: lack of authority to change the policy; lack of accountability for extra staffing; no assignment of responsibility to reduce when overstaffed; no mechanism for follow-up. We used the processing map to help identify gaps in service and areas for improvement, root cause analysis to help us determine where to focus our improvement efforts; baseline, process and counterbalance measures to help us evaluate success; PDSA cycles as we tried different approaches. **Results:** Staffing levels for 2013 showed a decrease extra in staff; a 54% improvement. 4 hour shifts where staffing met the minimum target show a 22% reduction; 4 hour shifts where staffing was below minimum target increased 70%. Changes were reflected by increase of approved short notice PTO by 2566 hours above the previous 4 year average. **Conclusions:** We demonstrated an improvement in reducing the number of shifts with extra staff by more than our target of 20%.

Sponsored Research - None

2525129

IMPLEMENTING A SIZING CHART FOR NASAL CANNULA PLACEMENT TO DECREASE ASSOCIATED PRESSURE ULCERS IN INFANTS.

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BACKGROUND The Joint Commission definition of a "Pressure ulcer" is a broader term that includes decubitus ulcers but also includes any ulcerations associated with pressure. Over a three-month period in 2015 the Intensive Care Nursery (ICN) at Thomas Jefferson University had five patients who developed pressure ulcers due to placement of an improper size nasal cannula being used for that patient. Infant nasal cannulas are typically classified as being for micro premature, premature, neonate, infant and intermediate infant size patients. There is no instruction by manufactures for fitting a cannula to the actual size of the patient in kilograms. Cannulas also were not of a universal size for various manufactures. **METHOD** Using manufacture specifications and measurements taken by our Biomedical department, a sizing chart was developed to fit the proper size cannula based on a patient's weight in kilograms. Four different manufactures were used in our nursery. (See table below) **RESULTS** Since the implementation of the Nasal Cannula Size Chart in the Intensive Care Nursery at Thomas Jefferson University Hospital, the incidence of pressure ulcers associated with the use of nasal cannulas has remained zero in the initial five-month period. **CONCLUSION** The implementation and use of a size chart based upon a patient's weight for nasal cannula use by hospitals may be a vital tool in reducing the incidence of pressure ulcers associated with nasal cannula use in the infant population; it may also be a vital tool which should be included in the manufacture packing material. Further investigation is needed to analyze data after one year to confirm our hypothesis the use of a Nasal Cannula Size Chart reduces pressure ulcers.

Sponsored Research - None

Nasal Cannula Size Chart

	< 750g	750-1000g	1000-2500g	2500-4000g	> 4000g
Ram Cannula	Micro Premature	Premature	Neonate	Infant	Consider Pediatric
Salter Cannula	******** ********	Premature	Neonate	Infant	Intermediate Infant
Vapotherm Cannula	Premature	Neonate	Infant	Intermediate Infant	Consider Pediatric
Fisher & Paykell Cannula	Premature	Neonate	Infant	Intermediate Infant	Consider Pediatric

2528372

PULMONARY DEAD-SPACE FRACTION IN UNCOMMON ETIOLOGIES OF ACUTE RESPIRATORY DISTRESS SYNDROME.

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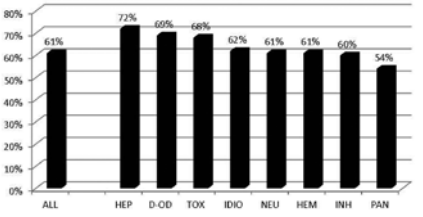
Background: Little is known about pulmonary dead-space fraction (V_D/V_T) in uncommon etiologies of acute respiratory distress syndrome (ARDS). We used our hospital's ARDS quality assurance database to examine the degree to which V_D/V_T is altered by various, less-common causes of ARDS. **Methods:** Of the 685 patients in our data base, 83 had an uncommon source of ARDS, 74 of whom did not have sepsis as a co-diagnosis (which was an exclusion criterion). There were 8 etiologic categories: hepatic failure (HEP, N=5) drug overdose (D-OD, N=8), Inhalation injury (INH, N=8), idiopathic (IDO, N=7), neurogenic (NEU, N=5) and pancreatitis (PAN, N=18). Two other categories combined similar or inter-related injury mechanisms Toxic (TOX, N=7) included chemical, radiation and cytoxic causes, Hemorrhagic shock (HEM, N=16) also included 2 cases of transfusion-associated and 2 reperfusion-associated lung injury. V_D/V_T was measured using the Enghoff-Bohr equation. An arterial blood gas was drawn simultaneously to measure mixed expired CO_2 using volumetric capnography (NICO monitor, Philips). Statistical analysis comparing V_D/V_T between different etiologies was done by Kruskal-Wallis test. **Results**: Although there was a clear trend towards differences in V_D/V_T between etiologies, this was negated by greater differences within etiologic groupings, and the small sample sizes ($p = 0.07$). Nonetheless, HEP, D-OD, and TOX causes of ARDS were associated with the highest abnormalities in V_D/V_T. Interestingly, PAN was associated milder alterations similar to those found in trauma-associated ARDS. The highest V_D/V_T found in HEP may partly reflect prominent pulmonary arteriovenous shunting (associated with high blood ammonia levels). In the other etiologies with salient increases in V_D/V_T (DOD, TOX) chemically-induced injury to the pulmonary capillary endothelium may have caused pronounced microvascular embolization. However, in the case of DOD, unrecognized aspiration also could explain the pronounced elevation in V_D/V_T. **Conclusion**: Although V_D/V_T was elevated in less common sources of ARDS, there was a tendency towards wide variation within and between etiologies.

Sponsored Research - None



2528391

SOCIOECONOMIC STATUS AND PULMONARY FUNCTION TESTING IN A MEGA HEALTH FAIR.

