ANALYSIS OF AEROGEN AERONEB SOLO NEBULIZER GAP TIME WITH AND WITHOUT THE AERONEB SOLO LEUR TO DETERMINE SAFE AND EFFECTIVE USE WITH FLOLAN.

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Nebulized Flolan has an in vivo half-life of 3-6 minutes. Therefore, nebulization gaps inherent to the Aerogen nebulizer should not exceed 3 minutes for safe and effective use specific to aerosol interruption. This prompted us to carefully study gap times with and without the Solo Leur attached to the Aerogen nebulizer. Methods: We conducted a 2 hour bench test dripping normal saline into the Aerogen Aeroneb Solo nebulizer at 8 ml per hour via the Alaris pump. One hour was tested with the Solo Leur and one hour without it. We counted the aerosol gaps and timed their duration. Results: The Solo Leur produced 29 gaps in one hour with an average duration of 53.5 seconds (sd 25.7, median 58 seconds, high 94 seconds). Without the Solo Leur there were 21 gaps in one hour with an average duration of 96 seconds (sd 21, median 91 seconds, high 126 seconds). Conclusion: The Solo Leur inserted into the nebulizer had a greater number of gaps, less duration per gap and less total gap time per hour than without the Solo Leur in the nebulizer. However, neither the Aerogen nebulizer with or without the Solo Leur approached the 3-6 minute Flolan half-life range. This nebulizer can safely and effectively be used with Flolan because the gap durations are less than Flolan's half-life.

Sponsored Research - None

1127021

EFFICIENCY OF AEROSOL DEVICES DURING NONINVASIVE POSITIVE PRESSURE VENTILATION IN A SIMULATED ADULT LUNG MODEL.

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BACKGROUND: Although patients with acute increase in airflow resistance may require aerosol therapy and noninvasive positive pressure ventilation (NIPPV), the efficiency of different aerosol devices during NIPPV is not well understood. The purpose of this study was to determine the efficiency of jet nebulizer (JN), vibrating mesh nebulizer (VMN) and pressurized metered-dose inhaler (pMDI) during NIPPV. 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. NIPPV was administed via full face mask with PIP/PEEP of 20/5 cmH2O. Aerosol generators were placed between the leak and the mask. Albuterol sulfate (2.5 mg/ 3ml) was nebulized with the JN (Micromist), and VMN (Aeroneb Solo).Four puffs (108 µg/puff) administered with pMDI (ProAir HFA) and spacer (Aerovent) that is placed in the recommended Normal position (pMDI-N) with aerosol plume directed towards patient, and Reversed position (pMDI-R) with aerosol directed away from patient (n=3). Filters were eluted with 0.1 HCl and analyzed by spectrophotometer at 276 nm. Residual volume was determined gravimetrically. Descriptive statistics, repeated measures ANOVA and independent t test were used ($p<0.05$). RESULTS: The mean (± SD) values for inhaled mass, percentage of dose inhaled and residual volumes are shown in the table below. During NIPPV inhaled mass and inhaled mass percent were very significant ($p=0.042$ and $p=0.028$, respectively). Aerosol delivery with JN was lowest during NIPPV. VMN has a significantly lower residual volume than JN ($p=0.0001$). Efficiency of pMDI was not significantly different at both orientations ($p=0.253$). CONCLUSION: The type of aerosol device used during NIPPV influence aerosol delivery in this simulated adult lung model. The JN is less efficient than VMN and pMDI in either orientation.

Sponsored Research - None

	JN	VMN	pMDI-N	pMDI-R
Inhaled Mass (mg)	0.33 ± 0.02	0.72 ± 0.05	0.10 ± 0.01	0.09 ± 0.01
Inhaled Mass Percent (%)	13.12 ± 0.72	28.83 ± 1.93	23.53±2.03	21.38 ± 0.32
Residual volume (gm)	1.65 ± 0.14	0.10 ± 0.07		

1132924

CONVERSION FROM INHALED NITRIC OXIDE TO INHALED EPOPROSTENOL REDUCES COSTS OF INHALED PULMONARY VASODILATOR THERAPY IN CRITICALLY ILL PATIENTS.

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Background: The use of inhaled pulmonary vasodilators has become a focus of cost-reduction initiatives in hospitals providing this therapy to critically ill patients. Respiratory Care and Pharmacy Departments are investigating ways to provide this therapy while also reducing costs during the current times of fiscal challenges. Method: Retrospective chart review comparing administrative processes and costs associated with inhaled nitric oxide and inhaled epoprostenol in 105 patients receiving pulmonary vasodilator therapy. Inhaled epoprostenol is ordered via the hospital's provider order entry system, approved in the pharmacy order verification system, and then prepared by the pharmacy department in a viaflex bag which contains 2.4 mg of epoprostenol in 80 mL of sterile diluent specific for epoprostenol (concentration 30 mcg/mL). This preparation is stable for eight hours at room temperature and covered with an amber light protected bag during administration. The initial dose is 0.05 mcg/kg/minute and titrated down to 0.01 mcg/kg/minute depending on patient response and tolerability. The respiratory therapist documents the hanging of a new bag every eight hours by scanning the mixed product in the electronic medication administration record and then administers it through a smart infusion pump via a mechanical ventilator and vibrating mesh nebulizer as a continuous nebulization. Results: A total 105 patients were included in this study with 53 patients receiving inhaled nitric oxide and 52 patients receiving inhaled epoprostenol. Assuming a low contract price for inhaled nitric oxide, the mean cost per patient receiving inhaled nitric oxide was $3,930 ± 4,210 and was $838 ± 997 for patients receiving inhaled epoprostenol ($p<0.0001$). Assuming a high contract price for inhaled nitric oxide, the mean cost per patient receiving inhaled nitric oxide was $14,240 ± 15,255 and was $838 ± 997 for patients receiving inhaled epoprostenol ($p<0.0001$). Conclusion: Our inhaled epoprostenol program requires a multidisciplinary effort from order entry to administration. Inhaled nitric oxide is 4.5 to 17 times more expensive per patient than inhaled epoprostenol.

Sponsored Research - None

1134769

EFFECT OF VIBRATING MESH DESIGN CHANGES ON AEROSOL PRODUCTION AND AEROSOL PAUSE TIMES.

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INTRODUCTION: The advent of new aerosol technology (vibrating mesh) for continuous aerosol therapy has redefined the term continuous aerosol therapy1 and given us the ability to quantify lung dose2. Revisions to the vibrating mesh (Aeroneb Solo) currently in development raised the question as to how the changes would effect aerosol production. Our objective was to determine how the modifications would effect aerosol run and pause times as compared to the original design. METHOD: A pulmonary infusion pump (CME America 575 BodyGuard) with a dedicated infusion set was used to deliver solution (nss) to a vibrating mesh nebulizer (Aerogen® Aeroneb Solo). Both the original vibrating mesh (Solo) and the revised model (Solo II) were evaluated, at flow rates of 4 ml and 12 ml per hour. Aerosol production and pauses were observed and timed. RESULTS: Aerosol pause times in seconds for the original design (Solo) versus revised design (Solo II) at 4 ml per hour (118.3 ± 29 vs. 119 ± 6.4) at 12 ml per hour (27.3 ± 10.1 vs. 26.6 ± 1.2). Aerosol run times in seconds for the Solo versus the Solo II at 4 ml per hour (73.9 ± 19.2 vs. 18.6 ± 2.1) at 12 ml per hour (125.1 ± 48.5 vs. 18.3 ± 0.6). The aerosol run time for the Solo II was 9 times more consistent at 4 ml per hour and 80 times more consistent at 12 ml per hour. The pause time for the Solo II was 4.5 times more consistent at 4 ml per hour and 8.4 times more consistent at 12 ml per hour. CONCLUSIONS: Standard deviation on both run and pause times for the Solo II were significantly lower allowing for increased accuracy of aerosolized medication delivery. Large standard deviations in aerosol pauses could lead to under and/or over medicating. The significantly lower variability in pause times with the new design allows for safer and more precise delivery of aerosolized medication. 1. Dailey P, Walsh K, Thongpradit P, Aerosol Pause Times Associated With Vibrating Mesh Nebulizer. . Resp Care 2010 November 2. Dailey P, Raghunathan K, Thongpradit P, Walsh, K, Fink J. A Mathematical Model for Achieving Target Lung Dose of Prostacyclins. Resp Care 2010 November

Sponsored Research - None

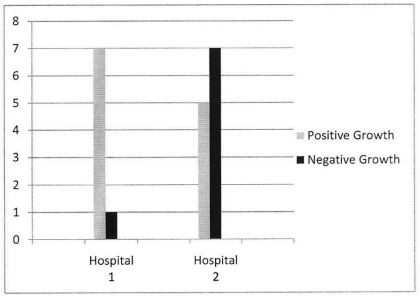
1133287

COMPARISON OF MICROBIAL GROWTH IN SMALL VOLUME NEBULIZERS.

Randy Williams, David Chang; University of South Alabama, Mobile, AL

Background:This study was a comparison of microbial growth in nebulizer reservoirs from two local hospitals. One of the hospitals used a continuous liter flow to dry the nebulizers after use and only changed them when they were visibly soiled. The second hospital left the nebulizers to air dry but changed to new ones once a week. The hypothesis was that leaving the flow running would decrease the occurrence of microbial growth in comparison to no liter flow. Method: Approval was obtained from the institutional IRB before the study. The used nebulizers were collected from the hospitals after the treatments had been discontinued or the patients had been discharged. Samples from the inside of the nebulizers were collected using standard sterile techniques. The agar plates were cultured for 48 hours on blood (BBL) and Columbia (CNA) agar plates by the Biomedical Sciences Department at the university. Results: 87% of the nebulizers from the hospital that used flow to dry the nebulizers showed positive growth whereas 42% of the nebulizers from the other hospital that used no flow showed growth. Conclusions: The data show that using a gas flow to dry the nebulizers do not improve on the incident of microbial growth. The hospital using flow to dry the nebulizers should evaluate or revise its policy on the way to handle the nebulizers after a treatment. Due to the low sample size, statistical analysis was not possible. Future studies should increase the sample size so that statistical analysis could confirm or reject the significance of the findings in this study.

Sponsored Research - None



Hospital 1 uses flow and hospital 2 uses no flow to dry nebulizers

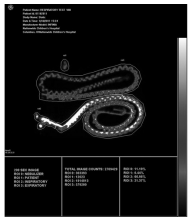
1135966

EVALUATION OF CIRCUIT PARTICLE DEPOSITION USING THE AEROGEN MICROPUMP AEROSOL GENERATOR WITH A CLOSED-SYSTEM VENTILATOR CIRCUITS.

Kimberly Farney[1], Jennah Hollen[2], Brandon Kuehne[1], Laurie A. Gibson[3]; [1]NICU Respiratory Therapy, Nationwide Childrens Hospital, Columbus, OH; [2]Respiratory Care, Nationwide Childrens Hospital, Columbus, OH; [3]Department of Radiology, Nuclear Medicine Section, Nationwide Children's Hospital, Columbus, OH

Background There has been much discussion on the efficacy of aerosolized medication given through closed-system ventilator circuits. The Aerogen micro pump aerosol generator has traditionally been an acceptable method of aerosolized medication delivery system in the hospital setting. However, little is known about how much aerosolized medication is actually delivered to the patient when used in-line through closed-system ventilator circuit. Methods We performed testing through an Airlife Carefusion Infant Respiratory (RT4851-12) closed-system circuit connected to an Avea Ventilator utilizing a Bio-med device test lung. Each test disbursed a 3 ml of TC 99mTC DTDA as our aerosol. The Aerogen micro pump was placed either proximally or distally in the circuit and patient effort was simulated at a 0.45 minute volume. The two variables tested were an increased respiratory rate and placement of the Aerogen micro pump. All nebulizer sessions were performed over the duration of medication. All circuits were then placed under a GE Infinia Hawkeye Gamma Camera. Results Data was analyzed from 17 sessions. The Aerogen was placed at the heater, and the average medication delivery was 0 .20% ±0.14 (n=6). When the Aerogen was placed 18 inches from the patient, the average medication delivery was 7.79% ±4.2 (n=11). Single factor analysis of variation (ANOVA) yielded a P= 0.130 between the two placements Conclusion With the intubated patient there was not a statically difference in delivery of the aerosolized medication by increasing the minute volume. Additionally, we found that moving the Aerogen micropump closer to the patient resulted in no significant increase of medication delivery to the patient.

Sponsored Research - None



1136227

SELF-EFFICACY AT TAKING INHALED CORTICOSTEROIDS IN AFRICAN-AMERICAN ADOLESCENTS PRESCRIBED DAILY INHALED STEROIDS FOR THE TREATMENT OF PERSISTENT ASTHMA.

Emeli Yevu; Respiratory Care Program, Rush University, Chicago, IL

Background: African American adolescents have disproportionately high rates of asthma morbidity and mortality. Poor Adherence to prescribed daily inhaled corticosteroids among this population may be a contributing factor. This study explored levels of self-efficacy at taking daily inhaled corticosteroids in a sample of inner-city African American adolescents with persistent asthma prescribed daily inhaled corticosteroid medication. Methods: Nine urban African American adolescents completed this study. Eligibility criteria included: age 16-20 years (mean 17.8), persistent asthma, and being on a prescription daily inhaled steroid medication. All participants completed the Inhaled Corticosteroid Self-Efficacy Questionnaire. Results: Participants average score on the Inhaled Corticosteroid Self-Efficacy Questionnaire was 57.11 % (range 33%-91%). Conclusion: This study showed that self-efficacy at taking inhaled corticosteroid medications among this sample of urban African American adolescents was low. Interventions aimed at improving self-efficacy at taking inhaled corticosteroids may increase adherence and improve asthma outcomes in this important population subgroup. This study warrants replication with a larger sample size.

Sponsored Research - None

1139859

AEROSOL DRUG DELIVERY VIA SVN AND RESUSCITATION BAGS TO PATIENTS WITH TRACHEOSTOMY.

Arzu Ari, Robert Harwood, Meryl Sheard, James B. Fink; Division of Respiratory Therapy, Georgia State University, Atlanta, GA

BACKGROUND: Literature on aerosol delivery to patients with tracheostomy is limited. The purpose of this study was to evaluate aerosol drug delivery to patients with tracheostomy using different brands of resuscitation bags. METHODS: An upper airway of a teaching manikin was intubated with a tracheostomy tube (Portex) of 8 mm ID, and a collecting filter (Respirgard II) placed between the trachea and a passive test lung. Three different brands of resuscitation bags (Ambu Inc, Westmed and Smiths Medical) were ventilated with 2 hands at a rate of 12 bpm. A jet nebulizer (eValueMed, Trianim), which was placed between the bag and patient airway with a 15 mm adapter and 6 inches of 22 mm ID aerosol tubing, was operated at 8 lpm O2 to administer albuterol sulfate (2.5 mg/3mL). Each condition was repeated in triplicate (n=3). Drug was eluted from the filter and analyzed with spectrophotometry (276 nm). Descriptive statistics and one-way ANOVA were used for data analysis at the significant level of 0.05 ($p<0.05$). RESULTS: The table shows inhaled mass (mean ± SD) and percentage of nominal dose delivered distal to the trachea. While aerosol deposition ranged from 11.9% to 15%. Differences among resuscitation bags in both inhaled mass ($p=0.217$) and inhaled mass percent ($p=0.218$) were not significant. CONCLUSION: In this model of a tracheotomized adult, the efficiency of aerosol deposition via different resuscitation bags with a SVN was similar. Further studies are warranted to establish inhaled dose with different types of aerosol generators and resuscitator bags.

Sponsored Research - None

	Ambu Inc.	Westmed	Smiths Medical
Inhaled Mass Percent (%)	11.85 ± 1.11%	13.25 ± 2.39%	14.96 ± 1.89%
Inhaled Mass (mg)	0.29 ± 0.02	0.33 ± 0.05	0.37 ± 0.04

1128166

AEROSOL DEPOSITION USING A VIBRATING MESH NEBULIZER IN TWO POSITIONS DURING HIGH FREQUENCY OSCILATION IN AN INFANT LUNG MODEL.

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Background: Aerosol deposition to the lung remains controversial during High Frequency Ventilation (HFOV). Recent bench testing has been performed that evaluated deposition in several types of simulated adult lung models, but there is little data available that evaluates delivery in a simulated pediatric or infant setting. We conducted a filter study to evaluate lung deposition of albuterol during HFOV with a vibrating mesh nebulizer (VMN). Method: A VMN (Aeroneb, Solo,Aerogen) was placed inline with the 3100A HFOV (Viasys) at the patient wye for 2 testing conditions and prior to the humidifier for a third condition. An 8 french inline Ballard suction catheter with a wye adapter was connected to a 3.5 ETT measuring 18 cm in length and connected to a single chamber of an infant test lung (TTL, Michigan). Compliance was set at .003 ml/cmH20. Ventilator Settings: MAP 20, I time 33%, Power 2.24 (Amplitude 28), Flow 20LPM, FiO2 set at 60%. Hz was set at 10 and 12 for consecutive testing with the nebulizer positioned at the patient wye. Hz was set at 10 during testing of the VMN placed prior to the humidifier. The VMN was filled with a 3ml (2.5mg) dose of albuterol and nebulized continuously until empty. Albuterol was eluted from the filters and analyzed with the Nanodrop ND 1000 Spectrophotometer (276 nm). Results are reported in mm absorbance. Results: See chart. Discussion: In our simulated infant lung model, albuterol delivery with the VMN placed at the patient wye was similiar with settings of both 10 and 12 Hz. Minimal drug was absorbed in the filter when the nebulizer was placed prior to the humidifier. More testing needs to be conducted to compare nebulizer delivery during HFOV compared to other ventilation modalities in a simulated infant lung model.

Sponsored Research - None

Albuterol absorption

Position and Hz	Absorption
Wye-10Hz	.08
Wye-12Hz	.09
Before humidifier-10 Hz	.004

*mm absorbance

1150003

REDUCING TOTAL COSTS OF AEROSOLIZED MEDICATION DELIVERY USING THE AEROECLIPSE II BREATH ACTUATED NEBULIZER.

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Introduction: We hypothesized the AeroEclipse II breath actuated nebulizer combined with aqn aggressive dosing and frequency protocol would result in cost savings. Methods: We transitioned a 38 bed pulmonary unit from traditional jet nebulizers to BAN nebulizers and developed a medication dosing and frequency protocol. Albuterol was converted to 0.5 ml of a 0.5% solution with 1ml normal saline. Atrovent was converted to one half unit dose. The breath actuated mode via mouthpiece or mask interface with normal saline increased to 2 ml and continuous mode was used. Frequencies were changed from Q4 to Q6 and QID to TID. BANs were changed weekly versus daily with traditional nebulizers. Average hourly rate, treatment time, drug costs, and device costs for June through November 2008 were compared to 2007. To ensure effectiveness of therapy we compared the average number of both scheduled and PRN treatments per patient per day. Subsequently, we utilized this model to convert all impatient beds to BAN in June 2010 and compared data to a similar time period in 2009. Results: Our initial 2008 conversion resulted in a 20% decrease in total costs with an annualized savings of $52,360. Additionally a 31% decrease in minutes per day in therapist time to administer medications and 21% increase in duration between treatments was realized. The average number of scheduled treatments per patient per day was 3.4 and 2.8 in 2007 and 2008 respectively while the average number of PRN treatments was 0.16 and 0.15 in 2007 and 2008 respectively. In the 2010 analysis BAN nebulizers account for an 18% decrease in total costs, and a 19% decrease in total treatment time. Use of BAN nebulizers resulted in an annual savings at Forsyth Medical Center of $186,789 and estimated savings of $475,411 across Novant Health facilities. Average number of scheduled treatments per patient per day was 3.3 and 3.1 in 2009 and 2010 respectively while the average number of PRN treatments was 0.24 and 0.27 in 2007 and 2008 respectively. Additionally, we compared 2010 data from the units in our initial 2008 group to ensure the improvement reported was maintained in that area. Conclusions: Using the AeroEclipse II breath actuated nebulizer in conjunction with an aggressive medication dosing and frequency reduction protocol provides significant savings. Greater gains have been realized for the pulmonary specific unit which treats patients with more severe pulmonary conditions.

Sponsored Research - None

1123558

FEASIBILITY OF THE USE OF A MICROPUMP DURING THE BIVENT/APRV MODE OF VENTILATION.

Enrique Ortega[2], Bob Demers[1], Manny Banderas[1]; [1]Resp Care Services, Methodist Hospital of Southern California, Arcadia, CA; [2]School of Respiratory Therapy, Platt College, Ontario, CA

We are about to deploy the Solo® micropump nebulizer (Aerogen Ltd., Galway, Ireland) for ventilator patients at our hospital. On occasion, a patient whose ventilator circuit already incorporates the micropump will be placed on the BiVent (also called "Airway Pressure Release Ventilation" or "APRV") mode. We wondered to what extent high BiVent pressures might adversely affect our ability to deliver medicated aerosol with the micropump. In fact, we thought it distinctly possible that gas might migrate retrograde across the micropump's mesh transducer, rendering the delivery of an aerosolized drug impossible. To ascertain the effects of BiVent on our ability to administer aerosols, we employed a lung model which has been described elsewhere (http://web.me.com/bobdemers/DCS_Website/
BiVent_APRV.html) to simulate BiVent at the following settings: P_{HIGH} = 30 cm H_2O; P_{LOW} = 0 cm H_2O; t_{HIGH} = 4.0 sec; and t_{LOW} = 0.3 sec, resulting in a mean pressure of 28 cm H_2O. 3.0 mLs of water was instilled into the micropump, and the elapsed time required for the elaboration of this entire aliquot was observed to be 332 seconds. Next, we verified the elapsed time necessary to deliver a three-milliliter aliquot during ventilation of the lung model by means of Pressure-Regulated Volume-Controlled (PRVC) ventilation at a tidal volume of 500 mLs, a respiratory rate of 15/min, and a positive end-expiratory pressure ("PEEP") setting of 5 cm H_2O, resulting in a mean pressure of 12 cm H_2O. The time required to generate the entire aliquot as an aerosol under these conditions was observed to be 321 seconds, a time duration which was merely 3% shorter than that seen with BiVent. Our bench tests indicate that the employment of the Aerogen Solo micropump to administer aerosolized agents to patients during BiVent can proceed in precisely the same fashion as applies to more conventional modes. Although these agents could presumably be delivered during BiVent by means of a metered-dose inhaler (MDI), the performance of the micropump during conventional ventilation has been reported to be vastly superior to that of the MDI (Am J Respir Crit Care Med 1999; 159: 63-68). Specifically, the dose of albuterol delivered to a lung model by means of the micropump in that study was shown to be more than six times the dose generated by means of an MDI coupled to a spacer. Consequently, we would prefer to use the micropump in lieu of an MDI for aerosol dosing during BiVent.

Sponsored Research - None

1120829

SAFETY AND THERAPEUTIC POTENTIAL OF INHALED ALKALINE GLYCINE IN OBSTRUCTIVE AIRWAY DISEASE.

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Background: Airway pH affects lung health on biochemical, cellular, and physiologic levels. Airway acidification, caused by both intrinsic and extrinsic factors, plays a role in disorders of the pulmonary tract. Additionally, most inhaled beta-agonists and anticholinergic therapeutics achieve better active and passive absorption through the airway epithelium to access the smooth muscle targets when airway lining fluid (ALF) is alkaline. The development of an inhaled alkaline glycine buffer could offer therapeutic promise for patients requiring inhaled medications or suffering from airway pH imbalances. Objective: We hypothesized that providing inhaled alkaline therapy would buffer acids in ALF, alkalinize the airway and therefore increase exhaled breath condensate (EBC) pH safely, without lowering pulmonary function. Methods: After obtaining baseline spirometry, EBC pH, and exhaled nitric oxide (eNO) values, we treated 10 stable adult subjects with known obstructive airway disease with a 2.5 mL nebulized solution of isotonic NaCl and 100 mmol/L of alkaline glycine (pH 9.8) over ten minutes. Following the nebulization, we re-obtained spirometry, EBC pH, and eNO. Results: Alkaline glycine inhalation was tolerated by all subjects with no clinically significant change in spirometric parameters and no excessive rise in EBC pH. Airway alkalinization was confirmed by a mean increase in EBC pH of 0.35 (p=0.02). eNO did not change significantly (p=0.38). The only statistically significant change noted in spirometry was a mean decrease in forced vital capacity (FVC) of 3.3% (p=0.035). Conclusion: Alkalinizing ALF increases EBC pH without compromising pulmonary function. This indicates that inhaled alkaline therapy is safe and possibly beneficial for subjects with airway acidification.

Sponsored Research - This work was funded by The National Institutes of Health and the University of Virginia Philip Morris Tobacco Research Fund.

Mean Physiologic Measurements Pre/Post Alkaline Glycine Inhalation

	Pre	Post	Δ	Statistical Significance
Heart Rate(bpm)	79	75.2	-5%	p=0.610
Respiratory Rate (bpm)	15	14	-4%	p=0.635
Pulse Oximetry (SPO2)	98.1	98.7	+0.6%	p=0.479
FEV1	2.92	2.87	-1.6%	p=0.361
FVC	3.79	3.66	-3.3%	p=0.035
FEV1/FVC	78.99	79.64	+0.8%	p=0.499
FEF 25-75	3.26	3.28	+0.6%	p=0.881
PEF	6.58	6.47	-1.7%	p=0.562
eNO	29.5	27.6	-6%	p=0.38
EBC pH	7.54	7.90	+0.36	p=0.031

1126235

THE EFFECT OF INTERFACES ON AEROSOL DELIVERY IN SIMULATED SPONTANEOUSLY BREATHING ADULTS WITH TRACHEOSTOMY.

Alaa A. Bugis, Robert Harwood, James B. Fink, Lynda Goodfellow, Arzu Ari; Respiratory Care, Georgia State University, Atlanta, GA

BACKGROUND: The purpose of this study was to characterize aerosol delivery with tracheostomy collar (TC), Wright mask (WM), and aerosol mask (AM). The secondary purposes were to compare albuterol delivery between an opened vs. a closed fenestration hole and also to determine the effect of I:E ratio on aerosol delivery. METHOD: Albuterol (2.5 mg/3 mL) was administered to an invitro model consisting of an adult teaching mannequin upper airway with stoma intubated with a fenestrated tracheostomy tube, 8 mm (Shiley™). The cuff was deflated. A collecting filter (Respirgard 303) at the level of the bronchi was connected to a breathing simulator with parameters (VT 400 mL and RR 20/min) with I:E ratios of 2:1 and 1:2. The jet nebulizer (eValueMed) was operated with O2 at 8 L/min (n=3). The flow was discontinued at the end of nebulization. The nebulizer was attached to a tracheostomy collar (AirLife), Wright mask (Wright Solutions LLC) and aerosol mask (AirLife). Drug was analyzed by spectrophotometry (276 nm). Paired t-test and ANOVA, were performed (p<.05). RESULTS: Table shows mean (± SD). Aerosol delivery was greater with TC (with and without fenestration open) than either mask (p< .05). Closing the fenestration hole increased aerosol deposition significantly at 1:2 ratio (p=.04) Increasing I:E ratio from 1:2 to 2:1 increased aerosol delivery with tracheostomy collar-fenestration opened (p =.009), Wright mask (p=.02) and aerosol mask (p =.01). CONCLUSION: The tracheostomy collar delivered more aerosol to the bronchi than the Wright or aerosol mask. 2:1 ratio increases aerosol deposition more than 1:2. Closing the fenestration hole improves aerosol delivery.

Sponsored Research - None

I:E	TC-FO	TC- FC	WM	AM
1:2	6.98 ± .80	9.37 ± 1.45	4.08 ± .56	3.46 ± .04
2:1	11.57 ± 1.38	12.44 ± 1.38	7.15 ± .55	6.11 ± .46
p value	.009	.18	.02	.01

TC-FO: Tracheostomy Collar-Fenestration Open, TC-FC: Tracheostomy Collar-Fenestration Closed, WM: Wright Mask, and AM: Aerosol Mask

1133107

COMPARISON OF THE PERFORMANCE OF JET NEBULIZERS MARKETED IN TAIWAN.

Hui-Ling Lin, Li-Ting Chao, En-Rong Chao; Respiratory Therapy, Chang Gung University, Taoyuan, Taiwan

Aerosol therapy with jet nebulizer has been used widely to delivery drugs for the management of the respiratory diseases, in both adults and children. Jet nebulizers are manufacture with differences between various brands and models. Objective: The purpose of this study was to demonstrate in vitro inhaled drug mass and aerosol depositions of Salbutamol from various jet nebulizers presently marketed in Taiwan. Methods: The inhaled mass of salbutamol (mass on the inhalation filter) was collected using a breathing simulator (ALS5000, IngMar Medical) that mimicked the breathing patterns of an adult. Ten nebulizers were tested (Galemed Corp. (A,B), Deepsound Corp. (C-F), Pacific Medical Supply Corp. (G), Headstar Medial Corp. (H), Besmed Corp. (I), Dadsun Corp. (J)). Each nebulizer was charged with 1 vial (2.5 mL/5.0 mg) of salbutamol inhalation suspension in 4 mL diluent and run until sputtering sound (n= 5). Inhaled drug was eluted from the filters, T-piece, reservoir tube, and the nebulizer and analyzed with a spectrophotometer (Hitachi Crop) at 276 nm. Statistical analyses were performed for inspiratory filters and reservoir with one-way ANOVA and for nebulization time, drug depositions of dead volume, T-piece, expiratory filter with Kruskal Wallis test and Mann-Whitney U test, p< 0.05 as significant. Results: The table shows time (in seconds) and deposition as percent (mean±SD & median (range)) of unit-dose of salbutamol on nebulizer reservoir, inspiratory filter, T-piece, reservoir tube, expiratory filter, and the total drug mass. Conclusion: Nebulizers perform differently with wide range (6 – 14%) of available inhaled drug dose. Factors influencing nebulizer performance include the size of the baffle, the design of the T-piece, and the angle of the plastic capillary tube and siphon for drawing the medication.

Sponsored Research - None

	Time (s)	Nebulizer(%)	Insp. Filter(%)	T-piece(%)	Reservior(%)	Exp. Filter(%)	Total(%)
A	626(544-689)	34.6(31.5-44.5)‡	14.4±3.4	1.4(1.1-3.6)	2.0±0.8	19.5(14.5-21.0)	74.5±3.8¢
B	724(613-834)	68.6(62.5-71.)	6.5±2.1¥	0.6(0.2-0.9)£	0.6±0.2	11.2(6.7-14.9)¶	86.9±5.0
C	434(378-503)	38.8(34.7-43.3)	12.4±1.5	4.8(3.5-5.7)	2.3±0.9	18.6(16.4-19.7)	76.4±5.6
D	706(483-800)	51.6(36.3-63.5)	10.1±3.7	3.7(1.4-6.3)	2.0±2.8	14.5(11.7-20.8)	79.8±8.1
E	487(481-689)	44.2(42.2-49.5)	13.1±1.7	2.5(1.1-5.5)	1.4±0.7	19.5(16.8-20.5)	81.0±2.1
F	449(331-489)	40.3(39.2-41.8)	13.2±1.5	2.8(2.0-4.5)	2.8±0.8	18.9(14.6-20.5)	77.6±1.9
G	353(325-377)†	49.7(42.8-49.8)	8.9±1.2	2.1(1.2-2.3)	2.2±0.3	15.9(14.5-18.5)	77.6±4.7
H	399(325-567)	37.6(27.6-45.1)	13.1±2.0	4.1(2.3-4.4)	2.0±0.4	19.5(17.3-20.4)	74.7±9.0
I	701(606-792)	46.1(42.7-49.5)	12.5±2.5	1.0(0.9-1.3)	1.1±0.2	19.3(16.3-20.6)	80.1±3.6
J	507(455-688)	40.1(33.4-50.8)	14.2±2.2	1.3(0.8-1.4)	1.7±0.6	18.4(17.1-20.9)	76.9±6.3

† = p <0.05 (by Kruskal Wallis test) than A、B、C、D、E、F
‡ = p <0.05 (by Kruskal Wallis test) than B、G、I
¥ = p <0.05 (by ANOVA test) than A、C、E、F、H、I、J
£ = p <0.05 (by Kruskal Wallis test) than A、C、D、E、F、G、H、I、J
¶ = p <0.05 (by Kruskal Wallis test) than A、C、E、F、G、H、I、J
¢ = p <0.05 (by ANOVA test) than A

Comparison of nebulization time (s) and drug deposition (%)

1134553

PRELIMINARY REPORT OF A QUALITY IMPROVEMENT PROJECT TO ASSESS THE REPRODUCIBILITY OF MEASUREMENTS OF ETT POSITION IN PEDIATRIC PATIENTS.

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INTRODUCTION: One technique for assessing ETT position in infants & children is measuring the distance from the intersection of the ETT and lip or nose to the cut end of the endotracheal tube. We sought to determine the reproducibility of these measurements. METHODS: Three different respiratory therapists (RT's) independently measured these distances on a convenience sample of intubated patients in our NICU/PICU/CICU. Results of measurement were blinded between RT's, and were made using newborn measuring tape (resolution = 0.25 cm). The last charted measurement from the ventilator flow sheet was also noted for a total of 4 measurements. Patients were intubated orally or nasally. For the oral route, we secured ETT's using a specially modified umbilical clamp that has an appropriate sized hole drilled through the center of the clamp through which the ETT is passed. The clamp is then taped to the patients face (Loughead et al. Jt Comm J Qual Patient Saf. 2008 Mar;34(3):164-70). For this route, the measurements were made from the umbilical clamp to the cut end of the ETT. The nasally intubated population is measured from the nasal septum to the cut end of the ETT. Age, weight and ETT size were also noted. Results were classified according to the degree of agreement between the multiple measurements according to the following scheme; if all four measurements agreed = 100% congruent, if 3 of 4 measurements agreed = 75%, if 2 of 4 measurements agreed = 50%, if all 4 measurements were different = 0% congruent, RESULTS: Data were obtained on 13 patients who ranged in age from 1-45 weeks, with a mean (SD) = 12.2 (15.2) weeks. Patient weight ranged from 2.9-6.6 Kg with a mean (SD) = 4.1 (1.3) Kg. ETT sizes included 3 patients with 3.0 mm and 10 with 3.5 mm. Five patients were intubated nasally & 8 orally. Measurement agreement was: 100% congruent = 6 patients (46%), 75% congruent = 3 patients (23%), 50% congruent = 3 patients (23%), 0% congruent = 1 patient (8%). Maximum difference between the longest and shortest measurement on the same patient was 1.5 cm. CONCLUSION: Multiple observers obtained the same measurement of ETT position in less than half of patients. This lack of agreement can potentially lead to poor assessment of ETT position and possibly unnecessary re-taping and or repositioning of ETT. We speculate that a more reproducible measurement system might be possible and intend to explore this idea further.

Sponsored Research - None

1155238

IMPROVING TRACHEOSTOMY PATIENT SAFETY VIA A RESPIRATORY THERAPY DEPARTMENT SAFETY COMMITTEE.

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BACKGROUND: After the development of a safety committee in the respiratory therapy department, it was found that storage of back up tracheostomy supplies at each tracheostomy patient's bedside was inconsistent. Supplies were unavailable, incomplete, or inaccessible within the patient's room. This was viewed as a potential patient safety issue due to the risk of accidental decannulation. The safety committee reviewed the current method and practice of the hospital. A literature review was performed on current recommended practice. It was found that a shared responsibility of obtaining the supplies between respiratory therapy and nursing caused confusion and inconsistent practice. METHOD: Based on our literature review, the safety committee developed a checklist of the necessary back up tracheostomy supplies to be made easily accessible at the bedside in the event of accidental decannulation. The respiratory therapy staff took over the responsibility of obtaining and placing the back up tracheostomy supplies in each tracheostomy patient's room. The respiratory therapy staff was educated on the necessary supplies and the new method. A tool was developed to audit the placement of back up tracheostomy supplies. This auditing tool has been completed and reviewed at least bi-monthly in a random fashion to ensure compliance with the new method. RESULTS: Prior to the initiation of this new method, it was perceived that compliance with standard practice was generally poor at less than 30%. After implementation of the checklist, education, and staff awareness of the auditing process, our compliance improved to 86% in four months. CONCLUSION: Creating a respiratory therapy department safety committee, charged with improving overall safety and standard practice, utilizing research, education, and performance improvement, is vital for the success of the entire hospital and most importantly for the safety of the patient.

Sponsored Research - None

1061437

AGGRESSIVE ORAL CARE IN THE FIGHT AGAINST VENTILATOR ASSOCIATED PNEUMONIA IN CHILDREN ON LONG-TERM MECHANICAL VENTILATION.

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BACKGROUND: Ventilator associated pneumonia (VAP) is among hospital infections with the most preventable death. 3 VAP's high burden of disease and costs of care have made it a high priority in numerous national patient safety campaigns. At Our Children's House at Baylor (OCH) we determined that the use of a pediatric VAP bundle inclusive of an aggressive oral care policy and procedure (PnP) implemented in pediatric long term acute care setting, in conjunction with a comprehensive oral care kit, can drastically reduce the number of reported VAP cases. METHOD: A retrospective analysis of ventilator days and reported VAP cases were done during a 6 year period. All patients included in the study were 3 months -18 years of age. Those included in the analysis required long term ventilator management and had a tracheostomy on admit to the facility. RESULTS: During the six year period from January 2005 to December 2010 there were 11,811 ventilator days. There was three recorded case of VAP in June 2006. Since July 2006 our VAP rate has been documented at 0%. CONCLUSIONS: VAP can be reduced with a comprehensive Pediatric VAP Bundle and oral care PnP. With the characteristics of our special patient population including their multiple problems and comorbidities and working with family members adhering to our practice model while learning to care for their child, we need to ensure infection control standards are met. This patient care model for us increases the probability of VAP. This makes the success of OCH has demonstrated with a 0% VAP rate even more remarkable. We attribute this to strict adherence to our very specific Pediatric VAP Bundle and oral care policy. The multidisciplinary approach also encourages all to be accountable for their part in oral hygiene and upholding the success of the facility and phenomenal patient outcomes. Patients with tracheotomies afford the clinician easier opportunity for effective oral hygiene thus reducing the possibility of bacterial load.

Sponsored Research - Received a non-restricted educational grant from Sage Products.

1125597

HIGH RISK PATIENT PROTOCOL: PREVENTING RESPIRATORY COMPLICATIONS.

Pete Weber; Bellin Hospital, Green Bay, WI

Intro: A patient death occurred related to respiratory complications from over sedation. Methods: A literature review was conducted on high risk identification. It was discovered that no formal guidelines for risk identification existed. To begin the data collection process, the hospital's sentinel and near miss events were studied. Trends were identified and served as a foundation for development of risk factors. A formal communication tool identifying contributing risk factors was developed and implemented. The tool is reviewed and validated by the RN at each transition of patient care upon handoff. Respiratory Care is called by the receiving nurse (floor nurse) and Respiratory assess the patient for further ETCO2 requirements. The list consists of uncontrollable factors (e.g. co-morbidities with which the patient presented and controllable factors, patient response to sedation/opioids). A treatment protocol which included the following components: (a) hourly observation, (b) positioning for adequate air exchange, (c) patient controlled analgesia (PCA) monitoring hourly for first hours after initiation, (d) exhaled carbon dioxide monitoring (ETCO2) with respiratory therapist consult, and (e) appropriate nursing assignments based on acuity and geographical placement on nursing unit. Extensive education was completed with staff emphasizing the concept of oxygenation versus ventilation. Respiratory Care leaders provided our nursing staff with mandatory classroom education on monitoring equipment, the communication tool, and the high risk protocol. Results: No deaths or sentinel events from over sedation related compromise have occurred since inception of high risk protocol. Emergent Narcan administration has decreased by 85% since the implementation of the High Risk Protocol on the Orthopedic unit in March 2009. Currently, the hospital has gone over 600 days without a serious safety respiratory event. Huddles continue to occur with any Narcan administration to facilitate continual learning. The high risk communication tool was acknowledged as a leading practice by The Joint Commission during 2010 site visit.

Sponsored Research - None

1135907

THE UTILIZATION OF SUB-GLOTTIC ENDOTRACHEAL TUBES TO REDUCE VENTILATOR ASSOCIATED PNEUMONIA RATE.

Kenneth Mill, Linda Cornman, Robert Leshko, Angela Lutz; LVHN, Allentown, PA

Introduction: Patients in the intensive care unit (ICU) are at risk for dying not only from their critical illness but also from secondary processes such as nosocomial infections. Pneumonia is the second most common nosocomial infection in critically ill patients, affecting 27% of all critically ill patients. Eighty-six percent of nosocomial pneumonias are associated with mechanical ventilation and are termed ventilator-associated pneumonia (VAP). A primary goal of any clinical institution is to reduce its current VAP rate. One postulated etiologies of ventilator-associated pneumonia is the development of bacteria Biofilm. A growing body of evidence has demonstrated that bacterial colonization of the gastrointestinal tract, with subsequent aspiration around the endotracheal tube cuff, is a major source of VAP. A preventive strategy gaining momentum is the use of new endotracheal tubes designed to reduce the risk of VAP. Endotracheal tubes which have a separate suction lumen that allows for continuous suctioning of subglottic secretions. This action prevents aspirated bacteria from around the cuff to travel into the lower respiratory tract. Hi-Lo Evac and Seal Guard are sub-glottic endotracheal tubes that may help reduce the development of a Biofilm and aspiration. Body: To help reduce the current VAP rate at Lehigh Valley Health Network, the following processes were implemented: First, a multi-disciplinary team was formed to examine and assess our institution's current management of patients on mechanical ventilated patients. The committee reviewed current CDC recommendations and scientific journals' outcome data. Based on the above findings, the utilization of the Hi-Lo EVAC and Seal Guard (Mallinckrodt, Tyco, Pleasanton, CA) endotracheal tube were instituted. Formal and bedside clinical education was conducted along with the development of on-line computer tracking of types of endotracheal tube insertion. Results: Since implementation of the sub-glottic endotracheal tubes four years ago, our institutional VAP rate has been reduced from an apex of seventy-nine to its current level of eighteen. Conclusion: Since the advent of the utilization of sub-glottic endotracheal tube, there has been a significant reduction in our institution's VAP rate. A multi-disciplinary approach to reduce our VAP rate to even a lower value will continue to be a major hospital initiative.

Sponsored Research - None

VAPs Rate

Year	VAP Rate	Ventilator Days
2007	79	15129
2008	64	16149
2009	32	16996
2010	18	16908

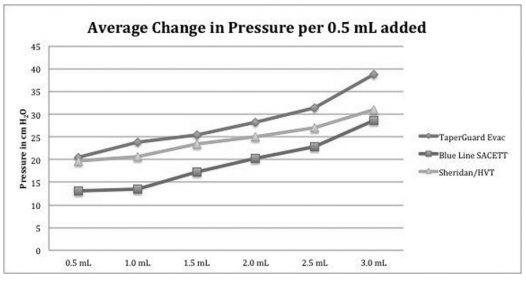
1100890

CUFF PRESSURE INCREASES OBSERVED WHEN EXTRA VOLUME IS ADDED TO AN ENDOTRACHEAL TUBE CUFF.

Jim Fielder, Roger Gilbert; Overlake Hospital Medical Center, Bellevue, WA

Background: Volume is added to endotracheal tube cuffs at the onset of intubation and at various times during the time the patient remains intubated. Frequently these additions to these volumes are made without cuff pressure measurement. The purpose of this research was to determine the effect of adding different amounts of volume to endotracheal tube cuffs. The specific aims are to determine the average amount of pressure increase to the trachea for different amounts of volume added from 0.5mL up to 3.0mL. Method: 30 endotracheal tubes from three different vendors (Mallingkrodt, Portex, Hudson RCI) were analyzed in the study. Ten tubes from each vendor were inflated to a starting pressure of 25 cmH2O inside of the "artificial trachea" model used. Volume was added in 0.5mL increments up to 3.0mL and the pressures documented. The process repeated for all 30 tubes. All results were documented, analyzed for their statistical measure, and charted. Results: At every level observed the pressure, increases at each 0.5mL of volume added were highest in the Mallingkrodt tube, followed by the Hudson RCI tube and the lowest pressure increases were with the Portex tube. For all three tubes, the average pressure change from each point of measure (0.5mL to 1.0mL volume added, etc.) increased in a larger increment. All 30 tubes had extremely high pressures measured when as little as 3mL of volume added to the cuff, ranging from 128 to 206cmH2O. The median pressure at 0.5mL volume added ranged from 38.00 to 45.50cmH2O, and at 3.0mL volume added ranged from 142.00 to 197.00cmH2O. Conclusions: All first cuff inflations should be performed with intention and the cuff pressure measured, not just inflating to a quick inflation with 6 to 10 cc's of volume. In addition, at any time during the intubation period, whenever it is determined the cuff volume needs to be increased, the same process be used, measurement of the cuff pressure be done at the time the volume is added. This will prevent over-inflation of the cuff, which results in high cuff pressures. We have shown a rapid increasing amount of cuff pressure for each 0.5 mL of volume added to the cuff. Our model trachea size being very similar to an adult trachea, we have shown the pressure increases rapidly with small increases in volume.

Sponsored Research - None



1149630

A BENCH-TOP MODEL: THE COMPARISON OF LEAKAGE OCCURRENCE AROUND ENDOTRACHEAL TUBE CUFFS IN CONVENTIONAL ENDOTRACHEAL TUBES AND THOSE NEWLY DESIGNED TO PREVENT MICRO-ASPIRATION.

Crystal Frey, Sarah Garrison, Valerie Hathaway, Alicia Schroeder; Saint Catherine University, Saint Paul, MN

BACKGROUND: Because ventilator-associated pneumonia (VAP) affects up to 25 percent of intubated patients receiving mechanical ventilation for greater than 48 hours, endotracheal tube (ETT) manufacturers have designed new innovative technology that is targeted towards decreasing the risk of micro-aspiration and, in turn, decreasing instances of VAP. OBJECTIVE: An in vitro study was designed in order to compare conventional ETTs with newly designed ETTs and to determine their cuffs effectiveness at decreasing leakage of fluid around the cuff. METHODS: Three types of conventional ETTs (Mallinckrodt HiLo, Portex Profile Soft Seal, Sheridan/HVT) were studied and compared with three types of ETTs that feature new technology (Kimberly-Clark MicroCuff, Mallinckrodt HiLo Evac, Mallinckrodt HiLo TaperGuard Evac). Trachea models were constructed using 6" of 22mm tubing with smooth interior corrugation that fit into a plastic denture cup to act as a stand and a reservoir for leakage. The ETT cuffs were placed into the trachea model and were inflated to either 28 cmH2O or 64 cmH2O. Dyed liquid was instilled above the cuffs and the ETTs were observed for time at total leakage. RESULTS: A large standard deviation was calculated, signifying a wide range of variation in time until total leakage occurred in each different type of ETT. It was found that the MicroCuff provided the best seal for the longest time at both pressures. CONCLUSION: Because there was a significant difference between the effectiveness of the MicroCuff in preventing cuff leakage and the conventional ETTs, it was concluded that newly designed ETT's and cuffs prove to have some potential. Keywords: Endotracheal tube (ETT), cuffs, leakage, aspiration, Ventilator-Associated Pneumonia (VAP), polyurethane cuff, Benchmark model, trachea.

Sponsored Research - None

1131204

Q48HR SUCTION CANISTER CHANGE PROTOCOL EXPERIENCE.

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Suction collection canisters are used in almost every patient care area. These canisters provide a reservoir where solid and liquid components are separated from air and aerosols. The air and aerosols are then allowed to be withdrawn into the central suction system. Collection canisters are typically 800-2000ml in volume and contain a disposable rigid shell or a flexible inner liner. In clinical use they allow biological fluids to be contained at room temperature. Endogenous and exogenous organisms can thrive in this closed environment supported by suctioned physiological debris and nutrients. Once these collection vessels have been employed clinically, they become an environmental reservoir of contaminants and pathogens in that patient care area. Ventilator Associated Pneumonia (VAP) bundles commonly includes the recommendation that collection canisters be changed at a minimum of Q24hrs. The primary motivation for these recommendations is to attempt to remove the suction collection circuit as a potential vector for infection to the patient. This abstract will show how an evidence based protocol of 48hrs can reduce the cost of disposable components without and adverse effect on VAP Rate The reduction of risk from the suction collection circuit revolves around determining an effective change interval for the disposable components of the circuit. By regularly changing circuit components it is believed the vector of exogenous organisms from the suction circuit to the patient may be broken before the organism burden placed on the patient is too great. In October of 2009 our institution initiated a change in protocol whereby suction collection canisters in the SICU & MICU were changed on a Q48hrs basis instead of a Q24hrs basis. This change was based upon published data and the proper selection of reusable medical equipment. This change in protocol did not adversely affect the VAP rate for these two units (1.6 vs. 2.4). It is estimated that this change in protocol saved the institution over $1000 per ICU bed per year and resulted in a similar reduction in the amount of red bag waste from the facility.

Sponsored Research - None

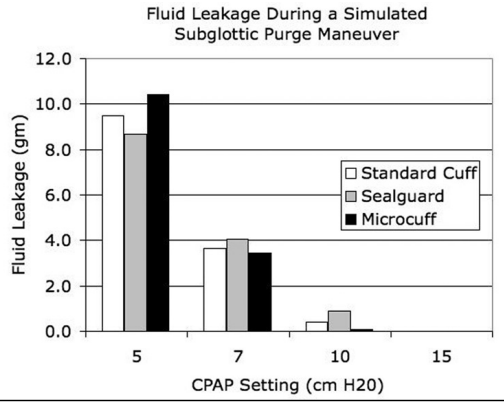
1150216

COMPARISON OF SIMULATED SUBGLOTTIC PURGE MANEUVERS USING ENDOTRACHEAL TUBES WITH DIFFERENT CUFF DESIGNS.