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Background Several studies reported that there is a decrease in lung function values in low socioeconomic (SES) population areas. Reports suggests that individuals in low SES have low FEV1 and FVC values compared to high SES areas. In this study we are evaluating the relationship and association between pulmonary function results and socioeconomic status in a selected population at a mega health fair in southern California. **Methods**: This study was approved by the Institutional Review Board at Loma Linda University. Sixty subjects participated in this study, 32 males and 28 females with a mean age (52 ± 14.46). All subjects underwent simple spirometry testing, according to American Thoracic Society guidelines, and then answered a written questionnaire assessing their SES (income, level of education, living status, served in the military, social life, and life satisfaction). Vital signs, BMI, and neck circumference measurements were taken as well. **Results**: Mean Forced Vital Capacity (FVC) % was (89 ± 18.956), Forced Expiratory Volume (FEV1)% (89.13 ± 22.80), FEV1/FVC % (96.77 ± 17.67), and FEV 25-75% (89.16 ± 37.59). There was a significant indirect relationship between serving in the military and FEV1/FVC % values of (p=0.002). 14 out of 23 subjects reported current smoking with an average of 18 packs per year while 37 declined to answer smoking related questions. About 50% of subjects have some college or high school degree as highest level of education earned. About 33% of the subjected were unemployed and 25% were self-employed. There was no significance nor relationship between any spirometry results and other SES values such as income, level of education, and owning a house. **Conclusion**: Our study showed no significant difference between spirometry findings and socioeconomic status, this was not expected given that smoking prevalence is well documented as well as supported by our limited data, which tend to be higher amongst lower socioeconomic groups. We believe that significant findings in military personal might be due to many variables, not limited to, breathing silica from the sand, asbestosis, etc. It was also unclear as to why 61% of our subjects declined answering smoking related questions, fear of questionnaire answers finding its way to insurers maybe one facet. Our study was limited by its small sample size and further studies are warranted to demonstrate associations between pulmonary function results and socioeconomic status.

Sponsored Research - None

2528704

INDEPENDENT LUNG VENTILATION AND NITRIC OXIDE AS RESCUE VENTILATORY STRATEGY IN ARDS.

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We present the case of a male patient 77 years old with medical history of Lung and Kidney vasculitis biopsy diagnosed in 2010 and antiphospolipid syndrome without known episodes of venous thrombosis treated with prophilactic enoxaparin. 1 week with cough and fever and the last 24 hours before coming to emergency room with acute respiratory failure. At his admission pulse oximetry 77% at room air, respiratory rate 30 per minute and Thorax CT with Bibasal consolidation more extensive in the right lower lobe, multiple areas of ground glass mainly at the right lung. Relevant Blood exams Creatinine 1.8, BUN 57 mg/dl, Filtration rate 29.4 ml/min, 10,300 leucocyte and 21% bands, PCR 47.62, Procalcitonin 17.10. Clinical course was complicated and 12 hours after his admission he was intubated and mechanically ventilated with a PaO2/fiO2 ratio of <100 with 12 cms H20 PEEP, because of refractory hypoxemia prone position was attempted without response. Every attempt to increase PEEP resulted in lung overdistension, decreased compliance and oxigenation. For that reason it was decided to intubate with a doble lumen endotracheal tube for independent lung ventilation as well as the use of Nitric Oxide, with this strategy PaO2/FiO2 ratio increased to 300 and 72 hours latera the patient was wean from NO and the double lumen endotracheal tube was changed for a single lumen, the patient mantained PaO2/FiO2 around 200, sedation was decreased and the patient was ventilated in a spontaneous mode. Although Independent lung ventilation was described early this century its use in critical care is rare. We present the case of this patient on which conventional strategies failed and this combined strategy; independent lung ventilation and nitric oxide were clearly benefical for both oxigenation and the weaning process. To our knowledge this combined strategy has not been reported maybe because most of the ILV cases described were before NO was used in the treatment of ARDS however as in this case this combination could be used as a rescue strategy in selected cases were asymmetric disease or predominant one side pathology is observed avoiding lung overdistension, protecting the healthier lung and even administering drugs in a selective mode.

Sponsored Research - None

Blood gas and Radiology

Date	pH	PaO2/FiO2	PaCo2	HCO3	BE	SatO2%	FiO2	Intervention
29 March 2016	7.29	116	42	20.1	-6.5	98	100	single lumen tube
29 March 2016	7.45	51	31	24.3	-0.8	94	100	15 PEEP
29 March 2016	7.28	76	48	25.4	-1.3	96	100	PRONE
30 March 2016	7.31	172	50	24	-1.2	99	100	Independent lung Ventilation ILV
2 April 2016	7.48	218	39	29.9	5.9	100	100	ILV+NO 20ppm
6 April 2016	7.48	177	36	26.9	3.2	100	100	tracheostomy

2529517

NOISE EXPOSURE FROM MECHANICAL VENTILATORS DURING NONINVASIVE POSITIVE PRESSURE VENTILATION WITH AN INTERFACE-HELMET.

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BACKGROUND: The interface-helmet has some advantages over other types of interfaces, such as less skin damage and a higher tolerance. However, the patient's head is completely covered by the helmet, and noise generated by the inspiratory flow from the mechanical ventilator may prove to be annoying. The purpose of this study was to assess noise exposure from mechanical ventilators during noninvasive positive pressure ventilation (NPPV) with the interface-helmet. **METHOD:** The subjects were 5 mechanical ventilator models. The noise intensity inside and outside the interface-helmet were assessed by placing lavalier microphones near the ears and using a sound-level meter. We evaluated the peak-inspiratory flow through the respiratory circuit and assessed noise exposure from mechanical ventilators during NPPV with the interface-helmet, with or without bacteria filters at the junction between the entrance to the interface-helmet and the branches of the respiratory circuit (PS: 0, 5, 10, 15cmH_2O). **RESULTS:** The noise intensity varied according to the model (PB840> V60> Servo-i> e360> C2), and bacteria filters had an effect which obstructed the passage of sound (Pneu-Moist> PALL> PORTEX> INTERSURGICAL> DAR). Compared with the outside it was less noisy inside the helmet, and the noisiness during NPPV was enough to tolerate. There was no correlation between the noise and peak inspiratory flow. The operation noise from the interior of mechanical ventilators increased noise intensity. **CONCLUSIONS:** It is suggested that noise exposure from mechanical ventilators during NPPV with an interface-helmet has a direct relation to the operation noise within mechanical ventilators. Mechanical ventilators taking measures against noise are able to reduce the noise intensity.

Sponsored Research - None

PS: 10cmH_2O	PB840			C2		
	Inside (Left, Right)		Outside	Inside (Left, Right)		Outside
Non-Filter	30.14	24.95	64.8	7.16	5.52	55.2
DAR	19.58	15.31	60.5	6.21	4.81	54.4
Pneu-Moist	14.99	11.33	60.1	-	-	53.9

(dB)

Hyphenation points mean it was impossible to measure by measurement device due to the low noise level.

2529528

AN ASSOCIATION BETWEEN VARIANTS OF LEPTIN(LEP), ADIPONECTIN(ADIPOQ) AND OBESITY-RELATED SLEEP APNEA OF POSTMENOPAUSAL WOMEN IN KOREA.

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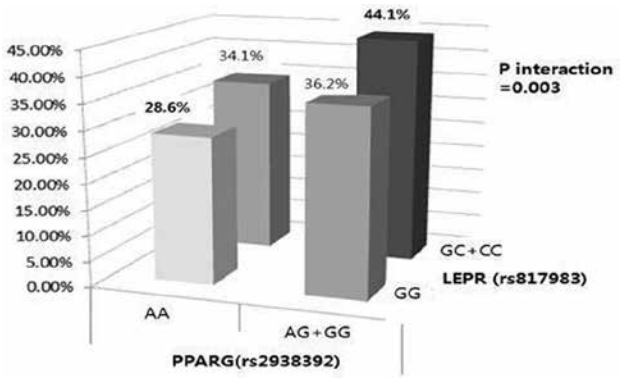
Background: The Fifth Korea National Health and Nutrition Examination Survey (KNHANES V) was conducted in 2012, and the results showed that the overall prevalence of adult obesity (BMI≥ 25kg/m2) was 32.6 % (36.3 % in men and 28.0 % in women). A more recent study revealed that positional sleep apnea was more common in the patients with mild Obstructive sleep apnea (OSA) and the positional tendency of OSA patients was affected by central obesity. Such the factors as the severity of OSA, the weight, the waist size and the waist to hip ratio (WHR) are also related to the positional tendency **Method:** We analyzed the polymorphism of the genes LEPR, ADIPOQ and PPARγ in 907 postmenopausal women to demonstrate the relationship between genetic variants of obesity-related genes and the components of Obstructive sleep apnea (OSA) in postmenopausal women. **Results:** The results showed that the weight levels (Overweight and obesity) were higher in the GT+TT genotype of rs1501299 of ADIPOQ gene and the GC+CC genotypes of rs8179183 of LEPR gene. Waist sizes and waist to hip ratios (WHR) were higher in the GG genotype of rs8179183 of LEPR gene. The prevalence of Obstructive sleep apnea (OSA) was higher in the AG+GG genotype of rs2938392 of PPARγ gene and the GC+CC genotype of rs8179183 of LEPR gene. **Conclusions:** The study found that several SNPs of adiposity-related genes were associated with Obstructive sleep apnea (OSA), as well as obesity. This association would provide a possible genomic linkage of the OSA in postmenopausal women.

Sponsored Research - None



2529544

A CONCORDANCE ANALYSIS OF SELF-REPORTED AND COTININE-VERIFIED SMOKING PREVALENCE RATES OF MALE AND FEMALE SMOKERS IN KOREA.

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Background: The current anti-smoking policies in Korea are heavily relying on the self-reported smoking prevalence data from the Korean National Health and Nutrition Examination Survey. However, due to the traditional Korean culture that imposes conservative standards on female smokers, a self-reporting method may not be an accurate measure of female smoking prevalence in Korea. This study investigated smoking prevalence rates of Koreans from 2008 to 2014 to examine a possible underrepresentation of self-reported female smokers, and a trend of non-smoking rates to see effectiveness of anti-smoking campaigns. **Method**: A total of 17,868 Koreans, including 8,235 men and 9,633 women, participated in both the National Health and Nutrition Examination Survey from 2008 to 2014 and a follow-up urinary test to have their cotinine levels measured (missing the cotinine data in 2012 and 2013). The participants were classified as a smoker or non-smoker based on the survey, where the non-smoker group included both never-smokers and ex-smokers. Additionally, the urinary cotinine concentration of 50 ng/ml was used as a cut-off to distinguish smokers from non-smokers. **Results**: The concordance rates of self-reported and cotinine-verified smokers found a significant gender difference. The female concordance rates of self-reports and cotinine test results were significantly and consistently lower than those of males, e.g., 94.95% of male and 54.82% of female in 2014 (see the Table for the more results). As for a non-smoking trend, the results showed a decrease in the percentages of smokers in both genders. From 2008 to 2014, female smoking rates dropped from 13.99% to 7.86% and males from 49.94% to 42.04%. **Conclusions**: The gender gap found in the concordance rate raises the red flag to validity of self-reporting of female smokers. The self-reported smoking prevalence in Korean women may be extensively underestimated and should take into account a large number of hidden female smokers due to social and cultural denigration inflicted on women in Korean society. Also, the decreasing non-smoking rate found in this study may support the effectiveness of anti-smoking campaigns promoting positive social perceptions for non-smoking. Nonetheless, this study recommends further research on biochemical verifications to validate the results of national tobacco surveys and sociocultural discussions for an accurate understanding of smoking behaviors by gender.

Sponsored Research - None

2529972

ASSESSING THE EFFICACY OF DIRECTING THE FLOW FROM A 5-LPM CONCENTRATOR THROUGH TWO PEDIATRIC FLOWMETERS.