Mark S. Siobal, Gregory Burns, Roberto Bautista; Anesthesia, SFGH/UCSF, San Francisco, CA

Background: The subglottic purge maneuver (SPM) is a method of clearing secretions pooled above the endotracheal tube (ETT) cuff. Various methods for performing this maneuver have been described. ETT cuffs are made with polyvinylchloride (PVC) or thin walled polyurethane (PU), and can have a barrel or tapered shape. This study was done to determine if ETTs with different cuff designs affect the efficiency of the SPM performed at varying levels of CPAP. Method: ETTs of size 7.5 with a standard barrel shaped PVC cuff (Mallinckrodt, HiLo), a tapered PU cuff (Mallinckrodt, Seal Guard), and a barrel shaped PU cuff (Kimberly Clark, Microcuff) were tested. A trachea model positioned at a 30-degree angle with a collection chamber attached at the end was connected to a spring loaded test lung with the compliance set to 40 mL/cm H20. The trachea was intubated with the ETT and the cuff was inflated with 10 mL of air. The trachea was filled with 15 mL of colored water above the cuff. The ETT was attached to Drager XL ventilator in the CPAP mode, Slope 0, Flow Trigger 3L/min, with the Vt limit set to 2.0 L. CPAP levels of 5, 7, 10, and 15 cm H20 were tested. At each CPAP setting the ETT cuff was rapidly deflated for approximately one second and reinflated. Fluid leakage around the deflated cuff was captured in the collection chamber and measured using a gravimetric method. Five measurements at each CPAP level for all ETTs were performed. The highest and lowest measurements were discarded and the remaining three were average. Results: Fluid leakage during the maneuver decreased as CPAP level increased. There was no leakage when CPAP was set to 15 cm H20 for all ETTs tested. Conclusion: In this invitro lung model, cuff design did not impact the effectiveness of a simulated SPM at varying levels of CPAP using the Draeger XL ventilator.

Sponsored Research - None



1150116

INCREASED THICKNESS AND VOLUME OF MUCUS DURING AIRWAY DISEASES FACILITATE ITS CLEARANCE DURING COUGH.

Anpalaki J. Ragavan[1], Cahit A. Evrensel[1,2], Peter Krumpe[1,3]; [1]Biomedical Engineering, University of Nevada, Reno, Reno, NV; [2]Mechanical Engineering, University of Nevada, Reno, Reno, NV; [3]VA Sierra Nevada Health Care Systems, 1000 Locust Street, Reno, NV

BACKGROUND During airway diseases (asthma, cystic fibrosis and/or COPD) when mucus clearance by cilia is impaired, clearing of purulent mucus by cough becomes vital.In all these diseases volume and thickness of secretions in airways is considerably increased, the effect of which on cough mechanics is unclear. Mucus viscosity also considerably increases with inflammation. We hypothesize that larger the amount of mucus larger may be the differences in velocities of air and mucus leading to larger agitation and displacement consequent upon air mucus interaction. Increased agitation in mucus during cough may lead to increased viscous energy losses adding resistance, which may be reduced by inducing elastic forces in the mucus. METHODS Two groups of mucus (4 per group) similar to airway mucus of patients with airway diseases were prepared by cross-linking 0.01 molar(M) Locust Bean Gum (Sigma, St Louis, MO) solution with different amounts of 0.02M Borax($Na_2B_4O_7[10H_2O]$) solution titrated with sucrose and/or food starch solutions. The ratio of storage modulus (G', measure of elasticity) to viscosity(η') (measured at 1Hz) was varied between 15 and 100 while keeping surface tension (62.6±0.1dyne/cm for group1 and 67.8±2,3dyne/cm for group2), and adhesivity (32.96±1.94ergs/cm^2 for group1 and 19.75±0.74ergs/cm^2 for group2) within group constant. The G'and η' were measured at room temperature (24±5°C) with a rheometer (AR1500, TA Instruments, New Castle, DW). Coughs were generated in a Plexiglas adult model trachea by diverting a 300ms burst of air using a computer controlled solenoid valve after placing mucus in four volumes (0.2mL, 0.4mL, 0.7mL or 1.0mL) inside trachea. Displacements of mucus were measured during coughs at each of two constant velocities (12m/s, and 15m/s). Cough velocity was measured by a differential pressure transducer (Validyne, Northridge, CA) and pneumotachygraph. RESULTS Displacement of mucus increased with volume of mucus inside trachea at all G'/η' ratio at both velocities (Figure 1). At 12m/s the volume required to initiate displacement was larger than at 15m/s at all G'/η'. Displacement of mucus increased with G'/η'. The increase was larger, larger the volume of mucus. CONCLUSIONS Mucus hyper secretion during airway diseases may depend on patient's ability to generate adequate cough velocities. Increased elasticity of mucus during diseases may reduce energy losses at high air flows, increasing displacement.

Sponsored Research - None

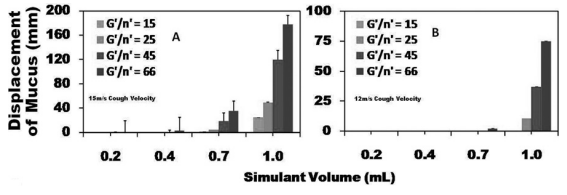


Figure 1: Simulated airway mucus volume versus displacement shown at two cough velocities 12m/s(A) and 15m/s(B) at five G'/ η' values

1147657

EXHALED BREATH CONDENSATE ASSESSMENT IN STREET TRAFFIC-OPERATOR AND OFFICE-WORKERS EXPOSED TO SÃO PAULO CITY AIR POLLUTION.

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ABSTRACT Objective: Exhaled breath condensate (EBC) and nasal lavage (NL) have been used to assess biomarkers of airway inflammation. The aim of this cross-sectional study was to determine pH and cytokines in EBC and in NL of non-smoking male street traffic-operators and office-workers in São Paulo city. Methods: EBC and NL samples were obtained from 73 street traffic-operators (27-56 years) and 14 healthy office-workers (21-42 years). Clinical data, exhaled carbon monoxide, pH and cytokines were evaluated in EBC and NL of both groups. PM10 concentrations 8-hrs/5 days at fixed-sites were also determined. Results were analyzed by Mann-Whitney test. Results: Traffic-operators were older than office-workers (42 ± 7 and 30 ± 5 years, p<0.001). Clinical data were similar between traffic-operators and office-workers: systolic blood pressure (118 ± 13 and 118 ± 12 mmHg, respectively), diastolic blood pressure (82 ± 8 and 78 ± 11 mmHg, respectively), heart rate (69 ± 9 and 70 ± 10 bpm, respectively) and respiratory rate (15 ± 3 and 14 ± 2 rpm, respectively). Compared with office-workers, traffic-operators had lower EBC pH (8.12 ± 0.14 and 7.80 ± 0.46, respectively, p<0.001) and NL pH (7.99 ± 0.33 and 7.30 ± 0.28, respectively, p<0.001) and increased exhaled carbon monoxide (2.4 ± 0.9 and 4.5 ± 1.5 ppm, respectively, p<0.001). The EBC acidification was combined with increased concentration of interleukin (IL)-1β and IL-10 (7-fold and 1.7 fold, respectively, p<0.047). Cytokines in NL were similar between groups. Outdoor concentrations of PM10 was significantly higher in the work place of traffic-operators compared with the office-workers (26.67 ± 5.50 ppm and 22.53 ± 5.15 ppm, respectively, p=0.006). Conclusion: This study indicates that street traffic-operators may be under increased risk of airway inflammation due to exposure to increased air pollution in their work-day.

Sponsored Research - None

Demographic and clinical data of traffic-operators and office-workers

Variables	Traffic-operators n = 73	Office-workers n = 14	P-value
Age (years)	42.03 ± 6.56	29.6 ± 5.42	0.001
Body mass index (kg/m2)	27.4 ± 3.7	24.5 ± 3.0	0.005
Systolic blood pressure (mmHg)	118.3 ± 12.5	117.9 ± 12.1	0.923
Diastolic blood pressure (mmHg)	81.7 ± 8.1	78.2 ± 10.7	0.261
Heart rate (bpm)	69 ± 9	70 ± 10	0.792
Respiratory rate (rpm)	15 ± 3	14 ± 2	0.186
Exhaled carbon monoxyde (ppm)	4.45 ± 1.55	2.36 ± 0.93	0.001

1141585

A MULTIFACETED QUALITY IMPROVEMENT APPROACH WAS ASSOCIATED WITH A DECREASED INCIDENCE OF UNPLANNED EXTUBATIONS AT KING FAHAD MEDICAL CITY.

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Background: Unplanned extubations (UEX) are associated with increased morbidity and even mortality in critically ill patients. Objective: To implement a comprehensive, multifaceted quality improvement (QI) initiative that improves care management policies and guidelines, enhances and monitors their adherence, and decreases UEX in mechanically ventilated patients in ICU settings, targeting an international benchmark incidence of <1 UEX per 100 ventilator days. Methods: The incidence of UEX in 9 critical care units at King Fahad Medical City (KFMC) was assessed in 2486 patients with a total of 17364 ventilator days. The study comprised 2 periods: 1) pre-intervention (1124 patients/7275 ventilator days; April to December 2009); and 2) post-intervention (1362 patients/10089 ventilator days; January to September 2010). The comprehensive QI program included practical and theoretical educational sessions implemented after a review and update of extant internal policies and guidelines, and expanded quality control monitoring of intubated patients to include additional relevant criteria. In addition, to assure a safer practice, exceptional care was delivered by requiring the presence of a specialized respiratory therapist during any mobilization of high risk patients; that is, those with known difficult intubation, high ventilatory settings, or morbid obesity. UEX data and information on possible risk factors related to: 1) the patient (acuity and level of sedation); 2) tube type and placement (assessed radiographically and by external position); 3) patient-tube interface (tying and/or taping procedure); and 4) staff-related factors (specific staff involved, activity at the time of the UEX) were also recorded. Results: UEX events decreased significantly from 180 (16% of patients) in the pre-intervention period to 56 (4.1% of patients) after implementing the new program (p<0.001). In addition, UEX incidence decreased significantly from 2.47 to 0.56 per 100 ventilator days (p<0.001). Conclusion: A comprehensive educational and monitoring QI initiative to decrease UEX in mechanically ventilated ICU patients at KFMC was associated with a significant decrease in UEX.

Sponsored Research - None

1077144

INADEQUATE DURATION IN THE PRONE POSITION RESULTING IN DECREASED OXYGENATION AFTER TURNING BACK TO THE SUPINE POSITION IN AN ANIMAL MODEL WITH ACUTE RESPIRATORY DISTRESS SYNDROME.

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Background: Despite the belief that the prone position (PP) improves oxygenation in ARDS and ALI, studies on mortality in patients are inconsistent. A meta-analysis showed that, in those studies that resulted in uncertain effects of PP on mortality, the average daily duration of PP was 7-hours. The aim of this study was to investigate oxygenation changes related to PP for 8, 16, and 24 hours over a 24-hour period, in a porcine model of ARDS/ALI. Methods: Fifteen female pigs (30.21±3.24kg, 76.5±5.9cm) were anesthetized and ventilated. Lung injury was induced via intra-tracheal lavage with HCl (pH 1.0) to create an ARDS/ALI model. The pigs were randomly assigned to either: an 8-h group (PP for 8 hours, supine for 16 hours); a 16-h group (PP for 16 hours, supine for 8 hours); and a 24-h group (PP for 24 hours). ABGs and hemodynamics were measured every four hours for 24 hours and the intrapulmonary shunt index (QS/QT) was calculated. Lung wet-to-dry ratio (W/D) and histology were used to examine the trends of oxygenation differences in the groups. Data were examined by ANOVA. Results: After turning to PP, the PaO2/FiO2 levels in all 3 groups increased rapidly. After 8 hours in PP, the PaO2/FiO2 of the 8-h group began to drop and was close to pre-prone levels at 24 hours. No drop in PaO2/FiO2 levels was observed in the other 2 groups. The mean PaO2/FiO2 levels in the16-h group and the 24-h group were significantly higher than in the 8-h group over the 24-hour period (PaO2/FiO2 at baseline, 8, 16, and 24 hours in the 8-h group vs. 16-h group vs. 24-h group respectively: 151.3± 34.0, 251.8±65.3, 179.9±113.4, and 170.1±102.4 vs. 146.6± 47.3, 264.1± 66.2, 285.9± 52.2, and 322.6± 17.1 vs. 157.0± 28.8, 267.2± 54.7, 319.8±109.8, and 346.3± 49.6, P <0.05). There was a significant decrease in Qs/QT in the 24-h group compared to the 8-h group (17.7± 6.0% vs. 27.7±6.3% at 24 hours, P= 0.035). There were no significant differences in hemodynamics, W/D, and the injury scores. Conclusion: Oxygenation in this porcine model was positively correlated to the duration of PP over a 24-hour period. PP for 8 hours a day did not effectively decrease the intrapulmonary shunt, therefore could not maintain improved oxygenation in the ARDS/ALI porcine model. Lying PP for 16 hours or longer was safer and effectively improved oxygenation by decreasing the intrapulmonary shunt.

Sponsored Research - Beijing education and scientific research department

The comparison of PaO2/FiO2 for 3 groups at different time

Time	8-h group (n=5)	16-h group (n=5)	24-h group (n=5)	F	P
unmodeled	388.2±64.9	367.0±76.8	345.0±31.7	0.63	0.550
baseline	151.3± 34.0	146.6± 47.3	157.0± 28.8	0.11	0.899
4th hour	201.1±19.1	202.9±18.2	218.5±59.6	0.32	0.731
8th hour	251.8±65.3	264.1± 66.2	267.2± 54.7	0.09	0.918
12th hour	185.6±111.3	282.6±66.7	306.2±77.6	2.68	0.109
16th hour	179.9±113.4	285.9± 52.2	319.8±109.8	2.89	0.094
20th hour	182.3±109.7	288.1±32.0	341.9±71.2	5.46	0.021*
24th hour	170.1±102.4	322.6± 17.1	346.3± 49.6	10.37	0.002**

*P <0.05, ** P <0.01

1144774

COHERENCE OF COUNTING TALK TEST TO DETERMINE AN APPROPRIATE EXERCISE INTENSITY IN COPD PATIENTS WITH MODERATE AND SEVERE LEVEL.

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Background Aerobic exercise programs have been developed respecting accepted standards of fixed percentages of maximum heart rate (55% -90%) or in the provision of maximum oxygen consumption (40-85% of VO2R; ACSM, 1998). The use of maximum heart rate is a practical parameter but in COPD patients it may be influenced both by heart problems and drug treatments in progress. Aims To evaluate if the Counting Test Talk, (as a variation of the Talk Test method), compared to the maximal FC values, can be used to estimate an appropriate exercise intensity in patients with chronic obstructive pulmonary disease (COPD). Methods 11 subjects (7 M and 4 F), average age of 71.58 ± 7.2 years old, with COPD were examined; they underwent a cycle of re-training to strain for 8 weeks, 5 days a week. During this time a 30-minute workout was performed as follows: 4-5 minutes of warm-up until the set speed was reached (initially equal to '80% of 6'WT), at tree times, 5-15-25 minutes,Counting Test Talk values, heart rate (HR) and Borg RPE scale were recorded. These results were compared to the ones recorded, during rest time, when the subjects counted aloud (1-10000, 2-10000, etc.). The highest number reached was recorded as CTT during rest time. Results With the Pearson coefficient ($r \geq 0.95$) significant connections between CF and CTT were found. A similar result was observed between CTT and RPE, Borg scale ($r \geq 0.93$) and Borg scale RPE and HR ($r \geq 0.90$). Conclusions The results show that the CTT is a safe system, that can be self performed by the subject with COPD in order to control the training; when values equal 30-55% of the CTT during rest time, effort respects the ACSM recommendations concerning the intensity of the exercise, from moderate to strong level.

Sponsored Research - None

1144615

CORRELATION BETWEEN SMOKING HISTORY AND WBC COUNT.

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Background: Cigarette smoking has an inflammatory effect on the lungs causing the release of white blood cells (WBC) in the body. Studies have shown an elevated level of leukocytes in the sputum and blood in smokers. This study was done to evaluate the relationship between smoking history and leukocyte count of a patient population in a city in the southeastern U.S. Method: Institutional IRB approval was obtained before implementation of the study. Forty sequential inpatients over 18 years old were recruited for this study. The inclusion criterion is verified physician orders on sputum analysis via bronchoscopic or induced sputum samples. The data on smoking history of these patients were collected by personal interview. They were asked how long they had been smoking and how many packs they smoked a day. The medical records of these patients were accessed to obtain the results of the laboratory test on the number of WBC found in the bronchoscopy or induced sputum samples. The smoking history by pack-year and WBC count were recorded on a data collection form. Pearson correlation and linear regression (StatPac software) were used to evaluate the relationship between smoking history and sputum WBC count. Results: The smoking history of the 40 patients ranged from 0 to 305 pack-years. The WBC count of the sputum sample showed a weak linear relationship ($r2 = 0.1312$) between the smoking history and increase of WBC count in the sputum (see figure). Conclusions: Based on the population of patients in this study, a weak correlation was found between the number of pack-year a patient smoked and the number of white blood cells found in the sputum. Future related studies should take the following factors into account in the methodology: larger sample size, sputum collection techniques, recent use of antibiotics, chronic pulmonary infections, and history of asthma.

Sponsored Research - None

1135732

DEVELOPING AN ASTHMA MANAGEMENT PLAN TO MEET THE JOINT COMMISSION'S ASTHMA CARE MEASURE- 3, INCLUDING ALL SEVEN COMPONENTS.

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Background: In 2007, The Joint Commission introduced 3 Children's Asthma Care (CAC) Measures • CAC-1 Use of Relievers for Inpatient Asthma • CAC-2 Use of Systemic Corticosteroids for Inpatient Asthma • CAC-3 Home Management Plan of Care (patients 2-17 with a primary diagnosis of asthma) Data collection regarding these measures for children's hospitals began with discharges in April 2007. CAC-3 was initiated as a test measure pending endorsement and was implemented as a production measure beginning July 1, 2008. The National Heart Lung and Blood Institute, National Asthma Education and Prevention Program Expert Panel also recommends that clinicians provide a written action plan to all patients with asthma. CAC-3 was developed to address the following 7 components[2]: **1. Controller Medications 2. Reliever Medications 3. Methods and Timing of Rescue Actions 4. Environmental Triggers 5. Follow-up appointment (to include physician name, phone number, and appointment date/time or time frame 6. Proof that parent received a copy 7. Proof that a copy exists in the medical record Methods:** A team of key stakeholders developed an Asthma Management Plan which incorporated all 7 of the mandated components. The team designed a two-ply, one page, two sided document which facilitates completion of the standard. Front page addresses: controllers, relievers, rescue actions, follow-up appointments, and proof that parent received one of the two-ply copies (one copy stays with medical record). Rear page addresses: Environmental Triggers. A picture of the document has been included. **Results/Conclusion:** Prior to implementation of the Asthma Management Plan, Joint Commission compliance of all 7 components was 4-11%. After implementation, compliance increased to 75-80%. The hospital goal is 95%, therefore improvement cycles continue to increase compliance. [2]National Heart, Lung, and Blood Institute, National Asthma Education and Prevention Program; Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma.

Sponsored Research - None

1128392

UTILIZING AN IMPROVEMENT METHODOLOGY TO IMPLEMENT THE JOINT COMMISSION CHILDREN'S ASTHMA CARE MEASURE 3.

Laurie A. Smrz, Chris Gall, Khris E. O'Brien; Respiratory Care Services, Children's Hospital of Wisconsin, Milwaukee, WI

Background: In 2007, The Joint Commission introduced 3 Children's Asthma Care Measures (CAC) • CAC-1 Use of Relievers for Inpatient Asthma • CAC-2 Use of Systemic Corticosteroids for Inpatient Asthma • CAC-3 Home Management Plan of Care (patients age 2-17 with a primary diagnosis of asthma) Data collection regarding these measures for children's hospitals began with discharges in April 2007. CAC-3 was initiated as a test measure pending endorsement and was implemented as a production measure beginning July 1, 2008.The National Heart Lung and Blood Institute, National Asthma Education and Prevention Program Expert Panel also recommends that clinicians provide a written action plan to all patients with asthma. **Methods:** Utilizing Six Sigma improvement methodology, Children's Hospital of Wisconsin (CHW) implemented a process to provide patients, (2-17 years old) admitted with a primary diagnosis of asthma, with an asthma home management plan. The ultimate goal is 95% of these patients will receive an asthma management plan. The following important key steps were utilized: **1. Bring Together the Right Team:** • High Level Leader Champion • Physician Champion • Content Champion • Process Owner • Membership that represents all disciplines affected **2. Meetings:** • Focused • Timeline driven • Tasks/responsibilities assigned with expectations of completion prior to next meeting **3. Review Best Practices of Other Institutions:** • Auto populate form • Create electronic form with forcing functions **4. Provide Education:** • Key stakeholders and committees • Focused on Process and Content • Multiple vehicles for education (written, in-service, oral, web-cast) **5. Process: DMAIC Model:** • **D**efine the Project • **M**easure/**A**nalyze Data (Provide constant feedback and continuous monitoring) • **I**mprove (Implement and evaluate) • **C**ontrol **Results:** After implementation of the Asthma management plan CHW compliance with CAC-3 improved from 5% in 2007 to 79% in 2011. **Conclusion:** While our current compliance rate is 79%, we continue to utilize our improvement methodology to steadily increase these rates to reach our target goal of 95%. Our process identified these key markers for success: • Committed team members • Process owner must be able to navigate the hospital system • Provide education messages through multiple vehicles • Evaluation and feedback are key to sustained improvement

Sponsored Research - None

1127062

COMPARISON OF CLINICAL OUTCOME IN PATIENTS WITH PULMONARY ARDS AND EXTRAPULMONARY ARDS.

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INTRODUCTION The American- European Conference Consensus held in 1994 described two discrete etiological pathways leading to Acute Respiratory Distress Syndrome (ARDS): direct/pulmonary and indirect/extrapulmonary causes. These two forms of ARDS differ in radiological appearance, respiratory mechanics and in response to different mechanical ventilation strategies like PEEP therapy, alveolar recruitment and prone position. The purpose of this study was to investigate if the etiological difference in these two forms of ARDS has any effect on the clinical outcome of the patients with pulmonary and extrapulmonary ARDS. MATERIAL AND METHODS 51 patients were enrolled into the study in a tertiary hospital in India, out of which 15 patients were diagnosed with pulmonary ARDS and 36 with extrapulmonary ARDS. The etiology of ARDS was ascertained on the basis of medical history, physical examination, chest radiography and lab investigations. Among pulmonary ARDS patients, bacterial pneumonia was the most common cause whereas the most patients with extrapulmonary ARDS had sepsis. All patients received mechanical ventilation using the protocol followed by ARDS Network low tidal volume ventilation strategy. Statistical analyses was performed using a statistical software package(SPSS). Descriptive frequencies were expressed using the mean (SD) and the median (range and interquartile range, IQR). Level of significance were expressed as p value and odds ratios (ORs) [95% confidence intervals (CIs)] RESULTS There were 33 males and 18 females in the study, with a mean age of 43 ± 19 years. At ICU admission, patients with extrapulmonary ARDS were young and sicker than those with pulmonary ARDS but there was no difference in the PaO2/ FiO2 score or static compliance between both the groups. Also, there was no difference in hospital survival between the two categories of ARDS patients ($p > 0.05$) CONCLUSION Within the limitations of being a small group study, the category of lung injury did not influence the length of ICU stay or the ultimate survival rate between both the groups and this study has shown that the etiological factor has no influence over the ARDS mortality.

Sponsored Research - None

1124605

EFFECT OF ROFLUMILAST TREATMENT ON HEALTH STATUS IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE.

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Background: Roflumilast, a once-daily oral phosphodiesterase-4 selective inhibitor recently approved by the FDA, has been shown to reduce the risk of COPD exacerbations in patients with severe COPD associated with chronic bronchitis and a history of exacerbations. This study aimed to investigate the effect of roflumilast treatment on health status in COPD patients. Method: Data was from Study M2-111 (OPUS) - a 52 week randomized, double-blind, placebo-controlled, parallel group phase 3 clinical trial of roflumilast 500 mcg once daily in patients with COPD. The Transition Dyspnea Index Questionnaire (TDI) was used to measure dyspnea as an impairment of patients' daily living. TDI compares the health state to that measured by the BDI (Baseline Dyspnea Index) and thus by definition it relates to changes from baseline. For TDI, a score of 1 unit improvement was generally accepted as a minimal clinically important difference. An analysis was performed on the overall patient population, subpopulation with a history of exacerbations and subpopulation with chronic bronchitis. In each treatment group, the proportion of patients with improvements or deteriorations in TDI focal score of ≥1 unit at week 52 (last observation carried forward) was calculated and was compared using chi-square test. Results: A total of 1,173 COPD patients were enrolled in the trial: 567 in the roflumilast group and 606 in the placebo group. The proportion of patients with improvements in TDI focal score of ≥1 unit was higher in the roflumilast group than in the placebo group in the overall population (38.70% vs. 30.92%, $p = 0.0059$), subpopulation with a history of exacerbations (38.85% vs. 29.63%, $p = 0.0040$), and subpopulation with chronic bronchitis (41.46% vs. 33.06%, $p = 0.0193$). The proportion of patients with deteriorations in TDI focal score of ≥1 unit was lower in the roflumilast group than in the placebo group in the overall population (16.85% vs. 25.55%, $p = 0.0004$), subpopulation with a history of exacerbations (15.83% vs. 26.14%, $p = 0.0002$), and subpopulation with chronic bronchitis (15.69% vs. 23.31%, $p = 0.0097$). All the differences were statistically significant. Conclusions: An analysis of clinical trial data demonstrated that roflumilast improves dyspnea outcomes in COPD patients, particularly among those with a history of exacerbations. Reducing exacerbations for COPD patients with a history of exacerbations may improve health status.

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1138046

THE RELATIONSHIP BETWEEN KNOWLEDGE OF INHALED CORTICOSTEROIDS AND ADHERENCE TO INHALED CORTICOSTEROIDS AMONG AFRICAN AMERICAN ADOLESCENTS.

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BACKGROUND: Asthma prevalence, morbidity, and mortality rates are high for low-income urban African American adolescents. Inadequate adherence to daily controller medications, specifically inhaled corticosteroids, may be a key factor leading to poor asthma outcomes in this population. It is important to study the role of potential reasons, including level of general asthma knowledge and knowledge of inhaled corticosteroids, which may be contributing to low adherence. METHODS: This study examined the relationship between both general asthma knowledge and knowledge of inhaled corticosteroids with adherence to prescribed daily inhaled steroids in a sample of urban African American adolescents with persistent asthma. The study was a pilot feasibility study to determine if a larger study should be conducted. Twelve urban African American adolescents between 16 and 20 years of age, diagnosed with persistent asthma, and prescribed a daily inhaled steroid medication, participated. Subjects completed the ZAP Asthma Knowledge Instrument and the Inhaled Corticosteroid Knowledge Questionnaire. Adherence was measured objectively using an electronic monitoring cap, the Doser CT, placed on their daily inhaled steroid medication. RESULTS: On average, participants answered 71% of the items correctly on the ZAP Asthma Knowledge Instrument (range 59-87%, n=11) and 60% of the items correctly on the Inhaled Corticosteroid Knowledge Questionnaire (range 0-86%, n=9). Mean adherence to daily inhaled corticosteroids, measured over a 21 day period, was 19% (range 0-71%, n=9). CONCLUSION: Overall, the results show that general asthma knowledge and knowledge of inhaled corticosteroids are much higher than adherence to daily inhaled corticosteroids. Perhaps knowledge may be necessary but not sufficient to promote adequate adherence. Given the small sample size and missing data, further investigation is warranted. Sponsored Research – none.

Sponsored Research - None

1136373

EFFECT OF OMEPRAZOLE ON PULMONARY FUNCTIONS IN PATIENTS OF MILD TO MODERATE CHRONIC OBSTRUCTIVE PULMONARY DISEASE WITH GASTROESOPHAGEAL REFLUX.

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Background: Acid gastro-oesophageal reflux may aggravate respiratory symptoms in patients with chronic obstructive pulmonary disease (COPD) by increasing airway hyperresponsiveness through vagally-mediated pathways we aimed to study the effect of omeprazole on Pulmonary functions in patients of chronic obstructive pulmonary disease with gastro esophageal reflux. Methods: The present study screened 38 mild and moderate COPD patients. All the patients underwent esophageal manometry and dual probe 24 hour esophageal pH monitoring. Twenty consecutive patients of diagnosed GERD received omeprazole 40 mg daily for 6 weeks. Spirometry was done at baseline and after 6 weeks of treatment. The primary outcome measures were improvement in reflux symptoms and the change in pulmonary function tests (FEV1, FEV1/FVC and PEFR) and blood oxygen saturation. Results: There was a significant reduction in GERD symptoms after therapy with omeprazole in comparison to baseline. Significant decline in FEV1 was observed after the therapy with a p value of 0.02. FEV1/FVC and PEFR compared with baseline and after therapy showed no improvement with p value of 0.056 and 0.31 respectively. A statistically significant improvement was seen in blood oxygen saturation after therapy with a p value of 0.04. Conclusion: Treatment with omeprazole in COPD patients with gastroesophageal reflux is beneficial by reducing the symptoms of GERD and improving the blood oxygen saturation. However it had no effect on pulmonary function. Abbreviations: COPD: Chronic obstructive pulmonary disease, GERD: Gastroesophageal reflux disease, FEV1: Forced expiratory volume in 1 sec., FVC: Forced Vital capacity, PEFR: Peak expiratory flow rate, SpO2 : Blood oxygen saturation

Sponsored Research - None

1148957

A QUASI-EXPERIMENTAL STUDY OF THE RELATIONSHIP BETWEEN LUNG DISEASE KNOWLEDGE AND BRIEF LUNG HEALTH EDUCATIONAL SESSIONS.

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Purpose: Public awareness of COPD and its detection with spirometry is lacking. Most patients at high risk for developing COPD do not know their FEV1 and FVC. The first purpose of this quantitative quasi-experimental study is to determine the baseline knowledge of lung disease among the general medical outpatient clinic population at North Shore University Hospital. The second purpose is to examine the relationship between patient lung disease knowledge scores and brief lung health educational sessions provided by respiratory therapists. Methods: A respiratory therapist assessed patient baseline knowledge of COPD and spirometry's role in evaluating lung function with a 12 item survey tool before and one week after an educational intervention. The brief educational sessions were conducted by a respiratory therapist.Pre and post knowledge score analyses consisted primarily of descriptive methods. Results: Twenty five patients were evaluated. Baseline knowledge of COPD and Spirometry's role in evaluating lung function was low for each of the 12 items on the survey. Following the educational intervention knowledge scores increased for each item on the survey. The survey knowledge change was most notable for the following items: spirometry is used to evaluate lung function, 85% increase; causes of COPD, 37% increase; spirometry recommendation for those with chronic respiratory symptoms, 50% increase; COPD is increasing in America, 32% increase. Conclusion: COPD is now the 3rd leading cause of death in America and patient awareness is low. Brief lung health educational sessions can improve both knowledge and health seeking behavior among patients treated in a general medical clinic setting. Respiratory therapists can play an important role in the provision of patient education related to COPD.

Sponsored Research - None

1121445

"THE ADDITION OF AN AIRWAY CLEARANCE SPECIALIST IMPROVES PATIENTS OUTCOMES AND SATISFACTION"

Ginger Browning, Ed Conway, Jamie Wooldridge; Cincinnati Children's Hospital, Cincinnati, OH

Introduction; Cincinnati Children's Cystic Fibrosis inpatient team saw the need to create an Airway Clearance Specialist position. This position was created as a result of the respiratory therapist feeling our patients needed more education about the importance of airway clearance. The hiring of our Airway Clearance Specialist has allowed for more discussion of airway clearance during rounds, has allowed for patients to have more dedicated time for learning new airway clearance modalities, and has given patients and parents more support and a resources for airway clearance. Method; To evaluate the effectiveness of our Airway Clearance Specialist we looked at two measures. The first measure was change in FEV1 in patients a year out from hiring the Airway Clearance Specialist. We also did a patient/parent survey to demonstrate whether or not the patients and their families felt the role added support for them. FEV1 data was collected from 151 patients whom the Airway Clearance Specialist saw within the first year. A survey sent to our patients and families to determine if they felt having an Airway Clearance Specialist review their airway clearance technique twice a year was beneficial. Results; Our CF Center sees 200 patients, during the first year the Airway Clearance Specialist met with all patients and families twice. During these visits, 184 patients were introduced to a new modality of ACT and 16 patients reviewed their current ACT modality. FEV1 data was obtained on 151 patients during the first year. This data was compared to the year prior and the results showed 44% had an improvement or stayed the same with an average increase of 12%. The survey was sent out to all patients in or CF Center. Response to the survey showed 83% thought it was beneficial to have an Airway Clearance Specialist, 5% felt it was not beneficial and 12% were not sure. We also asked if they felt their knowledge of ACT improved since we hired our Airway Clearance Specialist, 73% thought their knowledge improved, 10% felt their knowledge didn't improve, and 17% were not sure. Conclusion; We feel the addition of our Airway Clearance Specialist has significantly improved our centers goal of providing best practice in airway clearance. Patients and families feel that they now have a resource for airway clearance.

Sponsored Research - None

1129826

ASTHMA RESPONSE TEAM.

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Asthma continues to be the number one reason for pediatric admissions to the hospital along with the number one reason patients are seen in the emergency room. Our institution utilizes a Clinical Asthma Score (CAS) to determine severity of asthma. This has allowed us to develop a inpatient asthma pathway that has shown continued decreases in length of stay and cost associated with pediatric asthma. One area that we felt was not being met, was asthma management for patients seen in the emergency room and discharged from the emergency room. we developed a program to address the asthma management of patients discharged from the emergency room. Utilizing certified asthma educators, respiratory care responds to pages from the emergency room to provide asthma management for patients prior to discharge. We start with obtaining a patient history that focuses on current severity and symptoms for the past two weeks. We review their history for the past year as it concerns their asthma to determine risk. The ART therapist then provides asthma education that consists of asthma pathophysiology, medication use, triggers and trigger avoidance, peak flow and holding chamber usage. We use placebo inhalers to teach proper medication and holding chamber usage. We perform peak flows with each patient along with labeling their peak flow meter with the predicated values. Each patient is provided with a Philips Respironics Children's Asthma Care kit prior to discharge that contains a peak flow meter, Optichamber valved holding chamber and mask, asthma self help booklet in English and Spanish, educational DVD and a carrying case. The ART therapist then develops the asthma action plan utilizing current NHLBI EPR-3 guidelines. A follow up appointment is made with the patients PCP; if no PCP is available a walk-in appointment is scheduled with our own continuity clinic. The ART therapist then reviews the asthma action plan with the parent insuring that a signed copy is placed in the patients chart along with providing a copy to the parent. The ART coordinator enters all information in the database as well as providing referral to Children's Medical Services- asthma management program offered through the state department of health. A copy of the current asthma action plan is securely faxed to all school aged children's school nurse. One year data has shown that we are meeting or exceeding our targets in all areas except for ICS therapy and bedside Spirometry.

Sponsored Research - None

Measures and Targets

Measure	CMC ED	Target
7 day returns	2%	5%
Asthma action plan done in ED	91%	75%
Inpatient admit	10%	25%
PICU admit	1%	5%
Asthma education in ED	96%	75%
Persistent W/O ICS	11%	10%
Bedside Spirometry completed	34%	50%

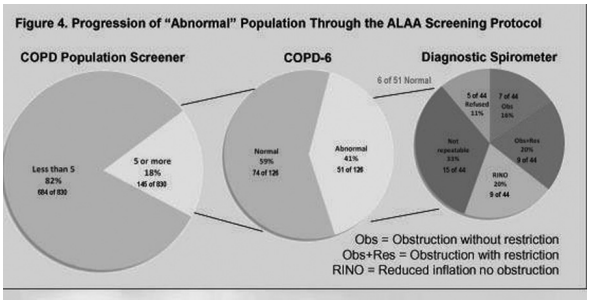
1107535

A NOVEL APPROACH TO SPIROMETRY SCREENING FOR COPD AND TOBACCO USE.

Scott Cerreta; American Lung Association in Arizona, Tucson, AZ

ABSTRACT: A total of 840 participants participated in ALAA Community Screening for COPD events from 2007 to May 2010. The ALAA protocol includes several documents and tools designed to maximize efficiency with minimal reliance on additional staff. The primary focus is to promote healthy lungs through tobacco prevention and cessation, raise awareness for COPD through lung health screens and spirometry testing, and connect participants with abnormal lung function to local physicians for further evaluation. The ALAA protocol includes several screening tools and steps to narrow spirometry testing to a small number of people with a valid indication to perform diagnostic spirometry. The results of this project are designed to evaluate the effectiveness of the ALAA COPD Community Screening model. Of the 840 participants that completed a COPD Population Screener, 684 (82%) had a screening score of less than 5 and 147 participants (21%) chose to have a COPD-6 test administered even though it was not indicated. And 21 of these 147 COPD-6 tests had a confirmed abnormal diagnostic spirometry test (14%). This confirms effectiveness of the COPD Population Screener as a suitable replacement for diagnostic spirometry as the screening tool. Results of 126 participants with a screener score of 5 or more, indicated that 59% had a normal COPD-6 test and 41% had an abnormal test. Of the 31 screeners who had an abnormal COPD-6 test and repeatable diagnostic spirometry, 25 screeners (81%) reported an abnormal repeatable diagnostic spirometry test. This data suggests the COPD-6 is a very effective tool at dwindling the participants down from 126 to 44 that needed to have a diagnostic spirometry test. Furthermore, a high percentage (88%) of the COPD-6 tests were confirmed by diagnostic spirometry to in fact reveal abnormal lung function.

Sponsored Research - None



1068918

IMPROVING MDI ADMINISTRATION EDUCATION TO CAREGIVERS.

Lisa Devoto, Edward Conway; CCHMC, Cincinnati, OH

Background: Current practice at CCHMC for inpatients with asthma is to have the caregiver demonstrate effective MDI technique prior to patient's discharge. Currently we do not assess the caregivers' knowledge prior to asthma education. The purpose of this study was to evaluate the implementation of an assessment tool to measure baseline understanding and technique for caregiver administration of MDI's to pediatric patients. We tested the hypothesis that observed MDI technique was improved following asthma education by a trained Respiratory Therapist. Methods: A data sheet was created and implemented that allowed Respiratory Therapists to observe patient or caregiver MDI knowledge and technique before and education. Respiratory Therapists on the asthma impatient unit were all trained and checked off on MDI technique prior to implementation to create interrater reliability. Education was differentiated between administering the MDI with an aero chamber and mouthpiece, and administering the MDI with an aero chamber and mask. There were 9 observational data points for the mask group and 12 observational data points for the mouthpiece group. Percentages of correct technique were calculated for each observational category and statistical analysis was performed in SigmaPlot version 11. A Mann Whitney Rank Sum Test was used to compare overall improvement pre and post education for each group. Significance was set at p=<.05. Results: In the mask group, mean correct technique observed pre education was 91% (.13), and .97(.06) in the post education group, (p=.04). In the mouthpiece group, mean correct technique observed pre education was 91% (.11), and .88 (.21) in the post education group, p= .8. Discussion: Effective MDI technique is important for home management of asthma and preventing hospital admissions. Measuring baseline knowledge and technique for patients and caregivers can be an effective tool in assessing asthma education needs. In our cohort of patients, overall knowledge and technique significantly improved in the mask group. Although there was no difference, in the overall correct technique in the mouthpiece group, individual categories and assessment points during the process were improved.

Sponsored Research - None

1148231

PREDICTING THE PERSONALITY TYPE IN ASSOCIATE DEGREE RESPIRATORY THERAPY STUDENTS AT JEFFERSON COLLEGE OF HEATLH SCIENCES.

Linda Cochran; Jefferson College of Health Sciences, Roanoke, VA

Background: A literature review reveals numerous publications regarding the Jungian personality type of varying health care practitioners; all of which are reported in dichotomous terms (Introversion vs. Extraversion; Sensing vs. Intuition; Thinking vs. Feeling; Judging vs. Perceiving). There are limited results for respiratory therapy students and none present the findings with a numeric score. The purpose of this research was to confirm the personality type of the students as well as a determining a numeric score. It is postulated the numeric scores will be more accurate in predicting the strength of behaviors or performance. Method: Beginning in 2008, incoming respiratory therapy students were asked to complete a personality assessment. Over three years, eighty-four students agreed to participate. As found in previous research, the majority of students were designated as ESFJ, the second highest of the sixteen classifications estimated in the general population in the United States (12.3%). Using the ESFJ classification as a foundation, the number of questions answered in each category was assigned a score on a continuous 10-point scale. For example, someone who chose all answers used to indicate an E preference would receive a score of 10; while someone who did not chose any answer leading to an E preference, would receive a score of 0. A score of 5 would indicate half of the answers indicated an E designation and half I. This was done for all four dichotomies. Results The information was entered into a SPSS data base and analyzed for descriptive statistics. The results are in Table 1. Conclusions: While a major of the students are ESFJs, the strength of the means limit our ability to apply generalities in the educational setting. Only the J score was significantly greater than the mid score of 5. The scores do offer opportunities to correlate individual scores to performance in cognitive and psychomotor arenas.

Sponsored Research - None

Table 1

	E Score	S Score	F Score	J Score
Mean	5.95	5.65	6.10	6.88
Standard Deviation	2.19	1.80	2.00	1.63

1134965

A VALID ACADEMIC PATH TO PROMOTE RESPIRATORY PHYSIOTHERAPY.

Emilia Privitera[2], Vittoria Galimberti[3], Anna Brivio[5], Simone Gambazza[1], Luciana Ptacinsky[4], Mario Nosotti[2], Luigi Santambrogio[2]; [1]Rehabilitation Unit, Azienda Ospedaliero Universitaria A. Meyer, Firenze, Italy; [2]Thoracic Surgery and Lung Transplantation, Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milano, Italy; [3]Pulmonary Rehabilitation, Ospedale San Giuseppe Fatebenefratelli, Milano, Italy; [4]A.O. Ospedale Niguarda Ca' Granda, Milano, Italy; [5]Pediatrics CF Center, Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milano, Italy

BACKGROUND A one-year post-graduate Master in Physiotherapy and Pulmonary Rehabilitation has been offered within the University of Milan Medical School in collaboration with Associazione Italiana Riabilitatori dell'Insufficienza Respiratoria (ARIR). The aim is to cover a gap in Italian Physiotherapy academic curricula offering a course with theoretical and practical teaching that make students capable of using different techniques and procedures in respiratory physiotherapy. After the recognition by the International Education Recognition System (IERS), ARIR wanted to investigate if and how this course has affected students' attitude and their profession. METHODS A structured questionnaire made up of 15 multiple-choices items (8 on perceived quality of education and 7 on professional change) was sent by email to all physiotherapists who graduated in the previous four editions of the Master. One month was given for completion. Age, gender, year of degree and year of Master where considered as background variables. RESULTS We had a 78% response rate with 57 out of 73 physiotherapists sending the questionnaire back. Mean age was 37 years (23-60) and women were the majority (78%). Forty-two students (74%) worked in the respiratory field at the time of application but only 15 (36%) dealt with respiratory patients only. Expectations were completely met at the end of Master for 71% of physiotherapists. 96% reported greater professional and clinical skills after the master with a 67% saying working team relationship has improved. 28% improved their job position thanks to the master degree and physiotherapy working in the respiratory field increased by 22%. CONCLUSIONS This course seems to meet students expectations and offer a solid knowledge to better work within the field of respiratory physiotherapy. It is also a way to promote the profession of respiratory physiotherapy in Italy.

Sponsored Research - None

1131550

LEADERSHIP STYLES OF RESPIRATORY CARE PROGRAM DIRECTORS AND FACULTY SATISFACTION AND FACULTY WILLINGNESS TO EXERT EXTRA EFFORT.

Nancy Weissman; Respiratory Care, Palm Beach State College, Palm Beach Gardens, FL

Background: Over the next ten years, there is a considerable number of respiratory care program directors that are likely to retire. An understanding of leadership characteristics of current program directors will be critical for the future of the profession. There is limited research published about leadership characteristics of respiratory care educators. This study will help fill that void and serves as a foundation for further research. For that reason, the aim of this research is to examine the leadership characteristics of all accredited respiratory care program directors to determine the relationship between the director's leadership style, faculty satisfaction with their leader, and faculty's willingness to exert extra effort. Method: Program director, faculty and program demographics were obtained with a researcher-designed questionnaire. Program directors leadership characteristics were measured by the Multifactor Leadership Questionnaire (MLQ). Commission on Accreditation for Respiratory Care (CoARC) accredited program directors (n=321) and their full and part-time faculty (n=172) received an e-mail requesting participation in the study with a web link to obtain demographic information. Faculty members received an e-mail from Mind Garden, Inc. with a web link to complete the MLQ. Results: A significant relationship between faculty satisfaction ($p < .001$), and each of the following types of leadership: transformational, transactional, and passive/avoidant behaviors. Additionally, the results found a significant relationship between extra effort and transformational and passive/avoidant leadership behaviors ($p < .001$) and transactional leadership behaviors ($p = .008$). Conclusion: With many program directors close to retirement, mentors are needed to help develop future program director's potential. Program directors in respiratory care education possess the leadership qualities necessary to provide for the needs and expectations of the community in which they serve. Although the results of this study are preliminary, they are supported by current research in other allied health professions and a parallel can be drawn. This study is the foundation of understanding of the leadership characteristics of program directors in respiratory care. Furthermore, this study adds to the literature base of faculty satisfaction in allied health programs.

Sponsored Research - None

1045012

COPD SPECIALIST COURSE: EVALUATING KNOWLEDGE AMONGST HEALTHCARE PROFESSIONALS.

Scott Cerreta; American Lung Association in Arizona, Tucson, AZ

: The COPD Specialist Course was introduced in 2007 as a result of the Arizona Comprehensive Lung Disease Control Plan. The course provides a comprehensive overview of COPD including practical information that providers can use in their work with patients who have, or who are at risk of developing COPD. This course is knowledge based. The objectives of this evaluation are to assess baseline, post-course, and 3-month post-course knowledge of COPD and whether or not this course leads to system changes that permit organizations to screen and treat patients for COPD more effectively. A total of 183 health care professionals (HCPs) completed the full day COPD Specialist Course. The majority of HCPs included respiratory therapists (97), nurses (42), and practitioners (12). Consistent with last year's report the overall percent in knowledge based on 5 repeatable questions and confidence scores on 5-point Likert scale for the 2010 report were very low on pre-test (28% / 2.65), produced highest scores on post-test (4.28 / 76%), and 3-month follow-up tests revealed scores in the middle (3.78 / 54%). This data suggest that continuing COPD education amongst all healthcare professionals remains critical. Course participants are taking personal action to educate and assist their patients with COPD. This year more organizations report systematic changes with COPD education and awareness compared to last year.

Sponsored Research - None

1068921

THE UTILIZATION OF A RESPIRATORY CARE JOURNAL CLUB TO FACILITATE STATE CONTINUING EDUCATIONAL CREDITS.

Kenneth Mill, Steve Pyne, Linda Cornman, Lutz Angela; LVHN, Allentown, PA

Maintaining State License is a mandatory requirement to maintain job employment. The accumulation of thirty continuing educational credits (CEUs) is mandatory for respiratory practitioner licensure renewal in the State of Pennsylvania. There are many avenues to obtain CEUs to meet this state requirement. Journal Clubs are historically utilized to help enhance learning about current practices, review evidence-base outcomes, and facilitate knowledge on how to critically examine study designs and outcomes. To aid our staff to meet the state requirements we developed an internal journal club. Practitioners attending the schedule meetings were able to garner continuing respiratory care educational credits (CRCEs) form the American Association of Respiratory Care (AARC). The club was open to all internal practitioners, physicians, and rotating respiratory students. The Respiratory Care Journal Club meets monthly and during the meeting, two club members present current RC Journal Articles for review and discussion. Two weeks prior to the meeting, articles that are to be reviewed, are distributed to all committee members. Each article is reviewed and discussed for thirty-minutes. Each member receives one CRCE unit for attending the meeting. An article summary sheet, along with meeting minutes is disseminated to absent committee members for review. Prior to obtaining CRCE credits for the journal club, the majority of practitioners obtained a large percentage of their educational credits from external offerings. Post CRCE implementation over fifty-percent of the CRCEs obtained by staff was from internal offerings via the journal club and other educational venues. Other positive impacts noted from these monthly meetings were improved staff satisfaction, enhanced job performance, and changes of current practice to reflect evidence based literature. Implementation of a Respiratory Care Journal Club has not only help staff fulfill state license requirements, but also has fostered an educational atmosphere within our department.

Sponsored Research - None

1113532

ASSESSMENT OF INTEREST IN AND NEED FOR A RESPIRATORY CARE PRECEPTOR TRAINING PROGRAM.

Lori VanBeusekom; St Catherine University, St Paul, MN

ASSESSMENT OF INTEREST IN AND NEED FOR A LOCAL RESPIRATORY CARE PRECEPTOR TRAINING PROGRAM Background: There has been a significant amount of work promoted by the American Association for Respiratory Care (AARC), through a clinical preceptor training work group, in developing a standardized preceptor training program. Preceptor training has the potential to strengthen competency and professionalism and foster consistent excellence in patient care. The purpose of this study was to assess local community interest in a preceptor training program and identify specific areas of needed support that could improve the preceptor-student experience. Methods: An on-line survey was distributed to 300 Respiratory Therapists employed at seven local hospitals in the Minneapolis-St Paul metropolitan area. These seven hospitals serve as clinical affiliates for Respiratory Care Programs across the state of MN. Results: 75 out of 300 invited therapists completed the survey (25%) and 68 of those 75 (91%) had experience as a preceptor. 60 respondents (80%) expressed interested in attending a preceptor training program. Thirteen items identified as being important for a successful preceptor experience were found to be lacking in some degree when analyzed using the paired observation two-tailed t-test ($p \leq .0005$). The largest gap between importance and presence was found in the ability of students to communicate goals. Conclusion: There is community interest in a preceptor training program. Tools to support the needs of preceptors are needed to improve the preceptor experience. In particular, communication tools to enhance dialogue between students and preceptor are warranted.

Sponsored Research - None

1120718

DETERMINING STUDENT KNOWLEDGE ABOUT AGING; INTERPROFESSIONAL EDUCATION.