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Background Oxygen is generally abundant and readily available in practically all clinical venues in the US. However, this isn't always the case in other parts of the world. One possible solution to this issue, especially with babies, is to use single flowmeter concentrators attached to dedicated pediatric flowmeters. The purpose of this study was to assess the efficacy of directing the flow from a single flowmeter concentrator through two such pediatric flowmeters (i.e. splitting the flow). **Method** A 5-Lpm Perfecto2V oxygen concentrator (Invacare, Elyria, OH) was checked for flow and FiO_2 via a 7-foot length of small bore tubing attached to a validated US LX system concentrator test station (Invacare, Elyria, OH). Then two 7-foot lengths of similar tubing were attached to the single limb via a wye connector. The distal end of each tube was attached to a pediatric flowmeter (Model IRCPF 16, Invacare, Elyria, OH) that was checked for flow accuracy. A 7-foot length of tubing connected the output flow to a test station. The concentrator flowmeter was set a 2 Lpm and flow and FiO_2 for each pediatric flowmeter were checked at 0.25, 0.5, and 0.75 Lpm. **Results** Note: FiO_2 was rounded to the nearest whole number; flow was rounded to the nearest 100th of a Lpm. Station A Flowmeter Setting FiO_2 Flow 0.25 .85 0.17 0.5 .90 0.41 0.75 .93 0.62 Station B Flowmeter Setting FiO_2 Flow 0.25 .85 0.25 0.5 .92 0.5 0.75 .93 0.75 **Conclusion** As can be seen from the data, there was a slight but noticeable variation in the flowrate between the two flowmeters (< a 10th of Lpm). Since the two pediatric flowmeters are set by adjusting a dial to place a ball on the number line, there may have been a slight difference in the ball height (ball placement was verified through observation by two viewers). It is concluded that, while careful monitoring and ball adjustment are important elements, it is efficacious to split the flow from a 5-Lpm concentrator through two pediatric flowmeters.

Sponsored Research - None

2530769

PUFF PUFF, WHEEZE, WHEEZE! OH HOW I WISH I COULD BREATHE. PREVALENCE OF UNDIAGNOSED ASTHMA IN OLDER ADULTS.

Timothy A. Larson, Linda Griggs; Aultman Health Foundation, Canton, OH

Background Aging of the U.S. population is a major health challenge. Older adults have higher rates of hospitalization due to chronic disease, including Chronic Obstructive Pulmonary Disease (COPD), and complex care needs $_{(2)}$. Asthma is the most common type of obstructive lung disease with a prevalence of 10% in patients > 60 years of age and a mortality rate of 6%, the highest of all age groups $_{(1, 7)}$. Asthma in older adults is rarely diagnosed. Health symptoms such as asthma are often blamed on age when there may be a treatable cause. Ohio has a high prevalence of asthma affecting > 9% of adults $_{(8)}$ and exceeds the Healthy People 2020 goal to reduce asthma hospitalizations by 150% for geriatrics $_{(9)}$. The purpose was to determine the prevalence of undiagnosed obstructive lung disease in older adults, specifically asthma. **Method** This study was a descriptive correlational study using a convenience sample at senior health fairs. Inclusion criteria; age 65 and older, English speaking, and able to read and write. Participants completed a questionnaire, pulmonary function screening, and pulse oximetry reading. If a history of asthma was noted, the participant completed additional questions related to asthma control. **Results** N=117 42% screened positive for obstructive lung disease (OLD) defined as FEV1 <80%. 28% of these had no previous diagnosis. 79% of the nondiagnosed OLD screening, screened positive for asthma. **Conclusions** Overall, 10% of older adults had or may have asthma correlating with current literature. Improvement in the diagnosis of OLD could lead to quality of life in older adults **Disclosures** IRB approval was on October 2nd, 2015. The authors have no associations with the industry.

Sponsored Research - None

2530831

WEANING ELBW INFANTS WITH NEURALLY ADJUSTED VENTILATORY ASSIST : A CASE REPORT.

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Introduction: Neurally adjusted ventilatory assist(NAVA) assists the patients' spontaneous breath synchronously by trigger of diaphragmatic activity and delivers a proportional pressure, regardless of the disease or size of the patient. This new mode of ventilation may offer potential solutions to many of the challenges posed by neonatal ventilation. However, experience with the use of NAVA in the neonatal population, especially the premature baby, is limited. Here we present an experience of applying NAVA mode to wean an ELBW premature baby from high frequency ventilator successfully. **Case summary:** This premature female baby was born with gestational age of 22^{+2} weeks and birth weight of 510gm. She was intubated with ventilator support immediately after birth and surfactant was given due to RDS. During hospitalization, high frequency ventilation(HFO) was used due to pulmonary hemorrhage and nitric oxide inhalation was given then due to pulmonary hypertension. Quickly, the X-ray of chest revealed bubbling appearance compatible with bronchopulmonary dysplasia. After 3 months of HFO support, the high setting (frequency:12Hz, delta P:18cmH2O, mean airway pressure:12 cmH2O, FiO2:60%) persisted. Due to difficult weaning from HFO and unstable oxygen saturation, we switched ventilator mode to NAVA with initial setting of NAVA level:1.2 cmH2O/uV, PEEP:5 cmH2O and FiO2:50%. After one hour support of NAVA mode, the patient's respiratory pattern became much more smooth and the saturation kept >95% stably. After 48 hours of NAVA, we started to wean NAVA by dropping NAVA level and FiO2 and this patient was successfully extubated after 10 days of NAVA mode. **Discussion:** The respiratory pattern in premature baby is extremely varied. It's not easy to find an appropriate trigger method to facilitate respiratory synchrony between patient and ventilator. The NAVA delivers respiratory support by reflex control of the patient's diaphragmatic activity, determines the peak inspiratory pressure, inspiratory and expiratory time for each breath and the respiratory rate. It makes the patient more comfortable and weans smoothly. We suggested NAVA is an ideal synchronized ventilator for ELBW infants without frequent apnea.

Sponsored Research - None

2530922

ANALYSIS OF CHARACTERISTICS AND PROGNOSTIC FACTORS IN ADULT PATIENTS USING BIPAP IN KOREA: A RETROSPECTIVE SINGLE CENTER STUDY.