Helen Sorenson, Martha M. Acosta; Respiratory Care, The University of Texas Health Science Center, San Antonio, TX

Background: The aging of America is a reality. Currently there is potential for 10,000 individuals to turn 65 every day, a trend that will continue for 12-15 years. Over 30 to 50% of admissions to hospitals are now patients 65 and older.(IOM 2009) More training/education is necessary to improve care of older adults delivered by interprofessional allied health personnel. RTs, paramedics,firemen,and clinical lab scientists are all involved in geriatric care, either directly or indirectly. Understanding normal age-related systemic changes vs. disease related changes in older adults is important, as is understanding age-related changes in lab values, issues related to transporting older adults with dementia, recognizing elder abuse and awareness of how ageist attitudes can adversely affect older adults. Methods: For the past 3 years, students in the Clinical Lab Sciences and Emergency Health Sciences programs have attended a 3-4 hour Geriatric Symposium each year taught by faculty from Respiratory Care and Physical Therapy. Pre and post-tests were given to all students to assess entry-level knowledge of aging issues and knowledge after completion of the symposium. Results: The average score on the Aging pre-test was 66.1%. The average score on the Aging post-test was 84.0%. Conclusion: The symposia have been successful in raising awareness of aging issues, and have now been incorporated into the curriculum for Clinical Lab Science, Emergency Health Science and Respiratory Care students.

Sponsored Research - None

2011 Data	Gender	Average Age	Pre-Test Scores	Post-Test Scores
CLS Students	Female,21Male, 7	Female,24 Male 29	65.5%	85.7%
EHS Students	Female,1 Male, 25	Female,33 Male,34	68.2%	84.6%
RT Students	Female, 9 Male, 7	Female,27 Male, 25	64.7%	81.9%
Total	N = 69		66.1%	84.0%

1126461

USE OF HIGH FIDELITY SIMULATION TO IMPROVE CRITICAL THINKING SKILLS AND DECISION MAKING IN THE NEONATAL INTENSIVE CARE UNIT.

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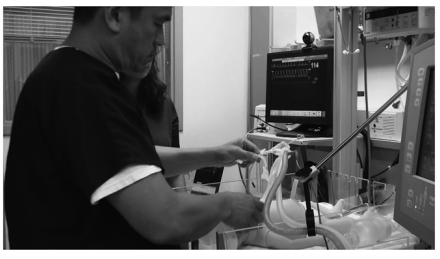
Background: National first-time pass rate on the clinical simulation exam (CSE) for the period 2007-2011 was 58.8%. Our students (n = 76) performed at that level or better. On the decision making portion of the CSE our students scored 71.9% +/- 1.5% (4 cohorts) which includes one neonatal case study. Reviewing scores for the neonatal case, 43.6% failed decision making. Given the instability of neonates and the crowded environment of the NICU, human patient simulators have been suggested to be a useful tool for assessing and improving critical thinking skills. We developed simulations that address initiation, adjustment, and troubleshooting of mechanical ventilation (including high frequency oscillatory ventilation; HFOV) of a neonate. We hypothesize that implementation of these scenarios in our curriculum will improve performance on decision making. We will test this hypothesis with internal measures and performance on the neonatal portion of the CSE. Method: Scenarios for initiation, ventilator adjustment, and troubleshooting were developed in collaboration with our Level III clinical affiliate and programmed into a high fidelity neonatal simulator (Laerdal's SimNewb). The simulator is intubated and subsequently ventilated with either conventional ventilator or HFOV. Scenarios involve deterioration of physiologic and/or blood gas values, requiring appropriate assessment and subsequent adjustment of ventilator parameters or identification and resolution of equipment related problems. Results: This semester our junior class will be randomly assigned into 3 teams of 4-6 students per team. Each team will then be tested with each of the three scenarios; performance will be videotaped and presented to the class for debriefing. Seven weeks later the students will be retested with each scenario to assess performance in their decision making. Conclusion: In our first scenario administration 40% of the students made inappropriate clinical decisions. We believe that use of these scenarios will not only provide crucial exposure and experience that is required for entry level competence, they will also improve critical thinking skills. The outcome measures we will use to assess improvement in critical thinking skills will be performance on the developed scenarios and the students' decision making scores on the CSE neonatal patients.

Sponsored Research - None



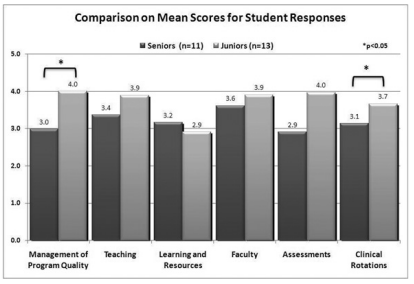
1127144

A NEW BSRT PROGRAM IN SAUDI ARABIA: EFFECT OF STUDENT EVALUATIONS ON CURRICULAR CHANGES AND OVERALL IMPACT ON QUALITY OF THE PROGRAM.

Mansour Alaiwah[2], Amir Omair[2], Omar Alzumai[2], Adil Alotaibi[2], Ruben D. Restrepo[1,2]; [1]Respiratory Care, UTHSCSA, San Antonio, TX; [2]Respiratory Care, King Saud Abdulaziz University - Health Sciences, Riyadh, Saudi Arabia

Background: Student evaluations of a new academic program provide important insights and feedback that may shape up the future curriculum and provide ideas on implementing new strategies. The Respiratory Care Program at King Saud Abdulaziz University Health Science is a "brand new" program that adopted the curriculum from the Respiratory Care Program at South Alabama University (SAU). Our senior class received the unmodified curriculum from SAU between 2009 and 2010 and will graduate in June 2011. After completing their first year they were asked to complete a survey evaluating the quality of the program and based on their feedback some changes have been implemented during the past academic year (2010-2011). Objective: The primary objective of this project was to compare responses regarding the evaluation of the program quality between the junior and the senior class in order to evaluate the success of implementing the changes made to the program during the last year. Methods: We designed a 52-item comprehensive questionnaire to evaluate six different areas: management of program quality, teaching, learning resources, faculty, assessments, and clinical rotations. A conventional Likert scale was used to record the responses (1= strongly disagree; 2= disagree; 3= neutral; 4= agree; 5= strongly agree). Twenty four (24) questionnaires (seniors, n=11; juniors, n=13) were used for the descriptive analysis. A "t" test was used to compare groups and significant difference was defined as a p value < 0.05. Results: There was a significant difference between juniors and seniors regarding their evaluation of the management of the program quality (p=0.01) and the clinical rotations (p=0.01). While the other comparisons did not reach statistical significance (learning and teaching p=0.05; learning resources p=0.55; faculty p=0.33; clinical rotations p=0.05), the mean Likert scale score for the overall quality of the program improved by 10% (senior class = 3.2 vs. junior class = 3.7). Conclusion: Although the program is at a very early stage of development, the implementation of new changes based on student feedback during the first year has resulted in significant improvement of its overall quality.

Sponsored Research - None



1129853

STAFF EDUCATION INCREASES REPORTING OF SAFETY EVENTS.

Peter J. Black, James Y. Findlay, Steve E. Sittig; Respiratory Care, Mayo Clinic, Rochester, MN

Background: A culture of safety is essential to the success of all hospitals. Event reporting (near-misses, sentinel events) is an important part of this process. At our institution respiratory therapists (RT) are encouraged to report events by calling an event pager. As part of a Respiratory Care Department safety initiative we interviewed staff therapist through casual conversation about reporting events and discovered that staff did not report all events. This was attributed to miscommunication with nursing, concerns regarding fear of retribution and ambiguity of near-miss and sentinel events. We hypothesized that provision of appropriate education to RTs would improve understanding of the event reporting process and encourage event reporting. The department adopted a plan to provide event reporting education to our respiratory therapists as an excellent way to promote safety. Method: A poster presentation with discussion was developed. This covered: a culture of safety, non-punitive environment, what events are, differences between near-miss versus sentinel, why do we report and how to report. All RTs attended the presentation in early January, 2010. A retrospective review of three years of event data was done one year after the poster presentation. The total number of events for each year was tabulated and then pre- and post-education years compared as a percent increase or decrease in reported events. Data were analyzed in Excel spread sheet. Results: Total events reported by RTs in 2008, 2009, 2010 were 28, 29, and 42, respectively (Table 1.). A review of three years of data displayed an increase in event reporting of 50% (2008), 44.8% (2009) when compared to 2010. Conclusions: Providing appropriate education improved RTs understanding of the event reporting process. Our department observed an increase in event reporting one year following the poster presentation. This will presumably translate into appropriate event reporting and an enhancement of the culture of safety in our institution. Respiratory Care departments should include a directed educational component as part of an event reporting process.

Sponsored Research - None

Table 1. Comparison of Event Reporting Pre- and Post-Education

	Pre-education	Pre-education	Post-education
Year	2008	2009	2010
Events Reported	28	29	42

1149011

IMPLEMENTING ASTHMA STRATEGIES IN SCHOOLS THROUGH DEVELOPING COMMUNITY PARTNERSHIPS.

Kathleen Hernlen, Susan Whiddon, R. Randall Baker; Respiratory Therapy, Georgia Health Sciences University, Augusta, GA

Background: The East Central Health District (ECHD) of Georgia has an asthma death rate that is significantly higher than the state and national death rates for children under the age of 14. A 2009 study assessed the status for implementing asthma management strategies in ECHD schools using the National Heart Lung Blood Institute's "How Asthma Friendly is Your School "survey. Forty one of the 112 (36.6%) schools returned the surveys. 14% of the schools reported they had a written Indoor Air Quality (IAQ) management plan. The purpose if this study was to educate and assist schools in the development and implementation of IAQ management plans Methods: Three of the superintendents of the 7 school districts that participated in the 2009 study agree to participate in this project. They suggested a school from their district that had either a high number of asthmatic students or known air quality problems. Principals were educated about the need for and goals of IAQ management and the EPA's IAQ Tools for Schools kit. The process was explained to the faculty and staff of each school and volunteers were recruited for exhaled nitric oxide (eNO) measurements taken pre- and post- implementation of the IAQ plan. An IAQ walk thru team was formed at each school consisting of the principal, representatives from the maintenance, custodial or physical plant and GHSU investigators. A walk thru of each class room was performed. Results: Pre eNO measurements of 76 teachers at the 3 schools were obtained with an average eNO of 16.09 ppb. Post eNO measurements are in process. The IAQ teams assessed 115 class rooms in the three schools. IAQ team members identified and discussed barriers to IAQ management with each teacher during the walk-through along with measures that could be taken to improve IAQ. The results and suggestions to improve IAQ were discussed with each principal and a report with recommendations to improve IAQ and a sample IAQ plan was sent to each superintendent. Conclusions: Effective non-adversarial education, positive two way communication, and input from all levels and members of the school system are essential to develop and implement a successful IAQ plan. Principals are adapting their policies to address the air quality issues found in the study. The policies will be implemented in the fall of 2011. One school district has adapted an IAQ management plan and is in the process of implementing it in all 59 schools in the district.

Sponsored Research - W.G. Raoul Foundation

1148055

A FIVE YEAR COMPARISON OF PERCEPTIONS ABOUT PRECEPTING.

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INTRODUCTION: Preceptors serve as role models and instructors for newly hired employee. They often have specialized training to prepare them for this role in addition to having a strong desire to mentor others. In order to gain greater insight on how best to motivate preceptors and improve our program we surveyed this group. With data from two separate surveys we are able to report the impact of program refinements in preceptor opinions. METHOD: We conducted like surveys in 2006 and 2011, Participants were asked to score each question as follows using a 1-3 scale: 1 Strongly Influenced, 2 Some Influence, and 3 No Influence. The percentage of "strongly influence" were calculated for each question for both periods. DISCUSSION: Preceptor's realizing the impact of their participation in department operations acconts for the highest percentage increase of 26%. A 22% increase in response was observed in the areas of performance appraisal, seeking more knowledge, and interacting with other disciplines. Strong influence was also observed in those areas related to exploring professional organizations and inquiring about an advanced degree . CONCLUSION: The data reflects a positive trendin perception in all areas associated with the precepting activity. These data support the positive impact of ongoing support and investment in the preceptor program. We also demonstrate that staff value being more engaged in department activities and the benefits of collaboration that result from precepting.

Sponsored Research - None

Question — Responses in Percentages	2006	2011
Has precepting helped improve your communication skills?	55	58
Has precepting brought you more interactions with other disciplines?	33	53
Has precepting helped provide a positive impact on other disciplines?	58	61
Has precepting encouraged you to seek more knowledge?	52	74
Has precepting helped your performance appraisal?	27	49
Has precepting influenced you to help participate in department operations?	24	50
Has preceting helped you to value your profession more?	52	55
Has precepting influenced your exploration professional organizations?	24	37
Has precepting influenced you to inquire about an advanced degree?	15	29

1149673

THE CLINICAL REASONING OF EXPERT, COMPETENT, AND NOVICE RESPIRATORY THERAPISTS WORKING IN THE ACUTE CARE SETTING ABSTRACT.

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Background: The purpose of this qualitative case study was to develop an understanding of when and how respiratory therapists used clinical reasoning in the acute care settings. Method: The framework for this study included clinical reasoning, the novice-to-expert continuum, and reflective practice. This qualitative study was designed to gain an understanding of therapists' decision making in the acute care settings of neonatal and pediatric intensive care units from the perspective of the therapist themselves. After obtaining IRB approval from both the University of Georgia and the Medical Center of Central Georgia, observation and interviews were conducted with therapists working in intensive care units. Results: The findings of this study indicated that respiratory therapists used nine different types of clinical reasoning as components of their work in the neonatal and pediatric intensive care units. It also revealed a difference in the types of reasoning used to solve problems based on a therapist's years of experience and the quality of those experiences. These therapists used multiple types of clinical reasoning almost simultaneously. The results also indicated that these respiratory therapists could rapidly shift from one method of reasoning to another, depending on which aspect of complicated clinical problems attracted their attention. They also revealed the presence of practice contextual factors they believed affected their development of expert clinical reasoning skills. Those hindering their development of good reasoning included; limited or lack of experiences, lack of time and staffing, and limited expectations and nonsupport of physicians. Those that facilitated good reasoning, included previous similar experiences, a good scientific base of knowledge, well written guidelines from which a strong system of unwritten protocols could be developed, collaborative reasoning, and the expectations and support of physicians. Conclusion: The reasoning of respiratory therapists can be facilitated by increasing the similar experiences, providing well written guideline in the forms of policy and procedures and providing the expectations that their reasoning is expected and valued.

Sponsored Research - None

1149965

STUDENT SURVEY COMPARING TEGRITY POWERPOINT LECTURE RECORDINGS VS. CONVENTIONAL DIGITAL VIDEO.

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BACKGROUND: The Respiratory Care Department of The University of Texas Medical Branch, at Galveston has been providing their students with digital video recordings of lectures accessed through Black Board for the past three years. The current study compares the use of the conventional video recordings to a second group of students using computer based Tegrity Power Point recordings.METHODS: Lectures were recorded in the classroom using a conventional video camera with a lapel blue tooth audio transceiver. The digital video was subsequently compressed using Sorenson Squeeze software and then posted to blackboard within 48 hours. Computer based Tegrity PowerPoint lectures were recorded by using a desktop computer webcam. These lectures were uploaded within 24 hours of completion. We compared the surveys collected from two groups of students: 75 RC students with access to live videos, and 50 Clinical Laboratory students with access to Tegrity recordings. Survey questionnaires were completed anonymously and had no other student identifiers. The questionnaire was divided into two parts: (1) outcome and (2) technology.RESULTS: (1) Outcome: The majority of students in both groups –Tegrity (98%) and Conventional Video (82%) thought that the recordings were an effective Instructional Tool. Of the Tegrity group 94% would recommend lecture videos to future students compared to 82% using conventional video. (2) Technology: 89% of the Tegrity students did not encountered any problems in accessing the lectures from blackboard compared to 86% for students accessing conventional video. The Survey also indicated that the conventional video quality was better when compared to the Tegrity recordings (86% vs 74%). CONCLUSION: Our study indicates that students believe videotaped classroom lectures using either technology are a valuable educational tool. The study also shows that a higher percentage of students think that the video quality is acceptable when using conventional video recordings vs. Tegrity recordings.

Sponsored Research - None

1139237

UNDERSTANDING THE PSYCHOSOCIAL ASPECTS OF WATERPIPE TOBACCO SMOKING (HOOKAH) AMONG COLLEGE STUDENTS.

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Background: Waterpipe smoking has obtained popularity among college students in the U.S., partly due to its exotic appeal, social nature, and perceived harmlessness. Waterpipe smoking differs from other health risk behaviors in that it is novel, lacks policy control, lacks uniform health messaging, and holds diverse variations in its practice. Method: This study consisted of a sequential mixed methods approach designed to provide an understanding of the factors that influence waterpipe smoking intention among college students. The purpose of the study was to gather empirical data through a random survey and to provide contextual rich data through qualitative methods that allow for greater depth and elaboration in responses. Sixty-three college students (smokers and nonsmokers) were interviewed regarding their current waterpipe and cigarette smoking behavior, knowledge, attitude, and beliefs about waterpipe tobacco smoking as compared with cigarette smoking. Additionally, three focus groups were held with current waterpipe tobacco smokers. This data informed a random survey completed by 388 undergraduate students attending a public university. Results: Forty percent of undergraduate students reported having ever smoked waterpipe tobacco with 18 percent reported being current smokers. This data supports other reports on college students in the US. Reasons cited for smoking waterpipe tobacco ranged from escapism from the pressures of college to helping students focus on their schoolwork. Students in this study perceived waterpipe tobacco smoking as being less harmful than cigarette smoking. Many of the students have purchased a pipe to allow more frequent smoking on campus at a cost reduction. When asked where they search for health information on waterpipe tobacco, many students cited the Internet, while others relied on information from hookah bar owners. Discussion: Lack of information on the negative health effects of waterpipe tobacco smoking has led young adults to believe that it is a safe alternative to cigarette smoking. Research shows that waterpipe tobacco smoking has similar addictive capabilities as cigarettes and contains additional heavy metals, due to the burning charcoal. Health messages and policy is needed to help curb this trend in tobacco smoking.

Sponsored Research - None

1114774

EVALUATION OF PEER TEACHING IN THE RESPIRATORY THERAPY LABORATORY.

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Background: Laboratory instruction is an important component of respiratory therapy (RT) education. Research has shown that peer teaching, pairing first-year and second-year students, is not only an effective method of instruction, but also enhances students' professional and personal development. Implementing peer-teaching in the respiratory therapy laboratory can offer opportunities for developing leadership skills and for enhancing instruction. Method: Twenty-two second-year RT students conducted laboratory sessions for 22 first-year RT students on a variety of topics related to mechanical ventilation and arterial blood gases. First and second-year students completed evaluations of the peer learning and peer teaching experience, respectively, at the end of each lab. Students rated the quality of their experience using both a 5-point Likert-type scale and through open-ended questions. Results: 100% of first-year and 90% of second-year students reported increased levels of confidence and improved communication skills, understanding and retention of the topics covered as a result of the peer teaching experience. Positive aspects of peer teaching reported by second-year students included feelings of satisfaction, responsibility, and respect in addition to mastery of the material as a result of required prep time. On the other hand, the amount of preparation was time-consuming, and some felt nervous or uncomfortable while conducting their lab session. First-year students responded that they felt less intimidated and appreciated practical tips from students who had recently been in their position. Conversely, they reported that some second-year students were impatient with their questions. 100% of RT students agreed that the experience was positive and that they would like to repeat it. Conclusions: Peer teaching represents an underutilized, yet highly effective resource for RT laboratory instruction. It potentially plays an important role for both teacher (developing professional skills like communication, decision-making, leadership, confidence, and respect) and learner (improved understanding and retention of topics learned).

Sponsored Research - None

1130202

RESPIRATORY THERAPY STUDENT AWARENESS OF NATIONAL PATIENT SAFETY GOALS.

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Introduction: National Patient Safety Goals (NPSG) play an important part in clinical practice in acute care hospitals. There is significant emphasis and culture on learning and abiding by these standards regulated by Joint Commission. The purpose of this study was to test a student's awareness of NPSG and determine if they are prepared to comply with these multidisciplinary guidelines as they enter full clinical practice as Respiratory Therapists upon graduation Method: A 10-question survey approved by the University Hospitals Case Medical Center Institutional Review Board was given to student volunteers of respiratory therapy affiliate programs (anticipating graduation within six months) to assess how they apply the NPSG in clinical practice for Respiratory Therapists. Signed consent was obtained from school affiliates and each student who chose to participate while at a clinical rotation at University Hospitals Rainbow Babies & Children's Hospital. There was no discussion regarding the NPSG at any time prior to the survey. Demographic information was collected to determine if students had prior knowledge and if they recognized signs related to the goals posted in any areas. Basic knowledge of the NPSG was defined as answering 8 out of 10 questions correctly or a score of 80%. Results: 53 of 54 subjects participated in the survey. 75% stated that they had a prior basic understanding and 66% indicated that they noticed a sign related to NPSG during their clinical sites. 430 out of 530 questions were answered correctly resulting in a mean score of 81%. Scores are displayed in average percentages achieved by group in the table below. Conclusion: Respiratory therapy students exhibit a basic awareness of the National Patient Safety Goals related to Respiratory Therapy and understand the importance of applying them in future clinical practice.

Sponsored Research - None

	#1	#2	#3	#4	#5	#6	#7
Total	90	50	160	100	80	20	30
Correct	78	38	127	78	65	16	24
	87%	76%	79%	78%	81%	80%	80%

1132079

TO PROTOCOLIZE OR NOT TO PROTOCOLIZE: THAT IS THE QUESTION!

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Background:Protocolized management of mechanical ventilation has received significant attention in mostly adult ICU populations. We have made multiple attempts to implement protocolized management in our pediatric population with limited success. The ability to facilitate adoption of similar protocols in pediatric ICUs may be related to extreme variability of duration of mechanical ventilation that is associated with patient demographics and severity. The purpose of this study was to evaluate the potential barriers to adopting protocolized management in a general med/surg pediatric ICU that may be attributable to patient characteristics or severity upon ICU admission. Method: Retrospective review of patient characteristics and duration of mechanical were extracted from our institutional ICU surveillance database for all mechanically ventilated pediatric patients over a 6 1/2 period (July 2004-Dec 2010). In addition, we extracted a metric of patient severity as assessed for the first 12 hours of ICU support. Results: A total of 7131 patients were admitted to our PICU during this review period, of which 2714 (38%)required mechanical ventilatory support. Duration of ventilation demonstrated significant variability (121 hours +/- 195 hours; mean +/- 1SD). This variability was present in most of the diagnostic categories we examined and was associated with patient characteristics and severity at time of admission. Conclusion: Substantial variability in duration of mechanical ventilation is present in our pediatric ICU population and appears to be associated with individual patient characteristics and severity. This variability makes adoption of standardized management protocols difficult and may limit success in various subsets of our general med/surg ICU patients. Further studies are warranted to identify subsets of patients whose variability is more homogenous to allow for standard ventilator management.

Sponsored Research - None

1149510

TEN YEAR MULTIDISCIPLINARY EXPERIENCE OF REDUCING ACCIDENTAL EXTUBATIONS IN A PICU.

David Thelander; Respiratory Care, Childrens Memorial Hospital, Chicago, IL

Background: Accidental Extubations (AE) are events which have the potential to lead to more serious consequences. Documenting the causes of AE's can lend insight into why they are occurring. The PICU Quality Assurance (QA) committee has been tracking AE's and their causes since 2000. The QA committee decides when interventions are necessary to help prevent AE's. Members of the QA committee include physicians, nurses, respiratory therapists, pharmacists and members of other disciplines. Method: A monitoring tool was developed in 2000 to assess the causes for AE's. This tool is filled out by the PICU respiratory specialist and includes a chart check, review of CXR's, and an interview of the bedside RN and RT. The results are presented quarterly at multidisciplinary QA meetings by the respiratory specialist. Trends are watched for, problems are identified and plans are developed to address the issues. Problems which accounted for 76% of the reasons for AE's included undersedation, bed space issues, security of ETT's and positioning of the ETT in the airway. Actions taken to address these issues included 1. Revision of sedation policies. 2. Inservicing RN's on sedation policies and the difference between sedation and pain medications. 3. Development of a competency to review taping of ETT's for the RT staff. 4. Training for Residents and Fellows to emphasize the need to review CXR's for proper ETT placement. 5. Informing PICU managers to assign bed spaces so that RN's could view patients at all times. Some interventions were initiated in 2000 and some in 2004 and 2006 after significant increases in AE's were observed. Results: The data for 2001-2010 was 36,729 ventilator days, 170 AE's, and .46 AE's per 100 ventilator days. The highest number of AE's was 23 in 2004, and the highest rate was .85 per 100 ventilator days in 2006. The AE rate per 100 ventilator days has steadily declined over the last 3 years. Starting in 2008, the rates have been .41, .39, and .21. Conclusions: Using a multidisciplinary approach has facilitated the AE rate to slowly decline over the past three years and helped the PICU keep the AE rate at an acceptable level. Having other disciplines involved in this process makes it easier to brainstorm, and come up with and carry out action plans to reduce the number of AE's and their potential complications.

Sponsored Research - None

1120423

EVALUATION OF NUMBER OF TIMES VENTILATOR CIRCUIT IS BROKEN COMPARING TWO TYPES OF ETCO2 DEVICES.

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Background: ETCO2 is used as a standard of practice for mechanically ventilated patients in our 35 bed Pediatric Intensive Care Unit,(PICU). Our standard device has been the GE capnostat mainstream monitor. New microstream technology has introduced the new microbeam IR sensor into sidestream monitoring capabilities. This new technology is theorized to help isolate the ETCO2 waveform and increase accuracy in small pediatric patients compared to previous mainstream technology. One of the components of our VAP bundle is to decrease the incidence of breaking the ventilator circuit. With use of mainstream end tidal monitors, the ventilator circuit requires Respiratory Therapists to frequently break the circuit to recalibrate and/or dry the adapter. We tested the null hypothesis that there would be no difference in the number of times we were required to break the ventilator circuit with mainstream ETCO2 technology compared to a new device with sidestream technology. Methods: As we introduced the GE capnoflex sidestream monitor into clinical practice, a data collection form was developed to collect the following data: type of adapter, number of times the circuit was broken, Inline treatments administered, and a comment section to document disconnect for bagging or patient transports. The form was filled out by the bedside Respiratory Therapist for each standard 12 hour shift. Statistical analysis was performed in SPSS version 18. A one sample t test was performed to compare mean differences in the number of times the ventilator circuit was broken with the GE mainstream adapter compared to the GE sidestream adapter. Results: N=82 total sample were collected with 44 in the sidestream group and 38 in the mainstream group. Mean number of times the ventilator circuit was broken was .5 (.59) times per 12 hour shift in the sidestream group compared to 1.29 (1.08) times per 12 hour shift in the mainstream group (p=<.001). The presence of inline treatments correlated with an increase in breaking the circuit in both groups. Conclusion:In our patient population,there was a statistically significant decrease in frequency of broken ventilator circuit for patients receiving the GE sidestream adapter compared to the mainstream adapter. The need for further research exists to evaluate the correlation in this decrease in breaking the ventilator circuit and a possible decrease in the incidence of Ventilator Associated Pneumonia.

Sponsored Research - None

Frequency of broken circuit and incidence of treatments

Adapter Type:	Number of times vent circuit was broken per 12 hour shift	Presence of treatment
Mainstream (N= 38)	1.29 (1.08)	11 (29% of N)
Sidestream (N= 44)	0.5 (.59)	9 (20% of N)

1100384

SHIFTING ATELECTASIS: A SIGN OF FOREIGN BODY ASPIRATION (FBA) IN A CHILD.

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Introduction: Foreign body aspiration (FBA) is a serious, often life-threatening condition. In infants and children there are several conditions that could mimic an aspirated foreign body such as asthma, croup, pneumonia, and bronchiolitis. Case Summary: An eighteen month old was admitted to PICU intubated, after presenting in the emergency department with a productive cough, tachypnea, tachycardia, and perioral cyanosis. The patient presented during peak RSV season. A rapid RSV screen was performed and reported as negative. Arterial blood gas prior to intubation revealed PH-6.96, PCO2- 101, PO2- 272, and HCO3- 22.4. Parents report the cough began a few weeks ago and recently became productive. This progressed to frequent "coughing spells" and respiratory distress. There is no history of asthma. Initial chest X-ray revealed complete opacification of the right hemithorax with medistinal shift. Persistent wheezing was noted with diminished breath sounds on the right. Continuous albuterol, chest physiotherapy, lung recruitment, and positioning were initiated. Day 4, overall improvement of the right lung atelectasis had occurred. Ventilator settings, albuterol, and chest physiotherapy were weaned. On Day 6, frequent desaturations, into the 50's, occurred. Increases in FIO2, PEEP, and manual bagging failed to improve saturations. Breath sounds indicated wheezes on the right with diminished lung sounds on the left. Chest x-ray revealed near-complete opacification and extensive atelectasis of the left lung with medinastinal shift. Immediate fiberoptic bronchoscopy was performed at bedside revealing a foreign body. The patient was emergently transferred to the OR for foreign body extraction. A pinto bean was removed from the patient's left mainstem bronchus. Postoperative breath sounds were equal. Chest x-ray showed marked improvement of the left lung with minimal right atelectasis. Extubation occurred on Day 8 with subsequent dismissal on Day 11. Discussion: Our patient had persistent symptoms and signs compatible with respiratory tract infection and asthma but was not responsive to medical treatment. Therefore, further workup is warranted which included the bronchoscopy to evaluate the cause of respiratory symptoms. FBA should be considered when a patient exhibits unexplained symptoms consistent with airway obstruction, shifting atelectasis, and refractory medical treatment.

Sponsored Research - None

1148228

COMPARISON OF RELATIVE HUMIDITY AND TEMPERATURE WITH TWO TYPES OF HUMIDIFICATION DEVICES.

Cynthia C. White, James Johnson, Thomas J. Cahill; Respiratory Care Division, Cincinnati Children's Hospital Medical Center, Cincinnati OH, OH

Adequate humidification plays a large role in managing pediatric patients with artificial airways. Current humidification practice for most pediatric patients receiving mechanical ventilation is active heated humidification. The Medisize Gold Booster humidification system combines an HME option with a Teflon heater unit that also provides active humidification as opposed to a standard humidifier. We tested the hypothesis that there was no difference in delivered relative humidity with the Booster HME system (Medisize, Finland) in comparison to the Fisher Paykel 850(F&P) heater set in invasive mode utilizing a heated wire Evaqua circuit(Cardinal Healthcare)in a pediatric lung model. Methods: A Servo i (Maquet, Sweden) ventilator was calibrated according to manufacturer's recommendations and set up with a pediatric/adult Evaqua circuit. A TTL Lung model 5601i (Michigan Instruments, Grand Rapids, MI) was set with a lift bar, and driven by a second Servo i ventilator to achieve a tidal volume of 100mL and 200mL respectively and a RR of 30 BPM. A thermohygrometer was placed at patient wye to measure RH and Temperature with both the Medisize System and Fisher and Paykel system at both tidal volume settings. Results: RH measured with both humidification devices and at both tidal volume settings was 99.9%. Temperature at the wye with the Medisize system was 24.8 degrees C. Temperature measured with the F&P system measured 29.8 degrees C. The Medisize system took a slightly longer period of time to reach full RH than the F&P system set up with the Evaqua circuit. Conclusion: Both the F& P 850 Heater with Evaqua circuit and Medisize HME booster system were able to provide 100% RH in our simulated pediatric lung model. More clinical testing is required to assess deadspace, patient tolerance, and condensate produced by the Medisize device. A future battery pack for the Medisize device may prove useful for providing active humidification to ventilated patients during patient transport and time off unit.

Sponsored Research - None

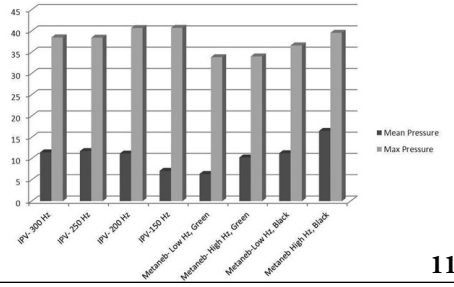
1104338

COMPARISON OF TWO HIGH FREQUENCY DEVICES FOR AIRWAY CLEARANCE IN A SIMULATED PEDIATRIC LUNG MODEL.

Cynthia C. White, James Johnson; Respiratory Care Division, Cincinnati Children's Hospital Medical Center, Cincinnati, OH

Background: Two devices are available that enable clinicians to utilize an intrapulmonary Continuous High Frequency Oscillatory (CHFO) modality for airway clearance and lung recruitment. The IPV® (Percussionaire) uses a sliding phasitron to create the percussive flow waveform. The Metaneb® (Hillrom) functions with a fixed orifice adjustable venturi. No published data is currently available that compares the two devices. We tested the hypothesis that there is no difference in mean pressure or flow delivery comparing similar frequencies with the Metaneb to the IPV in a simulated pediatric lung model. Methods: A dual chamber TTL Lung model 5601i (Michigan Instruments, Grand Rapids, MI) was used with a lift bar to simulate a pediatric spontaneously breathing lung model. A pneumotachometer (AD instruments) was calibrated and was placed at the proximal airway. Two minutes of continuous data was recorded to a laptop computer for each testing variable. The IPV was tested at 4 frequencies ranging from 150 to 300 Hz. The Metaneb was tested with both the black and green rings at two positions, (high and low) ranging from 180-220 Hz. Statistical Analysis was performed in SigmaPlot version 11.0. One way ANOVA was used to compare mean outcome variables with Holm Sidak for post hoc analysis. Significance was set at $p = <.05$. Results: There was no difference in mean pressure with the IPV, Hz 250 compared to high Hz with Metaneb, green ring, or compared to the low Hz, black ring. With the Metaneb, black ring at the high Hz, MAP was higher in all testing conditions. (p=<.001). There was also no difference between IPV, Hz 150 and Metaneb, green ring, low Hz. There was a significant difference in mean flow at most frequencies with both devices.(p= <.01). There was no difference in mean flow between IPV, 250 Hz and low Hz Metaneb black ring, or the Metaneb green and black ring at low Hz. Max flow ranged from 1.5LPS -2.2LPS with IPV and 1.71-2.35LPS with Metaneb. Conclusion: Mean pressure and flow varied at each testing frequency, but were acceptable at comparable frequencies with both the IPV and Metaneb. Max pressure was slightly higher with IPV than Metaneb using the green ring. Using the black ring appears to achieve a higher MAP. Further testing needs to be conducted to compare pressure with additional flow to set a CPEP with the metaneb compared to an external PEEP valve with IPV. The Metaneb should also be tested with mechanical ventilation.

Sponsored Research - None



1134229

EXTRACORPOREAL MEMBRANE OXYGENATION AS A MECHANISM FOR REHABILITATION WHILE AWAITING LUNG TRANSPLANTATION: PROGRAM DEVELOPMENT.

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Objectives: Lung transplantation is an important therapeutic option for a number of illnesses, but outcomes in the setting of critical illness have been poor. In the most severely ill patients, Extracorporeal Membrane Oxygenation (ECMO) may be required for pre-transplant support, and in this context, both morbidity and mortality are high. Pre-transplant myopathy and deconditioning contribute to prolonged hospitalization and poor outcomes with critically ill patients. We describe the integration of a rehabilitation program including ambulation for three critically ill ECMO patients being bridged to lung transplantation. Methods: A multidisciplinary team including personnel from the pediatric critical care, respiratory care, and lung transplant services developed a program to rehabilitate lung transplant patients while on ECMO. Results: Three patients (16, 20, and 24 years of age) with end-stage cystic fibrosis, admitted to the Pediatric ICU for respiratory failure, were rehabilitated on ECMO while awaiting lung transplantation. Each underwent internal jugular vein cannulation with a double lumen cannula for venovenous ECMO followed by tracheostomy. Pre-transplant, each patient was treated with an aggressive pulmonary toilet regimen including intrapulmonary percussive ventilation and mucolytics to optimize secretion clearance and allow for weaning of mechanical ventilation. In addition, these patients underwent a rigorous physical therapy regimen that included passive exercise, sitting, standing, and ambulating with assistance. Ambulation on ECMO involved a coordinated effort among respiratory therapists, ECMO specialists, physicians, physical therapists, perfusionists, and nurses, to assure patient safety. All patients were successfully transplanted and weaned to room air tracheostomy collar within 24 hours. Conclusions: Rehabilitation and ambulation can be safely implemented during ECMO. Therapy and rehabilitation may lead to improved outcomes, shorter duration of mechanical ventilation, ICU stay, and hospital stay following lung transplantation. Programs of this nature may lead to changes in the management of patients awaiting lung transplantation. It is possible that increased utilization of ECMO prior to transplant may improve the potential for reconditioning, improving patient outcomes and post transplant length of stay. Additionally, these findings may have potential implications for all patients treated with ECMO.

Sponsored Research - None

1134299

A STANDARD NEONATAL SELF-INFLATING RESUSCITATION BAG WITHOUT A RESERVOIR DELIVERS OXYGEN CONCENTRATION OF MORE THAN 60%.

Eribaweimon Shilla, Dr Leslie E. Simon Lewis; Respiratory Therapy, Manipal College of Allied Health Sciences, Manipal, Karnataka, India

ABSTRACT OBJECTIVE: To evaluate the fraction of delivered oxygen (FDO2) concentration using a standard self-inflating bag (VBM of 250 ml capacity) with a pressure gauge manometer without a reservoir at different oxygen flow rates. To compare the FDO2 at different peak inspiratory pressure (PIP) of 20 cm H2O and 30 cm H 2O. METHODS: The test is done on a neonatal test lung and the average of best two readings was taken. The required equipment to start are Drager Baby Log 8000 plus flow sensor calibrated, 'Y' adaptor with two neonatal test lungs, VBM self-inflating bag with a pressure gauge without a reservoir, flowmeter with an oxygen tubing (112 cm) to set flow rate of oxygen and an oxygen analyzer along with a time recorder to measure the percentage of FDO2 at different timing. The FDO2 was recorded at 1 minute up to 5 minutes by setting a timer. The FDO2 was recorded at each flow rate at two different PIPs. The respiratory rate was fixed at around 40 breaths per minute and the tidal volume range at each PIP was also recorded. RESULT: The mean FDO2 concentration was slightly lower in the first one minute and gradually increased. The FDO2 ranges from 50% to 85% at different flow rates. The FDO2 measured in the entire test from 1L/m to 10 L/m flow rate showed a mean ±SD of 71.85% ± 11.49 with PIP of 20 cmH2O, mean± SD of 64.60%± 11.58 with PIP of 30 cmH2O. The FDO2 between two PIPs showed a mean ±SD of 68.22% ± 5.12. The average mean tidal volume at different PIP was 27ml and 36ml approximately. CONCLUSION: Oxygen delivery was consistently more than 60% with standard neonatal resuscitation bag without reservoir with oxygen flow rate above 2l/min. The FDO2 in this test differed from the information contained in the Standard Guidelines of Neonatal Resuscitation regarding self-inflating bag without a reservoir. The drop of FDO2 with a PIP of 30 cm H2O is due to more entrainment of air into the self-inflating bag which blends and hence decreases the oxygen concentration. Preterm /Asphyxiated neonates requires restriction of oxygen flow rate of less than 2l/min when used for resuscitation without reservoir in absence of standard blenders to deliver oxygen below 60%.

Sponsored Research - None

FDO2% increses with change in flow rate at different PIP

PIP=20cmH2O			PIP=30cmH2O
Flowrate L/min	Mean FDO2%	Flowrate L/min	Mean FDO2%
1	55.04	1	47.53
2	64.46	2	51.37
4	64.18	4	61.03
5	75.38	5	69.46
6	81.26	6	73.08
8	83.82	8	75.13
10	78.82	10	74.62

1145613

THE BRONCHOTRON VENTILATOR: HOW OSCILLATORY CPAP, PULSE FREQUENCY, AND PULSATILE FLOW RATE INFLUENCE THE VENTILATORY DYNAMIC.

Mitchell Goldstein, Michael Terry, Victor Bannis, T. Allen Merritt, Carter Tong, Elba Fayard, Ricardo Peverini; Neonatology, Loma Linda University Children's Hospital, Loma Linda, CA

Background: The Bronchotron is a high frequency ventilator that uses a flow based activation to provide high frequency pulsations to the airway. Pulse Frequency, Oscillatory CPAP, and Pulsatile Flowrate settings can be adjusted using an analog dial for various pediatric critical care and neonatal applications; however, there is little information as to how these interact with each other and what relationship exists with respect to the different settings. Objective: We asked if flow and pressure characteristics were predictable accross pediatric and neonatal critical care applications. Design/Methods: A Sinusoidal Bronchotron (Percussionaire, Sandy Point, ID) was connected in line with a Fleisch Pneumotachogram interfaced with a Validyne (Northridge, CA) flow sensor. Easy Sense for the IBM PC was used to sample flow and pressure data at 100 ms intervals. Pulse Frequency, Oscillatory CPAP, and Pulsatile Flowrate were varied incrementally from 0-11 (on the dial) while flow and pressure data were sampled. Data were analyzed for maximum pressure and flows and fitted to a categorical ternary representation using Statistica 9.0 (StatSoft, Tulsa, OK). Results: Results are detailed in the categorical graphs enclosed for different levels of Oscillatory CPAP. Conclusions: Predictable flow and pressure patterns result from changes in the operating parameters of the Bronchotron. These may be useful in defining a working range from the analog settings.

Sponsored Research - None

1149711

USE OF A PROCEDURAL CHECKLIST DRAMATICALLY IMPROVES TRACHEOSTOMY TUBE SAFETY IN CHILDREN.

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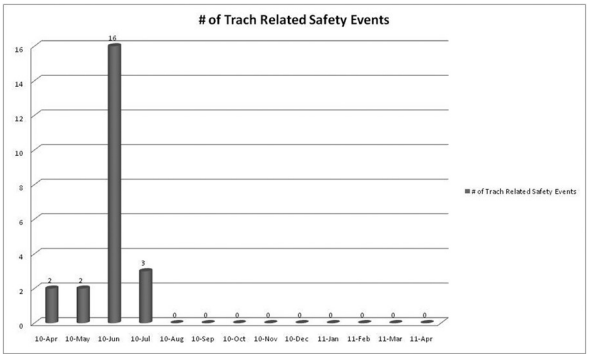
Background: Our department provides approximately 992 new and replacement tracheostomy tubes for infants and children annually. Variation in tube brand, size, length, flange type, absence or presence of cuff, type of cuff and custom template use increases the variables that may introduce risk of error and injury. Electronic error reporting validated our concerns. We determined to improve safety and eliminate preventable harm for our tracheostomy patients. Method: Our multidisciplinary Airway Advisory Committee developed a safety checklist, "time out," to be followed prior to all routine tracheostomy tube changes in the Newborn Infant Intensive Care and Progressive Care Units, the areas with the highest use of tracheostomy tubes. Using the checklist, appropriate tracheostomy parameters, as well as team roles and elements of Universal Protocol are reviewed, then documented on the checklist. After piloting, an iterative checklist was created which modeled the surgical safety checklist used for procedural time outs. Headings for pre-procedure, prior to procedure start, and after procedure complete were used to imitate format. RTs and RNs were trained during a skills fair and return demonstrated understanding and competent use of the checklist was validated. Results: Tracheostomy tube placement and change errors were significantly reduced. In our NIICU, we recorded 16 errors and reduced safety process defects to our current tracking which shows 339 days since our last tracheostomy tube related error. Conclusions: Tracheostomy related safety events benefit from tracking to identify risk and current safety practice. Established safety initiatives, such as a time out checklist as was used in our case, can be applied to improve safety or eliminate risk for never events in respiratory care practices despite the lack of published outcomes for specific, RT-sensitive safety indicators.

Sponsored Research - None



1149666

NASAL RESPIRATORY SUPPORT (NARES) VIA THE NARES USING NEOTECH RAM NASAL CANNULA IN NEWBORN INFANTS WITH RESPIRATORY DISTRESS: NASAL CONTINUOUS POSITIVE AIRWAY PRESSURE [NCPAP] OR NASAL CANNULA-INTERMITTENT MANDATORY VENTILATION [NC-IMV] FROM DELIVERY ROOM TO DISCHARGE.

Richard Hernandez[1], Rangasamy Ramanathan[2]; [1]Newborn Respiratory Care, LAC+USC HealthCare Network, Los Angeles, CA; [2]Division of Neonatal Medicine, LAC+USC Medical Center, Los Angeles, CA

Background: NARES (NCPAP or NC-IMV) is increasingly used in newborn infants either as a primary mode or following extubation from mechanical ventilation via the endotracheal tube to minimize lung injury as well as ventilator associated pneumonia (VAP). Nasal interfaces currently used are cumbersome to set up, difficult to provide Kangaroo care, and is associated with a significant risk for short- and long-term nasal injury/deformities. We report our experience using Neotech RAM Nasal Cannula in the delivery room and in the newborn intensive care unit to deliver NARES as well as Nasal High Frequency Oscillatory Ventilation (NHFOV). Methods: We used conventional ventilators (Avea, Servoi, Bear Cub) and Sensormedics HFOV to provide NARES. Ventilator specific guidelines were developed and used during NARES. We used 3 different sizes of NC (2.0 mm. 2.5 mm, and 3.0 mm ID) for this study. Patients received feedings via orogastric tube per NICU protocol. Results: Twenty two preterm and term newborns (Birth weight 635-4100 g, Gestational age 26-41 weeks, postnatal age 1-124 days) were managed on NARES using the Neotech RAM NC. Mean airway pressure prior to initiating NARES ranged from 7-13 cm H_2O. Blood gases before and after initiation of NARES was similar, with no deterioration in oxygenation or ventilation. Number of desaturation episodes was similar or decreased following NARES. One patient with bronchopulmonary dysplasia (BPD) was successfully managed on NHFOV and subsequently weaned off to low flow NC. No case of VAP or nasal injury was reported in our experience. No cases of feeding problems were reported during NARES. Conclusions: NARES using Neotech RAM NC can be used safely and effectively either as a primary mode for neonatal resuscitation in the delivery room or following a period of mechanical ventilation via the endotracheal tube. Additional studies to evaluate the usefulness of NARES using Neotech RAM NC in the delivery room as well as its impact on BPD are needed and are underway.

Sponsored Research - None

1136385

VARIABILITY OF FRACTIONAL INSPIRED OXYGEN DURING SIMULATED PEDIATRIC NON-INVASIVE VENTILATION.

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BACKGROUND: Non-invasive ventilation (NIV) is commonly used to treat respiratory insufficiency in pediatric patients. The purpose of this study was to determine the variability of fractional inspired oxygen concentration (FiO2) during simulated NIV use. METHODS: A bench model was constructed to test the performance of the V60 ventilator (Philips Respironics, Andover, MA). The single limb V60 ventilator circuit was connected to a pediatric test lung. FiO2 measurements were made with the GE Datex Ohmeda Compact Monitor with E-COVX gas module (GE Healthcare, Madison, WI) connected in-line between the ventilator circuit and test lung. FiO2 was recorded during biphasic positive airway pressure (BiPAP) ventilation. The inspiratory pressure was varied in order to ascertain the effect of inspiratory flow rate on FiO2 variability. All data was recorded using S5 Collect 4 and converted to MS Excel for analysis. The mean, standard deviation and range was calculated for each set FiO2. RESULTS: Please see table. All results are expressed as FiO2 percentage. CONCLUSIONS: Changes in inspiratory flow rates did not significantly affect the FiO2 variability. The greatest variation in oxygen delivery was found at 50%. Stable FiO2 delivery was apparent at all other levels tested. Because these data were not collected during clinical use of the device, our study is somewhat limited. Carbon dioxide rebreathing could be present during clinical application of non-invasive ventilation and would cause fluctuations in FiO2 regardless of ventilator performance. Further study investigating this phenomenon during pediatric NIV use may be necessary. FiO2 variation data during NIV may help future researchers develop means of accurate inspired and expired gas analysis. Applications could include oxygen cost of breath and indirect calorimetry.

Sponsored Research - None

Set FiO2 (%)	Measured FiO_2 (%mean±SD)	Max FiO2 (%)	Min FiO2 (%)	Max-Min (%)
21	20.92±0.04	-	-	0.13
40	40.61±0.15	0.16	0.99	0.62
50	52.68±0.99	1.5	2.36	3.24
60	59.74±0.11	1.84	1.42	0.36
80	78.69±0.22	0.97	1.42	0.72
100	97.33±0.09	2.14	0.48	0.73

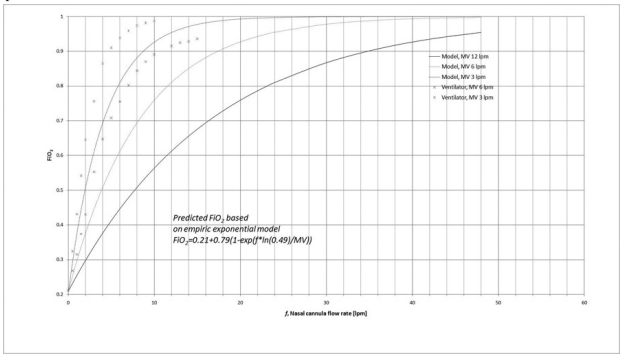
1149918

HIGH FLOW NASAL CANNULA: WHEN DOES HIGH FLOW MASK HYPOVENTILATION?

Rita T. Giordano[2], Lisa Tyler[2], Daniela H. Davis[1], Richard J. Lin[1,2]; [1]Anesthesiology and Critical Care Medicine, The Children's Hospital of Philadelphia, Philadelphia, PA; [2]Respiratory Care, The Children's Hospital of Philadelphia, Philadelphia, PA

Background: High flow nasal cannula (HFNC) has become popular as a mode of support which can be better tolerated than a mask interface but may still offer benefits of non-invasive support such as overcoming inspiratory resistance and providing end expiratory pressure. The application of HFNC is appealing for small children and infants where achieving an adequate mask fit that is well tolerated may be challenging. It is important to understand the effective FiO2 provided by different flow rates of nasal cannula oxygen so that safe parameters can be established for use of HFNC which minimize the risk of masking hypoventilation. However, there is a lack of data available in the literature. Methods: We developed an empiric equation between FiO2 and nasal cannula flow rate which would 1)account for the commonly used rule of thumb for nasal cannulas in adults (0.04 increase for each lpm), 2)be asymptotic to an FiO2 of 1.0 with increasing flow, and 3)have a scale factor for minute ventilation, since the effective FiO2 is less than the FiO2 of the nasal cannula gas due to entrainment of air to meet minute ventilation demands. Results: The expression FiO2=0.21+0.79(1-exp(f*ln(0.49)/MV)) has the specified features, where f is the nasal cannula flow rate, and MV is the minute ventilation. The predicted values for MV of 3 lpm are comparable to those measured in infants by Kuluz (Resp Care 46(9), 897-901 (2001)). This expression is graphed below for MV of 3, 6, and 12 lpm. For comparison, measured FiO2 for an LTV 1200 with minute ventilations of 3 and 6 lpm is also shown. Conclusions: We have been able to develop an expression which provides estimates of FiO2 as a function of nasal cannula flow that are consistent with a commonly used empiric rule for adults and with available neonatal data. This can be the basis of guidelines for use of HFNC which minimizes risk of masking hypoventilation.