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Background: An advance in medical technology and increase of old patients with chronic respiratory failure are increasing the prevalence of BiPAP. This study was done to evaluate the clinical characteristics, outcomes, and prognostic factors of adult patients requiring BiPAP in a university hospital. **Method:** Retrospective chart review was performed on 239 adult patients, who received noninvasive BiPAP at academic tertiary referral hospital with approximately 2,700 beds from March, 2014 to February, 2016. We analyzed the characteristics between the weaning success and the weaning failure groups. Data were expressed as the number (percentage) or median (interquartile range). This study was approved by the ethics committee of Asan Medical Center (No.2016-0358). **Results:** The median age of the patients was 69 years (56-77) and 63.2% were male. The causes of BiPAP were acute respiratory failure (69.1%), acute exacerbation of chronic respiratory failure (18.8%), and neuromuscular disease (12.1%). Mortality was 20.5% and the patients requiring home BiPAP at discharge were 25.1%. The overall weaning rate from BiPAP was 52.3%. The weaning success group had a higher heart failure (19.4% vs 9.5%, p=0.034) and a lower total duration of BiPAP (median 4 days(2-7) vs 9 days(4-18), p<0.001) compared to the weaning failure group. Total duration of BiPAP ≥ 5 days, chronic lung disease, and heart failure were independently associated with successful BiPAP weaning. **Conclusions:** Chronic lung disease, heart failure and total duration of BiPAP appeared to be significantly associated with successful weaning from BiPAP.

Sponsored Research - None

2531740

THE PREDICTIVE FACTOR OF HOSPITAL SURVIVAL FROM MECHANICAL VENTILATION IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASES.

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Background: The incidence of weaning failure from mechanical ventilation (MV) increases in patients with chronic obstructive pulmonary disease (COPD). The aim of this study was to investigate the predictive factor of hospital survival after planned extubation in COPD patients with respiratory failure. Methods: A retrospectived review from medical records was conducted for the COPD patients with respiratory failure. All of these patients were under endotracheal tube intubation with MV support in intensive care units (ICUs) of Chi-Mei Medical Center, Taiwan from 1 Jan, 2010 to 31 Dec, 2011. Patient characters, such as disease severity (APACHE II, and TISS scores), body mass index (BMI), vital signs, laboratory data were collected. Successful weaning from MV was defined as without reintubation over 72 hours after endotracheal tube extubation. The stay time in hospital and their medical costs were measured also. Statistical analysis of the data was done by SPSS version 18.0. Logistic regression statistical analysis was done. Statistical significance was set at p 0.05. Result: 285 COPD patients with MV support were enrolled in this study. The hospital survival rate was 93.0% (265 over 285 cases) of these patients. Compared with the hospital survival cohort, low albumin level (2.5 VS 2.7 gm/dl), and low mean arterial pressure after extubation (90.1 vs. 97.4 mmHg) were found in the hospital death patients. Moreover, prolonged ICU (11.7 VS. 10.0 days) and hospital stays (31.3 VS. 26.8 days) with higher costs of medical care (395 VS 283 thousands in New Taiwan Dollars) were also found in this cohort. The higher albumin level (albumin value ≥2.75 gm/dl) revealed the most significant predictive factor of hospital survival (p<0.05) for the cohort. Conclusion: The higher albumin level(albumin value ≥2.75 gm/dl) revealed an important predictive factor of hospital survival for COPD patients after extubation. The hospital death patients exhibited a prolonged ICU and hospital stays with higher costs of medical care. Keywords: hospital survival, extubation, COPD, respiratory failure, albumin.

Sponsored Research - None

The multi-factor analysis predictors of hospital mortality after planned extubation in COPD patients with respiratory failure.

	OR(Odds Ratio)	95%CI	P value
Albumin value before planned extubation<2.75*	3.352	1.071-10.488	0.038

PS: The statistical analysis ways were the logistic regression and ROC statistics analysis.
* : Albumin value before planned extubation<2.75,AUC=0.646,p=0.03

2531806

SLEEP DISORDER BREATHING ASSESSMENT IN LOW SOCIOECONOMIC STATUS PATIENTS IN A MEGA HEALTH FAIR CLINIC.

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Background: Sleep disordered breathing (SDB) is a general term used to describe a variety of breathing difficulties occurring during sleep. Several studies reported the possibility of having higher SDB in lower Socioeconomic Status (SES). There are several screening tools that measures SDB such as Epworth Sleepiness Scale (ESS) and STOP-BANG (SB) questionnaire. The purpose of this study is to measure the relationship between both screening tools and SES. We hypothesize that patients with low SES have lower sleep quality and higher chances of SDB. **Methods:** Sixty subjects participated in this study, 32 males and 28 females with a mean age (52 ± 14.46). This study was conducted at a mega health fair in southern California targeting patients with low socioeconomic status. A questionnaire assessing socioeconomic status, pulmonary health and sleepiness were distributed. ESS and SB were used to assess sleep disordered breathing. Patient assessment included heart rate, oxygen saturation, blood pressure, height, weight, neck circumference, and body mass index. **Results:** For SB questionnaire, 36 subjects were intermediate risk, 5 high risk, and 19 low risk of sleep apnea. There was a significant direct correlation in neck circumference measurement and SB with a p=0.034, BMI (p=0.048), and Shortness of Breath (p=0.037). In ESS, 26 subjects scored within the (10-15) category, 20 within (8-9), 10 within (16-24), and 4 within (0-7). There was no significant correlation between ESS and SB with SES variables such as income, level of education, and owning a house. There was neither a significant correlation nor relationship between ESS and SB questionnaires. About 55% of the subjects have a total annual income of less than $20,000; 58% rent a home and 5% have no home; 33% are unemployed with 43% satisfied with their overall life.. **Conclusion:** We did not find any relationship between SES values such as income, level of education, owning a house that is related to SB or ESS. Our study supports previous findings that SDB is prevalent throughout the general population and disregards socioeconomic boundaries. Our study also supports a more recent study by Chung et al (2016, CHEST), where SB questionnaire items do not share equal predictive weight for OSA with significance seen with neck circumference. We believe that there was no significant results seen between SES and SDB screening tools is mostly due to the small sample size in our study, further studies are recommended.