Sponsored Research - None



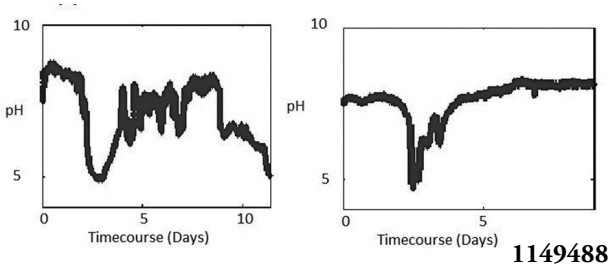
1150559

NON-INVASIVELY MEASURED EXHALED BREATH CONDENSATE PH CAN DETECT PULMONARY DECOMPENSATION IN MECHANICALLY VENTILATED PRETERM NEONATES.

Alix Paget-Brown[2], Scott T. Dwyer[1], John F. Hunt[1], Michael D. Davis[1,2]; [1]Division of Pediatric Respiratory Medicine, University of Virginia, Charlottesville, VA; [2]Division of Neonatology, University of Virginia, Charlottesville, VA

Introduction: Unless there is a witnessed event, with formula or blood suctioned from the endotracheal tube, determining airway health in mechanically ventilated preterm neonates is challenging. At best, infants with gestations <27 weeks continue a pattern of shifting atelectasis which can be difficult to ascertain vs. VAP, hemorrhagic pulmonary edema, aspiration pneumonitis etc. The need for non-invasive monitoring of airway markers of inflammation is great. Case Summary: We connected an Airway Lining Fluid Analyzer (ALFA) (Respiratory Research, Inc., Austin TX) to the exhaust port of a Sensormedic high frequency oscillator (HFOV was the mode during the event for both infants). We have previously shown that continuous monitoring of EBC pH is possible in intubated preterm infants on both conventional and high frequency ventilation. Here we present two such infants: one of which had a witnessed formula-aspiration event with emesis and suctioning of formula from the endotracheal tube; the other infant presented with pulmonary hemorrhage. Both infants showed a previously steady baseline followed by rapid drop in EBC pH at the time of the event with slow recovery over 2 days to previous baseline. Discussion: We propose that continuous monitoring of EBC pH may be a useful tool in determining airway health in preterm mechanically ventilated neonates. VAP is incredibly difficult to diagnose in preterm infants, who can remain intubated for prolonged periods of time. Clinically silent aspiration events may also be occurring with only the need for increased ventilator settings as an outward sign. The ability to use a non-invasive tool in continuous fashion to monitor a marker of inflammation in this population may be able to direct further diagnostic workup and cultures, as opposed to continued shifting atelectasis which would contribute to an infant's otherwise stable baseline readings.

Sponsored Research - This study was funded by a grant from the NIH.



1149488

WATER ACCUMULATION IN THE CIRCUIT DURING HEATED HUMIDIFIED NASAL CANNULA (HHNC) THERAPY USING TWO DIFFERENT HUMIDIFICATION SYSTEMS.

Rob Diblasi, David Crotwell, John W. Salyer; Respiratory Therapy, Seattle Children's Hospital and Research Institute, Seattle, WA

BACKGROUND: We recently began to migrate our HHNC delivery systems from Fisher-Paykel MR 730 humidification systems to MR 850 system. We received some sporadic and uncorroborated anecdotal reports that there was more "rain-out" with the MR 850 system. Thus we sought to compare the amount of water accumulation in HHNC circuits during simulated operation with both humidifier configurations. METHODS: We tested three each HHNC systems using both MR 730 & MR 850's. Both types of humidifier systems were operated simultaneously using Fisher-Paykel circuits. Room temperature was controlled at 65 degrees F. Proximal temperature was set at 37 degrees C and chamber to proximal gradient was set at - 3 (for the MR 730). The flow rates were set at 3 L/min and FIO2 of 30%. Each circuit was weighed dry prior to set up. Following a warm-up period of 20 minutes, each of the systems was run for 4 hours with an oscillating fan blowing continuously on the humidifiers and circuits to simulate difficult environmental conditions for the humidifiers. Following the 4-hour testing period, circuits were re-weighed. Volume of water accumulated was assessed by assuming that any difference in dry and wet weights was due to accumulation of fluid using the density of water (1 g = 1 mL). Mean (SD) values for accumulated water volume were calculated for each type of humidifier and tested for statistical significance ($P < 0.05$) using Students T-test. Results: Mean (SD) mL of water accumulated was: MR 730 = 11.2 (2.65) mL, MR 850 = 7.4 (6.0) mL. P = 0.14. Conclusions: We conclude that water accumulation was not statistically different between the two humidified nasal cannula systems. This finding highlights the difficulty with assessing the validity of anecdotal reports of equipment malfunction and demonstrates the need for product performance testing.

Sponsored Research - None

1155288

A LOOK AT DELIVERED NITRIC OXIDE WITH A HEATED HUMIDIFIED NASAL CANNULA.

Jeffrey W. Wright, Stephen Burton, Kevin Crezee; Respiratory Care, Primary Childrens Medical Center, Salt Lake City, UT

This study is to determine liter flows needed to attain the prescribed NitricOxide (NO) parts per million (ppm) to the lower airway using a Heated Humidified Nasal Cannula (HHNC). Study variables: Multiple inspiratory times (Ti), Tidal Volumes (Vt), Respiratory Rates (RR), and liter per minute (lpm) flows. Lung model: The lung model was a lexan plastic box with a silastic test lung placed inside the box to simulate thoracic motion. The the box volume was 165cc with multiple ports for gas sampling/return, and for mounting the model's nose. The nose consisted various adaptors and tygon tubing. To turn the model into a breathing device it was attached to a Drager Evita XL in Airway Pressure Release Ventilation (APRV) mode. In APRV, the pressure release time became the Ti, and the P high was the expiratory phase in our lung model. The communication tube between the Drager and lung had a screw clamp to regulate flows. The Study: A Fisher Paykel (FP) humidifier, FP HHNC, and INO Max DS were used in this study. The circuit was assembled and warmed to 37 C. The INO Max DS calibrated, and then set at a delivered dose of 20 ppm and analyzed. The sample line was attached to the lung model. The HHNC was placed on the lung model nose, 2 to 3 minutes would pass to allow lung gasses to reached a steady state before recording data. Parameter changes started with HHNC flows being increased in increments of 1 lpm starting at 2 lpm and ending at 6 lpm. After all lpm changes were complete, the flow would be decreased back to 2 lpm and the RR would be increased by about 10. The flow rates were again increased as described. Once the RR was 60 and HHNC was at 6 lpm, the Ti would be increased, RR decreased back to 30, HHNC flow rate back to 2 lpm. The process would start over.(see tables 1, 2, and 3) When Ti or Vt were changed the screw clamp was adjusted to ensure flow throughout the Ti. Results: It was found that RR made little change in the delivered NO. The lower flow rates showed the biggest decrease in the delivered NO ppm. Ti, Vt, and HHNC flows were the factors that made the greatest effect. A Vt of 15cc with 2 lpm showed a 25% reductions in the analyzed NO within the lung model. As the Vt decreased, so did the difference between set NO and delivered NO. Conclusion: Where Ti and Vt are variables that can't be controlled higher flow rates with the HHNC are going to be needed to deliver the prescribed dose of NO to a patient's lower airways.

Sponsored Research - None

1125086

NON-INVASIVE REHABILITATION PROGRAM IN CYSTIC FIBROSIS PATIENTS WITH URINARY INCONTINENCE.

Monica Donà[1], Giulia Mamprin[1], Milena Bosco[2], Anna Soncin[2], Liviana Da Dalt[3], Mirco Ros[1]; [1]Cystic Fibrosis Centre, Treviso, Italy; [2]Department of Physical Therapy, Treviso, Italy; [3]Pediatric, Treviso, Italy

INTRODUCTION: Stress urinary incontinence (SUI) is recognised as a frequent problem in CF due to repeated coughing and other factors causing increased pressure of pelvic floor (PF). AIM: To evaluate an educational-rehabilitation method to value the SUI in CF used in young patients (pts). PATIENTS AND METHODS: all CF women outpatients aged ≥ 10 yrs (42 patients, mean age 23,5 years, mean FEV1 78%). SUI's mechanisms were explained by using a comic and a questionnaire was used to identify and quantify the urinary leakage and discomfort. Twenty-six pts had SUI: 8 of them had a significant leakage and underwent a Pelvic floor muscle (PFM) exercises program. 18 pts with mild leakage were included in the study and they underwent an assessment of PFM strength and endurance. This evaluation was performed placing hands on the external region of PF and measuring the number and duration of contractions at the beginning of treatment (T0), 6 weeks (T1) and one month (T2) after treatment. Pts were divided in 2 groups with no statistically significant differences in clinical parameters and muscle's performance: 9 pts, treatment group (TG) followed a non-invasive rehabilitation program (1 session/week for 6 week) and 9 pts was included in control group (CG). RESULTS: Increased strength (3 vs 25 n of contractions, $p < 0.001$) and endurance (6 vs 28 sec duration of contraction, $p < 0.001$), reduced discomfort measured with VAS scale (31 vs 6, $p < 0.001$) and TG pts were found with no leakage at T1 and T2. The symptoms were unchanged in the CG at the same time intervals. CONCLUSIONS: This program improved muscles performance and reduced discomfort in CF young women. Specific assessment of SUI should be part of the routine care of CF pts. Long-term outcomes needs further studies.

Sponsored Research - None

1148225

NON-INVASIVE VENTILATION IN CYSTIC FIBROSIS: THE ITALIAN RESPIRATORY PHYSIOTHERAPISTS' POINT OF VIEW.

Sergio Zuffo, Simone Gambazza, Alessandro Capra; Rehabilitation Unit, Azienda Ospedaliero Universitaria A. Meyer, Firenze, Italy

BACKGROUND A physiological rationale has been demonstrated for the use of non-invasive ventilation (NIV) in patients with cystic fibrosis (CF) however, NIV is not part of the routine management of severe lung disease in CF. Possible explanations include the lack of clearly validated criteria to propose NIV, controversies with regard to ventilatory modes and settings, skepticism with regard to long-term efficacy, poor acceptance by patients and health workers poorly trained. Instead respiratory physiotherapists (RP) are often involved in the NIV management with different skills and tasks. AIM To survey and evaluate the role and competences of italian respiratory physiotherapists involved in the NIV management for CF and the rationale as perceived by them. METHODS A semi-structured online questionnaire consisting of 31 closed and 9 open ended questions was sent the Italian Group of Physiotherapists belonging to the Italian Society for the Study of Cystic Fibrosis, between March and April 2010. RESULTS Respondents (67%) represent 29 CF Centers (21 Centers and 8 Clinics) out of 35, which had a total of 4064 CF patients at the time of the study, 96 (2,4%) of whom were using NIV. NIV is a therapeutic choice used in 62% of those centers and RP (93%) are involved in its management. According to respondents, NIV is the first-line treatment to improve gas exchange (89%) and it is a valid tool as support to clearance techniques (68%) and exercise training (43%). Main criteria to propose NIV, according to RP, are hypercapnic pulmonary exacerbation (96%), lung transplantation waiting (96%), severe impairment of pulmonary function (89%) and difficulties experienced with clearing secretions (68%). Almost all interviewees do agree that NIV is part of the "core competence" for RP who work in CF Center (95%) and in CF Clinic (85%). A detailed picture revealed that 71% of RP choose ventilators, 96% is involved in the crucial choice of interfaces and 75% is in charge of ventilator settings. The majority of RP (93%) takes care of patients' comfort and compliance enhancement as well as periodic review of patients. CONCLUSIONS Although some limitations, this is the first italian study that explores how RP are involved in the NIV management in CF and their expectations about the benefits of NIV. CF centers and clinics take advantage of NIV and RP are involved in its management. Harmonizing the core competences of RP and the ventilatory care of CF patients is urgently needed.

Sponsored Research - None

1126266

HOW CREATING A COLLABORATIVE TREATMENT SCHEDULE FOR ADULT CYSTIC FIBROSIS PATIENTS CAN IMPROVE COMPLIANCE OF AIRWAY CLEARANCE THERAPY.

Tammy L. Kundinger, Anne L. Flaten; Respiratory Therapy, University of Wisconsin Hospital, Madison, WI

Background: University of Wisconsin Hospital is a center that specializes in the care of patients with Cystic Fibrosis(CF). Respiratory Therapists(RT) use a Respiratory Assess and Treat Protocol to determine the most appropriate care for the patient based on criteria defined by an assessment tool with algorithms. The Airway Clearance Algorithm includes guidelines specific to the care of a CF patient. A routine chart review revealed that these patients were not receiving all of the therapy as indicated per protocol due to patient unavailability, refusing therapy, and/or RT not documenting completely. With the support of the medical team, a treatment schedule was created for these patients to improve patient compliance to airway clearance therapy and the consistency of care. Method: Shortly after admission, RT met with the CF patient to develop a daily schedule that included airway clearance therapy four times per day. Thirty minute treatment times were available from 0730 through 1000 and then every four hours after the initial morning treatment. During the inpatient stay, if the patient was not compliant with the treatment schedule, the RT would notify the pulmonary nurse practitioner who in turn would follow up with the patient. This schedule was implemented with 23 adult CF patients that were admitted between 2/1/11-5/1/11. We reviewed the number of treatments that were scheduled to be provided and the number of treatments that were missed and compared it to the same data from prior admissions. Results: From 2/1/11-5/1/11, there were 1221 airway clearance treatments scheduled for 23 adult CF patients. Chart audits revealed that 84%(1028/1221) of the treatments were provided and 16%(193/1221) of the treatments were documented as refused by the patient. Prior admission data showed that there were 1213 airway clearance treatments scheduled for these same 23 patients. Chart audits revealed that only 71%(869/1213) of the treatments were provided and 28%(344/1213) were not given. The prior admission data did not include reasons why these treatments were missed. We suspect that this was due to the patient being unavailable, the patient refusing or incomplete documentation. Conclusion: A collaborative treatment schedule developed by the RT and patient and reinforced by the provider improves compliance of airway clearance therapy.

Sponsored Research - None

1141028

ASSESSMENT OF MALIGNANCY IN PATIENTS WITH IDIOPATHIC PULMONARY EMBOLUS: A PROTOCOL EVALUATION.

Robin Som; East Of England Deanery, London, United Kingdom

Background There are 65, 000 cases of pulmonary embolus (PE) in hospital per year in England and Wales. There is a significant association between idiopathic venous thrombosis and cancer and an increase in risk of diagnosis of cancer within a year of idiopathic venous thrombosis. The British Thoracic Society (BTS) guidelines suggests that all patients who do not have a major risk factor for PE should receive "a combination of careful clinical assessment, routine blood tests and chest radiography" and only when these indicate possibility of malignancy, should further imaging or invasive investigations for malignancy be considered. Our aim was to evaluate these guidelines in a large teaching hospital in England. Method A retrospective patient-chart review of all patients admitted with pulmonary embolus over 12 months was performed. A patient was excluded if they had a clear major risk factor for developing PE e.g. recent pelvic surgery, known malignancy etc. If a patient had no clear risk factor, the documentation during the admission was reviewed to see whether clinicians were complying with BTS guidelines and assessing for malignancy appropriately. A proforma was designed to check this, with 1 point being given for every aspect of history/investigation performed in regards to assessing for cancer e.g. 1 point awarded if the patient was asked about recent change in bowel habit; 1 point if the patient's serum calcium was checked. An overall score was given for each clinical assessment for malignancy for each patient (out of 14 for men; out of 15 for women). Results 202 patients with confirmed PE were admitted over 12 months. 39 patients were included in the study. In summary, compliance with BTS guidelines calling for thorough clinical assessment was poor in a number of parameters – patients were not asked if they were suffering from systemic symptoms of malignancy, or assessed for symptoms and signs of common malignancies associated with PE. Conversely, a number of patients were inappropriately referred for further investigation – particularly imaging - for possible malignancy without a documented history or examination pertaining to a specific malignancy. Conclusion Compliance with the guidelines from the BTS is poor. Adequate histories and examinations for malignancy are not being performed. This suggests that either the guidelines or the clinical practice needs re-evaluation.

Sponsored Research - None

1120970

WHO'S IN CHARGE?

Renee L. Uchtorff, Ronald E. Dechert, Kenneth Bandy; C.S. Mott Respiratory Care, University of Michigan Health System, Ann Arbor, MI

Background: Engagement of staff in department operations can be beneficial to the vitality of a Respiratory Care depertment. We implemented a program (charge therapist) in April 2010 that empowered staff in assignment and distribution of normal work shift activities. The Charge Therapist Pilot Program was implemented following development of roles, responsibilities and guidelines. One year after initiation of this pilot program, staff evaluations were distributed and collected from supervisors and staff. Method: Eligible staff with two years or greater experience were recruited for this program. The pilot initially started with 3 therapists and has progressed to a total of 13 therapists from both shifts. Staff surveys were distributed to elicit feedback regarding staff acceptance of this new activity. Results: Out of 38 surveys received, 67% feel that there has been a positive change in departmental direction with this program. Sixty percent feel more encouraged to participate in other department initiatives; 71% feel that Charge Therapists are well prepared to handle daily issues. Eighty-eight percent indicate that staff feel comfortable going to the Charge Therapist for daily issues. Our Charge Therapists feel more engaged since participating in this program and 58% are interested in pursuing supervision as a career choice. Supervisory responses were highly supportive of the Charge Therapist Program. Eighty-three percent feel the program has improved staff engagement and 86% feel it allows them a greater amount of time to focus on unit projects and needs. Conclusions: The Charge Therapist Program provides staff a mechanism for increased staff participation, development and engagement. In addition, it provides the opportunity for supervisory staff to utilize their time on alternative departmental needs and provides a more diverse support system for staff. The Charge Therapist Program also provides a framework for staff members who are considering supervision.

Sponsored Research - None

1126339

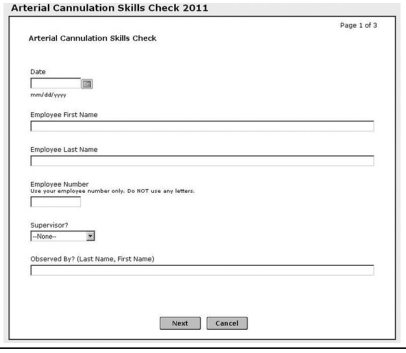
IMPROVED COMPLIANCE OF DEPARTMENTAL COMPETENCIES THROUGH INTERNET IMPLEMENTATION.

Rory A. Mullin; Respiratory Institute, Cleveland Clinic, Cleveland, OH

IMPROVED COMPLIANCE OF DEPARTMENTAL COMPETENCIES THROUGH INTERNET IMPLEMENTATION Rory Mullin, BS, RRT. Department of Respiratory Therapy, Respiratory Institute, Cleveland Clinic, Cleveland, OH BACKGROUND: In the past few years, our respiratory department has seen unprecedented growth in staff size and geographic coverage. A problem noted in previous years has been a method of ensuring staff compliance with annual competencies with paper forms. Traditionally, we had utilized a paper system, relying on the individual practitioner to provide proof of competency by printing forms, completing the competency, and returning the form to a supervisor. As the department grew, however, this process became unmanageable. The purpose of this project was to centralize all competency data while maintaining easy accessibility for management and staff. METHOD: This process involved inputting each competency form into an online survey system, SelectSurvey.NET (Atomic Design, LLC, Overland Park, KS). The staff was then required to click a link to the online form after completing a competency and complete the online form. The forms were collected on the online database. A monthly update into a spreadsheet allowed for completion assessment by management. RESULTS: On average, competency completion increased 14.56% over 1 year. Every competency saw an increase in completion between 2009 and 2010. CONCLUSIONS: Increased competency compliance was clearly a result of this online implementation. Staff no longer relied on out-dated paper forms or word of mouth to determine which competencies must be completed. Also, online forms could not be lost, a problem often seen with the previous system. Since the online forms presented a centralized and automated system, the burden of maintaining the paper system was taken off both the staff and management. A process is now in place to begin placing all departmental compliance forms online to remove the paper problem from the department.

Sponsored Research - None

Example of first page of a competency from online system.



1118795

UTILIZING WEB AND DATABASE TECHNOLOGY TO CREATE A CUSTOM ADAPTABLE, MULTI-SEARCH, REAL-TIME-EDITABLE, MULTIMEDIA-RICH PROCEDURES, POLICIES AND EQUIPMENT ONLINE TOOL FOR A RESPIRATORY CARE DEPARTMENT.

Steven M. Prince[1], James P. Jamieson[1], Richard F. Hinds[1], Donna M. Baxter[2]; [1]Respiratory Care, Mayo Clinic, Rochester, MN; [2]Anesthesiology, Mayo Clinic, Rochester, MN

BACKGROUND: A need existed to design, develop and deploy a faster and easy-to-use procedures, policies and equipment online tool, available 24 hours a day for clinical staff. Additionally, the need to incorporate robust functionality to manage real-time data changes and generate reports for management was desired. The subsequent solution transformed departmental information searching and retrieval, facilitated consistent, ongoing training and education of staff and simplified procedure/policy/equipment management with real-time editing and reporting capabilities to ensure quick, continuous quality improvement. METHOD: Requirements for the online tool were determined by meeting with department management and users. Ongoing reviews of the tool in the development phase allowed for modifications prior to live deployment. Server-side web programming (ColdFusion 7/9), client-side scripting and formatting (Javascript, HTML and Cascading Style Sheets) and database technology (SQL Server 2005) were used to design and develop the tool. Meta data collection was incorporated to allow for quick adaptability of the tool. Eight months of search data was reviewed. A survey was deployed to obtain user feedback. RESULTS: 1,217 procedures, policies and equipment web pages are managed by the tool, with end users submitting, on average, 775 open text searches per month, representing only a portion of total use of the tool (count does not include hyperlinked, index use) Average search time of just under half a second (.471 seconds) for open text searching for the top ten most-searched-for terms. A 26% (n=36) response rate was achieved for the survey. The following survey respondents agreed or strongly agreed that the online tool: Is easy to use (72%) Helps them do their job better (75%) Enhances their education of equipment (86%) Enhances their education of procedures (89%) Enhances their education of policies (78%) CONCLUSIONS: Utilizing web and database technology, a fast, easy-to-use, adaptable solution was created which transformed departmental procedure, policy and equipment information search and retrieval, enhanced education and enabled real-time editing and management of information. The tool is available on the Intranet to over 50,000 employees, 24 hours a day. Additional studies are necessary to further quantify endpoints such as staff satisfaction, information retention, increased compliance with procedures and policies and cost benefit analysis.

Sponsored Research - None

1149966

REFINING TOOLS AND PROCESSES TO HELP IMPROVE THE HIRING PROCESS.

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Objective: When a position becomes available at UCSD, as many as 300 applicants are received. This is due to six Respiratory Care programs within the region graduating over 150 students, a highly competitive local climate, and the economic conditions that traditionally increase public interest in careers within the health care field. The direct cost of hiring and orientating a new Respiratory Care Practitioner at UCSD is approximately $23,000. The expense of training and orientation, as well as the time and energy associated with the hiring/termination process, make it imperative that candidates with the highest potential to succeed are selected. We describe a process in place that has demonstrated success. Methods: In 2010, a team was formed to revisit processes and to develop a systematic approach that would provide reliable results and assure we selected the best candidates possible. Interview questions were redesigned to help identify characteristics that were best aligned with UCSD core values as well as questions that assess critical thinking skills. Pre screening interviews were incorporated to help identify issues that where problematic areas in the past. The hiring committee was expanded to twenty members inclusive of both staff and leadership. All committee members are given an opportunity to prescreen and select the best qualified candidates to be interviewed. Six to seven committee members participate on the interview panel and through discussion reach consensus on employee selection. Results: Since the revision of our hiring committee processes, we have been able to maintain a 90% employee retention rate with new hires which is up from 65% prior to its implementation. Our questionnaire and prescreening interview has proven to identify problematic areas before hiring the potential applicant. By identifying key questions that focused on UCSD core values and creating in depth questions that distinguished critical thinking skills, new candidates have transitioned with ease. Conclusions: The refined approach has helped to minimize the risk of making a poor decision and improved retention of new hires. We have a 100% satisfaction rate among members of our hiring committee regarding the changes that have taken place. We have also noted a general overall improvement in staff satisfaction due to the candidates that have been selected.

Sponsored Research - None

1132599

UNPLANNED EXTUBATION IN THE INTENSIVE CARE UNIT: ONE HOSPITAL'S ONGOING EXPERIENCE.

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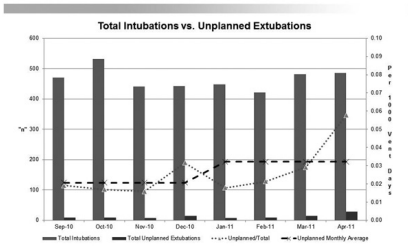
Background: Unplanned Extubation (UE) has been identified as a "threat to patient safety", with "risk factors and prevention strategies that have not been fully explored" (1). UE is routinely reported as part of each facility's adverse event reporting system and/or quality improvement program. One journal article placed UE as a focus for Morbidity/Mortality Conferences (MMC)(2). Memorial Hermann – Texas Medical Center (MH-TMC) routinely provides mechanical ventilation (MV) in 7 adult ICU's, comprising over 120 ICU beds. UE surveillance is part of the Respiratory Care Department's Quality Improvement Program. Method: Retrospective review of ongoing UE surveillance, maintained as part of the RC department's MV database. Literature and best practices are reviewed, with UE data for each month analyzed for developing patterns and/or causal relationships. Results: Eight months of data have been collected. UE has been reported as events per 1000 ventilator days, as well as by number of UE to total number of ventilator days by individual ICU (Table 1). There have been 98 UE events, with 3723 intubations during the same time period. The ratio of UE/Intubation is 0.026; the significance of this value has not yet been determined. Additional data including staffing rations, reintubation, sedation, time of day, and restraint use is collected and analyzed for significance. To date, less than 30% of the UE require reintubation. Restraints have been in place in over 80% of the UE events. No clear UE event pattern can be identified with staffing ratios. No correlation with degree of risk has been identified. Conclusion: Continued collection of data, with further isolation of associated factors regarding UE events is necessary to better identify and prevent UE. The development of a database has assisted in more uniform data collection and analysis, and will remain part of the Department's Quality Improvement Plan. 1 Tanios M et al "Can We Identify Patients at High Risk for Unplanned Extubation? A Large-Scale Multidisciplinary Survey" Respir Care 2010;55(5):561–568 2 Ksouri H et al "Impact of Morbidity and Mortality Conferences on Analysis of Mortality and Critical Events in Intensive Care Practice " Am J Crit Care 2010;19:135-145

Sponsored Research - None

(Table 1)



1133455

RECOGNIZING AND MINIMIZING DISTRACTIONS AND INTERRUPTIONS DURING RESPIRATORY CARE SHIFT TO SHIFT HANDOFF AT CHILDREN'S HOSPITAL OF WISCONSIN.

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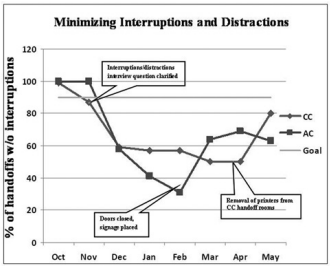
Background: The Joint Commission (TJC) has identified handoff periods as high risk events for patient safety. At Children's Hospital of Wisconsin (CHW), communication is a contributing factor in a majority of high level adverse events. To improve communication effectiveness, TJC identified key elements to be incorporated into care provider handoffs. One element includes minimizing or eliminating distractions/interruptions during handoffs. In early data, respiratory therapists (RT) had difficulty recognizing distractions/interruptions. Once identified, systems barriers were overcome to reduce them when possible. **Methods:** Utilizing a Plan-Do-Study-Act (PDSA) rapid cycle improvement approach, we conducted random handoff "face to face" interviews monthly to test the elements of provider handoffs. One of these elements included an evaluation of distractions/interruptions. During the interview process, we discovered that staff didn't recognize distractions/interruptions as occurring. Over time, the survey question was clarified to the following question to prompt potential distractions/interruptions: *Were there any distractions or interruptions during report? e.g.: pager, Vocera, printer, people talking/interrupting. If yes, list the number of times interrupted/distracted and specify what they were.* Using this method, the following key interruptions and distractions were identified: o Staff (RT & other services) not involved in the handoff interrupted the report. o A printer in critical care areas printed nursing report sheets during Respiratory handoff. Two key strategies were deployed to reduce distractions and interruptions. 1.Report room doors were closed and signage stating **"Handoff in Progress–No Interruptions"** were placed outside of the room during handoff. 2.Nursing printers were relocated to non-handoff locations. **Results:** The following graph illustrates the process of helping staff identify distractions/interruptions and the steps taken to reduce/minimize them. **Conclusions:** Recognizing and reducing distractions/interruptions is only one process improvement opportunity we have undertaken to incorporate TJC required elements into our Respiratory Care handoffs at CHW. Utilizing the PDSA cycle, intent, content, process and team effectiveness have been identified as key drivers to improve handoff. Work is ongoing in all of these areas to improve the communication effectiveness of our staff and to reduce the potential of handoff related events.

Sponsored Research - None



1144732

STATEWIDE SURVEY OF COMPUTER DOCUMENTATION ISSUES BY RESPIRATORY THERAPISTS IN ACUTE CARE HOSPITALS.

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Background: Multiple regulatory agencies and state licensure laws require accurate documentation of Respiratory Care services. Computer documentation has become the norm for this function. Although some computer systems have been specifically designed for Respiratory Care services, it is not uncommon for hospital information systems designed for other healthcare providers to be modified for use by Respiratory Care services. Modifications of general systems may not consider the multiple age-specific patients groups, geographic locations, and unique processes required for delivery of Respiratory Care services. The purpose of this statewide study was to evaluate the types of computer systems in use, time spent in computer documentation, downtime associated with equipment failure, efficiency, costs, and Respiratory Therapist satisfaction with computer systems in acute care hospitals.. **Methods**: A voluntary statewide survey was distributed to 4,343 Respiratory Care Practitioners in North Carolina with a total of 273 responses (n=273) producing a 6% response rate and a 99.6% completion rate. **Results**: The survey identified usage of computer systems specifically designed for Respiratory Care services and general systems modified for use by Respiratory Therapists. The survey revealed both negative and positive trends were which are summarized in the table below. Multiple negative issues were related to general, modified systems which required excessive time for computer documentation, inefficient and redundant activities such as multiple logins, downtime due to equipment failure, and staff dissatisfaction with specific computer systems. Positive trends included improved access to medical record information, improved legibility due to computerized physician order entry, and; improved patient safety via reduced medication errors. **Conclusions**: This survey indicates wide variations in the quality, ease of use, operational efficiency, and time spent in documentation using hospital computer systems. Depending on the system used, tremendous opportunities exist to improve efficiency, consistency with regulatory compliance, and improve Respiratory Care staff satisfaction with computerized hospital information systems.

Sponsored Research - None

Table 1: Statewide Survey Results for Computer Issues Reported By Respiratory Therapists in Acute Care Hospitals (n = 273).

Survey Question	Number of Responses	Percent Responses
What type of Respiratory Care computer system do you use?	Cerner…. 87 Theronyx.. 3 Clinivision… 52 Mediserve… 18 Meditech… 37 HBOC CareManager.. 1	Cerner…. 32% Theronyx…1% Clinivision.. 19% Mediserve…..7% Meditech…..14% HBOC CareManager.. 0.4%
Do you feel computer documentation has given you more time for clinical activities?	Yes: 94 No: 178	Yes: 35% No: 65%
Has computer documentation reduced order and medication errors	Yes: 199 No: 73	Yes: 73% No: 27%
Has computer documentation made your job simpler?	Yes: 134 No: 138	Yes: 49% No: 51%
How many total minutes per shift do you spend in the computer system on Respiratory Care documentation/charting?	30 mins/shift……23 60 mins/shift……63 90 mins/shift……70 120 mins/shift….56 180 mins/shift….29 240 mins/shift….31	30 mins/shift…… 9% 60 mins/shift…… 23% 90 mins/shift…… 26% 120 mins/shift…. 21% 180 mins/shift…. 11% 240 mins/shift…. 11%

1125176

DISRUPTIVE BEHAVIOR IN THE RESPIRATORY WORKPLACE.

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The purpose of this study was to investigate disruptive behavior in the respiratory workplace. The prevalence, clinical setting, sources and types of disruptive behavior were explored. Four hypotheses were tested: First, respiratory therapists experience disruptive behavior in the workplace. Second, Verbal disruptive behavior is the most common form found in the healthcare environment. Third, the incidence of disruptive behavior is higher among bedside caregivers compared to managers and educators. Finally, the greatest source of disruptive behavior is described. Methods: A 23 question survey gleaned data to evaluate disruptive behavior in the respiratory workplace. Informed consent was obtained. The survey was distributed electronically to respiratory therapists who were members of the American Association for Respiratory Care. Results: A total of 119 of a possible 3,941 participants (3%) completed the survey. Ninety six percent of individuals surveyed had experienced a form of disruptive behavior. An equivalent percentage of individuals, 96%, witnessed a co-worker experiencing a disruptive event. No difference in the type of disruptive behavior was experienced by job class. Bedside practitioners or staff respiratory therapists did not experience disruptive behavior more often than department technical directors, educators or supervisors. Disruptive behavior was deemed unacceptable. "Zero tolerance" initiatives were identified as a means to control disruptive behavior. Conclusions: Respiratory therapists in all job categories experience disruptive behavior. Victims are willing to explore effective ways to control disruptive behavior.

Sponsored Research - None

1129934

CREATING AN EFFECTIVE STAFF EMPOWERMENT MODEL IN YOUR DEPARTMENT.

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Introduction: Staff engagement in your key department functions is critical to overall staff satisfaction and ensuring effective operations. At Cincinnati Children's Hospital we employ a staff empowerment model that relies on clinical staff to make decisions regarding staff education, practice and research. We work within a structure that was developed to guide all shared governance activities throughout the medical center. We developed Chair responsibilities, staff eligibility and responsibilities, meeting guidelines, and leadership responsibilities. A survey was developed to assess staff satisfaction in a number of key department functions including staff opportunities to be involved in decisions that affect their work and their opportunities to be involved in shared governance. Methods: An anonymous staff satisfaction survey was sent to all Respiratory Therapists in the Division via Survey Monkey. The survey included 3 questions that were utilized to assess perceptions of Respiratory Therapists' involvement in overall divisional decision making, and opportunities to be involved in shared governance. A Likert scale was used for staff responses. Percentages were calculated in Survey Monkey for each survey question. Results: 54% of the division staff responded to the survey. See chart for results. Conclusion: Overall, survey responses were positive, but there is room for improvement to allow for staff involvement. The next phase in creating a successful shared governance structure involves evaluation of staff time allocation for completion of council projects. The development of an effective staff empowerment model can increase staff satisfaction with their overall involvement in key decision making structures within the department.

Sponsored Research - None

Survey Responses

Question	% Neutral	% Agree	% Strongly Agree
Opportunity to participate in shared govenance structure	18.9	42.5	24.5
Opportunity to be involved in decisions that affect my unit	25	37	15.7
Opportunity to provide ideas and suggestions	25.2	42.1	18.7

1149443

CAPNOGRAPHY MONITORING FOR PATIENT CONTROLLED ANALGESIA.

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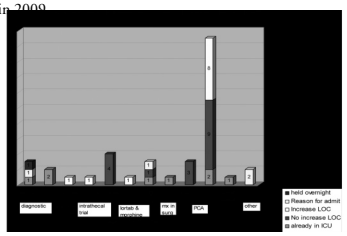
DESCRIPTIVE OVERVIEW:Capnography Quality Improvement Process-2009 Adverse Drug Events reviewed in January 2010:Breakdown on Narcotic Patient Controlled Analgesia (PCA)events.Multidisciplinary group examined processes:Anesthesia recommendation to use capnography on inpatients.Literature review of capnography supports patient safety.PCA orders revised to include capnography in risk stratified population.Respiratory Care budgeted for 25 oximetry/capnography machines.Full Process reviewed with staff and implemented June/July.Post implementation data supports impact in reduction of narcotic reversal. METHODOLOGY:2010:January-Pharmacy breakdown of 2009 Narcotic Reversals:PCA delivery involved in 50% of reversals.Nursing Peer Review:Respiratory suppression with PCA narcotic, above data included.Spring-Literature Search for Evidenced Based Practices:ETCO2 monitoring found to be earlier predictor of patient respiratory compromise than oximetry.Endorsement:from Anesthesia to monitor capnography on high risk patients.Cost Benefit Analysis:presented by Respiratory to Administrative Team for purchase of additional 25 multipurpose Capnography monitors based on PCA and Oximetry use.June-PCA Order Sets revised to include risk stratified indicators for Oximetry and ETCO2 monitoring.Staff Education & Competency.July-Order Sets made LIVE.Sept-Reinforcement of Nursing Education:at annual Skills Fair, including simulation.July to December-Quality Measures:Process monitored by Respiratory and Nursing.Adjustments made as needed.Narcotic reversal monitored by Pharmacy with data reported to Quality Councils. OUTCOMES:40% reduction in reversal of PCA narcotics.100% reduction in transfers to higher level of care for respiratory suppression with PCA narcotics. LESSONS LEARNED:Nurse Education:Increased understanding of intrapulmonary gas mixing & ventilation/perfusion relationship throughout clinical staff curriculum.Consider risk of desensitization to alarms:collaboration to reduce alarms.Continue to coach regarding process improvement:requires continual mentoring and monitoring of process and outcomes.Share success with staff:to continue to motivate toward culture of change and patient safety. CONCLUSION:More complete clinical picture of patient's respiratory status.Increased awareness of respiratory suppression and concomitant narcotic use.HCAHPS pain scores have remained stable with a 2% average increase.Process has been so widely used that we need more capnography machines.

Sponsored Research - None

Narcotic Reversal in 2009



1106420

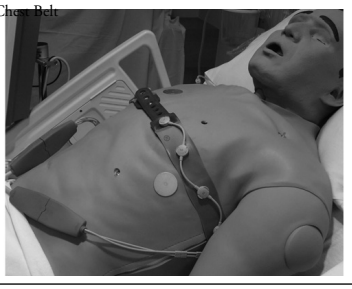
FEASIBILITY OF ELECTRICAL IMPEDANCE TOMOGRAPHY (EIT) FOR BEDSIDE PATIENT USE.

John S. Emberger[1], Joel Brown[1], Vinay Maheshwari[1], Gerard Fulda[2], John Getchell[2]; [1]Respiratory Care, Christiana Care Health System, Newark, DE; [2]Surgery, Christiana Care Health System, Newark, DE

BACKGROUND: EIT is a lung function monitoring technique using electrodes conducting impedance measurements. Changes in ventilation cause changes of impedance which can be displayed as cross-sectional images representing regional distribution of ventilation. EIT had not been feasible due to the process of securing many electrodes to the chest. A device (EIT Evaluation Kit 2, Draeger Medical, Luebeck Germany) using an elastic electrode belt may make bedside EIT feasible. We conducted an IRB approved feasibility study of EIT. METHOD: EIT was conducted on consented patients up to 6 hours/day over three days. Researchers observed and stored EIT data on the device. Caregivers were blinded to EIT data and EIT was not used to guide patient care. A properly sized electrode belt was placed on each patient during routine re-positioning. There are 5 different sized belts. Feasibility was observed including ease of placing the belt and initiating EIT monitoring. Issues affecting the ability to maintain EIT monitoring were observed. RESULTS: 13 patients were monitored with EIT (8 females). 27 days total of EIT monitoring were performed. Consent was not sought on 2 potential patients due to chest tube dressings covering EIT belt location. Consent was not sought on 1 potential patient due to pacemaker. 2 patients were monitored despite chest tube dressings. 2 patients were monitored with body weight > 300 pounds. Electrode belt placement was completed in less than 10 minutes. The belt was functional without electrode gel, however gel was used on 3 patients who had subjectively dry skin. EIT monitoring was always initiated in less than 20 minutes from entering the room. EIT required restart/re-zeroing on 5 patients periodically during the monitoring period. This was required due to vibration of the electrodes; vibrating (percussion) bed and patient agitation. Awake and alert patients were successfully monitored if not agitated. No skin breakdown/irritation occurred. Chest hair and breast tissue was not noted as affecting the EIT monitoring. CONCLUSION: EIT monitoring is feasible and can be quickly initiated at bedside with the use of a new elastic electrode belt depending on the following factors: 1)skin is intact and not covered with a dressing 2) patient is not agitated or being percussed 3) patient fits the electrode belt - EIT was successful in patients greater than 300 pounds. EIT is feasible and may be a valuable tool for monitoring regional lung ventilation.

Sponsored Research - None

Manikin with EIT Chest Belt



1140658

EVALUATING THE PROPER SUCTION CATHETER SIZE FOR AN ARTIFICIAL AIRWAY.

Chris Russian, Joshua F. Gonzales, Kevin Collins, Amanda Martinez; Respiratory Care, Texas State University-San Marcos, San Marcos, TX

Background: Current clinical practice guidelines (CPGs) recommend a suction catheter to endotracheal tube (SC:ETT) ratio of 50% or less to minimize the adverse effects of suctioning. This ratio is based on a comparison of external diameter of the SC to the internal diameter of the ETT. We theorized that a more accurate assessment of SC:ETT ratio would involve measuring the ETT total internal volume with and without the insertion of a SC. Current clinical practice and some respiratory care texts recommend a SC:ETT ratio that exceeds the CPG standard. Research Question: Does measuring endotracheal tube total volume with and without the insertion of a suction catheter provide a more consistent assessment of SC:ETT ratio based on current clinical practice? Methods: The current research project was granted IRB exemption (EXP2011P480) status by the institutional review board at Texas State University-San Marcos. ETT sizes of 10.0mm to 6.0mm will be examined with suction catheter sizes ranging from 6 to 16 Fr. Total ETT volume was established by filling each tube with fluid to the entire length of the tube. Next, researchers inserted a variety of suction catheters into each ETT and refilled the tube with fluid. Volume measurements were made with each suction catheter insertion. Only one catheter was inserted at a time. A comparison was made between the total volume held by each ETT and the volume held by each tube with a SC inserted. A SC:ETT ratio of less than 50%, based on volume measurements, was recorded at the conclusion of all measurements. Results: Total internal volume measurements were collected for each ETT size prior to SC insertion. After examining the SC:ETT ratio measurements, we determined that larger SC sizes could be used with some ETT compared to current CPG recommendations. Table 1. outlines our recommendations versus current CPG guidelines. Conclusion: We examined suction catheter size and volume displacement in relation to endotracheal tube total internal volume. Our results indicate the ability to use a larger suction catheter for elected ETTs while still maintaining a SC:ETT ratio of 50% or less based on volume measurements. We compared our findings with current respiratory CPG recommendations for SC:ETT ratio based on internal diameter measurement. Anecdotally, we believe our recommendations for suction catheter size based on ETT size is more consistent with current clinical practice.

Sponsored Research - None

ETT Diameter (mm)	Total ETT Vol (ml)	0.5 of Total Vol (ml)	Volume with 14 Fr Cath Insertion (ml)	Volume Ratio SC:ETT (%)	CPG Recommendation (Fr)	Our Recommendation (Fr)
10	24.4	12.2	19.2	5.2:24.4 (21%)	14	14-16
9	19	9.5	13.8	5.2:19 (27%)	12	14-16
8.5	17.8	8.9	12.6	5.2:17.8 (29%)	12	14-16
8	15	7.5	9.8	5.2:15 (34%)	12	14-16
7.5	13.4	6.7	8.2	5.2:13.4 (39%)	10	14
7	10.8	5.4	5.6	5.2:10.8 (48%)	10	14
6	7.8	3.9	2.6	5.2:7.8 (67%)	8-10	12

All suction catheter and ETT length 305mm unless indicated otherwise.
* Suction catheter and ETT lengths changed to 290mm
† Suction catheter and ETT lengths changed to 270mm
± Volume of a 16Fr suction catheter with length of 305mm equals 6.81mL

1118404

REDUCING HOSPITAL ACQUIRED NASAL PRESSURE ULCERS WITH LONG TERM NPPV USE.

Marlene Riggle, April Fields, Crystal Greene; Respiratory Care, Saint Joseph Hospital, Lexington, KY

The major driving influence behind the increasing use of Noninvasive Positive Pressure Ventilation (NPPV) has been to avoid the complications of invasive ventilation. Overall, NPPV is very safe, however it is not without potential complications, including necrosis of the skin. Pressure sores on the face are unique. Typically for all other pressure wounds the treatment and goal is to remove the pressure (i.e.: keep heels off bed, etc.) During NPPV the pressure exerted on the patient's face from the standard interface impairs capillary blood flow causing injury to the skin on the nasal bridge. Facial pressure sores were not included in the hospital wide skin care/wound care algorithm. A study was conducted to evaluate skin breakdown during NPPV use. The baseline data was collected randomly throughout the NPPV patient population with forty patients observed. A skin injury was observed in nineteen patients (48%). Prevention of skin break down was key. Documentation and pressure ulcer scoring guidelines were reviewed with an updated NPPV flow sheet implemented to reflect this documentation. Wound care consult documentation was added to the revised flow sheet. The therapists would assess the skin integrity on the cheeks and the bridge of the nose and document staging according to guidelines in the staging key located at the bottom of the NPPV flow sheet. If skin break down was noted, the therapist would enter a wound care team consult located on the hospital intranet and note the consult request at the top of the flow sheet. Pressure ulcers were treated with a silver antimicrobial wound gel along with a barrier pad to the bridge of the nasal area of the NPPV mask. It was observed that after the cushion barrier was placed on the mask, break down was only seen minimally with rare occurences of redness. The implementation of the new process made respiratory therapists, nurses and the wound care team aware of the pressure ulcers caused by long term NPPV use. The treatment and wound care consults have resulted in meeting our goal of improving or eliminating these hospital acquired pressure ulcers during consistent or long term NPPV use.

Sponsored Research - None

1055894

BENCH EVALUATION OF NPPV MASK LEAK COMPENSATED VCO_2 MEASUREMENT.

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Background: Measurement of CO_2 excretion (VCO_2) during non-invasive positive pressure ventilation (NPPV) is difficult because much of the exhaled CO_2 is leaked out at the mask seal and the mask port before it can be analyzed by the volumetric capnometry sensors. We have developed an algorithm to compensate for mask leaks and calculate VCO_2 during NPPV. This algorithm estimates and compensates for leak, modifies the measured $PetCO_2$ to compensate for mixing in the mask volume and calculates the compensated VCO_2. Because the vented port allows so much of the expired gas to escape prior to reaching the CO_2 sensor, an additional compensation step may be needed. Methods: We used a styrofoam mannequin head to which we glued a size large Performax mask (Philips-Respironics, Murraysville, PA) to simulate a mask-patient interface. Flow through the mannequin mouth was directed to a test lung (TTL, Michigan Instruments, MI) using a 6.5mm endotracheal tube. CO_2 gas was infused into the test lung using a precision mass flow controller (Alicat 1-SLPM-D, Alicat Scientific, Tucson Arizona). The volumetric capnometry sensors (Flow/CO_2) (NM3, Philips-Respironics, Wallingford, CT) were connected between the vented elbow connector and the exhalation port. The lung was ventilated using a V60 ventilator (Philips-Respironics, Carlsbad, CA) set at IPAP of 18 and EPAP of 4 cm H_2O. Respiratory rate was set to 10 breaths per minute. Lung compliance was set to 50 ml/cm H_2O. The exhalation port was connected between the sensors and the hose. CO_2 was infused into the test lung at 100, 150, 200, 250, 300, 350 and 400 ml/minute for 10 minutes at each infusion rate. Flow and CO_2 data were collected using the volumetric capnometer (NM3, Respironics/Philips, Wallingford, CT) interfaced to a computer. The exported waveforms were processed using a custom windows program written to implement the compensation algorithm. The resulting compensated VCO_2 measurement was compared to the actual CO_2 infusion rate. Results: The average measured inspired tidal volume was 2600 ml and the average measured expired tidal volume was 87 ml, which indicated that 96.7% of the inspired gas leaked out without being directly analyzed by the sensors. The table below shows the measured and infused CO_2 rates. With the compensation applied, the average error was reduced to -3.1%. Conclusions: This data shows that the leak and mask mixing compensation algorithm does well in spite of extremely large leaks.

Sponsored Research - Philips/Respironics

Average Measured VCO2	CO2 flow (ml/min)	Percent Error
101.7	100	1.7%
149.2	150	-0.5%
194.8	200	-2.6%
241.1	250	-3.5%
284.2	300	-5.3%
326.6	350	-6.7%
382.1	400	-4.5%

1129952

MEASUREMENT OF IN VITRO CHANGES IN ARTERIAL BLOOD GASES FOLLOWING INFUSION OF SUPERSATURATED DISSOLVED OXYGEN SOLUTION.

Daniel J. Grady[1], Terrence F. Smith[1], Michael A. Gentile[2]; [1]Respiratory Care, Mission Health System, Asheville, NC; [2]Department of Pulmonary and Critical Care Medicine, Duke University Medical Center, Durham, NC

Background: Patients experiencing acute myocardial infarction; who undergo PCI and reperfusion with solutions containing dissolved pO2 tensions of 760-1000 mm. Hg infused directly into coronary arteries, achieve significant reductions in myocardial infarct size [1]. The purpose of this study was to evaluate the In Vitro changes in arterial blood gases following injection of minute volumes of supersaturated dissolved oxygen solutions in discarded arterial blood samples. **Methods**: Using a novel hyperbaric tonometer, sterile water was supersaturated with 100% Oxygen gas by bubbling a gas flowrate of 10L/min into 500 ml. of sterile water exposed to a 17 degree C water bath for 20 minutes; at ambient barometric pressure (Pb = 763 mm. Hg.). The supersaturated oxygen solution produced a mean dissolved pO2 of 980 mm. Hg at 17 degrees C. The supersaturated dissolved oxygen solution was carefully withdrawn from the hyperbaric tonometer to avoid contact with ambient air bubbles using a tuberculin syringe. A total of 8(n = 8) discarded blood gas samples were randomly selected for baseline and repeat analysis following injection of supersaturated oxygen solution. A small volume (0.1 ml) of supersaturated, dissolved oxygen solution was directly injected into the discarded (2.0 ml) arterial blood samples, mixed, and immediately re-analyzed. All discarded samples were de-identified prior to mixing with supersaturated oxygen solution and repeat analysis. Blood gas analysis was performed using a Corning 178 Blood Gas analyzer operating at Pb = 763 mm. Hg and an electrode temperature of 37 degrees C. **Results**: The baseline mean pO2 of the blood gas samples was 82.1 mm. Hg. prior to injection of supersaturated dissolved oxygen solution. When 0.1 mL. of superoxygenated solution (having a mean pO2 =980 mm Hg) was injected into the discarded arterial blood gas samples, the final pO2 of the mixed blood increased to a mean of 120.0 mm. Hg, (n =8). A student "t" test indicated statistically significant differences between the baseline pO2 and mixed pO2 following injection of the superoxygenated liquid into arterial blood (p = 0.04). Results are shown in the table below. **Conclusions**: A supersaturated oxygen solution may be injected into arterial blood and achieve significant increases in dissolved paO2 and SaO2 In vitro. Additional research is necessary to determine clinical applications of this technology.

Sponsored Research - None

In Vitro Blood Gas Changes Following Micro-Injection of Supersaturated Dissolved Oxygen Solution

Parameter	Baseline ABG Mean +/- SD (n = 8)	ABG Sample After Infusion of 0.1 ml of Supersaturated Dissolved Oxygen Solution Mean +/- SD (n = 8)	Statistical Significance (Alpha = 0.05)
pH	7.40 +/- .01	7.39 +/- 0.01	Not Significant (NS)
PaCO2 (mm. Hg)	43.9 +/- 2.9	36.9 +/- 2.0	p = 0.027
PaO2 (mm. Hg)	77.3 +/- 7.7	120.8 +/- 15.5	p = 0.04
SaO2	93.9 +/- 2.0	96.6 +/- 2.0	p = 0.001
tHb (g/dl)	11.9 +/- 0.59	9.7 +/- 0.91	Not Significant (NS)

[1]. Stone, et al. Effect of Supersaturated Oxygen Delivery on Infarct Size After Percutaneous Coronary Intervention in Acute Myocardial Infarction. **Circulation, American Heart Association, October, 2009, pp 366-374.**

1132180

MEASUREMENT OF DISSOLVED OXYGEN TENSION IN FLUID FOLLOWING SUPERSATURATION OF FLUID WITH OXYGEN GAS USING A NOVEL HYPERBARIC TON0METER.

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Background: Weaver et. al. have shown that tonometry conducted inside a multiplace hyperbaric chamber produced strong correlations (R2 = 0.98) between predicted and actual dissolved oxygen tensions when the fluid was measured outside the hyperbaric chamber. [1] The purpose of this study was to evaluate the following questions: (1) Can a novel hyperbaric tonometer create supersaturated dissolved oxygen tensions in fluid which are maintained in fluid following removal from hyperbaric conditions? (2) What are the effects of varying tonometry temperature and pressure on supersaturated dissolved oxygen solutions? **Method**: A novel tonometer was constructed which mixed gas and sterile water under the following 3 groups of conditions (1) equilibration with air at 37 degrees C (n =15), (2) equilibration with 100% oxygen at 37 degrees C (n = 15), and (3) equilibration with 100% oxygen at 17 degrees C (n =15). The pO2 of the supersaturated sterile water solution was immediately analyzed following equilibration, using caution to avoid exposure to ambient air bubbles during removal of the fluid from the tonometer. A Radiometer ABL 330 blood gas analyzer was used for analysis of all tonometered fluid samples. All samples were analyzed under normobaric conditions using an analyzer temperature of 37 degrees C and ambient barometric pressure of 763 mm. Hg. Descriptive statistics and a t-test (alpha =0.05) were calculated for dissolved oxygen tensions for all three experimental groups above. **Results**: Following equilibration with air at 37 degrees C, the mean pO2 of sterile water was 150 mm. Hg (n = 14, sd = 4.5). Following equilibration with 100% oxygen at 37 degrees C, the mean pO2 was 613 mm. Hg (n=14, sd = 12.4). Surprisingly; when sterile water was equilibrated with 100% oxygen at 17 degrees C and removed from the tonometer to normobaric conditions, the mean pO2 increased to 977 mm. Hg. (n = 14, sd = 11.6). Statistically significant increases in dissolved oxygen tension were found between fluid tonometerd with 100% oxygen at 37 degrees C and at 17 degrees C ($p < .05$). **Conclusions**: A novel tonometer, which supersaturates fluid with dissolved oxygen gas, may generate hyperbaric levels of dissolved oxygen tensions when the fluid is removed from hyperbaric conditions and analyzed under normobaric conditions. These findings are consistent with the Weaver study. Additional research is necessary to determine possible clinical applications of this technololgy.

Sponsored Research - None

1. Weaver L, Howe S, and Berlin S. Normobaric Measurement of O2 Tension of Blood and Saline Tonometered Under Hyperbaric O2 Conditions. Journal of Hyperbaric Medicine, Vol 5, No. 1. 1990.

1131107

RELATIVE HUMIDITY OUTPUT AT DIFFERENT OXYGEN FLOWRATES USING SALTER HIGH FLOW CANNULA AND BUBBLE HUMIDIFIER.

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John Newhart RRT RCP, Richard M. Ford BS RRT FAARC UC San Diego Medical Center. Background: At our institution we have observed an increase in the utilization of high flow oxygen delivery systems. We sought an answer to the question, are bubble humidifiers' capable of adequately humidifying gas delivered to the patient at higher flows? We elected to bench test the Salter (Salter Labs Arvin, Ca) high flow cannula and bubble humidifier (HFBH) (REF7900) and measure relative humidity (RH) at flowrates of oxygen between 6 and 15LPM. Methods: We ran the HFBH and cannula at 6, 9, 12, and 15LPM of oxygen from a wall outlet. The HF cannula was attached to the HFBH and the two nasal outlet tubes of the cannula were attached snugly to a nose model configured with two small holes and similar spacing as nasal openings. This fitting was closed at one end with a 6" corrugated open ended tube on the other. A hygrometer sensor was inserted into the open end of the tubing with the sensing portion just downstream of the cannula openings. The sensor would only be exposed to gas from the cannula. For each flow setting, the temperature and RH reading of the sensor and accompanying components were allowed adequate time to stabilize. Results: Oxygen flowrates with corresponding RH: 6lpm/66%, 9lpm/60%, 12lpm/57%, 15lpm/54%. Conclusion: Our results indicate that the HFBH is able to significantly improve the relative humidity of dry gas. In using such devices we determined that patients are more comfortable with less complaints of nasal drying. The clinician should however be aware that humidity deficits continue to exist with such devices and impact on patients should be assessed.

Sponsored Research - None

1145294

EVALUATION OF ACCURACY AND RELIABILITY OF THE NEO-TEE DISPOSABLE T-PIECE RESUSCITATOR.

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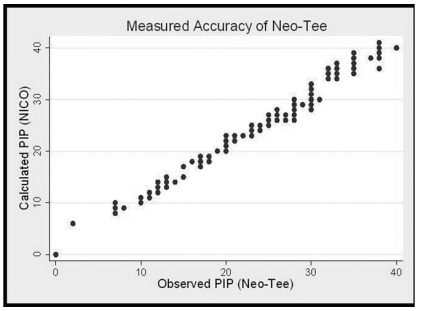
Background: T-piece resuscitators have gained popularity as devices used for both neonatal resuscitation and intermittent manual ventilation. Until recently, a substantial expense for the purchase of hardware was required to obtain reusable t-piece resuscitators. The Neo-Tee t-piece resuscitator (Mercury Medical, Clearwater, FL) incorporates the mechanical device into a disposable circuit. There is now a potential for more caregivers to adopt the practice of t-piece resuscitation courtesy of a technology that was formerly not available or affordable. The purpose of this bench study is to determine if a disposable resuscitator accurately and reliably delivers ventilating pressures at selected settings. Methods: Five Neo-Tee t-piece resuscitators were randomly chosen from a standard shipment supplied by the manufacturer. Resuscitators were adjusted to maintain the PEEP valve in a fully-closed position. Each circuit was independently attached to a flow sensor of the NICO 2 breath monitor (Respironics, Wellington, CT) and then to an infant test lung (Infrasonics, San Diego, CA) with known compliance of 1 mL/cmH2O. Manual ventilation was then simulated using this model. All five devices were evaluated at 12 predetermined levels of controlled pressure set within three color-coded zones on the Adjustable PIP Controller and at commonly-used flow rates of 5, 8, and 10 Lpm. Pressure readings on the built-in manometer were estimated by the investigator during simulated ventilation and were compared to calculated readings recorded simultaneously on the NICO 2 monitor using the Wilcoxon rank sum test. Reliability between circuits was evaluated using the ANOVA test. Results: There was no significant difference between the observed PIP (p = 0.38) or PEEP (p = 0.22) on the Neo-Tee when compared to the calculated pressures on the NICO 2. In addition, there was no significant difference in performance among disposable resuscitators when compared to one another (p = 0.54). Conclusions: In the laboratory setting, accuracy of delivered pressures and the reliability of circuit performance for the Neo-Tee resuscitators are consistent with the manufacturer's specifications.

Sponsored Research - None



1149785

THE COST OF MECHANICAL VENTILATION: REDUCTIONS DUE TO USE OF A COMMERCIAL ENDOTRACHEAL TUBE HOLDER.

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Background: Patients on mechanical ventilation are at high risk of complications, in particular unplanned extubations, lip pressure ulcers and ventilator-associated pneumonia (VAP). Hospitals recognize this and, to mitigate potential risk, can use a commercially-available endotracheal tube holder. A Medicare claims analysis was used to compare ventilated patients in hospitals using the Anchor Fast® oral endotracheal tube fastener to matched hospitals that did not, to assess for differences in cost of care in these patients. Methods: Medicare 2008 standard analytic files were used. 543 hospitals known to have purchased the Anchor Fast® oral endotracheal tube fastener in 2008 were identified and matched to an equal number of hospitals that did not. In-patient stays with mechanical ventilation longer than one day were identified by ICD-9 codes, and hospital costs for each were estimated by multiplying the hospital's Medicare cost-to-charge ratio by the hospital's charges. Length of stay (LOS) and frequency of complications (VAP, reintubation, chest x-rays, pressure ulcers and lacerations) were tallied. LOS and LN(cost) were analyzed using Tobit (left censored) and multiple linear regression, respectively; regressors included patient characteristics. Results: 97,360 patients, as described, were identified. The average cost of ventilated patients in hospitals not using the Anchor Fast® oral endotracheal tube fastener was $30,643 while the average cost in hospitals using the Anchor Fast® oral endotracheal tube fastener was $30,510, a reduction of $132 (p=0.032) per patient. The average LOS in hospitals using the Anchor Fast® oral endotracheal tube fastener was 20.1 days versus 20.3 days in hospitals not using the product, a difference of 0.2 days (p=0.007). Conclusions: The use of the Anchor Fast® oral endotracheal tube fastener may be associated with a statistically significant and financially important reduction in average costs for the patients studied. The average savings of $132 per patient includes the purchase of the device.

Sponsored Research - None

1135526

CORRELATION BETWEEN DIFFERENT TESTS TO ASSESS EXERCISE CAPACITY IN PATIENTS WITH CYSTIC FIBROSIS(CF).

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BACKGROUD: Regular assessment of exercise capacity in CF is a useful tool to facilitate exercise prescription and to monitor disease changes, in particular with aerobic tests that measure peak exercise (VO2). Indeed, aerobic fitness, measured by peak oxygen uptake during maximal exercise, is a strong predictor of survival. AIM: To investigate whether there were any correlations between the Cardio-Pulmonary Exercise Test (CPET), the Bruce Test (BT) and the Modified Shuttle Walking Test (MSWT). METHODS: PATIENTS 18 CF patients (6 male, mean age 16years,range 11-30), mean FEV1 80% predicted and mean VC 81% predicted. MEASURES All patients performed CPET on cycloergometer. All subjects performed BT that consisted of an incremental treadmill exercise test using Bruce protocol and with measurements of VO2. All patients performed MSWT in order to assess exercise tolerance, which was expressed in meters. A specific Armband was used for 3 days by each patient. A SenseWear®Armband is a complex multisensory activity monitor that includes a 2-axis accelerometer, sensor for heat flux, galvanic skin response, and skin temperature. Moreover it is able to calculate the metabolic equivalent (MET) and the number of steps/day. To evaluate physical activity expressed in METs/week, the Minnesota Leisure Time Activity Survey (MLTAS) Questionnaire, adapted form of the Minnesota Leisure Activity Survey, was used. RESULTS: We found a significant correlation between CPET and BT (r = 0,935, p<0,0001) and between CPET and MSWT (r = 0,731, p=0,0006). However there was no correlation between exercise performance's indexes and pulmonary function and nutritional status parameters. Finally there was a significant correlation between CPET (expressed in VO2) and MLTAS (expressed in METs/week)(r=0,83, p<0,0001). CONCLUSIONS: Our data showed that BT and MSWT are feasible, cheap, and easy to perform. These tests may be a viable alternative to CPET for assessing exercise capacity in CF patients. Moreover the questionnaire's analysis (MLTAS) showed that physical activity has a real physiological impact on performance's index. CLINICAL RELEVANCE STATEMENT: BT and MSWT are a feasible and cheap alternative to CPET and they may be used routinely to assess exercise tolerance in CF patients. Monitoring physical activity should be a primary goal in CF care.

Sponsored Research - None

1148202

ELECTRICAL IMPEDANCE TOMOGRAPHY USED TO MONITOR REGIONAL VENTILATION FOR A PATIENT WITH PNEUMONIA: A CASE STUDY.

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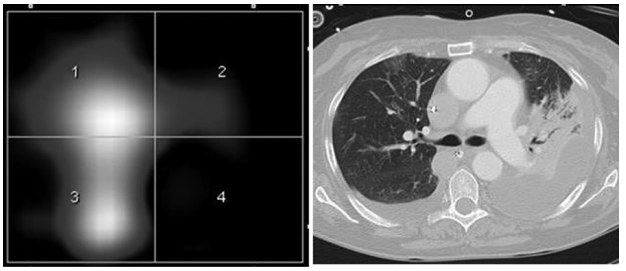
INTRODUCTION: Electrical impedance tomography (EIT) is a new method of monitoring regional lung ventilation. Using a chest belt with 16 electrodes, a small current is applied and impedance signals are measured across the electrodes in a cyclic method. EIT generates images generally at 20 frames per second which are viewed as a live movie of regional ventilation. We conducted an IRB approved blinded study for EIT monitoring (EIT Evaluation Kit 2, Draeger Medical, Luebeck Germany) of ALI/ARDS patients. The following case is one of the patients from our study. CASE SUMMARY: A 61 year old female presented to the emergency department with severe respiratory distress. The patient was worked up for pulmonary embolism versus pneumonia. The patient failed BiPAP in the emergency department with worsening ABG results, was intubated and transferred to the MICU. It was found that the patient had community acquired left lower lobe pneumonia by chest x-ray and CT-Scan. The patient was consented for the EIT study several days after admission to the MICU. Three separate days of EIT monitoring were performed over a 6 day period. All of the EIT monitoring showed that ventilation was occurring in the right lung and only minimal ventilation in the left lung. The patient was extubated after the first 5 days on the ventilator. The patient was re-intubated 3 days after that extubation due to worsening ABG values, increased work of breathing and impending respiratory failure. The image displayed is an EIT regional image as well as the CT-Scan image the day after re-intubation. At the time of EIT monitoring, the patient was on PSV 12, PEEP 5, FiO2 40%. Exhaled tidal volumes were 400 to 500 mls with RR 11 to 15 and SpO2 of 98%. The patient remained intubated for 3 more days then was extubated successfully. The patient was discharged 5 days after extubation, to a rehabilitation facility for muscle reconditioning before returning home. DISCUSSION: In this case of left lower lobe pneumonia, EIT imaging was comparable to CT-Scan images as well as chest x-rays. EIT may be a valuable device to monitor regional lung ventilation in patients with ALI or ARDS in the future.

Sponsored Research - None



EIT image showing regional ventilation and CT-Scan image on day 8 of a patient with left lower lobe pneumonia. The EIT device displayed that 84% of ventilation was in the right lung and 16% was in the left lung.

1135212

A CASE STUDY: BENEFITS OF USING AIRWAY PRESSURE RELEASE VENTILATION ON PATIENTS WITH RIB FRACTURES.

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Introduction: Airway Pressure Release Ventilation (APRV) is a mode of ventilation that provides for an elevated level of high sustained pressure that is periodically released to aid in CO2 clearance while allowing spontaneous breathing. APRV is applied with the objective to maintain lung volume resulting in improved lung mechanics, ventilation, and oxygenation due to recruitment of alveoli. The application of APRV in acute chest trauma is reported. Case Summary: A 72 year old male was admitted after being struck by a motor vehicle. The patient sustained 1 thru 8 right sided rib fractures as well as underlying hemopneumothorax and pulmonary contusion. The patient was intubated with initial ventilator settings of CMV VT 550 RR 12 and FIO2 50% with the PEEP being increased to 8 the following day due to extremely poor aeration of the right lung per chest film. Due to the decreasing lung volumes and the patient's asynchrony with the ventilator, APRV was initiated. Initial APRV settings were PEEP-High 25 PEEP-Low 0 Time-High 4.3 Time-Low .7. It was noted the patient was more synchronous with the initiation of APRV. Chest X ray post APRV initiation revealed significantly improved aeration of both lungs. Spontaneous breathing exercises on a setting of CPAP of 5 and Pressure support of 5 were started 2 days after APRV initiation. The patient was taken off the ventilator and transitioned to trach collar 14 days post APRV initiation. Discussion: Patients with multiple rib fractures have been known to develop increased atelectasis. Conventional ventilation on CMV in volume control or pressure control modes may not allow for the increased mean airway pressure needed for alveoli recruitment in conjunction with a spontaneous breathing patient. APRV is able to provide an increased mean airway pressure allowing for the recruitment and stabilization of collapsed regions with minimal sedation. Increasing mean airway pressure early in the course of the lung injury and providing the ability to spontaneously free breath, not only recruit alveoli, also requires minimal sedation. Weaning can often proceed more easily once the lung injuries have improved considering the patient was in a mode that facilitated spontaneous ventilation.

Sponsored Research - None

1148627

APPLICATION OF DIAPHRAGMATIC STIMULATION FOR A PATIENT WITH PONTINE ISCHEMIA.

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INTRODUCTION: Phrenic (PNS) and diaphragmatic stimulators (DS) can be successful in SCI and MS patients with respiratory failure (1,2,5); Medullary/pontine infarcts cause respiratory failure as well but few reports examine management (4). We present an application of DS in a patient with a pontine ischemia, and the protocol used to wean. SUMMARY: 56 y/o male with basilar artery thrombosis/ischemic insult to the pontine area. Patient awake, alert, with full extra-ocular movements, but unable to demonstrate voluntary control of other somatic muscles ("locked-in syndrome"). He was stabilized on MV, completed rehab, and discharged home. He returned several months later, still vent dependent. We considered him for DS by fluoroscopy "sniff test" revealing asymmetric movement and severe dyscoordination of contraction, indicating functional phrenic nerve with poor coordination resulting from CNS injury. He underwent DS placement and progressive pacing protocol. DISCUSSION: He began a DS protocol consisting of 15 minutes pacing Q2H at amplitude 25 mA, pulsewidth 150 µsec, rate 12 BPM, inspiration interval 1.1, pulse frequency 17, and pulse rate 10 consistent with previously published values (1). When not being paced, the patient was maintained on full MV support. ABG and vital capacity were monitored after each pacing session, with initial ABG on vent after pacing of 7.59/26/75/4.1. He progressed on Day 3 to 20 min every other hour, with ABG of 7.45/36/74/1.2. Pacing was advanced in increments of 5 minutes per session, maintaining Q2H during the day as tolerated. Pacing was not advanced if he reported fatigue or if VC < 10% from previous baseline. By Day 13, the pacing schedule was advanced to 60 min every two hours, with ABG 7.46/36/82/1.9. Final increases were conducted at home by family for a total of 12 hrs./day consisting of six sessions of 2 hour pacing followed by 1 hour vent breaks. The goal of 12 hours per day was accomplished despite severe neurological limitations. This method allowed for steady progress and minimized complications. It prevented fatigue, did not inhibit comprehensive rehabilitation. The protocol was simple and safe. We feel this protocol may benefit other clinicians who face similar challenges. 1 Alshekhlee, A.et al.Muscle Nerve,2008;38:1546-1552. 2 DiMarco, A. F.Respiratory Physiology & Neurobiology, 169, 200 – 209. 3 Feldman, M. H.Neurology, 21 (5), 459 – 478. 4 Lassman, A. B. et al.Archives of Neurology, 62, 1286 – 1288.

Sponsored Research - None

1133488

VENTILATOR ASSOCIATED PNEUMONIA IN LOW BIRTH WEIGHT NEONATES AT A NEONATAL INTENSIVE CARE UNIT – A FIVE-YEAR RETROSPECTIVE STUDY IN ONE MEDICAL CENTER.

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Objective: To determine the clinical characteristics and risk factors of development of ventilator-associated pneumonia (VAP) in low birth weight (LBW) neonates in a neonatal intensive care unit (NICU). Patients and Methods: We conducted a five-year retrospective study to review the data of the neonates with birth weight less than 2500 grams who were admitted to the NICU of Kaohsiung Medical University Hospital between Jan. 2005 and Dec. 2009. For the diagnosis of VAP, the patient was required to have received at least 48 hours of mechanical ventilation and developed a new radiographic evidence of pneumonia. Characteristics of patients with VAP and without VAP were compared using student t tests for numerical data and Chi-square tests for categorical data. Univariate and multiple logistic regression analysis were performed to explore the risk factors related to VAP in LBW neonates in NICU. Results: There were 605 LBW neonates (15 with VAP, and 590 without VAP) admitted to our NICU for at least 48 hours during the period of Jan. 2005 and Dec. 2009. The percentage of male gender, multiple gestations, and the use of human milk were not different between the two groups. There were significant lower gestational age (27.1±2.3 vs. 33.1±3.2 weeks), lower birth weight (944.4±268.4 vs. 1774.2±451.8 grams), and longer use of endotracheal tube (58.7±39.6 vs. 1.8±8.6 days) in patients with VAP than patients without VAP. Univariate analysis revealed that factors related to VAP were less gestational age, lower birth body weight, higher NTISS scores, lower Apgar scores at 1 minute and 5 minutes, the placement of peripheral inserted central catheter and endotracheal tube, and use of total parenteral nutrition. After multiple logistic regression analysis, the most significant risk factors related to VAP in LBW neonates was the days of insertion of endotracheal tube. Conclusion: VAP is still a problem in LBW with use of endotracheal tube in our NICU. The most significant risk factors related to VAP in LBW neonates was the days of insertion of endotracheal tube. Additional studies to develop strategy to prevent VAP are necessary.

Sponsored Research - None

1126451

INFANTILE HYPOPHOSPHATASIA ASSOCIATED WITH RESPIRATORY INSUFFICIENCY.

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Introduction: We report the successful use of chronic mechanical ventilation (MV) in an infant diagnosed with infantile hypophosphatasia (IHPP) who developed chronic respiratory failure. This case illustrates the patient's presentation, course, and feasibility of use of chronic MV in patients with this condition. **Case Summary:** Patient is a 3.8 y/o biracial female with family history of adult form of HPP. She was born full term and presented at age 2 months (mo) with poor feeding, hypercalcemia, hyponatremia, and microscopic hematuria. The patient received nutritional supplements, calcitonin and was discharged home. She was diagnosed with IHPP at age 3 mo, and one month later G-tube/Nissen were placed due to failure to thrive. She was hospitalized 5 times during the first 5 mo of life for non-respiratory problems. She was re-admitted at age 6 mo for respiratory and urinary tract infection. She developed respiratory insufficiency, and was started on heated high flow nasal cannula (4LPM/1.0 F_IO_2). She began having frequent episodes of respiratory distress requiring intubation and MV. Initial ventilator settings were PRVC, rate-25, Vt-40 ml, PEEP-7, and F_IO_2-.35. She was tracheostomized at age 8 mo after 2 failed extubations. She was transitioned to LTV at age 15 mo after 5 unsuccessful attempts. She required placement back on Servo 300 at age 19 mo when she acquired RSV lower respiratory tract infection. She transitioned back to the LTV at age 20 mo and was discharged home 2 weeks later on ventilator settings of SIMV-PC/PS, rate-35, PC-18, PS-14, PEEP-6, and O_2-1.5 LPM. She was readmitted one mo later with respiratory infection and acute respiratory failure and changed to the Servo-i. She was treated with antibiotics and transitioned back to the LTV at age 37 mo and discharged 2 weeks later. **Discussion:** IHPP is a rare inherited disorder (1/100,000 births) characterized by defective bone mineralization. IHPP is diagnosed before age 1 year with onset of symptoms usually occurring within 6 mo and has 50% mortality rate. Diagnosis consists of hypercalcemia, decreased alkaline phosphatase, metaphyseal flaring, enlarged fontanelles, and wide cranial sutures. IHPP is considered fatal secondary to respiratory insufficiency or infection resulting from a defective thoracic bellows system as a result of demineralization of the ribs. This case illustrates that chronic respiratory failure in patients with this condition can be effectively treated with MV.

Sponsored Research - None

1128515

USE OF AIRWAY PRESSURE RELEASE VENTILATION WITH A TRAUMATIC BRAIN INJURED PATIENT.

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INTRODUCTION: Clinicians may be reluctant to use Airway Pressure Release Ventilation (APRV) when managing patients with traumatic brain injuries. There is a question that with the application of APRV, the PaCO2 cannot be successfully managed. Therefore, with an increase in PaCO2, a concomitant increase in intracranial pressures will occur. In addition, there is concern of increased intracranial pressure related to the increase in mean airway pressure with APRV. CASE SUMMARY: This case reviews a 62 year old male that was found down (presumed fall). On admission, he presented with a subdural hemorrhage and a Glasgow Coma Scale (GCS) of 7. An intraventricular catheter (IVC) was placed to monitor intracranial pressure (ICP) and drain cerebral spinal fluid. Due to a refractory increase in ICP, the patient required a craniectomy. The ventilator support was set to maintain PaCO2 between 35 and 40 cm H2O. The patient was on a Drager Evita XL with settings of SIMV/Autoflow/PS with a set respiratory rate of 25, tidal volume 550, PEEP 14, and FIO2 of 55%. On these vent settings, the patient's ICP ranged between 8-14 mmHg. The patient was then transitioned to APRV with settings of: Phigh 26, Plow 0, Thigh 4.2, Plow 0.55 (set respiratory rate of 13), FIO2 55%. Due to the improved alveolar ventilation that APRV provides, there was no need to match the SIMV minute volume (which was 13.8 L/min vs. 11.8). Analgesia and sedation remained the same with Fentanyl and precedex. In addition, hemodynamics remained stable after transition to APRV. DISCUSSION: Transitioning this patient to APRV demonstrated an improvement in oxygenation, ventilation and peak airway pressures with no untoward result of increased ICP or PaCO2. APRV has been useful as a lung recruitment mode, however, further research is needed to show the effect of APRV with TBI patients and ICPs and CO2 management.

Sponsored Research - None

VITAL SIGNS	SIMV	AFTER APRV
ICP(mmHG)	7-11	4-12
CPP	74-92	74-89
ABG	7.45/35/150/26/2.7/98%	7.49/32/175/24/1.4/98%
MODE	SIMV 25/550/14	APRV 26/0 4.2/0.55
ATC	OETT: 8.0mm @100 compensation	OETT: 8.0mm @100 compensation
FIO2	55%	45%
MAP(cm H20)	21	24
SET RR (b/min)	25	13
TOT RR (b/min)	25	30
PEAK PRESSURE (cm H2O)	34-36	27
ETCO2	31	32
SPONT MV	0	12.4

1133202

HELIOX THERAPY IN THE TREATMENT OF MECHANICAL OBSTRUCTION SECONDARY TO CLOT FORMATION IN A PULMONARY HEMORRHAGE PATIENT.

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Introduction: A 3 year old, 15kg patient with a primary diagnosis of double outlet right ventricle with pulmonary stenosis, underwent a Kawashima procedure and hepatic vein baffle to the pulmonary circulation. The patient suffered a cardio-pulmonary arrest and was subsequently supported for five days with ECMO. After decannulation from ECMO, the patient suffered recurrent pulmonary hemorrhages leading to altered gas exchange and the need for high ventilatory pressures. Case Summary: Due to worsening respiratory status, a bronchoscopy was performed which revealed numerous blood clots in the airways likely causing a "ball-valve" effect. Approximately six hours following the bronchoscopy the patient's ventilatory support was escalated from PCSIMV 36/6 x 20 100% to PCSIMV 42/6 x 22 100% with 6mL/kg Vt. The patient continued to demonstrate a significant respiratory acidosis (ABG 6.82/241/77/37). Support was further escalated to 46/10, the flow graphics on the ventilator were suggestive of inadequate emptying of the lungs, therefore, the rate was reduced to 16 and heliox therapy was initiated at an 80/20 helium/oxygen mixture. Upon initiation of heliox the CO2 elimination rapidly increased from 54ml/min to 162ml/min and the Vt increased to 15ml/kg. Copious amounts of thick clot were suctioned from the endotracheal tube within minutes of heliox initiation, whereas prior to heliox, minimal clot was suctioned. Within four hours the patient's ABG improved to 7.30/63/41/30 and the ventilator was weaned to 38/8 x 16 with Vt 13ml/kg. Eight hours following heliox administration the ABG was 7.36/56/47/29 and the ventilator was weaned to 36/8 x 16 with a 70/30 heliox mixture. Heliox was discontinued thirty-six hours later and the patient was successfully extubated. Discussion: Heliox therapy has been used for treatment of severe bronchoconstriction and other etiologies that cause the airways to be narrowed. Our case exemplifies the use of heliox to improve gas exchange in a patient with blood clot causing partial obstruction of small airways. Heliox allowed us to improve gas exchange by improving laminar air flow, by-passing clot and re-inflating collapsed areas of lung. Additionally, heliox appeared to help facilitate migration of clot to the upper airways for removal, possibly due to increased peak expiratory flow rates.

Sponsored Research - None

1135357

HELIOX VIA OXYMASK FOR ADULT AIRWAY COMPRESSION.

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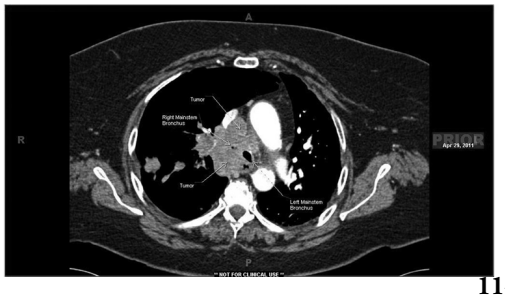
Introduction: Patients with lung cancer often experience dyspnea secondary to narrowing of the airway due to tumor growth. Heliox use is one method of reducing turbulence through a narrowed airway and relieving dyspnea. Case Summary: A 63 year old female, with progressive small cell lung cancer and persistent dyspnea was admitted to the ICU due to difficulty breathing with stridor and use of accessory muscles: RR 28, SaO2 94% on 2 lpm. The patient had a large right sided mass with bronchovascular encasement causing severe tracheal, bronchial, and vascular compression. There was a discussion of tracheostomy; however, upon evaluation it was evident the obstruction was too low for a tracheostomy to provide any relief. Within 12 hours of admission the patient was placed on an 80/20 mix of heliox via NRB mask at 10 lpm. The patient's dyspnea was improved, stridor cleared, and use of accessory muscles lessened; RR 20 SaO2 94% on 10 lpm HeO2 NRB. The patient was receiving daily radiation therapy treatments to reduce the size of the tumor. The challenges we faced were: high usage, limited availability of heliox and cost; $120.00 per tank, three tanks per day. Our usage rate would deplete the vendor's supply within two days and additional tanks were not available through any local vendor for 5 business days. In order to conserve gas, we attempted to reduce the heliox flow. The titration began with reducing the flow to the NRB mask to 6 lpm but the patient stated it wasn't enough, we increased to 8 lpm and she stated, "it would be tough" but she thought it might work, although she felt like it was a lot warmer. She was then placed on the OxyMask (Southmedic) with a flow rate of 4 lpm. Due to the design of the mask, the patient felt more comfortable than on the NRB mask at 8 lpm; RR 16 to 20, SaO2 96% on 4 lpm HeO2 OxyMask. We were able to maintain the flow at 4 lpm to 5 lpm for the duration of her stay; in addition we were able to place the patient on a nasal cannula at night while she slept. Thirteen days later the patient was discharged home to hospice care. Discussion: By using the OxyMask we were successfully able to titrate the heliox to achieve a therapeutic level that was comfortable and safe for the patient at half the flow rate effectively doubling our supply and achieving a 50% cost savings. We also have increased the supply of heliox in house and the vendor has increased their inventory in order to be able to care for similar patients in the future.

Sponsored Research - None



1140599

RECURRENT PLUGGING OF THE TRACHEOSTOMY TUBE: SOLVING THE PROBLEM OF HUMIDITY DEFICIT AND PORTABILITY FOR A HOME CARE TRACHEOSTOMY PATIENT WITH AIRVO™ (FISHER & PAYKEL).

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INTRODUCTION: We report a patient with severe OSA who had elective tracheostomy tube placement secondary to severe claustrophobia with inability to tolerate CPAP. The patient presents to our hospital multiple times with a tracheostomy tube obstructed with dried secretions. The patient has been unable to return to work secondary to this recurrent complication and reported inability to sleep. CASE SUMMARY: Interview reveals patient reported sleep deprivation, chest discomfort and chronic cough, knowledge deficit regarding suctioning, and non-compliance with the aerosol delivery device. Patient reports sleep disruption caused by compressor noise, condensate in the tubing, and the aerosol produced made the patient cold and wet and led to non-compliance. We trialed the AIRVO™ by Fisher & Paykel with this patient to provide heated humidity with heated wire circuit and a tracheostomy tube connection. The patient found the device easy to use, portable, and quiet. The patient had subjective improvement in chest discomfort and cough, was able to sleep through the night immediately, and had improved secretion clearance with no further issues with tracheostomy tube obstruction reported. Portability of device allowed the patient to return to an executive capacity career which required frequent air and overnight travel and public speaking. The addition of a HME during the day and subsequently capping the tracheostomy tube during the day also significantly enhanced quality of life for this patient once humidity deficit was resolved. DISCUSSION: The AARC Clinical Practice Guidelines recommend the use of supplemental humidity at 33 ± 2°C and a minimum of 30 mg/L of water vapor with a MMAD of 2-10 microns when the upper airway has been bypassed. The standard equipment available for providing heated humidity for tracheostomy patients in the home consists of an air compressor, a yoke-collar or rod type immersion heater, and a nebulizer bottle that aerosolizes through a length of aerosol tubing with a water trap spliced in to collect condensate. The distance the heated aerosol must travel makes it difficult at best to meet CPG recommendations. Patient compliance and meeting CPG recommendations with humidity therapy is a challenge at baseline. The AIRVO™ simplifies the application of humidity therapy for patients with a bypassed upper airway. Although this device fits a need in the homecare venue this new product is not currently reimbursed through most insurance.

Sponsored Research - None

1144880

USE OF NEURALLY ADJUSTED VENTILATORY ASSIST TECHNOLOGY TO FACILITATE SUCCESSFUL TRANSITION TO A HOME CARE VENTILATOR IN AN INFANT WITH CHRONIC LUNG DISEASE OF PREMATURITY.

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Introduction: Infants with chronic lung disease (CLD) requiring chronic mechanical ventilation present challenges to the medical team as they attempt to prepare the patient for homecare. Transition from a hospital type to a home type ventilator is a crucial step. We report on use of Neurally Adjusted Ventilatory Assist (NAVA) technology to aid successful transitioning to a homecare ventilator in an infant with CLD of prematurity. **Case Summary:** The patient is an 11 month old African American male, former 25-week preterm (birth weight 805 gm). He was born at another institution where he received surfactant therapy x1, and was placed on mechanical ventilation. He failed extubation 5 times and was successfully extubated on the 6th attempt at 2 months of age. The infant continued to have frequent episodes of tachypnea with desaturations and significant retractions. He developed CLD of prematurity and was transferred to our Hospital at 3.9 months of age for evaluation. The patient was supported with heated high flow nasal cannula (HHFNC) (3 LPM/1.0 F_IO_2). The infant was subsequently diagnosed with pulmonary hypertension and was started on sildenafil and inhaled nitric oxide at 10 ppm via HHFNC. He was reintubated at 5½ months of age due to hypercarbia ($PaCO_2$ 62-63 mmHg) and increased work of breathing (WOB). The patient was tracheotomized at age 6.7 months and was transferred to our long term care unit 2 months later. The plan of care was to transition from the Servo-i™ to a LTV 1200™ home ventilator for discharge. Once stable ventilator settings were reached the patient failed 3 attempts to transition to the LTV due to hypercarbia and increased WOB. The longest time on the LTV was 28 hours. At 11 months of age, a NAVA catheter was placed and used to optimize ventilator settings while on the Servo-i. The patient was then transitioned to an LTV and the NAVA catheter was kept in place for 4 days. Ventilator adjustments were made focusing on the E_{di} as an indicator of WOB and included increasing pressure support from 10 to 13 cmH_2O and adjusting the Rise Time Profile from 4 to 5, thereby decreasing the inspiratory rise time. The transition was successful and the patient was discharged home one month later. **Discussion:** Medical teams are challenged with patients with CLD who are difficult to transition to a home ventilator. NAVA allowed for the collection of objective data correlating to the WOB, and allowed for "real-time" ventilator adjustments.

Sponsored Research - None

1128418

TRANSITION FROM HIGH FREQUENCY OSCILLATORY VENTILATION TO BIVENT MODE OF VENTILATION TO FACILITATE INTRA-HOSPITAL PATIENT TRANSPORT: A CASE REPORT.

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Introduction: Patient transports within the hospital are frequent occurrences to provide diagnostic testing and specialized procedures. This case illustrates a positive outcome of a patient who was supported on high frequency oscillatory ventilation (HFOV) and was transitioned to the Servo-i™ in the BiVent mode to facilitate transport to obtain a computerized tomography scan (CT) after failing transition to conventional ventilator support. **Case Summary:** A 14 year old male with Hodgkin's lymphoma was being supported with HFOV. For reason of prognosis, the patient required a diagnostic CT necessitating a high-risk transport. It was not deemed possible to transfer the patient on HFOV and he failed an attempt to transition to PRVC secondary to high PIPs (58-60 cmH2O). Discussion ensued regarding the transition of the patient to the BiVent mode. During this transition blood gases and pulse oximetry were closely monitored to ensure that ventilatory deterioration did not occur. The patient's ventilatory status remained stable over the next 7 hours to allow time for transition and to account for CT availability. The only change that occurred during the transport to CT was an increase in the F_IO_2 to 1.0, otherwise the patient tolerated the transport without incident, and the diagnostic testing was accomplished. **Discussion:** Medical personnel are frequently faced with the decision of transporting patients requiring intense ventilatory support. This decision requires balancing the risk of transporting the patient versus the potential information obtained. In this case study, a detailed process was undertaken to ensure that the patient did not deteriorate after being transitioned to an alternative mode of ventilation. This exposed the patient to minimal risk and facilitated the transport for important diagnostic information. We found that ventilation in the BiVent mode allowed for this patient to be transitioned from HFOV for a short time period to accommodate transport for diagnostic testing without the risk of high ventilatory pressures seen with conventional ventilation.

Sponsored Research - None

Serial blood gases obtained pre- and post-transport.

Time	Vent	pH	PCO_2	PO_2	HCO_3^-	BE	O_2 Sat	F_IO_2
0428	HFOV	7.41	65.0	84.2	40.9	12.2	96.9	0.40
0927	BiVent	7.39	71.8	310.0	43.5	18.0	100.0	1.00
0947	BiVent	7.42	60.6	83.0	39.3	15.0	96.0	0.60
1040	BiVent	7.46	53.3	75.6	37.2	11.7	97.5	0.60
1123	BiVent	7.47	52.3	75.6	37.2	11.9	98.0	0.60
1315	BiVent	7.46	51.4	101.0	36.0	10.8	97.9	0.60
1524	BiVent (to CT-1635)	7.50	45.2	79.3	34.4	9.8	96.5	0.50
1750	BiVent (To PICU-1720)	7.50	43.2	232.0	33.5	9.2	100.0	1.00
1928	BiVent	7.51	43.1	62.1	34.3	9.8	94.8	0.60
2014	HFOV	7.44	52.7	59.3	35.6	9.8	92.2	0.40
2121	HFOV	7.36	66.7	74.4	36.6	9.1	94.6	0.40

1128547

LARGE AIRWAY OBSTRUCTION IN A PATIENT WITH AN UNDIAGNOSED DOUBLE AORTIC ARCH.

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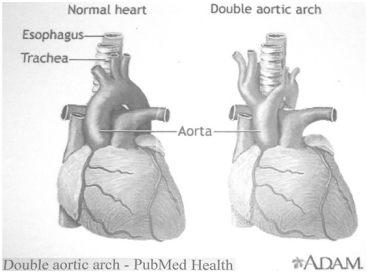
Introduction:Aortic arch anomalies account for only 30% of all congenital heart defects.Double aortic arch(DAA)is a relatively rare condition in which the aorta bifurcates into 2 vessels often resulting in a complete ring around the trachea(vascular ring).Varying degrees of airway compression can occur resulting in tracheomalacia and upper airway obstruction.Patients typically present with respiratory distress and stridor at birth but some may present later with a history of difficulty feeding and frequent respiratory infections.Definitive diagnosis is generally made by CT scan and repair of the defect is surgical.Here we present a patient(pt)with DAA and spirometry indicative of large airway obstruction with increased airway resistance. Case Summary:A 2 day old 37wk baby girl was admitted to our NICU for evaluation of stridor.She was noted to have respiratory distress,a high pitched cry,and stridor at the referring facility.An ECHO done prior to transfer was read to be WNL,as was a repeat ECHO done upon admission at our facility.She was initially managed on a HFNC,(High Flow Nasal Cannula)at 6LPM but progressed rapidly to NCPAP and then required intubation approximately 25hrs after admission due to increased WOB and ventilatory failure. The pts.flow-volume loops and pressure volume curves were indicative of a variable upper airway obstruction and her airway resistance was elevated at 263cmH2O/L/sec with a compliance of 7ml/cmH2O.Increasing the PEEP from 5cm to 10cm reduced the airway resistance to 108cmH2O/L/sec but there was minimal improvement in her spirometry.Further increase of the PEEP to 14cm produced near normal loops.Bronchoscopy demonstrated severe tracheomalacia with possible vascular compression of the airway.A CT scan confirmed the diagnosis of a DAA and she was subsequently taken to the OR for surgical repair.Post-operatively her flow-volume loops and pressure volume curves were dramatically improved and her airway resistance decreased to 70 cmH2O/L/sec.She was successfully extubated to room air 5 days after her repair and was discharged 8 days later. Conclusion:Higher than expected levels of PEEP may be needed in pts.with tracheomalacia.Ventilator spirometry can be valuable in pts.with large airway obstruction.While the definitive diagnosis of this pt.was made by CT scan,this case demonstrates the usefulness of flow volume loops, pressure volume curves,and airway resistance in detecting large airway obstruction in this patient.

Sponsored Research - None



1140756

THE USE OF CARBOGEN FOR APNEA TEST ON A PEDIATRIC PATIENT.

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Introduction: The use of carbogen for apnea testing during the declaration of brain death continues to grow in adult patient populations. However, to date, there are no documented cases in pediatric patients. The brain death declaration process includes a confirmatory presence of apnea. A persistent absence of clinical brain function must be demonstrated on two consecutive examinations separated in time, based on the patient's age or a single clinical exam with confirmatory testing, when appropriate. When confirming brain death on adults, there should be at least six hours between exams and at least twelve hours between exams on children > 12 months and <18 years of age. In cases of hypoxic-ischemic encephalopathy, a period of twenty-four hours should exist between exams. Case Summary: This is a 13 year old that was diagnosed with an anoxic injury due to a house fire and was being evaluated for brain death. The bedside assessment, performed by an attending physician, found there was enough clinical data to declare brain death. The carbogen method was selected for the apnea test due to high mean airway pressure @ 25 cm H2O and the desire to prevent derecruitment with the traditional method. Another advantage the carbogen method provides compared to traditional apnea tests is increased assessment of spontaneous effort. In the initial carbogen test the patient demonstrated spontaneous efforts within three minutes. Spontaneous effort was noted on the ventilator respiratory rate, waveforms, ETCO2 monitor and by assessing chest movement. The patient was then reassessed for apnea using the carbogen method two days later and was positive on the initial exam as well as the follow-up. The apnea test reached its goal at 6 minutes on both tests with no adverse effects. Discussion: The carbogen apnea test in this case study demonstrated the increased assessment tools for identifying spontaneous effort. It also continued to provide less chance of pulmonary or cardiac adverse effects and a predictable end point test compared to the standard apnea test.

Sponsored Research - None

	pH	PaCO2	PaO2	SPO2	HCO3	ETCO2	HR	BP	MODE	RESULTS
Test 1	7.45	38	457	98	23	36	137	170/90	APRV	Stopped in 3 minutes due to spontaneous effort
Test 2 Pre-apnea	7.36	42	433	98	23	35	86	97/48	APRV	POSITIVE Apnea test done in 6 minutes
Post-Apnea	7.19	68	418	98	25	62	98	105/47		
Test 2 Pre-Apnea	7.34	44	491	100%	23	38	106	109/55	APRV	Met ETCO2 goal in 6 minutes but ABG drawn at 8 minutes
Post-Apnea	7.17	72	485	98%	25	68	114	98/47		

1133345

AUTO-TRIGGERING AND OPTIMAL TRIGGER SENSITIVITY IN A PATIENT WITH A BIVENTRICULAR DEVICE.

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INTRODUCTION: A ventricular assist device (VAD) is a mechanical pump that is used to support heart function in patients with acute or chronic heart failure. These devices can be used in a biventricular or univentricular capacity. We report the case of a patient with a biventricular assist device (BiVAD), spontaneous respiratory drive and auto-triggering. CASE SUMMARY: A 2 year old 8kg female with restrictive cardiomyopathy presented to the cardiac ICU. The patient was intubated on day five of admission due to cardiopulmonary failure; respiratory support was maintained on PC-SIMV. Flow and pressure trigger were set to 1L/min and -2cmH2O respectively. No auto-triggering was observed. Heart function continued to deteriorate and on day fifteen a BiVAD was placed. The patient was not breathing and auto-triggering was detected almost immediately. In order to prevent auto-triggering, flow and pressure trigger sensitivities were set to 1.5L/min and -2.5cmH2O. As the patient recovered, chemical paralytics were lifted and the patient began making spontaneous respiratory efforts. It was technically difficult to set an optimal flow and pressure trigger in order to prevent auto-triggering while preventing dysynchrony and allowing spontaneous triggering. To determine the presence of spontaneous effort we turned the flow and pressure trigger to 10L/min and 10cmH2O respectively. If a negative deflection in pressure was associated with a positive deflection in flow (fig. 1), it was concluded that the patient was making spontaneous efforts. Upon making this determination, it was found that a flow trigger of 2L/min and pressure trigger 2.5cmH2O prevented auto-triggering but allowed adequate patient triggering (fig. 2).The patient was assessed for extubation and was extubated on day 26 to a nasal cannula. DISCUSSION: This case illustrates the impact of a BiVAD on the respiratory system and highlights the importance of discerning patient effort from auto-triggering. Because VADs are often implanted within the chest, it is possible for the pumping action of the VAD to cause changes in intrathoracic pressure. Although these changes are small, they may be enough to cause flow changes in the airway, leading to auto-triggering, hypocapnea, and respiratory alkalosis. The ability to specifically determine spontaneous respiratory efforts in this case ensured appropriate ventilator management in a patient at high risk for auto-triggering and patient-ventilator dysynchrony.

Sponsored Research - None

Figure 1.

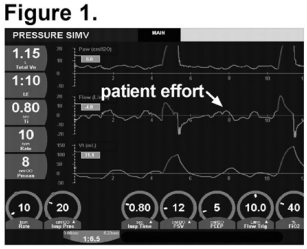
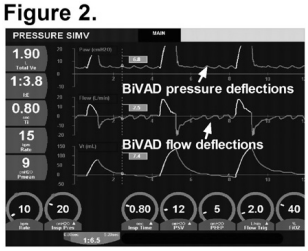


Figure 2.



1149919

LONG TERM EFFECTIVENESS OF CPAP TREATMENT WITH NASAL PILLOWS INTERFACE IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA SYNDROME.