Sponsored Research - None

2531870

RESPIRATORY CARE SAFETY AND SUPPORT INITIATIVES INCREASE PATIENT SATISFACTION IN ADULT PATIENT POPULATION.

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Background: A department initiative was made to monitor and maintain patient satisfaction in respiratory therapy delivery. A goal was set to achieve > 90% patient satisfaction annually. **Method:** In 2012, a survey was created to gauge patient satisfaction and monthly rounding was set in place to gather data. In 2013, in response to a near-sentinel event involving an asthmatic patient, the asthma alert was created. Asthma alert was designed to protect patients with severe reactive airway disease by signaling anyone entering the room. Signage is now displayed on the door of all "at-risk" patients. in 2014, an improvement was made to our survey to assess pain in post-operative patients while using expansive/percussive therapy. In response, our acuity adaptable care unit changed timeframes of therapy to line up with pain medication administration times. In 2015, we developed a COPD/asthma medication pamphlet for patient education. We strive to educate our patients to use their medication appropriately and as indicated. **Results:** Our patient satisfaction outcomes increased by 2% each year from 2012-2015 in response to patient safety/support initiatives set in place. **Conclusion:** Monthly patient satisfaction rounding has given valuable insight to our patients' needs. Responses set in place to the information that has been gathered has increased our satisfaction ratings by 6% in a 3 year timeframe. **Disclosures:** We have no disclosures.

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2531884

VARIABILITY IN DISTAL END-EXPIRATORY PRESSURE AND DISTAL FLOW RATES IN THREE DIFFERENT HIGH-FLOW NASAL CANNULA SYSTEMS.

Kevin P. Collins, Joshua F. Gonzales, Christopher J. Russian; Respiratory Care, Texas State University, San Marcos, TX

Background: High-flow nasal cannula (HFNC) therapy provides high flow rates of heated humidified gas above ambient oxygen level. Multiple systems are available to deliver HFNC therapy. This research examined the variability in distal end-expiratory pressure and distal flow rate measurements between three high-flow nasal cannula systems. Two hypotheses were generated for this study. The first null hypothesis states there will be no statistically significant difference for distal end-expiratory pressure and distal flow rates between the three HFNC devices. The second null hypothesis states there will be no statistically significant difference for distal end-expiratory pressure and distal flow rates for the set flow rates for each HFNC device. **Method:** HFNC therapy devices in this project included Fisher & Paykel (F&P) AIRVO™ 2, the Vapotherm Precision Flow, and the F&P 850. All systems were connected to Ingmar Medical's RespiTrainer® Advanced manikin head with large high-flow nasal cannulas. Placed on the distal end of the manikin head was a Hans Rudolph 1110A Pneumotach Amplifier One and a Series 3700A, 0-160 LPM, Heated Pneumotach to provide distal end-expiratory pressure and distal flow rate measurements. Measured flow rates and distal pressures were obtained at set flow rates of 10 L/m, 20 L/m, 30 L/m 40 L/m, 50L/m and 60L/m. Data were collected utilizing Dasy Lab® software and results were analyzed with the one-way ANOVA and Bonferroni post-hoc in SPSS version 22. This study was exempt from IRB. **Results:** Data were analyzed to assess differences between the three devices and between the set flow rates. There was no significant difference between the three HFNC devices and distal end-expiratory pressure (p=.364) or distal flow rate measurement (p=.204) There was no significant difference between the set flow rates and distal end-expiratory pressure (p=.149) or distal flow rate measurement (p=.113). **Conclusions:** The differences we observed between the three devices and the set flow rates did not reach statistical significance. Based on our findings we accept both null hypotheses. However, we found notable differences between the set flow rates and the measured flow rates for two of the devices. Table 1. These differences should be considered when using either HFNC therapy on patients. Additional research is needed to further assess the impact of these differences. **Disclosures:** All authors have no conflicts of interest or industry relationships to disclose.

Sponsored Research - None

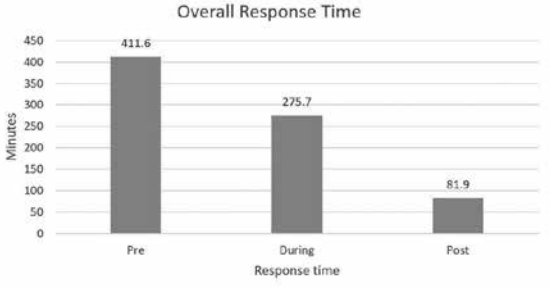
2531888

BENEFIT ASSOCIATED WITH IMPLEMENTATION OF A CORE RESPIRATORY THERAPY TEAM IN THE NEUROCRITICAL CARE UNIT.

Sumi Campbell; Respiratory Therapy, University Health Care, Cottonwood Heights, UT

Background The Neurocritical Care Unit at the University of Utah has become the region's largest and most technologically advanced unit providing care to critically ill neurological patients. There has been an expansion of beds, intensivists, neuromonitoring devices, implementation of a neuro-specific ventilator protocol, and a TBI protocol. A Core RT Team was organized to execute the NCCU Ventilator Protocol and to improve responsiveness to the unique needs of neurological patients. We tracked response time to correct abnormal ABG results prior, during, and post-implementation of the Core RT Team. We conducted a survey of MDs and RNs to assess the impact. **Objective** To improve vent change response time to abnormal ABG results for critically ill neurological patients where the normalization of PaCO2 is crucial. To increase communication between the MDs, RNs, and RTs and to assess the perceived impact on patient care by means of a survey. To increase the expertise and job satisfaction of RTs amongst the Core Team. **Methods** Patients in NCCU with diagnosis of CNS or PNS disease during Aug., 2014 to Sept., 2014, Jan., 2015 to Feb., 2015, and Oct., 2015 to Nov., 2015 were studied. Intubation duration > 6 h. A study began with a pH or CO2 level out of range in the ABG result following intubation and ended when normalized. When the ABG result became abnormal again, the measurement restarted. The endpoint was extubation or tracheotomy. Patients who were deceased were included in the study. The survey was conducted at pre- and post-implementation period among MDs/RNs, and the results were collected from February to March 2015 and March, 2016. Patients were assigned a study number that had no PHI associated with. **Results** The result was a substantial reduction in response time from pre-implementation of 411.6 minutes to 275.7 during and to 81.9 minutes post-implementation. The survey demonstrated complete satisfaction level on RTs' availability in the unit and communication level between MD/RNs and the RTs. **Conclusions** Since the initial implementation of the Core RT Team, the response time has shortened from 275.7 min to 81.9 min in the NCCU. Having an RT physically in the unit and getting the ABG results to their workphone enabled quicker response time and improved the responsiveness to the patient needs. NCCU staff survey results demonstrated that creating a Core RT Team has been a beneficial change for the unit.

Sponsored Research - None



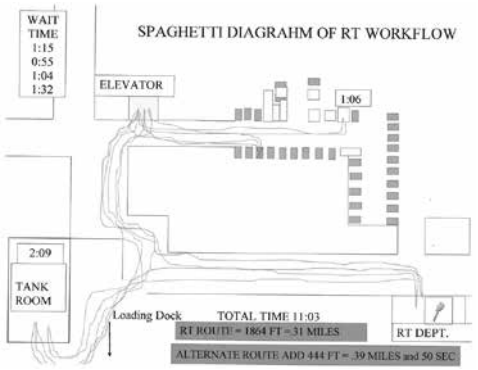
2531993

LEAN METHODOLOGIES IMPACT TO RESPIRATORY CARE SERVICES.

Deanna Gravely; Respiratory Care, Carolinas Healthcare System, Charlotte, NC

Background: The healthcare field makes up the country's largest industry. The decreasing reimbursement rates coupled with increasing operating expenses generates a significant problem. For Hospitals to survive in these times, there is a need to think outside of the box and look for ways to deliver patient focused, value-added care. Alternatives like Lean management philosophy and quality improvement methodology are becoming more popular in the medical arena with very successful outcomes. Lean methods focus on eliminating waste and spotlight the process and ways to optimize a procedure to benefit the customer's needs. **Methods:** Data obtained from ten observations across three very different facilities to evaluate the waste in daily activities of the Respiratory Therapists. Although the hospitals are very different, the observations revealed a common thread of tasks the therapists are completing that interrupted patient care, created increased wait times, excess motion, and did not use the full intellectual potential of the Respiratory Therapist. Surveys from 29 different facilities were obtained to gauge the standard at other facilities in completing these tasks. **Results:** The transfer of oxygen delivery to guest services department. The cost related to respiratory care providing this service is $47,320 and for guest services the yearly cost is $32,760. The annual savings associated with this project are $14,560 with 28 hours a week or 1,456 hours a year back at the bedside to impact patient care and outcomes. It has eliminated excessive motion to .31 of a mile each trip to respond and deliver oxygen tanks. Relieving the therapist of this task has positively impacted job satisfaction and engaged the team to participate and make changes to improve quality and processes. **Conclusion:** Lean methodologies provide the education and tools to see the waste, implement an improvement process and engage the team in problem-solving. Thinking this way can improve the therapist's workflow, increase the time at the bedside and provide faster, delay free response times for the delivery of care which may increase patient satisfaction and improve reimbursement. Lean thinking can make a positive impact on Respiratory Care Services by investigating and optimizing processes, removing the waste and ensuring the proper skill set is utilized in necessary daily work. **Disclosures:** The authors declare no conflict of interest.

Sponsored Research - None



2532020

AGREEMENT BETWEEN HEALTH CARE PROVIDER CLASSIFICATION AND CLINICAL DATA FOR ASTHMA SEVERITY AND CONTROL IN UNDERSERVED CHILDREN.

John R. Cameron[1], Maya Jenkins[2], Ellen Becker[1]; [1]Rush University Medical Center, Chicago, IL; [2]Northwestern Medicine Central DuPage Hospital, Winfield, IL

Background: Childhood asthma prevalence has stopped increasing, but rates for children living in poverty remain high.[1] The NHLBI EPR-3 guidelines recommend classifying asthma severity and control to guide asthma management. This study evaluated the agreement between the healthcare providers' classification and clinical data for asthma severity and control in a predominantly minority population. **Methods:** A retrospective chart review was conducted in a random sample of 600 children enrolled in an urban medical home network. Children were less than 18 years old, diagnosed with asthma, and had a routine healthcare encounter between March 2013 and March 2014. This study was approved by the medical center's institutional review board. The asthma severity and control classifications by medical providers were extracted from the electronic health record. Two researchers independently assigned EPR-3 severity and control classifications based upon the clinical data in the child's chart and resolved differences when they occurred. Descriptive statistics were computed for demographic information. The agreement between the healthcare providers' and researchers' asthma classification for severity and control was assessed using the two-way random effects interclass correlation coefficient (ICC). **Results:** The sample of 266 children who met eligibility criteria were 58.6% male; 72.2% African American, 20.7% Hispanic or Latino, 5.6% White, and 1.5% other; with a mean age of 9.8 ± 4.3 y. Across all routine visits (n = 286), medical providers' rate of documentation was 74.5% for asthma severity, and 58% for asthma control. The proportion of agreement between medical providers and clinical data for asthma severity was 67% (ICC = .733, 95% CI = .639 -.802) and asthma control was 85% (ICC = .824, 95% CI = .759 -.871). **Conclusions:** The assessment of asthma control by medical providers lags behinds their assessment of asthma severity in this sample of children from predominantly minority backgrounds. There was strong agreement between medical providers' and researchers' assessment of clinical data for asthma severity and control. Identifying effective strategies to increase the frequency and accuracy of asthma severity and control classifications may improve asthma management in this vulnerable population.

1. Akinbami LJ, Simon AE, Rossen LM. Changing trends in asthma prevalence among children. Pediatrics 2016;137(1):1-7.

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2532105

EFFECTS OF THERAPEUTIC SUGGESTION ON PAIN OUTCOMES ASSOCIATED WITH ARTERIAL PUNCTURES FOR BLOOD GAS ANALYSIS.