Andrea Lanza[1], Sara Mariani[2], Maurizio Sommariva[2], Katrina Sambusida[1], Petra Subert[2], Paola Proserpio[1], Lino Nobili[1]; [1]Centre of Sleep Medicine, Niguarda Hospital, Milan, Italy; [2]Physical Therapy and Rehabilitation Centre, Niguarda Hospital, Milan, Italy

Backgrounds: Inadequate adherence to CPAP therapy is the major hurdle when facing with obstructive sleep apnea (OSA) treatment. Mask discomfort is a common reason for low adherence or stop using CPAP. Nowadays there are alternatives to standard nasal masks, such as nasal pillows. These are not recommended as first line interface and there are no data about their long term efficacy. Our purpose is to asses long term effectiveness and adherence to CPAP treatment in OSA patients choosing nasal pillows as initial therapeutic option. Patients and Methods: 70 consecutive CPAP naïve patients (pts) affected by moderate-to-severe OSA: 55 M; age 60.0±11.5; Body Mass Index (BMI) 31.8±6.2; Epworth Sleepiness Scale (ESS) score 9.6±5.3; Apnea-Hypopnea Index (AHI) 42.6±19.0/h; Oxygen Desaturation Index 40.4±19.3/h; Mean SpO2 91.8±3.1%. Pts underwent an ambulatory CPAP initiation performed by an experienced respiratory physiotherapist. Pts were allowed to self-select the type of nasal interface they preferred to start the therapy, choosing among 9 models of nasal-masks and 3 of nasal-pillows. Only in case of side effects due to nasal CPAP, pts switched to face mask (12 models available). Pts were encouraged to report side effects and ask for changing mask if needed. Outcomes were assessed after 5 days, 2 and 8 months. Results: 33 (47.1%) pts chose nasal-pillows, 16 (22.9%) standard nasal-mask, while 21 (30%) needed a face-mask. These three groups didn't differ in age, gender, BMI, and baseline AHI. Mean CPAP pressure was 11.2 with nasal-pillows, 11.7 with nasal and 11.9cmH2O with face-mask. Side effects were reported in 38 (54%) pts without differences in groups. 14 pts changed type of mask and 13 changed model maintaining the same type. During the course of the study 1 pt refused treatment during titration, 1 lost weight and stopped therapy and 5 dropped out. 63 patients reached the 8-month follow-up. Mean daily CPAP use was 5.1±1.7 with nasal-pillows, 5.4±1.1 with nasal and 5.2±1.6h/night with face-mask. In all groups AHI remained less than 5/h and ESS was significantly reduced. The preference for nasal-pillows was confirmed: 25 pts after 8 months were using nasal-pillows, 14 nasal and 19 face-mask. 5 pts alternated pillows with nasal or face-masks. Conclusions: nasal-pillows, the most frequently self-selected interface in our group patients, are well-tolerated and show equal long term effectiveness and objective adherence as standard nasal mask in the treatment of OSA.

Sponsored Research - None

1149159

GLOBAL CARE PROJECT'S IMPACT, FOCUSED ON COPD PATIENT, IMPLEMENTING RESPIRATORY CARE FROM ACUTE TO REHABILITATION AND HOME CARE PROGRAM.

Roberta De Carli, Francesco Tursi, Rossella Cavalli, Mariano Scozzafava, Paola Seminari, Antonia Zucca, Simona Sommariva, Sara Forlani; Respiratory Rehabilitation, Azienda Ospedaliera Provincia di Lodi, Sant'Angelo Lodigiano, Italy

BACKGROUND: Effective management of COPD includes pharmacological and non pharmacological therapies. The benefit of Pulmonary rehabilitation are evident in patient with moderate, severe and very severe COPD. To optimise the course of treatment in COPD patient our Hospital implemented, in june 2010, the Respiratory division by a Pulmonary rehabilitation division, which aim is to ensure respiratory assistance during every stage of COPD by accurate individual diagnostic e therapeutic course, centred on patient's active participation. In January started a Respiratory home care project, with the aim to create a net centred on patient, who is the target of un effective cooperation among acute, rehabilitation and territorial care team. OBJECTIVES: The aim of our work is to investigate the impact of a global care project, focused on COPD patient, implementing respiratory care, which started in acute period, by rehabilitation and home care. METHODS: 60 COPD patients, GOLD stadio II, III, and IV, with exclusion of cancer progressive disease, admitted in Pulmonary rehabilitation division between January 2010 and May 2011, participated in the study. We evaluated hospital and ambulatory admission between January 2008 and may 2010, and between June 2010 and May 2011, to prove the attended abatement of hospital admission due to opening of Rehabilitation activity. We dispense 60 questionnaire to evaluate COPD global control perception and care effectiveness by patients. RESULTS: We studied 12 female and 48 male, with COPD, 26 GOLD stadio IV, 21 GOLD stadio II, 13 GOLD stadio II. 23 used Oxygen, 12 used non invasive mechanical ventilation. In every group we founded a reduction of the hospital admission. We prove an increased in ambulatory admission and phone contact among patients and respiratory team. By the questionnaire we prove a significative increase of disease control by patient. CONCLUSIONS: Preliminary data, related on 12 months of Rehabilitation activity, and 6 months of Home respiratory care, despite require corroboration in middle and long period, attest to a positive impact of a global care respiratory project. The development of a respiratory net assure the patient's active participation, by favourite connection with doctor, respiratory therapist and nurse. We hope to implement our project by a remote patient control using telemedicine program.

Sponsored Research - None

1149982

COHERENCE OF COUNTING TALK TEST TO DETERMINE AN APPROPRIATE EXERCISE INTENSITY IN COPD PATIENTS WITH MODERATE AND SEVERE LEVEL.

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Background Aerobic exercise programs have been developed respecting accepted standards of fixed percentages of maximum heart rate (55% -90%) or in the provision of maximum oxygen consumption (40-85% of VO2R; ACSM, 1998). The use of maximum heart rate is a practical parameter but in COPD patients it may be influenced both by heart problems and drug treatments in progress. Aims To evaluate if the Counting Test Talk, (as a variation of the Talk Test method), compared to the maximal FC values, can be used to estimate an appropriate exercise intensity in patients with chronic obstructive pulmonary disease (COPD). Methods 11 subjects (7 M and 4 F), average age of 71.58 ± 7.2 years old, with COPD were examined; they underwent a cycle of re-training to strain for 8 weeks, 5 days a week. During this time a 30-minute workout was performed as follows: 4-5 minutes of warm-up until the set speed was reached (initially equal to '80% of 6'WT), at tree times, 5-15-25 minutes,Counting Test Talk values, heart rate (HR) and Borg RPE scale were recorded. These results were compared to the ones recorded, during rest time, when the subjects counted aloud (1-10000, 2-10000, etc.). The highest number reached was recorded as CTT during rest time. Results With the Pearson coefficient ($r \geq 0.95$) significant connections between CF and CTT were found. A similar result was observed between CTT and RPE, Borg scale ($r \geq 0.93$) and Borg scale RPE and HR ($r \geq 0.90$). Conclusions The results show that the CTT is a safe system, that can be self performed by the subject with COPD in order to control the training; when values equal 30-55% of the CTT during rest time, effort respects the ACSM recommendations concerning the intensity of the exercise, from moderate to strong level.

Sponsored Research - None

1143893

ADDITIONAL EFFECT OF ARM SUPPORTED EXERCIZE ADMINISTERED DURING WEEKEND IN ADDITION TO STANDARD HOSPITAL REHABILITATION PROGRAM IN COPD PATIENT.

Rossella Cavalli, Simona Sommariva, Roberta De Carli, Paola Seminari, Antonia Zucca, Mariano Scozzafava, Francesco Tursi, Sara Forlani; Respiratory Rehabilitation, Azienda Ospedaliera Provincia di Lodi, Sant'Angelo Lodigiano, Italy

BACKGROUND: Arm exercise training is recommended in the guidelines for pulmonary rehabilitation. The rehabilitation adherence is mostly related to self-determined motivation and the autonomy support training can increase it. METHODS: A randomized controlled clinical trial non double-blind, included 32 admitted patients in Pulmonary Rehabilitation between January 2010 and May 2011 with moderate and severe COPD. Were excluded patients with COPD exhacerbation or heart failure in place and also cancer patients. Patients were randomly assigned to an intervention (n=16) or control group (n=16). Active cycle of breathing techniques and leg exercise was used in both arms. The control group underwent arm supported training only on working days, whereas the intervention group also during hospitalization weekends, when the intervention group patients used arm cycle ergometry Daven Bike for 30 minutes in the morning and in the afternoon and a training diary. The global performance, were measured using 6MWT. Dyspnea during activity of daily living (ADL) and health-related quality of life (HRQL) were measured using the SGQR. MRC and BORG scale were used to grading the degree of a patient's breathlessness. For each patient were also calculated the multidimensional BODE index. RESULTS: Premising that there was not any baseline difference between both groups, in the intervention group was greater for total SGRQ score, SGRQ symptom score, SGRQ activity score or SGRQ impact score. at hospital discharge in increase of 6MWD at discharge. Both groups significantly improved 6MWD post-training in comparison with baseline, but no significant difference were observed. No significant difference between the two groups even the BORG and MRC score. CONCLUSIONS: We observe that patients who have conducted training of the upper limbs with supported exercise by Daven Bike continuously, obtained a more marked improvement of health-related quality of life compared with the control group. Despite the overall improvement of the tolerance to exercise at hospital discharge, there was no additional benefit resulting from four hours of additional arm work during hospitalization. We are expanding the series and we are also introducing the assessment of arm function and exercise capacity in the limbs using the 6-min pegboard and ring test (6PBRT).

Sponsored Research - None

1149858

EASE OF USE ASSESSMENT OF THE MODIFIED BORG AND MODIFIED MEDICAL RESEARCH COUNCIL DYSPNEA SCALES.

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Background: Dyspnea scales are used for the evaluation of breathlessness in patients with chronic obstructive pulmonary disease (COPD). These scales have the potential to provide quick, easy, and rapid information about a patient's subjective assessment of ease of breathing. Two of the most frequently used scales are the Modified Borg Scale (MBS) and the Modified Medical Research Council (MMRC) dyspnea scales. The primary purpose of this study is to compare different dyspnea scales to determine ease of use with COPD patients. We hypothesize that patients with COPD can more easily communicate their level of dyspnea with the MMRC than those patients who use the MBS. **Methods:** Patients between the ages of 21 to 95 years with a diagnosis of COPD and current pulmonary rehabilitation prescription were recruited. Study participants were instructed to document their level of breathlessness while at rest and two minutes after completing their first prescribed exercise program using the MBS and MMRC dyspnea scales. The dyspnea ratings for each scale before and after graded exercise and patient preferences for ease of use were recorded on the data gathering form/patient questionnaire. Descriptive statistics were used to report results. **Results:** Twenty-five patients, ages 54 to 92 years, mean, 71 years (±SD 9.0) consented to study participation. Most participants were male (56%). Forty-eighty percent of subjects reported that their dyspnea level increased after exercise when using the MBS. However, when using the MMRC scale, only 40% of those same subjects reported an increase in their dyspnea level. In terms of ease of use, 52% of subjects found the MMRC easier to use. However, the majority of patients, 52%, reported the MBS as a scale that more accurately describes their dyspnea level. **Conclusions:** The MMRC may be an easy tool to use, but patients with chronic disease do not perceive it accurately described their dyspnea level.

Sponsored Research - None

1144066

A STUDY TO ASSESS GAINS IN ACTIVITIES OF DAILY LIVING WITH RATE OF PERCEIVED EXERTION PRE AND POST REHABILITATION.

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Background: A study was conducted to assess the Ratings of Perceived Exertion (RPE) using the BORG Dyspnea Index (BDI) with selected goal Activities of Daily Living (ADLs) among patients enrolled in pulmonary rehabilitation (PR). Objective: To measure pre and post outcomes with the RPE associated with ADLs for patients enrolled in PR. A tool created for an earlier pilot study of 18 patients was used to provide a visual "ladder" depicting the BDI, providing both a visual and numerical means of communicating degree of dyspnea. Method: 154 patients joining the PR program from December 2009 to December 2010 were asked to select up to 5 goal ADLs from a list of 25. For each of the activities selected, they were asked to identify the degree of dyspnea experienced using the visual "ladder". These ratings were noted along with their personal goals for rehabilitation. The patients were reassessed for their RPE for the same activities after completion of the program. The rehabilitation session included aerobic exercise, strength training as well as education meeting three days a week for six weeks. The mean scores were calculated pre and post-rehabilitation and compared to scores of the SF-36(a quality of life questionnaire), education test as well as the 6-min walk. Of the patients, 59% had a diagnosis of COPD, 43% were males and the mean age was 67 years. Results: The tool proved to be very effective in a larger group as it did in the pilot study. There were statistically significant RPE changes between pre- and post-scores (mean =5.11 vs. 3.67, p<.013). The mean percentage of decrease in dyspnea was 28%. There were no statistically significant differences by gender. All pre and post scores showed statistical differences. There was a significant decrease in RPE post-rehabilitation by 39% in 28 patients that walked <800 feet pre-rehabilitation. Conclusion: We plan to continue to use this easy tool which provided relevant change and good feedback to patients post rehabilitation. The results showed significant gains made by those patients that were limited in their ADLs as assessed by the 6 minute walk distance.

Sponsored Research - None

1150386

THE DIFFERENT UNDERSTANDINGS OF THE ROLE IN PULMONARY HYGIENE/TOILET AMONGST RESPIRATORY THERAPY AND NURSING STAFF.

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Background: The terms "pulmonary hygiene" and "pulmonary toilet" are commonly used in the acute healthcare arena. Acute care practitioners routinely instruct bedside caregivers to perform these tasks to assist patients with their pulmonary status. We hypothesize that role delineations between Respiratory Therapy and Nursing are perplexing and thus lead to less compliance with treatment interventions. Methods: A perception survey was presented to Respiratory Therapy and Nursing staff on an Intermediate Care Medical-Surgical Unit. A specific subset of patients was utilized for study purposes and included all patients admitted to the Trauma Emergency Service. The staff perceptions were assessed to determine their interpretation of the statement "pulmonary hygiene" and "pulmonary toilet", what their specific role in the care of the patient consisted of and knowledge of current policy and procedure. Results: Respiratory Therapy staff participation (N=80) resulted in 54 (68%). Registered Nurses (N= 51) participation was 33 (65%). Respiratory Therapy staff had an overall better understanding of the physiological aspects that the various treatment measures provided to the patient. They were knowledgeable regarding facility policy and procedure regarding pulmonary care. Nursing staff had favorable results regarding policy and procedure but had mixed reviews regarding the "definition" of pulmonary hygiene/toilet and what adjunct to therapy was incorporated. The overall understandings of the Nursing staff were the basics of pulmonary therapy but did have difficulty when delineating their role from the Respiratory Therapist role. Conclusion: The implementation of the pulmonary care perceptions survey provided insight into the beliefs and understanding of both the Nursing and Respiratory Therapy staff. These insights have prompted us to develop a consistent understanding of common terminology utilized in the acute care setting to optimize treatment plans in regard to respiratory status. A joint collaborative approach will be implemented to draw from the strengths of each separate division to provide excellence in care.

Sponsored Research - None

1017556

INPATIENT REHABILITATION OUTCOMES FOLLOWING LOWER EXTREMITY FRACTURE IN PATIENTS WITH PNEUMONIA.

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OBJECTIVE: To assess the impact of pneumonia on inpatient rehabilitation outcomes in persons with lower extremity fracture. METHODS: Secondary data analysis of medical records obtained from 919 facilities that subscribed to the Uniform Data System for Medical Rehabilitation (UDSMR) in 2005-2007. The sample included 153,241 patients who received inpatient rehabilitation services following lower extremity fracture. We used multivariable linear and logistic regressions to evaluate the independent effects of pneumonia on numerical (length of stay and discharge functional status [FIM instrument]) and dichotomous (home discharge [yes / no]) outcomes, respectively. RESULTS: Pneumonia was listed as a comorbity for 4,265 patients (2.8%). Significant ($p<0.01$) differences were observed between patients with and without pneumonia in the following variables: age (79.7±11.0 vs. 77.9±12.1 years), duration to admission (7.8±5.0 vs. 5.9±3.9 days), total number of comorbidities (7.8±1.8 vs. 7.5±2.6), admission FIM (56.4±16.1 vs. 62.2±15.7), male (38.2% vs. 27.8%), and white race (89.8% vs. 87.5%). The multivariable models indicate that patients with pneumonia on average experienced longer lengths of stay (0.4 days), lower discharge functional status (1.8 FIM points), and lower odds of home discharge (19%) compared to patients with no reimbursement-eligible comorbidity. CONCLUSIONS: This study provides evidence that pneumonia adversely affects inpatient rehabilitation outcomes among persons with lower extremity fracture.

Sponsored Research - None

1076278

COMPREHENSIVE OUTPATIENT PULMONARY REHABILITATION AS AN ADJUNCT TO TREATMENT IN PATIENTS WITH PULMONARY HYPERTENSION: EVALUATING EFFECTS ON SIX MINUTE WALK DISTANCE, DYSPNEA AND QUALITY OF LIFE.

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Background- Pulmonary Hypertension is an insidious disease process resulting in progressive exertional dyspnea and chest pain among symptoms contributing to deterioration of quality of life. The progressive nature of the disease leads to the adoption of a largely sedentary lifestyle, creating a vicious cycle of inactivity, muscle deterioration, and worsening symptoms. While current guidelines primarily advocate for pharmacologic intervention, recent studies have indicated that a clinically supervised exercise regimen can have a significant effect on exercise tolerance, dyspnea, and subjective quality of life. However, no studies to date have evaluated the effects of a comprehensive pulmonary rehabilitation program (CPRP) that includes supervised exercise, respiratory training, patient education, and a psychosocial intervention. This study sought to explore the effects of a CPRP on the Six Minute Walk distance (6MWD), Borg scale dyspnea, and Short Form 36 quality of life (SF-36 QOL) measures in these patients pre- and post-pulmonary rehabilitation. Methods and Results- This study was a retrospective review of existing data from a single, out-patient pulmonary rehabilitation center. It included all patients with a diagnosis of pulmonary hypertension that were referred by their physicians for participation (n=8). Each patient received an individualized course of treatment including the aforementioned components tailored to their individual limitations and designed to maximize their physical performance and quality of life. Data was collected regarding outcome measures pre- and post-rehabilitation and evaluated statistically using Wilcoxon signed rank analysis. After completion of the program all three outcomes parameters demonstrated significant changes post- pulmonary rehabilitation: 6MWD (p=.018), Borg scale dyspnea (p=0.017), and SF-36 QOL (p=0.028). Conclusions- This study indicates that a comprehensive pulmonary rehabilitation program could be a valuable addition to treatment for patients with pulmonary hypertension. To fully determine its beneficial effects on exercise tolerance and quality of life, a larger group of subjects need to be evaluated.

Sponsored Research - None

Outcomes Measures Post Pulmonary Rehabilitation

Outcome	Z	α
Post- 6MWD	-2.366	0.018*
Post-Peak Dyspnea Score	-2.388	0.017*
Post-SF36	-2.201	0.028*

Wilcoxson signed rank analysis (p<0.05)

1114006

VALIDATION OF INPATIENT TESTING FOR SLEEP DISORDERED BREATHING IN HOSPITALIZED PATIENTS WITH HEART FAILURE.

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Background: Sleep disordered breathing (SDB) is present in more than half of patients with heart failure (HF). Screening and expedited treatment for SDB in patients with HF is currently not a standard of practice. SDB worsens HF and may produce decompensation of HF. Screening for SDB during HF hospitalizations may improve post-discharge outcomes. To date there are no studies evaluating inpatient approaches to SDB diagnosis. We evaluated the specificity and sensitivity of inpatient sleep studies compared to the reference standard test, polysomnography (PSG). Methods: Patients underwent a cardiorespiratory sleep test during their hospitalization. Patients had a validation PSG within one year of discharge. SDB was defined as an apnea hypopnea index (AHI) greater than 15 events per hour. Central sleep apnea (CSA) and obstructive sleep apnea (OSA) was defined as having SDB with more than 50% of central events or obstructive events respectively. The outpatient validation PSG was a standard sleep study performed in an accredited sleep laboratory. Results: A total of 193 patients underwent both the inpatient and outpatient sleep studies. Patients had the following characteristics: mean age 55 +/- 14 years, BMI 33 +/- 8 kg/cm2 and left ventricular ejection fraction 36 +/- 17%. Of these patients, 43 had CSA, 123 had OSA, and 27 had AHI<15 on the inpatient study. Of those with SDB on the inpatient study (n=166), 160 continued to have SDB on validation PSG. Of the 27 patients who were negative for SDB on the inpatient test, only 14 continued to have no SDB on PSG. The sensitivity of the inpatient test for SDB was 92% with a positive predictive value of 96%. The negative predictive value was only 51%. Conclusion: Inpatient testing for SDB in hospitalized HF patients is feasible and has a sufficient positive predictive value. However, inpatient testing is not recommended as a definite method to rule out SDB, as patients in this population have a higher risk of SDB in the course of their HF.

Sponsored Research - None

1149818

WEANING PROTOCOLS & RSBI: CREATING A FOUNDATION FOR SUCCESSFUL EXTUBATION OF MECHANICALLY VENTILATED PATIENTS.

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BACKGROUND: The Rapid Shallow Breathing Index (RSBI) is demonstrated to be a pertinent measurement to assess the potential for successful extubation of mechanically ventilated patients. Little has been written regarding how RSBI should be applied as a metric in a comprehensive weaning protocol. At UCSD Medical Center, RTs evaluate patients for spontaneous breathing trials (SBTs) within a physician-approved protocol. As part of that protocol patients are screened for exclusion criteria (i.e., PEEP >5, FiO2 >45%, and hemodynamic instability) prior to initiating a 1-2 minute CPAP/PS trial using 0-5 cmH2O of PEEP and 0-5 cmH2O of PS. A RSBI is then calculated to determine if the patient should continue on a minimal CPAP/PS SBT for 2 hours provided their RSBI is below 100. An RSBI above 100 results in the patient being placed on an augmented PS SBT (8-20 cmH2O) for 30 minutes with the intent to re-evaluate in 24 hours. Only patients who successfully complete a 2-hour SBT are evaluated for extubation. We intended to demonstrate that when used in conjunction with an established weaning protocol, RSBI is an effective tool to assess patients' ability to wean from mechanical ventilation. METHODS: Over a 90-day period we collected sprint data on 97 patients placed in the weaning protocol in our adult ICUs. RTs captured data at bedside on standardized weaning flowsheets and manually calculated the RSBI. The data was then assessed to determine RSBI values predictive for successful extubation, which was defined as remaining off the ventilator at least 24-hours after extubation. RESULTS: Data collected registered 89 instances of liberation from the ventilator. Only three patients failed. Our success rate measured 96.6%; RSBIs ranged from 16-100 with 78% of total successful extubations registering RSBIs 20-79. CONCLUSION: RSBI is an effective tool when taken in context of the whole methodology of weaning a patient. A protocol that creates guidelines for precise patient assessment and consistent SBTs sets the foundation for its value as our experience demonstrates.

Sponsored Research - None

1150140

MEASUREMENT OF SUB TIDAL VOLUME AND MEAN AIRWAY PRESSURE CHANGES AS A RESULT OF RESISTANCE CHANGES ON THE HIGH FREQUENCY PERCUSSIVE VENTILATOR. A BENCH STUDY.

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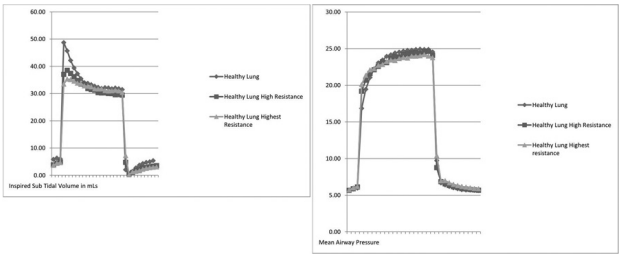
Introduction: The High Frequency Percussive Ventilator has been successfully used in the treatment of inhalation injury. It has been particularly successful with airway secretion mobilization. This device theoretically improves ventilation and oxygenation with a lung protective strategy. This bench study was designed to evaluate the changes in sub tidal volumes and Mean Airway Pressure with changes in airway resistance. Methods: The High Frequency Percussive Ventilator was setup with a PIP of 22 cm H2O, Demand PEEP of 2 cm H2O, Oscillatory PEEP= 6 cm H2O, I-Time 3.2 seconds, E-Time 2.9 seconds, phase 10 bpm; percussion rate = 340 bpm. The ASL 5000 was setup with a Residual Volume of .5 L, Compliance of 8 ml/ cm H2O, and Resistance at 120 cm H2O/L/sec, 80 cm H2O/L/sec, and 40 cm H2O/L/sec respectively. Results: Sub Tidal Volume measurements are given over a sample (34 sub tidal breaths) taken from a 1000 breath measurement. Conclusion: The High Frequency Percussive Ventilator demonstrated as much as a 46% Inspiratory sub Tidal Volume increase with a decrease in resistance from 120 H2O/L/sec to 40 H2O/L/sec. This also showed a 14% decrease in Mean Airway Pressure. The improvement in airway resistance leads to an increased tidal volume delivery and a minor decrease in Mean Airway Resistance. Further study of sub tidal volume delivered needs to be done to get a better understanding

Sponsored Research - None



1150234

CONTRIBUTION OF VENTILATORY MODE TO SUCCESSFUL LIBERATION FROM MECHANICAL VENTILATION IN PATIENTS WITH EXACERBATION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE.

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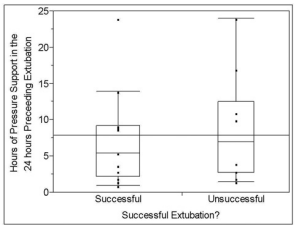
Background: Studies have suggested that assist-control mechanical ventilation may reduce respiratory muscle fatigue in patients with respiratory failure. Other studies have shown that assist-control ventilation may quickly lead to disuse atrophy of the diaphram, potentially complicating liberation from mechanical ventilation, supporting the use of pressure support ventilation around the time of extubation. No consensus has been reached as to which ventilatory strategy is best. Methods: To determine if there was a difference in the amount of time in pressure support ventilation between patients with successful and unsuccessful extubation, we carried out a single-center retrospective chart review of patients admitted an academic medical center from January 1st, 2010 to December 31st, 2010. Results: All patients who were admitted to the hospital with COPD and who required mechanical ventilation (n=192) were reviewed. We excluded patients that were not suspected of having an active COPD exacerbation, who were mechanically ventilated and managed at an outside ICU before transferring to our facility, were ventilated less than 12 hours, or had neuromuscular disease or other disease process, such as septic shock, that may prolong mechanical ventilation. Of the remaining patients (n= 31) we further excluded patients that underwent tracheostomy (n=3) and excluded from analysis, those that were DNR / DNI at the time of extubation (n=6). Of the remaining patients (n=22), 54.5% (n=12) of patients failed extubation. APACHE III scores in the successful extubation group (78.9 + 25.7) were similar to those in the unsuccessful group (80.1 + 25.2), as were Glascow Comma Scores (13.4 + 2.4) and (12.0 + 2.0) respectively. No significant difference was observed between successful and unsuccessful extubations in relation to the amount of time in pressure support ventilation in the 24 hours preceding extubation (P = .32, Wilcoxon rank sum test). Conclusions: We were unable to detect a significant difference in the amount of hours of pressure support ventilation preceding extubation between patients that had a successful extubation and those who did not. Our study shows that patients admitted for COPD exacerbation with no other major underlying conditions have a high rate of failed extubation. Further studies are needed to determine potential contributions of ventilatory mode on failed extubations in patients with COPD exacerbations.

Sponsored Research - None



1150467

HIGH FREQUENCY OSCILLATORY VENTILATION: ALGORITHMIC APPLICATION IMPROVES APPLICATION, MONITORING AND IMPLEMENTATION.

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Introduction: The popularity of High Frequency Oscillatory Ventilation (HFOV) increased after the influenza pandemic. Many hospitals acquired and implemented its use. However, the use of HFOV is far less frequent than conventional mechanical ventilation. This can result in errors on its application due to lack of training and practice. Further, there is practice variation in how to titrate HFOV and achieve the goals of ventilation and/or oxygenation. We created an algorithm to standardize the application of HFOV in an academic institution that started a HFOV program. We present the result of the first cases. Methods: A protocol was developed based on literature, other centers practice/ protocols and the authors experience. The protocol gives rules and goals from which two algorithms were constructed for management of ventilation and oxygenation. The algorithm and the protocol were placed at the bedside. The respiratory therapist (RT) had been trained on the use of the device, some had experience with pediatric HFOV, but had never applied it in adult population. At shift change, the RT, nurse, resident and the critical care fellow (all practically neophytes in adult HFOV) had a brief bedside training. We obtained the data on gas exchange, ventilator settings and changes on the initial patients placed on HFOV with this protocol. We evaluated time on HFOV, time at ventilation goals and protocol compliance. Results: Table 1 illustrates the time on ventilation and protocol compliance as percent of time. Compliance was achieved in majority of the time on HFOV. Most of the protocol non-compliance occurred during the initial hours of shift change with a new RT and during night shift. The non-compliance, however did not necessarily occur in the early period after the initiation of HFOV, and did not occur more so with either the ventilation algorithm or the oxygenation algorithm. The respiratory therapists reported ease of use of HFOV with an algorithm-based protocol approach. Conclusion: The two cases illustrate the convenience of using an algorithm-based protocol in a neophyte population to achieve goals set by a HFOV protocol. The standardized algorithmic approach allows recognition of opportunities to improve and sources of error and non-compliance.

Sponsored Research - None

Table 1. HFOV Algorithm compliance

Patient	Total Duration HFOV (hr)	Total protocol compliance (%time)	Oxygenation algorithm compliance (% time)	Ventilation algorithm compliance (% time)	Non-compliance oxygenation algorithm Night shift (% time)	Non-compliance Ventilation algorithm Night shift (% time)
1	39	69	80	62	62	53
2	87	68	88	98	55	75

1150553

PROCESS CHANGE IN A TRAUMA ICU RESULTS IN INCREASE SATISFACTION FOR RESPIRATORY THERAPIST/REGISTERED NURSE COLLABORATION.

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BACKGROUND The Select Trauma Intensive Care Unit at the University of Maryland Shock Trauma Center recently implemented an electronic input/output charting system (I-View®). I-View® is a device interface (e.g. patient monitor, mechanical ventilator, etc.) that allows the bedside clinician to upload data electronically that would normally be captured on a paper flow sheet. In the past both the respiratory therapist (RT) and registered nurse (RN) would document ventilator setting on their respected flow sheet. Prior to implementing it was decided that the RT would be solely responsible for the uploading of mechanical ventilator data which raised concerns about the RT/RN collaboration in the ICU. METHOD Prior to implementing I-View a collaboration/satisfaction survey was developed. Those who participated in the survey were asked to rate "how beneficial is the RT/RN collaboration to patient care" and "how satisfied are you currently with the RT/RN collaboration". A Likerd scale ranging from 0 to 3 (0 = Not Beneficial / Satisfied, 1 = Somewhat Beneficial / Satisfied, 2 = Beneficial / Satisfied, 3 = Very Beneficial / Very Satisfied) was used to rate clinician responses. RESULTS Pre implementation survey showed that 66.7% felt that RT/RN collaboration was very beneficial to patient care but only 12.5% were currently very satisfied with the collaboration. Six months post implementation the same survey was conducted revealing a significant increase with both the very beneficial (88.5%) and very satisfied (42.3%) categories. Both the pre and post survey had a 0% response of not beneficial, not satisfied. CONCLUSIONS In all cases, the respondents felt that post-practice change not only was the idea of RT/RN collaboration important, but that the actual collaboration between the healthcare providers had improved. Though the system is still in it's infancy, I-View has shown its' worth in job satisfaction and accuracy.

Sponsored Research - None

How beneficial is the RT/RN Collaboration to patient care/How satisfied are you currently with the RT/RN collaboration

	Very Beneficial	Beneficial	Somewhat Beneficial	Not Beneficial	Rating Average	Response Count
Pre	66.7% (16)	25% (6)	8.3% (2)	0%	2.63	24
Post	88.5% (23)	3.8% (1)	7.7% (2)	0%	2.81	26
Pre	12.5% (3)	58.3% (14)	29.2% (7)	0%	1.83	24
Post	42.3% (11)	46.2% (12)	11.5% (3)	o%	2.31	26

1148284

PROSPECTIVE COMPARISON OF THE INTEGRATED PULMONARY INDEX (IPI™) TO RESULTS FROM SPONTANEOUS BREATHING TRIALS (SBT).

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Background: Currently, the best predictors of readiness to wean are the RSBI in conjunction with an SBT. However, some patients pass the weaning evaluation, yet fail removal from mechanical ventilatory support. The IPI is an index of respiratory status derived from capnography and pulse oximetry data (PETCO2, RR, SPO2, PR). This study evaluated the relationship of IPI with results from standard weaning evaluations (RSBI + SBT). Methods: This IRB approved, prospective, observational trial was performed on mechanically ventilated patients. All patients received standard of care, no intervention was performed for the purpose of this study. All subjects had an RSBI evaluation, followed by an SBT, per hospital protocol. IPI was continuously recorded immediately before and during the SBT. Clinicians were blinded to IPI. At the end of each SBT, the staff RT determined the outcome of the SBT (pass or fail). The recorded IPI data was averaged over the first 30 minutes of the SBT, and analyzed to determine the ability of IPI to predict weaning evaluation outcome. Statistical analysis was performed using SAS 9.2, and included two-sample t-tests and ROC analysis. Results: Seventeen subjects (9 males) were studied. Results from 23 SBTs were evaluated, with 13 subjects performing a single SBT and 4 subjects having multiple SBTs. Nineteen SBTs were performed using pressure support and 4 using a T-piece. Of the 23 SBTs, 14 were rated by the staff RT as passing and 9 failing. Of those SBTs classified as failing, mean IPI was lower (7.4 ± 1.6) than those passing (8.8 ± 1.1) $p < 0.05$. ROC analysis revealed a sensitivity of 0.93 and a specificity of 0.56 for a cutpoint of 7.5, with the area under the ROC curve of 0.73. Upon further analysis, the investigators felt that 1 passing SBT could have been rated failing (RT decision was over-ridden by MD) and 2 failing SBTs could have been rated as passing (1 passed SBT but failed ETT leak test, 1 had RR only transiently in the 30's). With these classification changes, IPI was 6.7 ± 1.3 for failing SBTs and 9.0 ± 0.7 for passing SBTs, $p < 0.01$. Sensitivity was 1.0, specificity was 0.75, and the area under the ROC curve was 0.89 for the same cutpoint of 7.5. Conclusions: IPI demonstrates reasonable agreement with clinical evaluation of SBTs by RT staff and may be useful in predicting readiness to discontinue mechanical ventilation. Further study is needed to more clearly define the value of IPI during the weaning process.

Sponsored Research - Educational Grant from Oridion Capnography, Inc

1149161

ADAPTIVE SUPPORT VENTILATION REDUCES VENTILATOR DURATION IN A LARGE SURGICAL INTENSIVE CARE UNIT.

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Background:Adaptive Support Ventilation (ASV) is a closed loop mode that automatically adjusts ventilator rate and pressure support to provide the patient with the combination of rate and tidal volume that result in the least work of breathing. The mode adjust support based on patient's inspiratory efforts and minute ventilation. ASV is a feature available on the Hamilton Medical G-5 ventilator. Our institution implemented a new fleet of Hamilton G5 ventilators and had the opportunity to evaluate the question whether ASV had an impact on ventilator duration. Methods:This was an observational study comparing ventilator duration in a large Surgical ICU before and after implementation of ASV. Previously Covidien PB 840 and Carefusion Avea ventilators were utilized. Ventilator management with the 840s and Aveas included aggressive daily spontaneous breathing trials. ASV was introduced in March 2011. In additional to automatic rate and VT adjustments, ASV utilizes a ventilation monitor display with user configurable parameters. Our configuration for extubation criteria includes FiO2 <.60, inspiratory pressure <10cm, PEEP <8cm, RSBI <105, spontaneous breathing >75%, minute ventilation <14.2L . When a patient falls within the parameters,a timing window is displayed indicating patient readiness for extubation. The highly visible clock continues to be displayed so long as the patient remains within the acceptable parameters. Analysis utilizing measures of central tendency in univariate analysis was performed to determine arithmetic mean and normal distribution. A comparison of mean ventilator duration for the 3 month period prior to ASV implementation and the 3 months after implementation was performed. The patient population and other ventilator management strategies remained unchanged. Results:150 patients were ventilated in the baseline period. Mean ventilation duration was 84.80 hours. 141 patients were ventilated in the 3 month period after implementation of ASV. The mean ventilation duration decreased to 70.23 hours. The decrease in arithmetic mean ventilator duration was 14.57 hours or 16.6%. Conclusions:Daily spontaneous breathing trials provide a structured process to assist extubation decisions but sometimes may delay extubation until the following day. Automatic real time adjustments provided by ASV closed loop ventilation and a visual indicator of patient status has reduced ventilator duration in the Surgical Intensive Care Unit at our institution.

Sponsored Research - None

1147924

SOURCE GAS USE FOR TWENTY CRITICAL CARE VENTILATORS ON SIX DIFFERENT SETTINGS.

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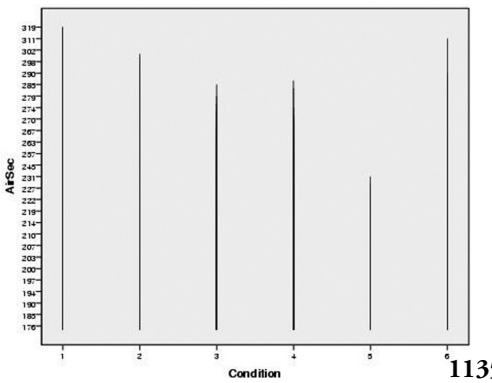
BACKGROUND: To save time and enhance safety, transport ventilators have given way to critical care ventilators for a large proportion of in-hospital transportation of patients requiring mechanical ventilation. Gas consumption of these ventilators varies widely, depending on the mode and individual settings. OBJECTIVE: We measured the gas use of critical care ventilators from department inventory during 6 conditions of common ventilator settings to determine how the modes and settings effect the time respiratory therapists have to transport without having to change tanks. We hypothesized that certain ventilator settings will significantly use more source gas than others. METHOD: One at a time, we connected 20 ventilators to oxygen and air E tanks. Each cylinder regulator had a digital display of tank pressure. We ran each ventilator until the pressure in each tank dropped exactly 100 psi. All FIO2s were 0.50 so air pressure dropped the quickest. For each of the 20 ventilators we had four different modes and six different ventilator settings. The 6 test conditions were 1) SIMV volume targeted pressure control (VTPC), 5 PEEP, 5 pressure support (PS); 2) SIMV-VTPC, 15 PEEP, 10 PS; 3) SIMV-VC, 15 PEEP, 10 PS; 4) SIMV-volume control (VC), 5 PEEP, 5 PS; 5) A/C-PC, 5 PEEP and 6) A/C-VC, 5 PEEP. We recorded the time in seconds for 100 psi drop in oxygen and air pressure for a total of 120 times. RESULTS: Seconds of air consumption required to drop the pressure 100 psi based on condition were: 1) 319, 6) 311, 2) 301, 4) 286, 3) 285 and 5) 231. Condition (5) A/C-PC mode with 5 PEEP consumed both air and O2 source gas faster than the other 3 modes or conditions (shortest time for 100 psi drop in pressure). CONCLUSION: Both brands of critical care ventilators used in this study consumed gas faster in A/C-PC mode. A/C-PC mode may not be the best choice for prolonged intrahospital transports.

Sponsored Research - None



1135631

DECREASING ICU LOS, VAP RATES, AND MECHANICAL VENTILATOR DAYS USING AN ELECTRONIC STANDARDIZED WEAN SCREENING TOOL BY THE RESPIRATORY THERAPIST.

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PURPOSE: To determine the efficacy of an electronic screening tool using standardized ventilator protocols, to better identify patients that can be weaned from mechanical ventilation to decrease mechanical ventilator days in a tertiary care center intensive care unit. METHODS: Every morning between 0500 and 0600 patients being mechanically ventilated that met nursing criteria received a sedation vacation so that the patient's ability to be weaned from the ventilator can be assessed. In order to identify patients that can be weaned from mechanical ventilation respiratory therapists perform sedation, respiratory, and hemodynamic assessments, as well as check for a leak around the ETT cuff, once the patients sedation has been titrated appropriately. If the patient meets the criteria identified within the wean screen the patient is then weaned by the dayshift therapist on a spontaneous breathing trial of PS 5cmH2O and a Peep of 5cmH2O for two hours. If the patient tolerates the PS trial and meets further extubation criteria they are then extubated by nursing and respiratory therapy. Those that do not tolerate PS trial are placed back on the previous mode of ventilation. RESULTS: Mechanical ventilator days/1000 patient days was 630.1 before and 585.9 post process. A decrease of 44.2 mechanical ventilator days per 1000 ICU days was observed. CONCLUSION: During the first three months of implementation we observed a decrease in mechanical ventilator days. CLINICAL IMPLICATIONS: When used properly a standardize tool to aid in the identification of patients that may be weaned from mechanical ventilation when used with ventilator protocols can decrease mechanical ventilator days per 1000 ICU days. An unexpected benefit was an increase in overall job satisfaction among Respiratory Therapists, as they felt their input in interdisciplinary team rounds and bedside rounds was more valued. Having a standardized tool in place also aided new ICU therapists in decision making as well.

Sponsored Research - None

1125240

PATIENTS' OPINIONS ABOUT SYMPTOMS WITH AND WITHOUT HUMIDIFICATION DURING NONINVASIVE POSITIVE PRESSURE VENTILATION.

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Background: Noninvasive positive pressure ventilation (NPPV) delivers air at a high flow, which is associated with airway mucosal drying and impaired upper airway function. Humidification and warming of the inspired gases may be required to prevent undesirable effects of cool, dry air on the upper airway mucosa during NPPV. In this study, patients receiving NPPV were asked to quantify symptoms associated with NPPV. We hypothesized that there would be a significant difference in patients' opinions about breathing dry versus humidified air during NPPV. Methods: This study used an unpaired two-group design, using a convenience sample from two hospitals. Patients who were receiving NPPV with or without heated humidification for acute hypercapnic respiratory failure were asked about symptoms such as dry nose/mouth, runny nose, watery eyes, nasal congestion, etc. using a previously described 12 item questionnaire, within 48 hours of the start of ventilation. Patients were asked to reply, "not at all," "somewhat," or "a lot," about their symptoms. All patients were ventilated using the BiPAP Vision ventilator. We followed-up to determine the eventual outcome of NPPV: intubation versus liberation from NPPV. Data analysis from the questionnaire combined the answers somewhat and a lot and compared the result to not at all, using a two-tailed Fisher's Exact test. P was set at .05. Results: Ten patients without humidification and four patients with humidification were included in the study, all of whom were using an oral/nasal mask. There were no differences in the response to the questionnaire between groups with the exception of more patients in the non-humidified group expressing they had dry mouth (p=.005). All patients were successfully liberated from NPPV. None required intubation. Conclusions: In this cohort, absence of humidification was associated with only dry mouth. None of the patients required intubation subsequent to NPPV.

Sponsored Research - None

1131439

PERFORMANCE OF FOUR VENTILATOR CIRCUITS, A BENCH STUDY.

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BACKGROUND Ventilator circuit compressibility and compliance varies between circuits. These values create compressible volume loss and may adversely affect ventilator performance. METHODS & MATERIALS The four ventilator circuits used were: Airlife Volume Ventilator, Fisher & Paykel Evaqua, Maquet non-compliant and a heated non-complaint circuit. The two ventilators used were: Maquet Servo-I and Drager Evita XL. We measured compressibility by setting tidal volume to 200 mL, flow of 40LPM, turning the high pressure alarm to max, occluding the end of the patient wye and then cycling the ventilator. Compressibility = Volume/pressure. We then used the drager circuit test for compliance and resistance values. The circuits were attached to a maquet rubber test lung and run through a series of test. We also added a five pound weight to the test lung to simulate decreased lung compliance. CONCLUSION The two non-compliant circuits had better compressibility and circuit compliance values however the change in volume delivered was not clinically significant. The ventilator circuits did not affect the time constants, work of breathing or measured compliance values.The changes in inspiratory and expiratory airway resistance were nominal. The authors of this abstract believe further research is needed to prove whether ventilator circuit compliance affects patient outcomes.

Sponsored Research - None

	Airlife	F&P	Maquet	Heated Non-compliant
Time Constant	0.72	0.70	0.70	0.66
VC 500 comp on	504/482	505/490	503/486	505/487
VC 500 comp off	500/478	499/480	499/475	499/475
Compressibility	2.06	2.04	1.94	1.83
Work of Breathing	1.37	1.39	1.47	1.41
Cdyn	21	21	20	21
Cstat	26	27	27	27
Circuit Compliance	1.9	1.8	0.7	1.0
Raw - Insp	0	.13	0	.24
Raw - Exp	0	.33	.21	.54
Drager PCV 30/5	649/651	666/664	633/633	646/647
Drager + 5 lbs	306/311	303/309	320/324	298/296
Servo PCV 30/5	694/648	664/617	677/634	674/630
Servo + 5 lbs	308/293	305/301	312/294	325/306

1128525

ASSESSMENT OF VARIABILITY IN RECRUITMENT MANEUVER DELIVERY AND UNDERSTANDING.

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Background: While no current guidelines exist regarding style and technique of recruitment maneuvers (RM), an unrecruited lung is at risk of atelectrauma, requires a higher fraction of inspired oxygen (FIO2) as well as higher ventilating pressures which in turn, increases the risk of barotrauma, chance of infection, decreased surfactant production and repeated inflammatory mediator response. This inflammatory response and the release of cytokines may to contribute to Multi System Organ Failure (MSOF) and possibly be fatal. Having observed a variety and inconsistencies of RM, a survey was conducted to determine RM delivery preferences and comprehension. Method: An email survey was sent to all staff therapists. Critical Care Medicine (CCM) physicians and Registered Nurses (RN) were surveyed individually with the following questions. 1. I would like to know if you were going to recruit a patient's lungs and had the freedom to perform it the way YOU prefer, would you: 2. Recruit with a Mapleson (Anesthesia) Bag? 3. Recruit with the vent? 4. For either one, is there anything specific or a system you prefer to follow? (i.e. increase/hold PEEP, PIP or Vt, add inspiratory hold, increase I time…etc?) 5. Is there a specific criterion you monitor or evaluate to determine that the lung has been recruited? Results: Of 58 staff members responding to the RM survey, 79% preferred to use a Mapleson (Anesthesia) Bag and eleven different styles of bagging described, 10% Preferred to wait for RT recommendations, 3% Preferred to use the Ventilator, 7% Preferred other methods: (CPT & suction). A variety of descriptions, length of time used/repeated, pressures (PIP & PEEP) and the values monitored to determine a successful RM were reported. Only 1 respondent mentioned the necessity of clamping the endotracheal tube (ETT) before transferring back to the ventilator and only 1 mentioned SpO2 was the deciding factor of a successful RM. Conclusion: The techniques used to deliver RMs differed greatly among staff members. It is suggested to expand this as a quality improvement project to all CCM physicians, RTs and RNs with a listing and description of Evidence Based Medicine (EBM) suggested styles of RM and information regarding possible benefits and risks to the patient. Additionally, development of a RM protocol may decrease the variances in RM style and possibly decrease the risk of injury to the patient.

Sponsored Research - None

Recruitment Maneuver Preferences	Respiratory Therapists	Registered Nurses	CCM Physicians
Bag/Lavage/Sx	0%	16%	0%
Bag w/Larger Volumes & Higher PEEP	11%	16%	0%
Bag w/ Increased PIPx10sec & Increased RR	0%	3%	0%
Bag & hold Increased PIP for sustained Ti	5%	6%	0%
Bag & Hold 30 CmH20 x 30 Sec.	16%	3%	38%
Bag & Hold Increased PIP/PEEP & clamp ETT	11%	0%	38%
Bag w/increased RR & PEEP	5%	0%	13%
Bag & Sx with Increased RR: monitor SpO2	0%	13%	0%
Bag w/ Longer Ti & higher PEEP	16%	3%	13%
Bag/Suction and recruit w/Dr's Orders	0%	3%	0%
Bag w/ PIP & PEEP	26%	3%	0%
CPT & Sx	0%	13%	13%
Vent: Open Lung; Increase PEEP/monitor VCO2,BP, SpO2	11%	0%	0%
Wait for RT	0%	19%	0%
Total Respondents	**19**	**31**	**8**

1132619

VOLUME DELIVERY AND MEASUREMENT CHARACTERISTICS OF THE TRILOGY 202 PORTABLE VENTILATOR.

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Introduction: The Trilogy 202 (Philips-Respironics, Murrysville, PA) allows ventilation with both active and passive circuit types. In Volume modes (VC), the Trilogy behaves differently with each circuit. We designed a bench study to evaluate volume delivery and measurement accuracy of the Trilogy 202 in VC at different lung mechanics and leaks. Methods: The Trilogy 202 was used to ventilate a TTL test lung (Michigan Instruments, MI) in A/C with both a passive and active circuit. Ventilator settings: rate- 12, FiO2 .21, PEEP 5 cmH2O, and a Ramp flow pattern. Resistance of 5 cmH2O/L/Sec was used in all test conditions. VT/Ti combinations of 250ml @ 0.6s, and 500 ml @ 0.9s were set with Compliance of 20, 40, and 60 ml/cmH2O. VT of 50ml @ 0.3s was used with C of 20 only. Measurements were made at six leak rates created with a series of stopcocks. Delivered VT (Del-VT) was measured at the proximal airway with an NM3 Monitor (Philips, Carlsbad, CA). VTE and leak rate were recorded from the Trilogy display for 6 breaths. Del-VT was compared with set VT and the Trilogy VTE. Results: With the passive circuit, Del-VT was within 10% of set VT and the Trilogy VTE was within 10% of Del-VT at all zero leak conditions. At 50ml VT, Del-VT was < 85% of set VT at leak 1 and 5; and was >30% of set VT at leak 2. VTE displayed on the Trilogy was within 10% of Del-VT at every leak. At 250ml VT, Del-VT was < 88% of set VT at leak 4 and 5 at each C. At leak 5 and C-60, the Trilogy VTE was < 88% of Del-VT and all other VTE measurements were within 10% of Del-VT . At 500ml VT, Del-VT was < 73% of set in all leak 5 conditions and the VTE display was < 90% of Del-VT in leak 5 @ C-60 and C-40 and in leak 4 @ C-60. With the active circuit, the Del-VT was within 10% of set VT for 50 and 250ml settings, as was the VTE display within 10% of Del-VT . At 500ml VT, Del-VT was <88% of set and displayed VTE was >14% of the Del-VT. Del-VT was < set VT by 27% at leak1, 54% at leak 2, and 66% at leak 3. Discussion: In VC, the Trilogy compensates for leaks < 30 L/min with passive circuit use and delivers increased VT compared to the active circuit. Measurement of VTE on the Trilogy accurately reflects Del-VT when leak is < 30 L/min.

Sponsored Research - None

1149055

GOING WITH THE FLOW: FACTORS THAT AFFECT FIO2 WHILE USING LOW PRESSURE O2 WITH THE PULMONETICS LTV 1200 VENTILATOR.