Frank J. Austan[2,1]; [1]Respiratory care Services, Corporal Michael J Crescenz Medical center, Philadelphia, PA; [2]Respiratory Care, Northeastern Hospital (Temple East), Philadelphia, PA

BACKGROUND: Arterial blood gases (ABGs) and associated needle puncture are described by patients as being a painful experience. This evaluation was initiated by staff members of respiratory care department who expressed concern during a quality improvement staff meeting about the intensity of pain emergency room patients experience during ABG procedures. Review of systemic reviews on acute pain management in adults associated with ABG punctures is limited. However one source compared the pain intensity scores of 40 hospitalized patients who received no pain reduction intervention as compared to those receiving pharmacologic intervention (infiltration of 0.7 ml 1 % lidocaine), the results revealed self-reporting pain intensity score was significantly reduced. This evaluation explores the use of therapeutic suggestion (TS) as a non-pharmacologic approach to ABG pain reduction. **METHODS:**The hospital's institutional review board (IRB) gave approval for this evaluation as a quality assessment / quality improvement initiative. N-25 patients were provided initial and follow-up ABGs. The initial ABG was drawn from the right radial artery and repeated in one hour from the left artery. Pain was measured using a verbal pain intensity scale and patient self-reported by post procedure by rating their level of pain on a scale of 0-4: 0=No Pain, 2=Mild Pain, 3=Moderate Pain, 4=Severe Pain. The intervention used one of two suggestions. Prior to the first puncture the arterial site was prepped with an alcohol wipe and provided suggestion (A), *"May I proceed?"* Post one hour the ABG was repeated, while prepping the left radial site, attention was directed to the alcohol wipe and verbal suggestion (B) spoken, *"Notice how cool this pad feel's, it's interesting how coldness numbs the skin."* A pre-post design was used assess the difference between suggestions A and B. **RESULTS:** Analysis of variance indicated that patients provided suggestion (B), (mean 1.72; SD=0.84) experienced pain reduction as compared to patients provided suggestion (A), (mean 2.4; SD=0.87). Patients n=25, p value was (less than 0.005) as determined by paired t-test. **CONCLUSION**: In adult patients TS as a nonpharmacological intervention appears to be a helpful adjunct in ameliorating the perception of pain associated with ABG needle punctures.

DISCLOSURES: None

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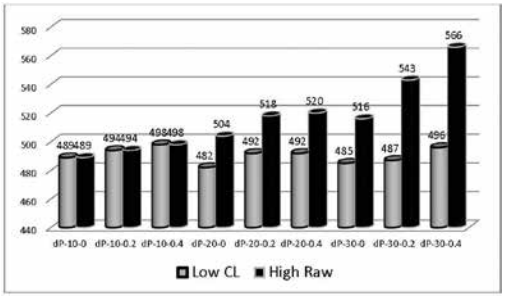
2528740

REDUCING COMPRESSION VOLUME DURING AN END-INSPIRATORY PAUSE PRIMARILY OCCURS UNDER CONDITIONS OF HIGH RESISTANCE AND HIGH COMPLIANCE.

Richard Kallet, Earl Mangalindan, Kelly Ho, Lance Pangilinan, Justin Phillips, Joseph Booze; Respiratory Care Services, San Francisco General Hospital, San Francisco, CA

Background: Pressurization of the ventilator circuit causes gas to be compressed and trapped within. Adding end-inspiratory pause (EIP) may diminish V_{CMP} because the EIP pressure gradient (PIP-Pplat) should inject gas into the lungs depending on 4 factors: magnitude of PIP-Pplat, pause time (T_{EIP}), airways resistance (R_{AW}) and lung compliance (C_L). We sought to determine whether differing conditions of simulated chest mechanics would alter the effects of EIP on V_{CMP}. We tested this in an adult lung model as a larger V_T and longer T_{EIP} would allow easier detection of these interactions. **Methods:** A Michigan Instruments Test Lung was used. Increasing dP (10, 20 and 30 cmH_2O) was accomplished by 2 methods. For decreasing C_L, a 7.5 mm ID endotracheal tube (ETT) was used while C_L was reduced from 80 to 30 to 17mL/cmH_2O. For increasing R_{AW}, C_L was kept at 80 mL/cmH_2O while ETT size was reduced from 7.5 to 6.5 and 6.0 mm ID. The Viasys Avea ventilator was used because it has very effective V_{CMP} compensation. Ventilator settings were: V_T = 500 mL, Inspiratory flow rate (square pattern) = 60 L/m, Rate = 15, PEEP = 5 cmH_2O. T_{EIP} was increased from 0 to 0.2, and 0.4s. A Fisher-Paykel heated wire circuit and MR290 chamber (heated for a minimum of 30 m) was used. Inspired V_T measured by the ventilator and at the circuit wye with a NICO (Philips) monitor. Ten consecutive breaths were analyzed with mean inspired V_T reported (Fig). Statistical analysis was done using Friedman test and Dunn's post-test. Alpha was set at 0.05 **Results**: As dP increased differences in inspired V_T appeared between low C_L and high R_{AW} conditions at increasing T_{EIP}. During low C_L, inspired V_T remained close to pre-set V_T (97%) without an EIP and was 99% with an EIP of 0.4s. In contrast, with high R_{AW} and high C_L, inspired V_T exceeded pre-set V_T from 18 to 66 mL (4-13% > preset V_T). We speculate that higher PIP-Pplat and slower rise in P_L would sustain gas flow into the lungs as T_{EIP} increased. Statistically significant results ($p < 0.001$) occurred in all comparisons within and between similar testing condition at dP of 20-30 cmH_2O and as T_{EIP} increased from 0 to 0.4s. **Conclusion:** The impact of T_{EIP} on inspired V_T is small, of questionable clinical importance and dependent upon respiratory system mechanics; with V_T overshoot occurring only under conditions of high dP caused by high R_{AW} and normal C_L.

Sponsored Research - None



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