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1. Background: For home care ventilators such as the Pulmonetics LTV, supplemental O2 can be provided using a low pressure source with a fixed flow rate. It is commonly understood that the effective FiO2 is mainly dependent on the "input" O2 flow rate relative to the patient's minute ventilation. Operator manual nomograms help estimate the relationship. We wanted characterize this relationship more precisely and in this process, discovered that other variables also play a role. 2. Method: We used an LTV 1200 ventilator in volume mode connected to a test lung with an O2 analyzer on the inspiratory limb. Input O2 flows were varied between 0 and 16 l.p.m., with minute volumes from 1.5 to 9.0 l.p.m., and inspiratory times (IT) from 0.3 to 0.6 seconds. Tidal volumes (TV) varied from 50 to 400 mL and constrained IT. Measurements of FiO2 were made with the O2 conserve feature both on and off (bias flow is shut off with O2 conserve turned on). 3. Results: The relationship between the fixed liter flow and FiO2 with O2 conserve off is similar to that found in the operator's manual. However the relationship changes dramatically when O2 conserve is on. For minute volumes ranging from 0.75 to 9.0 l.p.m., using O2 conserve, the input O2 flows required to achieve an FiO2 of 0.5 were 0.5 to 6.0 l.p.m. With O2 conserve off, the required O2 input flows ranged from 4.0 to 7.0 l.p.m. Each increase in input O2 flow causes a larger increase in FiO2 when O2 conserve is used. Longer IT results in a slightly higher FiO2. For a given minute ventilation with O2 conserve off, a smaller tidal volume results in a slightly higher FiO2. With O2 conserve on, the relationship between input O2 flow and FiO2 is more complex. 4. Conclusions: We speculate that with O2 conserve off, the LTV bias flow of 10 l.p.m. was a significant factor influencing FiO2 especially for minute volumes less than 10 l.p.m. With O2 conserve on, changes in fixed liter flow had a much more dramatic effect on FiO2. The increase in FiO2 with increased IT or smaller tidal volumes is most likely due to the lower flow rate required to achieve the prescribed tidal volume.

Sponsored Research - None

1149501

DO TIDAL VOLUMES AND FLOW RATES AFFECT RELATIVE HUMIDITY AND TEMPERATURE?

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Background: Humidity is a vital part of the respiratory system and thus an important aspect of proper mechanical ventilation. When the upper airway is bypassed via ETT or tracheotomy then a humidity deficit may be created leading to complications with retained secretions. The purpose of this bench study is to determine if either tidal volume or flow rate will affect the Hudson ChonchaTherm Neptune humidifier (Durham, NC) or the Fisher Paykel MR850 humidifier's (Irvine, CA) ability to deliver heated, humidified gas during mechanical ventilation. Methods: Each humidifier was placed in-line with a dual heated wire adult ventilator circuit. A thermo-hydrometer was placed in-line using a 22mm t-piece adapter immediately after the distal portion of the heated wire, just prior to the patient wye on the inspiratory side and after the inline suction device before the endotracheal tube (ETT). Relative humidity and temperature were recorded at both locations at various tidal volumes and flow rates. Results: It was seen that as tidal volume and flow rates increase there was a significant increase in temperature at the start of the ETT. Tidal volumes of 400 were found to have the highest mean relative humidity (98.41%) at the start of the ETT compared to 95.84% for tidal volumes of 600, 96.81% for tidal volumes of 800, and 96.51% for tidal volumes of 1230, respectively. The relative humidity prior to the start of the ETT was greatest at the flow rate of 40lpm (97.56%) compared to flows of 60lpm (95.59%) and 80lpm (96.59%). When relative humidity and temperature were converted to absolute humidity there were no significant clinical differences with changes in tidal volume and flow (Table 1). Conclusion: Neither humidifier tested outperformed the other. Although relative humidity, temperature, and thus absolute humidity varied with tidal volume and flow, both humidifiers were able to meet the minimum humidification (30 mgH20/L) and temperature (30°C) recommendations of the AARC clinical practice guidelines for humidification during mechanical ventilation. Sponsored Research- None

Sponsored Research - None

Mean Absolute Humidity (mgH20/L)

	1	2	3	4	5	6	7
HUD- A	36.25	39.46	38.70	36.14	40.67	38.73	43.04
FP- A	38.85	39.63	38.97	39.27	38.06	38.25	35.34
HUD- B	34.10	34.28	32.94	35.56	33.26	32.17	32.05
FP- A	38.54	35.10	36.00	35.14	32.93	31.94	30.13
KEY	Ventilator Settings (AC/VC)					KEY	Humidifier Type
1	Vt 1230, flow 80, It 1.0, rate 10					HUD	Hudson RCI
2	Vt 800, flow 80, It 1.0, rate 10					FP	Fisher-Paykel
3	Vt 800, flow 60, It 1.0, rate 10						
4	Vt 800, flow 40, It 1.3, rate 10					KEY	Circuit Location
5	Vt 600, flow 60, It 1.0, rate 10					A	Before Wye
6	Vt 600, flow 40, It 1.0, rate 10					B	Start of ETT
7	Vt 400, flow 40, It 1.0, rate 10						

1150480

EVALUATION OF PEAK INSPIRATORY PRESSURE AND INHALED TIDAL VOLUME DURING PC-PSV WITH VARIABLE PRESSURE SUPPORT ON THE DRÄGER V500.

Ross Armstrong[1], David Strong[1], Ridwan Awad[2], Lonny Ashworth[2]; [1]St. Luke's Regional Medical Center, Boise, ID; [2]Boise State University, Boise, ID

Background: Variable pressure support (VariablePS) is a new option available on the Dräger V500. VariablePS varies the pressure support at a fixed percentage determined by the clinician, allowing a spontaneously breathing patient the ability to retain a normal, spontaneous tidal breathing pattern, which is highly variable with differing volumes, flows, and inspiratory times. An increasing amount of literature is supporting modes of ventilation, both assisted and mandatory, that allows for variability of the normal breathing pattern.1 The purpose of this study is to determine the variability of the Peak Inspiratory Pressures (PIP) and associated inhaled tidal volumes. Method: The Hans Rudolph HR 1101 Electronic Lung Simulator was interfaced, using a size 7.5 ETT, to the Dräger V500. Settings on the HR 1101 were: Resistance 12 cm H2O/L/sec, Compliance 30 mL/cm H2O, Rate 15/minute, Amplitude 5, Load Effort Normal. The Dräger V500 was placed in PCV-PS with VariablePS active, PEEP of 5 cm H2O, Tube Compensation off, Slope 0.20 seconds, Inspiratory Flow Termination 25%, Pressure Support of 10, 15 and 20 cm H2O, Variances of 30% and 60%. At each pressure support setting with 30% and 60% variances, PIP and Inhaled Tidal Volume (Vti) were measured on the V500 for each breath. Data were measured on each breath for a total of 450 breaths. Results: The pressure support means were within 1 cm H2O of the set PIP (PEEP + pressure support). Volumes were highly variable depending on the amount of pressure support set and the percentage of variation applied to the pressure support. When set at 30% Variance, PIP was as low as 20% and has high as 40%. When set at 60% Variance, PIP was as low as 50% and as high as 60%. Conclusion: VariablePS provided a varying level of pressure support at each percent setting. Results demonstrated a variable tidal breathing pattern on a spontaneous breathing test lung. When using VariablePS, clinicians need to consider the PIP's and volumes that could be generated when a greater variability percentage is set using PCV-PS with VariablePS.

Sponsored Research - None

Variance 30%				Variance 60%			
	PS 10	PS 15	PS 20		PS 10	PS 15	PS 20
PIP Min	13	17	20	PIP Min	10	12	14
% Variation	0.2	0.2	0.25	% Variation	0.5	0.53	0.55
PIP Max	19	25	31	PIP Max	21	29	37
% Variation	0.4	0.33	0.3	% Variation	0.6	0.6	0.6
PIP Mean	15.7	20.9	25.6	PIP Mean	15.8	20.7	25.5

1139145

LUNG BYPASS FOR HERMANSKY-PUDLAK SYNDROME (HPS) PATIENT ELIMINATING NEED FOR MECHANICAL VENTILATION WHILE AWAITING LUNG TRANSPLANT.

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INTRODUCTION: HPS, an often fatal heterogeneous autosomal recessive disorder characterized by tyrosinase-postive oculocutaneous albinism, bleeding diathesis, lysosomal and kidney dysfunctions, pulmonary fibrosis, and colitis, is prevalent in northern Puerto Rico. 1 in 21 individuals' carries the gene and 1 in 1800 individuals is symptomatic. This HPS patient suffered from many of those complications the most prevalent being pulmonary fibrosis making mechanical ventilation impossible. Veno-Venous (V-V) ecmo with balloon atrial septostomy provided complete ventilatory support while awaiting lung transplantation. Case summary: 43 y/o intubated male admitted for lung transplant evaluation, after being rejected from several facilities, diagnosis HPS, severe pulmonary fibrosis, pulmonary hypertension. Day two of admission patient was cannulated via right intrajugular and right femoral placed on V-V ecmo. Oxygenation continued to be suboptimal with SaO2's <88% and PaO2's <60mmHg. On day three, the patient was taken to the catheterization lab where a balloon atrial septostomy was performed relieving right sided heart pressure providing a right to left shunt and increasing oxygenation to the left. On day four, due to advance stage of patient's disease, pulmonary hemorrhaging began; lung compliance decreased rapidly, minute volumes 0.19L/min to 0.8L/min, with no aeration. At this time it was decided to discontinue mechanical ventilation. Patient tolerated extubation. Twelve days following the original septostomy saturations began to decline. It was discovered the septostomy closed and needed to be reopened. After fourteen days on ECMO, two septostomy procedures, and ten days off the ventilator patient received double lung transplant. On day five following transplant, tracheostomy was performed second to failure to extubate; within two weeks patient started his first aerosol trach collar trial. Discussion: Using ECMO as a bridge to transplant, in this unique case, accompanied by an atrial septostomy and using the patients pulmonary pressures allowed for right to left shunting, thus increasing oxygenation producing adequate saturations and effective lung bypass.

Sponsored Research - None

1134456

EVALUATING THE SET RELEASE PERCENTAGE OF AUTORELEASE DURING APRV ON THE DRÄGER V500.

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Background: Airway Pressure Release Ventilation (APRV) is a mode of ventilation that is used by some clinicians, in the management of patients with ARDS. By combining two different levels of CPAP, APRV allows the patient to breathe spontaneously at any point during the respiratory cycle. Frequently, during APRV the TimeLow is set to end when a percentage of the Peak-Expiratory Flow Rate (PEFR) is reached. AutoRelease is an option available on the Dräger V500 that allows the clinician to set the release percentage, and then automatically switches to TimeHigh when the flowrate reaches this level. The purpose of this study is to measure the accuracy of AutoRelease percentage, while ventilating an electronic lung simulator at two different levels of resistance and compliance with three different release percentages. Method: The Hans Rudolph HR 1101 Electronic Lung Simulator was interfaced, using a size 7.5 ETT, to the Dräger V500. Settings on the HR 1101 were: Resistance 10 and 20 cm H2O/L/sec, Compliance 15 and 25 mL/cm H2O, Rate 0/minute, Amplitude 0, Target Volume 3000 mL, Load Effort Default. The Dräger V500 was placed in APRV at TimeHigh 5 seconds, PressureHigh 25 cm H2O, PressureLow 0 cm H2O, Tube Compensation 100%. At each compliance and resistance setting, AutoRelease was set to 25, 50 and 75%. PEFR was measured as the greatest flowrate during TimeLow. The lowest expiratory flow rate was measured by scrolling over one interval on the screen from the lowest pressure during TimeLow. The release percentage was calculated by taking the lowest expiratory flow rate and dividing it by PEFR. Results: Every measured average release percentage was lower than the release percentage set with AutoRelease, except the 25% release with a compliance of 25 ml/cm H2O and resistance of 20 cm H2O/L/sec. Conclusion: Clinicians are limited by the intervals displayed on the V500 screen when manually calculating a release percent during TimeLow. When setting TimeLow on patients with increased resistance and decreased compliance, clinicians may find AutoRelease more accurate due to limitations of cursor intervals on the V500 screen.

Sponsored Research - None

Resistance	Compliance	Set Release %	Measured Release %
10	15	25%	20%
	25		19%
20	15		20%
	25		25%
10	15	50%	44%
	25		45%
20	15		42%
	25		46%
10	15	75%	65%
	25		69%
20	15		36%
	25		62%

1139232

CORRELATION OF TIME CONSTANTS WITH TIME LOW AND RELEASE VOLUME IN AIRWAY PRESSURE RELEASE VENTILATION.

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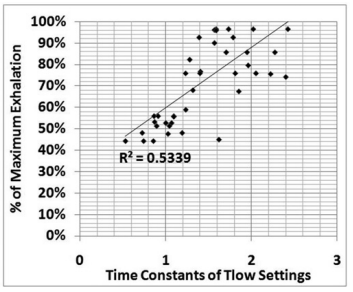
BACKGROUND: Time Constants (TC) can be measured in volume control ventilation by measuring static plateau pressure (PLAT), lung compliance (Cst) and airway resistance (Raw). TC calculation is as follows: TC = Cst X Raw. TC relates to the the time it takes to empty lung volume. (1TC=63%, 2TC=84.5% and 3TC=95%) Time low (Tlow) for Airway pressure release ventilation (APRV) is set to avoid alveolar collapse. Tlow is typically set based on exhalation flow graphic, but it has been suggested that Tlow could be optimally set with TC[1]. We wanted to determine if TC value of the Tlow setting correlates to the volume exhaled during the APRV release breath. METHODS: An IRB approved retrospective review of patients switched from volume controlled ventilation to APRV was performed. Patients who had Cst and Raw measurement in volume control within 2 hours on being placed on APRV were examined. TC was calculated from Cst and Raw. Maximum exhalation volume in APRV was calculated: Pressure High (Phigh) setting X Cst. Percentage of Maximal exhalation was calculated by Actual exhaled tidal volume ÷ Maximum exhalation volume. TC value was calculated for each Tlow setting: TC of Tlow Setting = Tlow ÷ TC. Correlation (r^2)for % of maximal exhalation volume and TC of Tlow settings. RESULTS: 26 patients with 46 sets of data were identified that had CST and Raw measured within 2 hours of being placed on APRV in the last year. Average TC measured in volume control was 0.61 ± 0.27 seconds. Average Phigh was 25 ± 4 (range 18-32)cmH2O. Average Plow was 0.79 ± 0.16 (range 0.5-1.2)seconds. Average TC value of the Tlow was 1.49 ± 0.53. % of exhalation correlated (r^2=0.53) to TC of Tlow. 1TC correlated to ~60% exhalation and 2TC correlated to ~88% exhalation volume in APRV (see chart). CONCLUSIONS: Based on TC calculated in volume controlled ventilation for patients moving to APRV: 1) % of exhaled lung volume correlates to time constant value of the Tlow setting, 2) One to two TC for Tlow setting appears to give 60% to 88% of maximal exhalation volume. Using calculated time constants while in volume controlled ventilation could help guide setting of APRV Tlow to optimally maintain lung volume and avoid alveolar collapse.

Reference: 1) A Modrykamien, R Chatburn, APRV: Alternative mode of mechanical ventilation in acute respiratory distress syndrome, Cleveland Clinic Medical Journal, Feb 2011

Sponsored Research - None



1150405

A BENCH COMPARISON: AN EVALUATION OF THE EFFECT OF PRESSURE CHANGES AND TUBING DESIGN ON TIDAL VOLUME DISPLAY ON THE PHILIPS V 60.

John Rendle[1], Lori Alturo[1], Thomas Blackson[2], James Hertzog[1]; [1]Respiratory Care, Nemours, A. I. duPont Hospital for Children, Wilmington, DE; [2]School Of Respiratory Therapy, Christiana Care Health System/Delaware Technical and Community College, Newark, DE

Background: The use of Non-Invasive Ventilation has increased greatly over the years. In an effort to improve the efficacy of this therapy we transitioned from smooth bore, non-heated circuits to heated wire circuits. A major concern of the Respiratory Care Department was the potential for a varying Vt dependent on the tubing type. An initial uncontrolled bench study showed a difference between the volumes delivered on an external monitor and the display of the Phillips V-60 ventilator. This prompted us to add a fixed volume control to the evaluation. Purpose: We created a bench model to evaluate the effect of pressure changes and tubing design on Vte displayed by the V-60. Materials & Methods: A calibrated 100 mL super syringe (SS) was used for all test conditions to simulate a patient breathing at a fixed Vt of 100 mL. The SS was attached at the patient connection of a V-60. An independent volume monitor (CO2SMO, Philips) was inserted between the SS and the ventilator circuit to verify inhaled and exhaled volumes were unaffected by CPAP and BIPAP adjustments made during the trial. Test conditions included ventilator settings of: CPAP 5 cm H2O, BIPAP 10/5, 20/5, 30/5 and 30/10 cm H2O. Ten sequential breaths were evaluated at each ventilator setting and the display of Vt was recorded from the V-60 and CO2SMO simultaneously. The test was repeated using (3) separate tubing designs: Fisher Paykel wide bore, heated wire circuit (RT 219), Philips smooth bore, non-heated wire circuit (312118), and Fisher Paykel standard bore, heated wire circuit (RT-202). Results: The COSMO flow sensor was unaffected by pressure changes ($p>0.05$). The V-60 volume display had significant error that increased as the pressure difference (delta P) increased ($P< 0.01$). The type of tubing used for gas delivery affected the degree of error displayed by the V-60 independent of delta P. Conclusion: The V-60 display provides an estimate of Vte and the magnitude of error of displayed Vte may be as high as 65% in cases of large inspiratory to expiratory pressure differences. Tubing design compounded the exhaled volume display error. The Vte displayed on the V-60 is not accurate and clinicians should be cautious when using this value for purposes other than trending the direction of volume change when CPAP/BIPAP settings are adjusted. Further research is warranted to determine if the results observed in this bench study produce comparable results in a patient model.

Sponsored Research - None

Circuit	Control Vt	Cpap +5	BIPAP 10/5	BIPAP 20/5	BIPAP 30/5	BIPAP 30/10
RT 219	100	100.0 (0)	96.7 (9.0)	130.0* (11.2)	167.5* (2.6)	145.0* (3.3)
312118	100	104.5* (1.6)	106.5* (4.7)	120.5* (1.6)	135.5* (5.5)	129.5* (2.8)
RT 202	100	95.0* (0)	105.0* (0)	114.0* (7.7)	129.5* (2.8)	115.5* (&.2

Comparison of Vt readings from the Philips V-60 with 4 separate pressure settings and 3 different types of tubing. Pressures displayed in cm H2O and volumes displayed in mL.
*= p <0.01 ()=+/- SD

1149847

A COMPARISON OF INITIATION POINTS OF HIGH FREQUENCY OSCILLATORY VENTILATION ON MORTALITY RATES IN PATIENTS WITH EXTRAPULMONARY CAUSES OF ACUTE RESPIRATORY DISTRESS SYNDROME.

Daniel P. Rausch, Reid Ikeda; Respiratory Care Services, The Queen's Medical Center, Honolulu, HI

BACKROUND: One year after the introduction of high frequency oscillatory ventilation (HFOV) for acute respiratory distress syndrome (ARDS), a retrospective review examining the effectiveness of HFOV in the treatment of pulmonary and extrapulmonary causes of ARDS was published in an abstract in Respiratory Care in 2009. HFOV implementation was evaluated by the same respiratory therapist with strict inclusion and exclusion criteria used in the Multicenter Oscillatory Ventilation for ARDS Trial (MOAT)1: Diagnosis of ARDS, pulmonary artery catheter wedge pressure < 18 and a mean airway pressure (MAP) of 24 on conventional ventilation. During the first year 7 patients with extrapulmonary causes of ARDS (predicted APACHE II mortality 49.5%) were evaluated with the results shown in Table 1. Unlike the group of patients with pulmonary causes of ARDS, predicted mortality did not decrease using the original criteria. In 2010 the starting point for HFOV was lowered to a MAP of 20, while other criteria remained the same. METHODS: A retrospective review was conducted comparing predicted and actual mortality, total ventilator days on conventional ventilation, days on HFOV, and intensive care unit (ICU) and hospital length of stay (LOS) of the two groups with extrapulmonary causes of ARDS at different HFOV initiation points. CONCLUSION: In this small sample the third year group with a starting MAP of 20 had a 20% higher predicted mortality, but actual mortality was 24% lower. Total ventilator days, ICU and hospital LOS were actually higher in the third year group. The longer ICU and hospital LOS were attributable to 2 patients with multiple comorbidities who had an average ICU and hospital LOS of 42 and 150 days. These findings suggest that initiating HFOV for extrapulmonary causes of ARDS at a lower MAP may have a positive impact on predicted mortality, but may not decrease ICU or hospital LOS. Reference 1. Derdak S et al for the MOAT Study Group. High Frequency Oscillatory Ventilation for Acute Respiratory Distress Syndrome: a randomized, controlled trial. Am J Resp Crit Care Med Vol 166. pp. 801-808, (2002)

Sponsored Research - None

First	Year N=7					
Vent days prior to HFOV	HFOV days	Vent days post HFOV	ICU LOS	Hospital LOS	Predicted Mortality	Hospital Mortality
2.3	4.2	6.21	16.1	25.4	49.5%	50%
Third	Year N=8					
Vent days prior to HFOV	HFOV days	Vent days post HFOV	ICU LOS	Hospital LOS	Predicted Mortality	Hospital Mortality
2.46	3.68	13.4	20.2	49.7	59%	37.5%

1145480

DIFFERENCE BETWEEN CALCULATED AND MEASURED TRACHEAL PRESSURES AT PEAK INSPIRATORY FLOW DEMAND DURING ATC ON THE DRAGER XL VENTILATOR.

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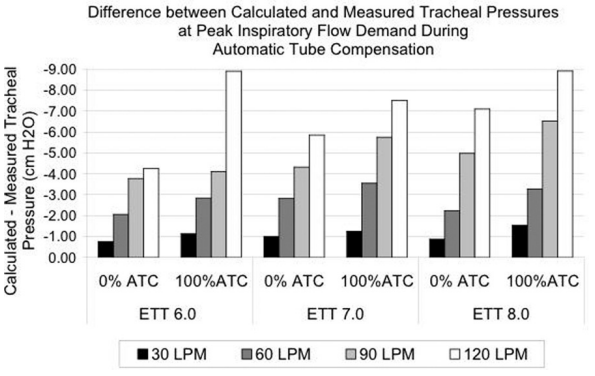
Background: Automatic Tube Compensation (ATC) is dependant on the calculation of tracheal pressure. This study was done to determine the accuracy of the calculated tracheal pressure deflection during ATC with varying peak inspiratory flow demands. Method: A dual compartment test lung (Michigan Instruments TTL, Grand Rapids, MI) with the chambers locked together was powered on one side (muscle chamber) by a Drager XL ventilator, Vt 500mL, RR 12, PEEP 5cmH2O, Ti 1.2sec, with varying inspiratory flow rates. Another Drager XL ventilator attached to the other TTL compartment (lung chamber), set in the Pressure Support mode with ATC on, PIP 15cmH2O, PEEP 5cmH20, Slope 0.2, Trigger 3L/min, was connected to an ETT inserted into smooth bore aerosol tubing with the cuff inflated. A pressure monitoring port was placed at the end of the tubing and connected directly to the lung chamber. At varying inspiratory flow rates, the difference between the calculated tracheal pressure (PCalc) and the measured tracheal pressure (PMeas) was determined. PMeas was recorded with a VenTrak 1550 Respiratory Mechanics Monitor (Novametrix, Wallingford, CT). Measurements were performed at 30, 60, 90, and 120L/min inspiratory flow rate with ATC of 0% and 100% using three different endotracheal tubes sizes (6.0, 7.0, and 8.0 mm) at the point of maximum negative tracheal pressure deflection. Five sets of measurements were recorded at each test condition. Results: During each test condition the difference between PCalc and PMeas increased with increasing inspiratory flow demands. The difference between PCalc and PMeas was greater with ATC set at 100%. Conclusion: There is marked variability in the accuracy of the PCalc at the point of maximum negative tracheal pressure deflection during ATC at both 0% and 100% compensation.

Sponsored Research - None

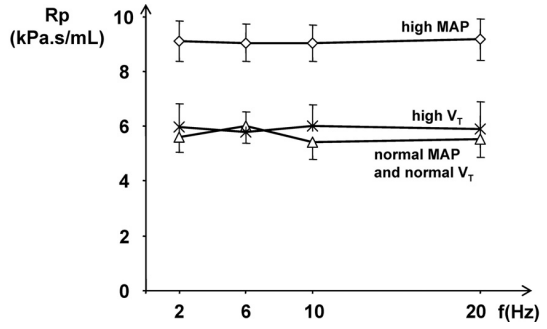


1148967

EFFECTS OF HFOV VENTILATORY PARAMETERS UPON THE LUNG HEMODYNAMICS IN RAT HEART AND LUNG DISSECTION.

Karel Roubik[1], Vladimir Zabrodsky[2]; [1]Dep. of Biomedical Technology, CTU in Prague, Fac. of Biomedical Engineering, Kladno, Czech Republic; [2]Dep. of Anesthesia and CCM, Charles University, Faculty Thomayer Hospital, Prague, Czech Republic

Background: Inflation of alveoli during mechanical ventilation causes stress to the lung tissue with the blood capillaries and thereby ventilation affects pulmonary perfusion. Specific pulmonary hemodynamic effects are associated with HFOV. The aim of the study is to investigate effects of HFOV ventilatory parameters upon the pulmonary perfusion resistance of a lung and heart dissection. Methods: The study was approved by the Institutional review board for the care of laboratory animals of the 1st Faculty of Medicine, Charles University in Prague. Eight female Wistar rats (230–270 g) were used. Heart and lung dissection was hung in a rigid heated chamber and ventilated with air containing 5% of CO_2 in order to keep the original bloodstream tonus. Pulmonary artery and left atrium were cannulated with input and output perfusion catheters leading from a linear or peristaltic pump into the heated reservoir of the perfusion solution (heparinized saline-albumin colloid solution). Ventilation was conducted with physiologic MAP (7.2 cm H_2O) and physiologic V_T values (2.1 mL at 2 Hz, 1.5 mL at 6 Hz, 1.1 mL at 10 Hz and 0.7 mL at 20 Hz), followed by ventilation with MAP increased by 90% and then with normal MAP and V_T increased by 75%. Perfusion resistance Rp was calculated from perfusion pressure recorded in the input perfusion catheter during the constant perfusion flow rate of 10 mL/min from the linear pump. Two-tailed Student's t-test was used for evaluation of differences in Rp. Results: Results are presented in Fig. 1. Perfusion resistance is independent on ventilatory frequency and independent on changes in tidal volume. An increase in MAP increases Rp significantly. Conclusion: MAP is the only HFOV ventilatory parameter affecting lung perfusion resistance significantly in the heart and lung dissection model. Acknowledgment: Supported by research project MSM 6840770012.
Sponsored Research - None

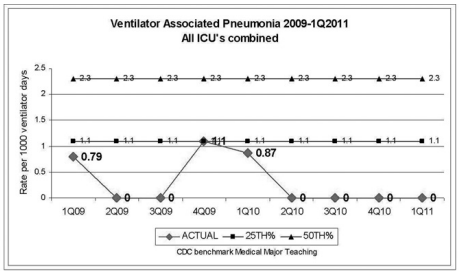


1149952

ELIMINATING VENTILATOR ACQUIRED PNEUMONIA: AN INTERPROFESSIONAL COLLABORATION.

Jon C. Inkrott, Christopher Orabella, Andrea L. Yates, Victoria Roelker, April Gochberg, Kathryn Brown, Myrkol Bolden, Molly Johantgen, Jude Gamel, Amy Russell, Kathy Bierman, Nancy Stamp, Robin Meisberger, Terri Kunkemoeller, Laura Powers, Karen Poleyeff, Donna Butler, Christopher Schmitt, Mark D. Johnson, Linda S. Baas, Anita Bennett, Evan Crawford, Michelle Sexton, Linda Kemper, Amy Shaw; The Christ Hospital, Cincinnati, OH

BACKGROUND: It is well estalished that VAP, the associated costs and resulting poor patient outcomes are of continued significance for the Respiratory Care profession and its practitioners. After two cases were confirmed in one of our three ICU's, a root cause analysis was performed. A Ventilator Management Committee (VMC) was organized to review and develop further guidelines. The objective was to eliminate VAP at our institution. The VMC is a multidisciplinary committee including MDs, RNs, RTs, RDs, Infection Control, Environmental Services, and Performance Improvement Specialists who were empowered by administration to make appropriate changes. METHOD: Current key components of The Ventilator Bundle and guidelines were reviewed from IHI, NIH, and the CDC. Interdisciplinary communication and definition of professional roles were also reviewed. The VMC expanded on the vent bundles to include the Richmond Agitation Sedation Scale (RASS), and subglottic suctioning for mechanically ventilated patients. These values are recorded on a two and four hour basis, respectively. Interdisciplinary collaboration was expanded by cross populating electronic charting for bedside caregivers to be able to review all information included in the vent bundle. Defined roles, techniques, and consistency in practice were also included in these guidelines. All ICU bedside caregivers were then educated on the new vent bundles, role definitions, and electronic charting changes. Chart audits and compliance of the expanded vent bundle values is audited weekly through the electronic medical record charting. The results are broken down unit specific as well as to individual compliance. RESULTS: Since the organization of the VMC in the second quarter of 2010, our institution has recorded zero VAP's in all three ICU's. The graph included shows this timeline and related cases per 1000 ventilator days. CONCLUSION:. Developing interprofessional collaboration is paramount for quality performance, preventing VAP and improving patient outcomes. The focus of continued training and compliance in the expanded vent bundles is the continued goal of this institution to maintain a zero VAP incident rate.
Sponsored Research - None



1125575

MULTIDISCIPLINARY STRATEGY TO REDUCE VAP.

Brian Glynn, Raymond Malloy, Linda Earle; Thomas Jefferson University Hospital, Philadelphia, PA

INTRODUCTION: Ventilator- associated pneumonia (VAP) is the leading cause of preventable deaths due to infection and is associated with an increased LOS of at least 6 days, prolonged ventilator dependence and an estimated 40K dollar increase per hospital stay. BACKGROUND: In 2007, the Department of Respiratory Care joined a multidisciplinary working group at Thomas Jefferson University Hospital charged with reducing the incidence of VAP from 10.0 to 0 incidences per 1000 ventilator days in 7 adult intensive care units. METHODS: The Ventilator Associated Pneumonia Bundle promoted by the Institute of Healthcare Improvement was the foundation of our initiative. The VAP working group clarified definitions, standardized procedures, and employed educational strategies throughout all disciplines. The working group incorporated best practices for ventilator care and maintenance, with elements including but not limited to q4hour oral care, q 12 hour chlorhexidine oral rinse, early tracheotomy, head of the bed elevation and endotracheal tubes with subglottic suction. An on- line record of compliance with VAP prevention bundle was reviewed monthly. A discussion of the diagnosis of VAP was held with the attending intensivist to confirm each suspected diagnosis. RESULTS: The VAP rate decreased from 10.0 to 7.57 per 1000 ventilator days in the first 6 months. A further drop was seen when ownership of specific metrics was identified, compliance with the prevention bundle was improved and electronic ventilator order entry was begun. We now have a sustained VAP of 3.0 per 1000 ventilator days over 2 years (with an increase of 50 ICU beds) translating to 29 lives saved and a minimum cost savings of 5.4 million healthcare dollars. CONCLUSION: This strategy will be expanded by examining the unique characteristics of each ICU to reach our goal of 0 VAPS.
Sponsored Research - None

1127460

THE EFFECT OF A DUAL TARGETING SCHEME ON TIDAL VOLUME DELIVERY DURING VOLUME CONTROL MECHANICAL VENTILATION.

Teresa A. Volsko[1], Justin B. Hoffman[1,2], Alecia M. Conger[1,2], Robert L. Chatburn[2]; [1]Health Professions, Youngstown State University, Youngstown, OH; [2]Respiratory Institute, The Cleveland Clinic, Cleveland, OH

Technological advances have increased the complexity of ventilator modes, and risk of operator error. The objective of this study was to compare subtle differences in volume control (VCV) ventilation with set-point and dual targeting. Two hypotheses tested were; (1) V_T delivery is different with VC using set-point versus dual targeting and (2) VC with dual targeting delivers V_T similar to pressure support ventilation (PSV). **METHODS:** The Ingmar Medical ASL 5000 lung model was used to simulate the pulmonary mechanics of an adult patient with acute respiratory distress syndrome during active and passive ventilation. Resistance was standardized at 10 $cmH_2O/L/sec$ and compliance at $32mL/cmH_2O$. Active breathing was simulated with frequency (f) = 26 breaths/minute, P_{Mus} 15 cmH_2O (Increase 30%, Hold 0%, and Release 25%) to produce a V_T of 384 mL. VCV was initiated with the Puritan Bennett 840 (set-point targeting) and the Servo-i (dual targeting). Settings during VCV were; V_T = 430 mL, mandatory f = 15 breaths/min, PEEP = 10 cmH_2O, inspiratory time = 0.7, pause time = 0, inspiratory rise time = 0, flow trigger = 3 L/min. During PSV cycle threshold was set to 30% and peak inspiratory pressure was adjusted to produce a V_T similar to that delivered during VCV. End expiratory tidal volume was collected on 10 consecutive breaths during active and passive breathing with VCV and PSV. Differences in mean tidal volumes (active vs passive model) were compared using ANOVA. Statistical significance was established at $P < 0.05$. **RESULTS:** Tidal volume difference varied with targeting schemes; VC set-point = 37.3 mL (±SD 3.5), VC-dual = 77.1 mL (±SD 3.3) and PSV = 406.1 mL (±SD 1.5), $P < 0.001$. Auto-triggering occurred during VCV set-point with active model. **CONCLUSIONS:** Dual targeting during VCV allows increased V_T compared to set-point but not as much as PSV.
Sponsored Research - None

1127969

EFFECT OF VARIOUS CLOSED SUCTION CATHETERS ON MEAN AIRWAY PRESSURE AND AMPLITUDE WITH A 3100B OSCILLATOR.

Patricia A. Dailey[1], Debbie Santucci[1], Kyle Walsh[2]; [1]Respiratory Care, Baystate Medical Center, Springfield, MA; [2]Clinical Engineering, Baystate Medical Center, Springfield, MA

INTRODUCTION: It has been suggested that the placement of some designs of closed suction catheters in-line with the 3100B Oscillator can affect mean airway pressure and amplitude. Our objective was to determine whether this statement carried any merit. In addition we were curious as to whether there was any advantage of one type of closed suction design over another. METHOD: A 3100B Oscillator was calibrated with a flexible filtered circuit. The settings were set at Power 5.0, Frequency 5.0 Hz, Flow 30 lpm, I time 33%, and O2 40%. A size 8.0 endotracheal tube was placed in a test lung and the cuff was inflated to create a seal. The proximal pressure line was placed between the closed suction catheter and the ET tube, in order to reflect any change in mean airway pressure (MAP) or amplitude (Δ P) caused by the placement of the catheter in-line. Data was collected at MAP's of 30, 35 and40, first without a catheter in-line and then with the Ballard T-piece, Ballard double swivel and Airlife closed suction with Verso adaptor. In between, catheters the MAP and ΔP were rechecked without a catheter to assure a return at baseline. RESULTS: Mean Δ P with set MAP's of 30, 35, and 40 (48.75 ± 0.5, 47.75 ± 2.12 and 46.5 ± 0.58 respectively). Mean MAP with set MAP's of 30, 35 and 40 (30.4 ± 0.3, 35 ± 0.32 and 40.1 ± 0.15 respectively). CONCLUSIONS: The Δ P and MAP variability between the different suction catheters was not statistically significant. However, one system (Airlife with Verso adaptor) carries the added benefit of a detachable suction catheter at the sealed adaptor (Verso adaptor) which provides the ability to change suction catheters without interrupting the ventilator circuit. Minimizing circuit disconnects prevents lung derecruitment and reduces the risk of ventilator associated pneumonia.

Sponsored Research - None

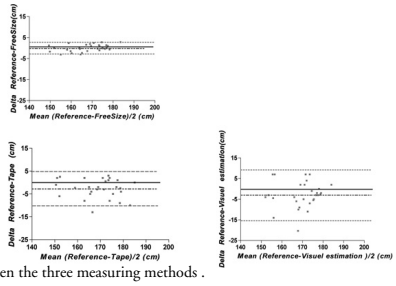
1133294

EVALUATION OF NEW TOOL TO MEASURE PATIENT'S HEIGHT DURING MECHANICAL VENTILATION: IMPACT ON PROTECTIVE VENTILATION (FREESIZE).

Azadeh Bojmehrani[1], Carmelle Bouchard[1], Pierre- Alexandre Bouchard[1], Erwan L'Her[2], Francois Lellouche[1]; [1]Institut Universitaire de Cardiologie et de Pneumologie de Québec, Québec, QC, Canada; [2]Medical ICU, University hospital of Brest, Brest, France

Introduction: Protective ventilation implementation requires the predicted body weight (PBW) calculation, based on gender and patient's height. Consequently, height inaccuracy may be a limiting factor to adequately reduce the tidal volumes. The main objective of this study was to evaluate a method for measuring the patients while on mechanical ventilation. Methods: Patients were included in the study before cardiac surgery and after informed consent. Reference heights of patients were obtained with a height gauge while patients were standing up (gold standard). Measures were also taken according to the Chumlea method. After the surgery, at ICU arrival, patient's heights were visually estimated by a nurse, a respiratory therapist and then measured by a nurse with a measuring tape. In addition, the patient's height was measured with an optical method (iphone camera) by an algorithm (FreeSize) developed for this study based on analysis of a leg's picture. Results: We present here the results for 30 patients (23 men and 7 women). Mean age was 62.3 ± 10 years; actual weight was 66.7±5.0 kg. Mean height measured with gauge before the surgery was 171±8 cm (reference). Mean height measured with camera was 171±8 cm. Mean height measured with a tape was 170±15 cm. The median difference between the reference and height found with Freesize was 0.27 cm with a maximum error of 3 cm. The median difference between reference and estimated height was 3.41 cm with a maximum error of 20 cm. The median difference between reference and the tape-measured height was 3 cm with a maximum error of 13 cm. The median difference between the PBW based on reference height and Freesize was 0.05 kg with a maximum error of 2.6 kg. The median difference between the PBW based on actual height and the estimated height was 3.3 kg with a maximum error of 17 kg. Conclusion: This study demonstrates that our new method to provides acceptable results, at least equivalent to the measure with a tape when patients are lying in bed under mechanical ventilation and better than the visual estimation. This technique could be useful to optimize the implementation of protective mechanical ventilation.

Sponsored Research - None



Difference between the three measuring methods .

1146813

LARYNGEAL MASK AIRWAY FOR SURFACTANT ADMINISTRATION IN AN ANIMAL MODEL.

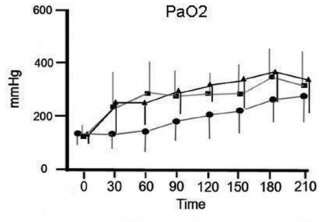
Brenda J. Plumm[1], Patricia Meyers[1], Cathy Worwa[1], Andrea Lampland[1,2], Mark Mammel[1,2], Kari Roberts[2]; [1]Infant Diagnostic and Research Center, Children's Hospitals and Clinic of Minnesota, St. Paul, MN; [2]Department of Pediatrics, University of Minnesota, Minneapolis, MN

Background: Surfactant therapy has dramatically improved outcomes of infants with RDS. Currently, intubation with an endotracheal tube (ETT) is required to deliver surfactant. Intubation, however, is an invasive procedure associated with adverse physiologic effects. If proven effective, the laryngeal mask airway (LMA) would provide a means of delivering surfactant while avoiding the need for intubation. We hypothesized that administration of surfactant through an LMA is as effective as administration through an ETT and that time and physiologic changes during instrumentation will be less in the LMA group. Methods: This study is a randomized, controlled trial using newborn piglets. Lung injury was induced via surfactant washout using normal saline. Animals were randomized into 3 groups: 1) LMA placed, no surfactant administered (control; n= 8); 2) surfactant (lucinactant, Discovery Laboratories, Warrington, PA) via an LMA (LMA group; n = 8); and 3) surfactant via an ETT (ETT group; n = 8). Physiologic data were recorded throughout the 3.5 hour study and analyzed using ANOVA. Results: We demonstrated that partial pressure of oxygen in arterial blood (PaO2) levels of the LMA and ETT groups were significantly increased compared to controls (p< 0.05). LMA and ETT groups were not statistically different. Heart rate, blood pressure and pH did not differ between groups. Time for successful placement of LMA was 19± 6 seconds vs ETT 98± 108 seconds (p= 0.0015); number of attempts required for successful LMA placement was 1.1± 0.34 vs ETT 1.9±1.7 (p=0.0294). Conclusion: Administration of surfactant via an LMA compared with an ETT resulted in similar improvements in oxygenation. Placement of the device required less time and fewer attempts. Data suggest that further study in human neonates is justified. If proven effective, some infants with respiratory distress may be able to receive surfactant while avoiding intubation.

Sponsored Research - Neonatal Resuscitation Program, American Academy of Pediatrics

Childrens Hospitals and Clinics of Minnesota

Surfactant donated by Discovery Laboratories, Inc



Pa_{O_2} levels in LMA (■), ETT (▲), and control (●) groups. Mean ± SD; $p < 0.05$, control *vs* LMA, ETT.

1125209

EFFECTS OF PNEUMONIA FOLLOWING BURNS AND INHALATION INJURY IN CHILDREN.

Ronald Mlcak, Oscar E. Suman, David N. Herndon; Shriners Hospitals for Children, Galveston, TX

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

Sponsored Research - None

1129862

EFFECTS OF TIDAL VOLUME AND PEEP ON MORTALITY IN PEDIATRIC PATIENTS WITH INHALATION INJURY.

Ronald Mlcak, Oscar E. Suman, David N. Herndon; Shriners Hospitals for Children, Galveston, TX

BACKGROUND: Despite advances in critical care, inhalation injury continues to be a major source of morbidity and mortality in burn patients and often requires mechanical ventilation. The ARDS net study has shown a significant decrease in mortality when low tidal volumes are used for the treatment of ARDS. Whether the results hold true for patients of inhalation injury has yet to be studied. The purpose of the study was to determine the effects of tidal volume and PEEP on mortality in pediatric patients with inhalation injury over a two decade time period. METHODS: 769 severely burned pediatric patients with inhalation injury were retrospectively studies from 1986 to June 2007. Patients were stratified into two decades; 1986-1996 vs. 1997-2007. Mean initial tidal volumes used in the first decade were 14 ± 0.9 ml/kg vs. 9 ± 2 ml/kg in the second decade. Outcome variables included ventilator days, PEEP levels, incidence of pneumonia, incidence of atelectasis, and mortality. Data are reported as mean ± SD. Significance was accepted at p<0.05. RESULTS: Age and burn size were similar in both groups. Mean ventilator days in the 1986-1996 decade were 5.7 ± 4 vs. 9.0 ± 3 in the 1997-2007 decade (p<0.05). The average highest PEEP level used from 1986-1996 was 6.7 ± 1 vs. 9.1 ± 2 in the 1997-2007 decade (p<0.05). The incidence of pneumonia in the 1986-1996 decade was 25 % vs. 29 % in the 1997-2007 decade (p<0.05). The incidence of atelectasis was 42 % in the 1986-1996 decade vs. 64 % in the 1997-2007 decade (p<0.05). The inhalation injury mortality rate was 13.5 ± 8 % in the 1986-1996 decade vs. 14.7 ± 7 % in the 1997-2007 decade. CONCLUSION: Results indicate that the tidal volume and PEEP levels used to treat pediatric patients with inhalation injury had no significant effect on mortality. However lower tidal volumes were associated with a significant increase in ventilator days, incidence of pneumonia and atelectasis.

Sponsored Research - None

1126477

COMPARISON OF THREE ENDOTRACHEAL TUBE STABILIZING TECHNIQUES TO DECREASE UNPLANNED EXTUBATIONS IN VENTILATED NEONATES IN A LEVEL III NEONATAL INTENSIVE CARE UNIT.

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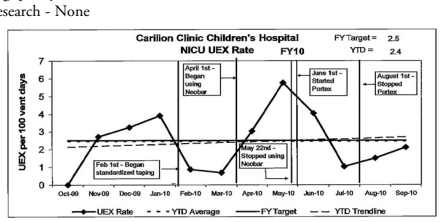
Background: Unplanned extubations (UEX) are a serious and potentially life-threatening event for a neonate. Unplanned extubations lead to emergent, less-controlled endotracheal re-intubations. Repeated intubations increase the risk of ventilator associated pneumonia, tracheal injury, and may prolong length of stay. Review of data from June 2009 – Jan 2010 for the our Level III Neonatal Intensive Care Unit (NICU) revealed a rate of 3.4 ± 7.1 UEX /100 ventilator days, with a year to date (YTD) of 4.5/100 ventilator days. This quality improvement study was undertaken to analyze the impact of three endotracheal tube stabilizing techniques to determine which would decrease the rate of UEXs within the NICU. Our goal was a target of 2.5/100 ventilator days. Method: A prospective cohort quality study was designed. Following review of the literature to determine best practice, three endotracheal tube (ETT) stabilization devices were identified for the study: Standardized Taping (a tape-only protocol); NeoBar™ (a weight-based color coded ETT stabilization device); and Portex® (an ETT size-based adhesive securement device). All patients requiring intubation from February 2010 to August 2010 were included in the study; each device was trialed for two months. A tracking tool was developed and data collected included: patient data, was protocol followed, circumstances and personnel present for UEX, level of sedation, and was re-intubation required. Each member of the interdisciplinary care-team was educated on use of each device prior to implementation period. Results: Seventy-eight neonates with a total of 703 ventilator days were included in this study. Of these patients, 17 UEX were observed (2.4/100 ventilator days). Thirty-nine patients were included in the standardized taping arm with a UEX rate of 0.9 ± 0.7 UEX/100; 27 patients in the NeoBar™ arm with a UEX rate of 3.0 ± 5.0 UEX/100 and 12 patients in the Portex® arm with a UEX rate of 1.0 ± 4.0 UEX/100. Due to increased UEXs the NeoBar™ trial was discontinued early. Conclusion: Standardized taping was the most successful in decreasing the unplanned extubation rate. This method provided the more secure airway stabilization and was adopted within the NICU as standard of care. By the end of the fiscal year 2010, we achieved a rate of 2.4/100 ventilator days, exceeding our target goal of 2.5/100 ventilator days. We continue to evaluate and track UEXs as part of our ongoing quality initiatives.

Sponsored Research - None



	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	YTD	Target
Number of UEXs	0	3	5	7	1	1	5	5	4	1	3	3	38	
Number of Vent Days	65	110	154	179	114	143	164	87	99	96	200	142	1553	
UEX per 100 vent days	0.0	2.7	3.2	3.9	0.9	0.7	3.0	5.7	4.0	1.0	1.5	2.1	2.4	2.5

1127692

PROSPECTIVE COMPARISON BETWEEN NEURALLY ADJUSTED VENTILATORY ASSIST (NAVA) AND CONVENTIONAL MECHANICAL VENTILATION IN PRETERM NEONATES.

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AUTHOR: Jose Batista RRT, Robert Tero, RRT-NPS, CPFT, Shyan Sun, MD, DCH Department of Respiratory Care and NICU, Division of Neonatology, Saint Barnabas Medical Center BACKGROUND: A new mode of mechanical ventilation, NAVA allows a patient to synchronize spontaneous respiratory effort with mechanical ventilation. Electrodes imbedded within the tip of a nasogastric tube detect the electrical activity of the diaphragm (Edi) and transmit this information to the ventilator. The ventilator breath is triggered and terminated by changes in electrical activity. The patient therefore determines respiratory rate, tidal volumes, peak pressure, inspiratory and expiratory times in synchrony with the ventilator. OBJECTIVE: To evaluate the efficacy of NAVA ventilation compared to that of conventional mechanical ventilation (CMV) in preterm infants. DESIGN/METHOD: A prospective observational study comparing between NAVA and conventional Pressure Control / SIMV with pressure support ventilation. Seven preterm infants were enrolled (mean gestational age 25.7 wk, range 24 – 27 wk, mean birth weight 746g, range 470 – 1245g). All had Respiratory Distress Syndrome. Each baby was ventilated with CMV for at least 30 min. then switched to NAVA for 30 min. The target is to maintain SpO2 between 85 to 93% and PCO2 between 40 to 50 mmHg. A steady state peak inspiratory pressure (PIP), Mean airway pressure (MAP) and FiO2 were recorded during two different periods of ventilation. RESULT:
Sponsored Research - None

NAVA compared with CMV

	PC/SIMV-PS	NAVA
Number	7	7
Trigger	flow	Edi
Trigger delay	Yes	No
Synchronization	Varied	100%
PIP cmH20	30.2 +/-6.5	20.7 +/-4.7
MAP cm H20	15.5 +/-9.2	13.0 +/-5.6
Fi02%	37.3 +/-16.8	29.2 +/-6.8

Compared to CMV, Neonates on NAVA required 30% less PIP, 16% less MAP, and 8% less FiO2
There was no inspiratory / expiratory mismatch and neonates appeared more comfortable on NAVA.
CONCLUSION: Preterm neonates on NAVA required less inspiratory pressure and less oxygen
concentration. These may indicate less ventilation induced lung injury and less oxidative stress (oxygen toxicity). Further studies are needed to demonstrate whether these beneficial effects will lead to reduced ventilator days, reduced BPD, and shortened length of NICU stay.

1145933

ADAPTIVE DYNAMIC INSPIRATORY NASAL APPARATUS(ADINA): COMPARISON TO TRADITIONAL NASAL CONTINUOUS AIRWAY PRESSURE (NCPAP).

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Background: The use of high flow nasal cannula has increased dramatically in the neonatal intensive care setting. High flow nasal cannula (HFNC) simulates a continuous positive airway pressure despite unpredictable leak by way of using a higher flow to "overwhelm" the resistive capacity of the nares and create a NCPAP like effect. There is no absolute way to assure that the transmitted pressures do not exceed what might be considered a safe range for the neonate. The ADINA introduces an additional safety mechanism designed to adaptively restrict the amount of pressure that can be delivered to the nasal interface. Although flows can be entrained up to 4 lpm, airway pressure is limited by an adaptive pop off valve set at 10 cm H20. Even if the pop off mechanism were to fail to actuate, the device would continue to provide high flow nasal cannula delivery at levels that are already in wide clinical use. Methods: Patients were randomized to receive either "standard" nasal CPAP with Hudson prongs or high flow nasal cannula with the ADINA (Adaptive Dynamic Inspiratory Nasal Apparatus). Hudson prongs NCPAP pressure was started at 4-8 cm H2O. High flow nasal cannula was started at 2-4 lpm of flow. Oxygen requirement, level of pressure or flow support, radiological changes, blood gases measurement, time to wean off protocol, and failure to wean/necessity for endotracheal intubation were monitored. 19 subjects were enrolled. Objectives: 1. Real-Time device actuation – Can high flow nasal cannula be delivered with a pop off that actuates in real time? 2. Comfort of interface – Can this Novel device provide a high flow nasal cannula effect simulating CPAP at the same comfort levels as those provided by conventional nasal cannula? Results: See table below. There were two parents who refused consent out of concern that their child would randomize to CPAP. Discussion: Although there was a significant difference apparent in days on ADINA versus NCPAP ($p<0.01$) (9.8 ± 8.6 v. 1.4 ± 0.7), a significant bias towards the ADINA cannula was evident (both towards selection and continuation). No patient failed within a week of starting ADINA, although several patient failed to tolerate NCPAP. Patients randomized to ADINA trended towards lower BW and PCA at time of study. No complications of air leak, hypotension, or barotraumas were evident in either group. Conclusion: ADINA appears to be at equivalent to NCPAP in providing non-invasive ventilation.
Sponsored Research - Neotech provided the ADINA cannulae for the study.

Patient	MOV on study	GA	Age at enrollment	BW in grams	NA at enrollment in grams	Surfactant	Previous MOV	Length at previous MOV	Failed therapy	Length on study
1 Adina 3L	38	39	3177	3260 yes	SIMV	2 days	No	1 day		
2 Adina 3L	28 2/7	29	1210	1180 yes	SIMV	4 days	No	31 days		
3 Adina 3L	28 2/7	28 6/7	734	755 yes	NIMV	4 days	No	7 days		
4 Adina 3L	24 1/7	36 4/7	447	2190 yes	NIMV	19 days	No	8 days		
5 Adina 3L	31 4/7	32 6/7	1625	1640 yes	NIMV	2 days	No	8 days		
6 Adina 3L	24 3/7	31 4/7	645	1550 yes	NIMV	13 days	Yes	14 days		
7 Adina 4L	30 1/7	32	1180	1260 no	NIMV	12 days	No	6 days		
8 Adina 4L	26 5/7	30 6/7	765	920 yes	PSVG	6 days	Yes	9 days		
9 Adina 4L	35 2/7	36	2890	2880 yes	SIMV	4 days	No	5 days		
10 CPAP	24	24 1/7	670	670 yes	HFJV	1 day	Yes			
11 CPAP 5	32 6/7	33 1/7	1717	1715 no	NIMV	2 days	No	1 day		
12 CPAP 5	28 6/7	29 1/7	1245	1211 no	NIMV	2 days	Yes	1 day		
13 CPAP 5	33 2/7	33 3/7	2222	2222 no	NIMV	1 day	No	1 day		
14 CPAP 5	32 5/7	32 6/7	2117	2117 no	NIMV	1 day	Yes	2 days		
15 CPAP 6	29 3/7	29 5/7	1089	1115 no	NIMV	2 days	No	1 day		
16 CPAP 6	35 2/7	38 1/7	1365	1790 yes	NIMV	9 days	Yes	1 day		
17 CPAP 6	37 2/7	39 1/7	4660	4774 no	SIMV	1 day	No	3 days		
18 CPAP 6	23 5/7	32 5/7	650	1580 yes	NIMV	10 days	Yes	2 days		
19 CPAP 7	30 2/7	36	1248	1690 yes	NIMV	21 days	Yes	1 day		

1150564

THE EFFECTS OF HIGH FLOW NASAL CANNULA ON THE USE OF INVASIVE VENTILATION AND NASAL CPAP IN A LEVEL IIIC NICU.

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Background: High flow, high humidity nasal cannulas (HFNC) are designed to deliver 100% humidity at or near body temperature. A number of manufacturers produce products capable of delivering HFNC. Vapotherm (Vapotherm Inc, Stevensville, MD), was introduced into the level IIIC Neonatal Intensive Care Unit (NICU) at Monroe Carell Jr. Children's Hospital in April, 2005. Vapotherm allows for the delivery of up to 8 liters per minute of blended oxygen flow in the neonatal population. In February of 2006, ten months following the introduction of Vapotherm to the NICU, Vapotherm sent out an official recall letter due to concerns surrounding infections from the organism ralstonia mannitolilytica. Based on the recall letter sent by Vapotherm, all units were removed from service in the NICU. One year later, after resolving the issue surrounding the recall, Vapotherm units were placed back into service. Objective: To determine the effects of high flow, high humidity nasal cannula use on ventilator days and nasal continuous positive airway pressure (NCPAP) days. Method: Data was retrospectively collected for a total of 39 months. Data collection spanned all important event markers from October 2004 thru December 2007 including data before the introduction of Vapotherm. Results: The use of HFNC had no significant effect on the number of ventilator days in the NICU, however, the number of NCPAP days were significantly affected by the use of HFNC. After the initial introduction of Vapotherm in the NICU, NCPAP days dropped by 42%. During the recall, NCPAP days increased by 36%. After infection issues were addressed and devices were placed back into service, NCPAP days decreased by 73%. Other Considerations: The cost for Vapotherm or Aladdin/EME (NCPAP) hardware is comparable at $5,867.92 and $6,350.00 respectively. The disposable supply cost for the Vapotherm is $94.84 and the Aladdin/EME disposable cost is $96.40 per patient. The cost for the ventilator supplies were not reported because ventilator days were not significantly affected by HFNC use.
Sponsored Research - None

1151632

DOES HYPEROXIC THERAPY ENHANCE THE RESOLUTION OF PNEUMOTHORAX IN THE NEONATE?

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Background: Spontaneous pneumothorax is estimated to affect 1 to 2% of neonates shortly after birth. In most cases, small to moderate spontaneous pneumothoraces will resolve within a few days without intervention. Nitrogen wash out has been used extensively to hasten the resolution of the pneumothorax. The relationship between hyperoxic therapy and the efficacy and earlier resolution of pneumothoraces is unknown. Hyperoxic therapy may have a negative effect on the neonate due to presence of oxygen free radicals. We examined the use of hyperoxic therapy versus conventional oxygen therapy with regard to the time of resolution of the pneumothorax, as defined as time of first feed. Method: Data were obtained using a retrospective chart analysis of neonates born at Hillcrest Hospital between 2008 and 2011. Records of 83 neonates were reviewed using the ICD-9 open pneumothorax diagnosis code. Inclusion criteria were all pneumothoraces treated with oxygen for a time period greater than six hours. Definition of onset of pneumothorax was based on physical exam findings followed by chest X-ray confirmation. Resolution of pneumothorax was based on time of first feed which occurred after noted clinical improvement, lack of tachypnea, and symmetrical breath sounds. Of the 83 neonates, 57 met inclusion criteria and were divided into two groups: Hyperoxic therapy (Group 1, 30 neonates) defined as 100% high oxygen, and conventional oxygen therapy (Group 2, 27 neonates), defined as those receiving oxygen to maintain a pulse oximetry reading greater than 90%. Resolution of pneumothorax was based on time of first feed. Statistical analysis included student T test. Results: Patients in Group 1 received a significant longer exposure of O2 (hrs) when compared to Group 2 (29.7 ± 5 SD vs. 12.6 ± 3.9 SD, P=0.009). Length of stay (days), and time to first feeding (days) were similar in both groups (4.6 ± 0.4 SD vs. 6.8 ± 2.9 SD, P=0.46 and 1.63 ± 0.2 SD vs.1.5 ± 0.29 SD, P=0.826 respectively). Conclusion: Considering time to first feed and length of stay, both Groups 1 and 2 had similar findings. Exposure of the neonate to hyperoxic therapy in the treatment of pneumothorax may not be necessary based on this study. In order to confirm the results, further randomized, controlled trials are recommended.
Sponsored Research - None

1150877

PRESSURE AND VOLUME COST OF HIGH FREQUENCY VENTILATION (HFV) OF INHOMOGENOUS LUNGS IN A NEONATAL TEST LUNG MODEL.

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Background: HFV may provide effective gas exchange with less lung injury, by using lower pressure (ΔP) and volume (Vt) excursions and lower peak pressures (PIP). With homogeneous lungs Vt, ΔP, and PIP are presumably uniformly minimized. However, neonatal lung disease is usually NOT homogeneous in compliance (C) or airway resistance (R), so hypothetically Vt, ΔP, and PIP may be regionally unequal, perhaps markedly. CO2 flux is believed to depend on frequency (F) times Vt2. "Cost" of HFV might be defined as Vt or ΔP required to provide a given CO2 outflow, i.e. Vt or ΔP divided by F x Vt2. Methods: A rigid-container test lung model was used in which C is the result of internal gas compression. HFV (Sensormedics® 3100A or Percussionaire® Bronchotron®) was connected via a 15 mm "Y" to two 3.0 L calibration syringes (Hans Rudolph) used as test lungs (C=0.15-2.1 ml/cmH2O set by varying their volumes), via a 4.0 mm endotracheal tube (ETT) and calibrated Pneuflo® (Michigan Instruments) parabolic airway resistors of 5-200 cmH2O/L/s in line with each lung. Vt to each lung as well ΔP, PIP, and mean pressure (MAP) were measured proximally, at the "carina" or Y, and in each lung with a Florian® (Acutronic) hot wire anemometer/monitor or Setra 239 pressure transducer, at various combinations of C, R, F, and proximal ΔP. ΔP and Vt per unit ventilation (F x Vt2) were calculated and compared between settings, holding F, ΔP, or F x Vt2 constant. Results: 1)ΔP attenuation across ETT and R depended on total distal impedance, with more ΔP drop across higher R and with lower distal impedance (higher C, lower R) 2)Vt to each lung depended on the total impedance (R and C) of the path to it, while its ΔP = Vt/C; there was higher ΔP with lower C; lung with higher R had lower Vt thus lower ΔP; Vt could vary markedly 3)MAP in lung fell as proximal ΔP rose and varied with lung impedance and F, impacting PIP. 4)PIP was higher in lungs with lower C and/or lower R. 5)The ΔP and Vt "cost" per unit ventilation depended on each lung's R and C as well as F and proximal ΔP; at equal F / proximal ΔP, a lung's "cost" may also depend on impedance of the other lung 6) Holding total F x Vt2 equal, "cost" of unequal lungs varied with F, often showing improved "cost" of one lung while the other became worse. Conclusion: Even in a simple physical model, distribution and cost of ventilation showed complex (though predictable) dependence on F and ΔP. No optimal F could be identified.

Sponsored Research - None

1130800

EFFECT OF A HIGH FREQUENCY AMPLITUDE ATTENUATION DEVICE ON EXHALED FLOW VARIABILITY DURING HIGH FREQUENCY OSCILLATORY VENTILATION.

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BACKGROUND: Due to a sinusoidal flow pattern and high rate of breath delivery during high frequency oscillatory ventilation (HFOV), it is technically difficult to accurately assess the exhaled gas flow using conventional airway monitors. Accurate exhaled gas analysis is necessary for indirect calorimetry and volumetric capnography. The purpose of this study was to demonstrate the effects of the high frequency amplitude attenuation device (HAAD) on the measured exhaled gas flow variation during HFOV. METHODS: The HAAD forms a seal around the exhalation valve of the HFOV device and incorporates an anesthesia bag (A-bag), to which an airway monitor is tethered via a standard connector. The HAAD directs exhaled gas from the HFOV device through the A-bag which then vents to an airway monitor for analysis. A bench model was constructed to test the device. The Sensormedics 3100A was connected to a test lung. The HAAD was attached to the exhalation port of the ventilator circuit. A flow analyzer, the eVent PF300, was used to measure flow rates. Data was recorded using a laptop computer and Flowlab Flow-Analyzer software during ventilation using an unmodified control circuit (without the HAAD) and a modified circuit (with the HAAD). Furthermore, recordings were made with the additional attachment of 1 (HAAD+1) and 2 (HAAD+2) 1L A-bags in series to the HAAD. The data was imported into MS Excel and GraphPad Prism for analysis. Maximum, minimum, range and standard deviation (SD) of flow were calculated to compare the variation of measured flow with and without the HAAD. RESULTS: Figure 1 illustrates the variation in measured flow with and without the HAAD. Results from the experiment are found in Table 1. CONCLUSIONS: The application of the HAAD reduced the flow range and standard deviation considerably. Although the application of additional A-bags to the HAAD did continue to reduce the range and standard deviation of flow, the degree to which they did so was minimal. The integration of the HAAD with an airway monitor may enable enhanced gas analysis during HFOV such as volumetric capnography and indirect calorimetry.

Sponsored Research - None

Figure 1.

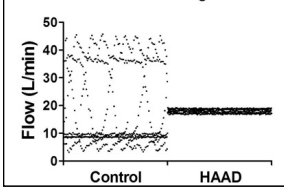

Table 1.

	Control	HAAD	HAAD+1 (2 A-bags)	HAAD+2 (3 A-bags)
$Flow_{max}$ (L/min)	45.7	19.2	18.9	18.7
$Flow_{min}$ (L/min)	3.2	16.2	16.7	17.3
$Flow_{max} - Flow_{min}$	42.5	3.0	2.2	1.4
SD (L/min)	13.7	0.7	0.6	0.3

1140577

HUMIDIFIED HIGH FLOW NASAL CANNULA USE IN NEONATES WITH CONGENITAL DIAPHRAGMATIC HERNIA.

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BACKGROUND: Humidified high flow nasal cannula (HHFNC) use is increasing in the NICU despite limited evidence. Unpredictable pressure delivery suggests caution in using HHFNC for support of infants at risk of volu/baro-trauma. One such population would appear to be infants with relative lung hypolasia, such as congenital diaphragmatic hernia (CDH). **OBJECTIVE:** Evaluate the relative efficacy and safety of HHFNC in a cohort of infants with CDH, as well as factors associated with failure or adverse outcomes. **DESIGN/METHODS:** A quality improvement tool was developed to prospectively monitor HHFNC use outside of a randomized controlled trial in 3 NICU's. Infants with CDH were specifically excluded from the radnomized trial. Between Oct 2006 and Jul 2010, 52 of 61 CDH infants operated on survived to extubation; 39 (75%) were managed with HHFNC. Pre-HHFNC respiratory support, indications, effectiveness, duration and complications of HHFNC use were assessed. Data are shown as median (25-75%) or percent. **RESULTS:** HHFNC start age was 15.6 (8.4-27.4) d, duration 7.8 (3.7-13.8) d, and start flow 5.0 (4.0-6.0) lpm. At time of HHFNC start, 24 (62%) infants were on ventilator support, the remainder were on CPAP or Nasal IMV; 21 (54%) were on inhaled NO therapy. Failure of HHFNC occurred in 6/39 (15%) of which 3 required return to ventilator support; subsequentially all 6 were successfully managed with HHFNC. Failure typically occurred within 5 days of start of HHFNC related to increasing FiO2 and/or distress. Failure was associated with prior ECMO therapy (5/12 v 1/27, P=0.007) and "need" for a maximum NC flow rate ≥ 6 lpm (6/19 v 0/20, P=0.008), but not related to type of support prior to HHFNC (vent 2/24 v non-invasive 4/15). None of the CDH infants developed air leak or had radiographic evidence of lung over-inflation during HHFNC therapy. **CONCLUSIONS:** Despite concerns over potential pressure related lung injury, HHFNC can be effectively and safely applied in the post-extubation support of most infants with congenital diaphragmatic hernia and relative lung hypoplasia.

Sponsored Research - None

1136462

EVALUATION OF OPTIMAL EXTUBATION SETTINGS FOR PATIENTS WITH SEVERE BRONCHOPULMONARY DYSPLASIA.

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Background: Extubating patients with bronchopulmonary dysplasia (BPD) from mechanical ventilation is often difficult. There is little data in the literature to predict successful extubation in this group. The Comprehensive Center for Bronchopulmonary Dysplasia (CCBPD) is a chronic care facility focused on infants with BPD and has significant experience extubating such patients. Objective: Our objective is to review all planned attempts to extubate patients with severe BPD and to determine if any pre-extubation clinical variables or ventilator settings are associated with greater rates of success. Methods: A chart review of planned extubation attempts in our CCBPD unit over a time period of over 3 years was performed. We recorded standard clinical and demographic data, including corrected gestational age (CGA), patient weight at extubation, history of necrotizing enterocolitis (NEC), interventricular hemorrhage (IVH), and ventilator settings prior to extubation. We then compared clinical data between those successfully extubated and those reintubated using single factor analysis of variation (ANOVA). We defined successful extubation attempts as avoiding the need to intubate for at least 72 hours. Informal unit guidelines suggested achieving a level of 40% FIO2 or below before a planned extubation was attempted. Results: Data was analyzed for 94 planned extubations involving a total of 62 patients. Sixty-one attempts were successful (65%). There were no statistically significant differences between successfully and unsuccessfully extubated groups in CGA (p=0.92), FIO2 (p=0.91), weight at extubation (p=0.29), Inspiratory Time (p=0.61), Respiratory Rate (p=0.56), or Positive End Expiratory Pressure (p=0.28). There was a statistically significant association between Peak Inspiratory Pressure (p=0.02) and Mean Airway Pressure (p=0.058) for successful extubations. Conclusions: This study suggests that the ventilator parameters of Peak Inspiratory Pressure and Mean Airway Pressure are statistically associated with successful extubations in patients with severe BPD. Moreover, patient demographics such as CGA, history of NEC and/or IVH did not seem to predict success. Notably, this study does demonstrate that patients with severe BPD can be extubated successfully from very high ventilator settings.

Sponsored Research - None

Ventilator Settings at Extubation

Ventilator Parameter	Successful Extubation Attempt	Failed Extubation Attempt
PIP cm H2O	39.7	43.8
PEEP cm H2O	7.4	7.6
Respiratory Rate Breaths per Minute	16.6	16.3
I-Time seconds	0.64	0.66
Mean Airway Pressure cm H2O	13.1	14
FIO2 %	34.2	34.4

1148316

IATROGENIC AUTO-PEEP AND ASSOCIATED HIGH PEEP ALARMS CREATED BY THE DRAGER VN500 VENTILATOR IN THE NEONATAL INTENSIVE CARE UNIT.

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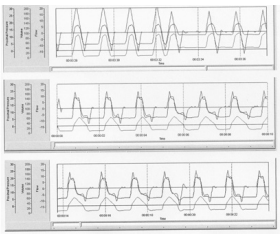
BACKGROUND: The Drager VN500 is a dedicated Neonatal and Pediatric ventilator that entered service in the Level 3 NICU in last November. The ventilator mode used in the NICU with the VN500 was PC-SIMV, and the software version was 2.10. Immediately upon connection to a patient the therapist in attendance noted a consistent alarm pattern. Upon assessment it was noted that the alarm indicated a PEEP high condition. METHODS: The patient-ventilator system was assessed and evaluated for obstruction of the endotracheal tube, expiratory valve or ventilator tubing. There was no identifiable source of obstruction identified. There was no identifiable cause for excessive PEEP and the ventilators were secured for evaluation in a controlled environment. RESULTS: Three newly acquired VN500 ventilator platforms were evaluated in the laboratory environment using the Michigan Instruments 5601i Adult/Infant test lung utilizing ventilator parameters commonly employed in our the Neonatal environment. Test lung settings were Compliance 0.003 L/cmH2O, Resistor Rp50, Infant Lung. VN500 settings were: Mode - PC-SIMV, Pinsp - 20cmH2O, PEEP 5 cmH2O, Frequency - 50/minute, and Inspiratory Time - 0.35 seconds. The data acquired from the Michigan Instruments5601i Adult/Infant test lung validated the hypothesis that during routine FIO2 adjustment the VN500 automatically adjusts the bias flow to expedite the FIO2 change. This rapid alteration of bias flow actuated the PEEP high alarm. The PEEP high alarm is triggered when the baseline PEEP exceeds 4 cmH2O greater than clinician set PEEP. The high auto-PEEP condition is created by the ventilators controlling algorithms furtive changes in bias flow. In addition to the excessive auto-PEEP increase during the FiO2 adjustment there is a baseline PEEP decrease following the FIO2 change. Graphic analysis demonstrates both the increase in PEEP created by the excessive flow increase and the excessive delay in the realization of the baseline, clinician set, PEEP. CONCLUSIONS: The VN500 and the initial software (2.10) created excessive and potentially dangerous levels of Auto-PEEP as well as a momentary loss of clinician set PEEP in our NICU. This iatrogenicaly created level of Auto-PEEP and co-attendant loss of baseline PEEP may be harmful in the context of an NICU. The final resolution is not in place 6 months after discovery and notification of the manufacturer.

Sponsored Research - None



Michigan Instruments 5601i Test Lung Data
Ventilation by Drager VN500 Neonatal/Pediatric Ventilator

1150062

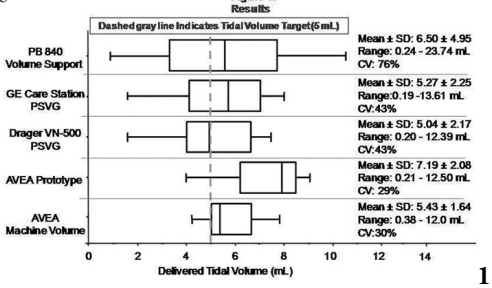
TIDAL VOLUME PRECISION DURING NEONATAL VOLUME-TARGETED, SPONTANEOUS MODES WITH A LARGE ETT LEAK IN AN ERRATICALLY BREATHING INFANT LUNG MODEL.

Rob DiBlasi, Kendra Smith, Dave Crotwell, John Salyer; Seattle Children's Hospital, Seattle, WA

BACKGROUND: Volume-targeted spontaneous modes of ventilation are gaining acceptance for use in premature infants to provide consistent tidal volume (VT) delivery. We evaluated 4 commonly used neonatal ventilator's ability to maintain target VT with changes in patient breathing patterns and respiratory effort with a large ETT leak. We hypothesized there would be no difference in the delivered VT between ventilator brands under these conditions. METHODS: Three each of 3 brands of neonatal ventilators were tested and a single unit of a fourth brand, using respective volume-targeted spontaneous modes, including: 1) GE Carestation; 2)PB 840(N=1); 3) Drager VN500; and 4) Carefusion Avea (Machine volume and new Prototype mode). The ventilators were set at VT=5 mL, Back-up RR 40 breaths/min, PEEP 5 cmH2O, and FIO2 0.21 and gases were humidified at 37°C for twenty minutes prior to testing. When available, the ventilator was set to limit excessive volume delivery at 125-130% of the set VT. The Ingmar ASL 5000 ventilator was configured using a customized breath sequence (n=155) consisting of erratic, spontaneous and apneic breathing patterns coupled with ongoing changes in mechanics and breathing effort. Each ventilator was attached to the ASL 5000 with a 2.5 mm ID endotracheal tube. Breath to breath VT delivery was measured using ASL software version 3.2 for the entire breath sequence. Customary descriptive statistics were calculated for delivered VT including coefficient of variation. Mean differences between brands were tested for statistical significance using ANOVA with significance established as $P < 0.05$. The precision of VT delivery was calculated using coefficient of variation (CV). RESULTS: Figure 1 shows the descriptive statistics and distribution of delivered tidal volumes for all ventilators tested. There were significant differences reported between ventilator brands ($p<0.01$) and we would characterize these performance differences as clinically important. CONCLUSION/DISCUSSION: There may be clinically relevant differences in these neonatal volume-targeted, spontaneous breathing modes that are based on how well the ventilator measures tidal volume and regulates inspiratory pressure to achieve a tidal volume target in the presence of a large endotracheal tube leak

Sponsored Research - Some of the ventilators provided for this study were done so by GE, Covidien, and Drager.

Figure 1:
Results



1150604

PERFORMANCE EVALUATION OF FOUR SUBACUTE CARE VENTILATORS IN A SIMULATED SPONTANEOUSLY BREATHING INFANT WITH CHRONIC LUNG DISEASE.

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BACKGROUND: Infants with chronic lung disease (CLD) commonly require invasive ventilation extending beyond the ICU setting. Many of these infants have a difficult time transitioning to subacute care ventilators presumably because they have difficulty triggering breaths. These limitations can result in prolonged ICU admission and increased hospital stay. We conducted experiments to evaluate trigger response and other performance characteristics in four flow-triggered subacute care ventilators. We hypothesized there would be no differences in ventilator performance comparing the Trilogy 202 (Philips Healthcare, Andover, MA), I-Vent 101 (GE Healthcare, Madison, WI) and LTV models 1000/1200(Carefusion, Yorba Linda, CA) in a simulated spontaneously breathing infant with CLD. METHODS: Ventilators were equipped with proprietary patient circuits and a leak test was performed. They were then attached to a spontaneously breathing lung model (Ingmar ASL 5000) configured with mechanics similar to those measured in an infant with CLD (C: 4 mL/cmH2O, R:150 cmH20/L/s, Pleural Pressure: -12 cmH2O, RR: 40) via a Custom 3.5 ID Neo Bivona TTS trach . Settings included Assist-Control/Pressure Control mode, PIP:24 cmH2O, PEEP:8 cmH2O, RR: 20 breaths/min, TI: 0.4 sec, Rise Time:1, Leak Compensation: ON, and Flow Trigger Level:1. Measurements of pressure-time product (PTP; an index of trigger work), PIP, PEEP, and tidal volume were obtained from the ASL 5000 (n=20). We assessed lung model graphics post-hoc to assess frequency of triggered breaths (Trigger Breath %= Total #spontaneous inspiratory efforts/#triggered ventilator breaths). In situations where all breaths were triggered, VT accuracy between the measured and delivered VT was calculated (% Error). RESULTS: Table 1 shows data for each ventilator and circuit configuration being used. Values are reported as Mean±SD. TheTrilogy 202, with flow triggering using passive and active flow circuits, was the only ventilator to capture 100% of spontaneous respiratory efforts at lower PTPs than the other ventilators tested. The Trilogy 202 and LTV 1000 provided better PEEP stabilization than the I-Vent 101 and LTV 1200. CONCLUSION/DISCUSSION: Based on these data, the Trilogy 202 may extend the ability for transitioning patients from critical care ventilators to subacute care ventilators more easily. This is due in part to the use of an incorporated proximal flow sensor placed at the airway.

Sponsored Research - Ventilators were loaned for this study

Table 1: Results

	Triggered Breaths (%)	PTP (cmH_2O*ms)	PIP (cmH_2O)	Volume Accuracy (% Error)	PEEP (cmH_2O)
Trilogy 202 (Active/Flow)	100	293.4± 74.6	22.5± 0.1	- 33.0± 14.7	8.3± 0.1
Trilogy 202 (Passive/Flow)	100	235.5± 21.5	21.8± 0.0	- 40.2± 10.6	8.4± 0.1
Trilogy 202 (Passive/Autotrack)	50	194.6± 7.1	21.6± 0.0	NA	8.3± 0.1
I-Vent 101	45	1536.3± 859.2	24.3± 2.9	NA	5.4± 5.2
LTV 1000	55	391.1± 132.9	24.0± 0.4	NA	8.1± 0.2
LTV 1200	70	592.2± 128.3	27.1± 2.0	NA	6.4± 4.2

1150577

A NOVEL METHOD FOR MEASURING CO2 ELIMINATION DURING HIGH FREQUENCY OSCILLATORY VENTILATION.

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BACKGROUND: The application of volumetric carbon dioxide (VCO2) monitoring is used during conventional ventilation as it provides continuous feedback pertaining to ventilation and lung perfusion. Exhaled gas monitoring is difficult during high frequency oscillatory ventilation (HFOV) due, in part, to rapid and significant changes in gas flow. This study examines the accuracy of a novel method for measuring VCO2 during HFOV in a pediatric lung model. METHODS: A high frequency amplitude attenuation device (HAAD) was attached to the exhalation valve of the Sensormedics 3100A high frequency ventilator. The HAAD works by directing exhaled gas through a 1 liter anesthesia bag which vents to an airway monitor for gas analysis. The HAAD reduces the oscillatory flow variations of HFOV exhaled gas and permits accurate monitoring using conventional flow and carbon dioxide monitoring technology. A bench model was constructed to test the method. A test lung was connected to the ventilator circuit. CO2 production (VCO2prod) was simulated by bleeding various amounts of CO2 (40-300ml/min) into the test lung. VCO2prod flow rate was measured and recorded before it was introduced into the test lung. Partial pressure of mixed expired CO2 (PeCO2), barometric pressure (Pb) and flow were measured using the Philips NM3 airway monitor. CO2 elimination (VCO2elim) was calculated by multiplying the CO2 fraction (PeCO2/Pb) by the total gas flow. Ventilator settings were recorded. A Pearson correlation and Bland-Altman analysis were used to determine the accuracy of VCO2elim compared to the known VCO2prod level. RESULTS: Correlation between VCO2prod and VCO2elim was $r^2=0.996$, $P<0.0001$. Figure 1 is a plot of VCO2elim versus VCO2prod. The best fit (solid line) and the one-to-one line of identity (dotted line) are shown. Figure 2 is a Bland-Altman plot of VCO2prod and VCO2elim. Bias was 8.1 ± 12.5 ml/min (mean ± SD), 95% limits of agreement were -16.5 to 32.7. CONCLUSIONS: The main finding was a statistically significant agreement between a known CO2 production level and CO2 elimination, measured using a novel, non-invasive method during HFOV. The Bland-Altman plot revealed a predictable proportional error and very good accuracy in the pediatric CO2 elimination range (~70-150 ml/min). Clinical application of this method may offer a significant advancement in airway monitoring during HFOV; permitting rapid determination of changes in ventilation and lung perfusion.

Sponsored Research - None

Figure 1.

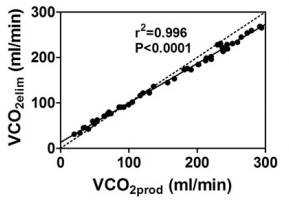
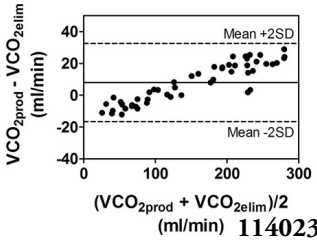


Figure 2.



1140230

INTRODUCTION AND EVALUATION OF METANEB ® IPV DEVICE IN A PEDIATRIC MODEL.

Cathy A. Hejl, Robert S. Trusty, Melissa M. Damas, Jon M. Langenfeld, Teresa Zustiak, William Wheeler, Michael Shreve; Respiratory Therapy, Childrens Hospitals and Clinics of Minnesota, Minneapolis, MN

Background: IPV was introduced in August 2010 with the Metaneb device. Diagnoses for patients treated included pneumonia with acute respiratory failure,bronchiolitis, and patients with innate mucociliary transport dysfunction. Methods and materials : Metaneb box,circuit adapters and valved tee for inline therapy. Policy and procedure was adapted to the use of an open entrainment ring on the circuit. In-vitro evaluation reflected this to be a safer choice to modulate delivered PIP, MAP during inline therapy. Full occlusion ring was employed on circuits on intubated patients with peep greater than 8 cm set. Results :75 patients,ages 4 weeks to 22 years were treated with invasive and non-invasive IPV therapy with Metaneb. 7 patients demonstrated intolerance by hemodynamic compromise or the inability to coordinate breathing mechanics. 5 patients were found to have positive ETT cultures after therapy started. Conclusions: MetaNeb therapy was found to be beneficial for patients in pediatric acute and critical care environment. 70% of patients treated demonstrated a significant improvement in CXR within 48 hours after staring therapy. Approximately 78 % of patients treated demonstrated a decrease in secretion burden after 24 hours of therapy. Our policy and procedure for administration of this therapy evolved from this evaluation. Patients with evidence of high airway resistance, or a disease process that demonstrated marked hyperinflation were not considered prime candidates for the therapy. Patients less than 2 years of age that required a mask interface for therapy are managed at a pediatric intensive care or intermediate care unit status. It was established in our policy and procedure to administer all medicated aerosolized therapy via ultrasonic therapy prior to the IPV therapy on in-line application of a MetaNeb treatment. Infection control standards developed included changing the small volume nebulizer cup every 24 hours, if the SVN cup was utilized. The MetaNeb circuit is changed every 3 days. The cleansing of any contact connections of the MetaNeb circuit and ventilator adapters and valved "tee" with Choraprep antiseptic wipes for 30 seconds prior to the introduction of the MetaNeb circuit into the ventilator circuit was mandated for in-line application.

Sponsored Research - None

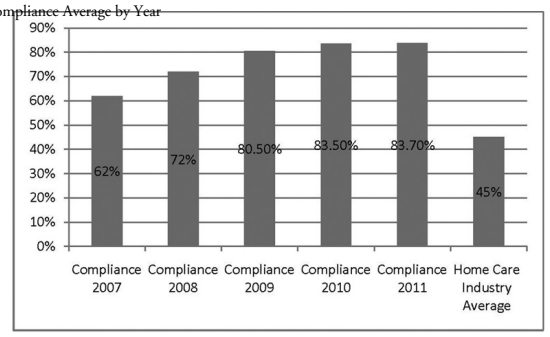
1135832

PAP THERAPY: INCREASING PATIENT COMPLIANCE THROUGH CLINICAL DRIVEN PATHWAYS.

Jenni Beilman, Becky Hall, Debbie Schuessler; Respiratory Care, Via Christi Home Medical, Wichita, KS

Background: In 2006, based on a health system wide initiative to increase our focus on clinical outcomes, the business decision was made to utilize only PAP devices that provide clinical data download capabilities. To achieve a more acceptable compliance rate, we believed a clinically driven pathway was required. The recognized national home care industry average for PAP compliance was approximately 40 to 50%. Third party payers are beginning to recognize the significance of compliance for overall health benefits. In November 2008 Medicare implemented guidelines focusing on more stringent PAP compliance requirements. Objective: In order to maximize PAP compliance, a clinically driven therapy pathway was developed and implemented which allowed individualized education and support with a respiratory therapist. Method: The pathway was implemented for all new PAP therapy patients and provided education and follow-up on a planned schedule to allow therapists to monitor the patient's symptoms and clinical data. This clinical supervision, along with wireless modems and data card downloads, allowed for close monitoring during the first 30 days which is widely recognized as the critical window to enable the patient to be successful with therapy. A therapist contacts the patient at a minimum of 24-48hr, 2 week, 30 day, 60 day, 90 day, 6 months. At each of these follow ups, a subjective patient interview as well as a review of the clinical data is done to determine the patient's response to therapy. We utilized the Respironics Encore Software Program to track and monitor our patients. Our clinical and compliance outcomes were derived by this program. Results: Since monitoring compliance, our PAP compliance percentile has risen from 62% to a current level of 83.7%. This represents an increase of 21.7%, and an increase by home care industry average of 38.7%. Conclusion: It was hypothesized that PAP compliance would be optimized when patients were followed via a therapist driven clinical pathway which allows for intensive intervention and oversight. Compliance rates were monitored over a period of 5 years and it was determined that they exceeded the national rate for PAP compliance by an average of 30% to 50%. References are available.

Sponsored Research - None



1144144

HEALTHSPRING MEDICARE ADVANTAGE PLAN-COMPREHENSIVE CASE MANAGEMENT RESPIRATORY PROGRAM.

Deandrea Prince, Michael Davidson, Frederick Watson; Health Services, HealthSpring, Houston, TX

Background: HealthSpring, a Medicare Advantage Plan, has approximately 8,000 members with a COPD/Asthma diagnosis in the Texas market. The 2010 costs of COPD/Asthma related care among HealthSpring beneficiaries age ≥ 65 years account for a significant part of medical expenses and a third of the acute admissions. In an attempt to reduce admissions, HealthSpring devised a unique approach which utilizes a Respiratory Therapist through the Comprehensive Case Management Respiratory Program. Objective: The Comprehensive Case Management Respiratory Program uses a Respiratory Therapist to focus on coordination of services to enhance the members' quality of life, reduce re-admissions, facilitate provision of services, and promote quality cost effective outcomes. Specifically, those diagnosed are targeted for more personalized attention. The program is also beneficial for our Special Care Program (SNP) members to meet CMS regulatory requirements and the members' personal health improvement goals. Method: The program was implemented for members with a COPD/Asthma diagnosis and two hospital encounters within the previous six months. The first step of the program consists of a respiratory therapist home visit after the member is discharged from the hospital. The second step following the initial home visit, the member will receive ongoing reinforcement telephonically from the Respiratory Therapist who interfaces with providers to facilitate effective communication, referrals, development of discharge planning and alternative treatment arrangements. Relevant metrics are tracked and compiled, such as medical cost and acute admissions, which are reviewed intermittently. Results: 265 patients with COPD/Asthma were enrolled in the program during the 2010 calendar year. The acute admits per thousand (ADK) decreased by 40%. This represents a considerable reduction in respiratory admissions and in overall medical expenses. There were small increases in durable medical equipment (DME) and utilization in prescription drugs which is indicative of members' adherence to using the respiratory equipment and medication. Conclusions: This program yielded significant results for patients with a COPD/Asthma diagnosis. The benefits of using a respiratory therapist, in a managed care setting, telephonically and face to face has had a great impact on reducing hospital admissions and utilization through education to improve the quality of life.

Sponsored Research - None

1132723

PATIENT SATISFACTION FOLLOWING A TRANSITION OF CARE COPD MANAGEMENT PROGRAM IN THE HOME.

Kimberly S. Wiles, Dan Easley; Klingensmith HealthCare, Ford City, PA

COPD patients are often discharged from the hospital with minimal information and very little follow up. The 30 day readmission rate in western Pennsylvania is 25%. With rehospitalization penalties imminent, it is important to implement programs targeting chronic disease management. The imperative with a transition program is that the patient and caregivers are given the knowledge to achieve an independent lifestyle. Objective: To evaluate 30 day patient satisfaction following a respiratory therapist driven COPD management program. Method: COPD patients requiring supplemental oxygen were admitted into a chronic disease management program, DASH (Discharge + Assessment & Summary @ Home). The program consisted of 3 home visits by a respiratory therapist within 30 days to educate, titrate oxygen during activities of daily, monitor oxygen compliance and adherence, etc. The patient established a motivational goal and a plan of care was developed around the achievement of that goal. The RT visits were supplemented with several phone calls by an in-house clinical care coordinator. A survey was completed by the patient after 30 days. Results: 20/31 patients completed the 30 day DASH program and returned a 30 day satisfaction survey. •100% reported a better understanding of the disease •55% achieved their motivational goal that was established on the initial home visit •Zero patients reported a hospital admission due to COPD •85% knew what to do in a "flare up" •2 patients called their physician regarding a "flare up", but avoided a hospital admission •95% knew how and when to take their medications •80% understood how the various breathing techniques to help control shortness of breath •90% were able to complete home activities on their own at the end of the 30 day program •3 of the 20 patients were involved in a pulmonary rehab program Conclusion: A respiratory therapist driven COPD transition of care program significantly increases patient confidence and perception of independence, while decreasing hospital 30 day readmissions.

Sponsored Research - None

1149309

PERFORMANCE OF ACTIVITIES OF DAILY LIVING AS A PREDICTOR OF REHOSPITALIZATION FOR PATIENTS WITH COPD EXACERBATIONS.

Brian W. Carlin[1], Dan Easley[2], Kim Wiles[2], Nan Rees[3]; [1]Allegheny General Hospital, Pittsburgh, PA; [2]Klingensmith HealthCare, Ford City, PA; [3]St. Clair Hospital, Pittsburgh, PA

Background: A significant number of patients with COPD who are hospitalized with an exacerbation are readmitted to the hospital within a 30 day period following discharge. Predictors for such rehospitalization risk have yet to be identified. Purpose: To evaluate the rehospitalization rates for patients with COPD using performance of activities of daily living as a metric marker. Method: The Discharge, Assessment, and Summary @ Home (D.A.S.H., Klingensmith HealthCare, Ford City, Pennsylvania) program is a respiratory therapist driven home care based program for patients with COPD who are using supplemental oxygen following discharge from the hospital. As part of the program the measurement of activities of daily living is made on the day #1, day #7, and day #30 post-hospitalization. A series of four patient selected ADLs is performed at each visit (e.g walking the four points of the home, loading the dishwasher). Oxygen saturations are maintained above 90% using a SmartDose Oxygen delivery system. Each ADL is performed and measured as either completed or not completed based upon the actual task at hand. Results: A total of 229 patients were entered into the study and had four ADLs performed at each of the three visits. 23/229 (9%) patients were readmitted to the hospital within a 30 day period. 8 (3.5%) were readmitted with a COPD exacerbation and the remaining 15 (6.6%) were readmitted for other reasons. For those patients (n=42) who performed 1 or less of 4 ADLs to completion by day #7 of the program, there were 8 (19%) readmitted. For those patients who could perform 2 or more ADLs to completion there were 15/187 (8%) readmitted. Conclusions: Those patients with COPD who were oxygen dependent following hospital discharge for an exacerbation who could perform one or less ADLs to completion by 7 days following discharge have a higher 30 day readmission rate to the hospital. Performance of ADLs may be a helpful marker to determine risk for rehospitalization and should be considered to be performed in the home environment following discharge.

Sponsored Research - Klingensmith Staff members performed the ADL measurements and data collection.

1150076

MEDICATION USAGE FOR PATIENTS WITH COPD WHO WERE READMITTED WITHIN 30 DAYS FOLLOWING HOSPITAL DISCHARGE FOR AN EXACERBATION.

Brian W. Carlin[1], Kim Wiles[2], Dan Easley[2], Nan Rees[3]; [1]Allegheny General Hospital, Pittsburgh, PA; [2]Klingensmith HealthCare, Ford City, PA; [3]St. Clair Hospital, Pittsburgh, PA

Background: Appropriate medication use is an important component in the management of a patient with COPD following a hospitalization for an exacerbation. Readmission rates may depend upon the actual medications being used. Objective: To evaluate the medication usage in patients with COPD who were readmitted to the hospital following discharge for treatment of an exacerbation. Method: The Discharge, Assessment and Summary @ Home (D.A.S.H., Klingensmith HealthCare) program was implemented for patients who require supplemental oxygen use following hospital admission and has been previously described in detail. For those patients who were readmitted to the hospital within the first 30 days following discharge, analysis of the respiratory medications being used was done. Medication usage was obtained directly from the patient by the respiratory therapist who was visiting the patient in the home on the day following hospital discharge. Medications were classified based upon the following: metered dose inhaler (MDI), long acting beta agonist (LABA), long acting muscarinic agent (LAMA), inhaled corticosteroid (ICS), oral corticosteroid (OCS), antibiotic (ATB), aerosol (beta agonist and/or muscarinic), or leukotriene modifier (LTM). Three hundred and one patients with COPD from 23 different hospitals were studied. Results: 14 of the 301 (5%) patients in the DASH program were readmitted within the first 30 days following discharge. The following medications/combinations were being used (Table 1). 4/14 (28%) were receiving an MDI or ICS only of which two patients were on no therapy. Only 1/14 (7%) was receiving an oral corticosteroid and 0/14 (0%) were receiving an antibiotic. 8/14 (57%) patients were on a combination that included LAMA and/or LABA, and an ICS and/or OCS. 2/14 (14%) were on a LAMA alone. Conclusions: In this COPD patient population who required rehospitalization within 30 days of hospital discharge, 28% of patients failed to be prescribed therapy that has been shown to reduce exacerbations. Variable usage patterns in this patient population exist. More well-defined guidelines regarding such therapy should be developed and implementation encouraged

Sponsored Research - Klingensmith HealthCare developed the program. Kim Wiles and Dan Easley are employees of Klingensmith HealthCare. Dr. Carlin and Ms. Rees have no financial interests in Klingensmith HealthCare.

Medication	Patients (Number)	MDI Use	Aerosol Use
LABA/ICS/LAMA	4	2	4
LABA/ICS/LAMA/OCS	1	1	1
LABA/ICS	3	1	3
LAMA alone	2	1	0
LABA alone	0	0	0
MDI alone	1	1	1
ICS alone	1	0	0
No therapy	2	0	0

1145622

TRANSITION OF CARE PROGRAM AND REHOSPITALIZATION RATES FOR PATIENTS WITH COPD WHO REQUIRE HOME OXYGEN THERAPY FOLLOWING AN EXACERBATION: AN UPDATE.

Brian W. Carlin[1], Kim Wiles[2], Dan Easley[2], Nan Rees[3]; [1]Allegheny General Hospital, Pittsburgh, PA; [2]Klingensmith HealthCare, Ford City, PA; [3]St. Clair Hospital, Pittsburgh, PA

Background: The overall 30 day readmission rate for patients with COPD following hospitalization for an exacerbation approaches 25% in the Western Pennsylvania area. Strategies need to be developed to effect a reduction in this readmission rate. Objective: To evaluate the effects over the past year of a home care based, respiratory therapist centered transition of care program for patients who require home oxygen therapy following hospital discharge from an exacerbation. Method: The Discharge, Assessment and Summary @ Home (D.A.S.H., Klingensmith HealthCare) program was implemented for patients who require supplemental oxygen use following hospital discharge. Data from the initial six months was reported previously. This data is a summary of the fourteen months of the program. The program consists of face-to-face visits by a respiratory therapist with the patient in the home environment on days 2, 7, and 30 following hospital discharge. Phone interviews by a care coordinator are then conducted in between these visits. Education, behavior modification, skills training, oxygen titration during performance of activities of daily living, clinical assessment, and adherence data collection are key components of the program. Four hundred thirty nine patients who were discharged from the hospital and required supplemental oxygen were enrolled into the program. Results: The 439 patients enrolled were from 23 different hospitals in the Western Pennsylvania area from March 2010 through May 2011. The primary discharge diagnosis was: COPD in 301 (69%); CHF 57 (13%); hypoxemia 33 (8%); pneumonia 19 (4%); and other 29 (7%). The 30 day readmission rate for the entire group was 7%. The 30 day readmission rate for those with COPD due to a recurrent exacerbation was 3% (8/301), for those with CHF due to an exacerbation was 5% (3/57), and for those with non-COPD diagnoses for any reason was 7% (3/81). 6% (18/301) patients with COPD were readmitted within 30 days for a diagnosis other than an exacerbation. Conclusions: Since the inception of the respiratory therapist based transition of care program, the 30 day rehospitalization rate remains below 7% for patients who were discharged from the hospital and required supplemental oxygen.

Sponsored Research - Klingensmith Health Care is a provider of DME equipment and is the developer of the program. Dan Easley and Kim Wiles are employees of Klingensmith Healthcare. Dr. Carlin and Ms. Rees have no financial ties to the program.

1145616

EFFECT OF A HOMECARE RESPIRATORY THERAPIST EDUCATION PROGRAM ON 30 DAY HOSPITAL READMISSIONS OF COPD PATIENTS.

Louis M. Kaufman, Ann P. Smith; Roberts Home Medical, Inc., Germantown, MD

Background: Nationwide, 22.6% of chronic obstructive pulmonary disease (COPD) patients require re-hospitalization within 30 days of discharge. Beginning in October 2012 hospitals could incur financial penalties for high readmission rates. The purpose of this study was to assess the effectiveness of a respiratory therapist education program on 30 day hospital readmission rates for COPD patients. Method: A retrospective chart review was conducted of 133 consecutive patients with a primary or secondary hospital discharge diagnosis of COPD, who were prescribed either oxygen or a nebulizer, and who were enrolled in the Roberts Home Medical, Inc. COPD education program. The study group included 84 females and 49 males with a mean age of 74 (range 48 to 100). Patients received a respiratory therapist home visit within 3 days of discharge and additional visits one week and one month after the initial visit. During each visit the respiratory therapist performed a clinical evaluation, provided instruction in the use of the medical equipment, and provided information on COPD and management of this disease including breathing exercises and proper nutrition. The respiratory therapist ensured prescriptions were filled and follow-up physician appointments made, reconciled medications, and provided instruction on the proper use of metered dose inhaler, dry powder inhaler, and/or nebulizer. Patients with portable oxygen were evaluated for use of intermittent oxygen flow and, if appropriate, a specific oxygen conserving device was titrated to provide oxygen saturations of ≥90% at rest and with exertion. If indicated, additional information was provided on smoking cessation, immunizations, and pulmonary rehabilitation. Results: The 30 day study was completed by 128 patients; two patients expired, two patients transferred to hospice, and one refused follow-up visits. During the 30 day period after initial discharge seven patients (5.5%) were re-admitted to the hospital for COPD or other diagnoses. Conclusions: In this sample of COPD patients the post-discharge hospital readmission rate was 5.5% compared to the national average of 22.6%. The data supports that this three visit education program delivered by respiratory therapists was effective in decreasing 30 day hospital readmission rates for COPD patients.

Sponsored Research - None

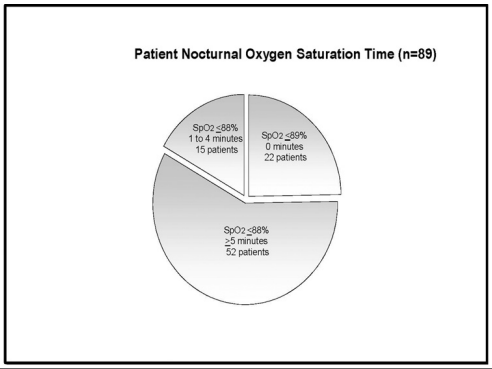
1127819

NOCTURNAL OXYGEN SATURATIONS OF COPD PATIENTS BREATHING PRESCRIBED OXYGEN.

Louis M. Kaufman; Roberts Home Medical, Inc., Germantown, MD

Background: Global Initiative for Chronic Obstructive Lung Disease (GOLD) and American Thoracic Society (ATS) guidelines indicate that long-term oxygen therapy (LTOT) patients should either be titrated to an SpO2 of ≥90% or have oxygen flow increased by 1 L/min during sleep. The purpose of this study was to determine whether LTOT patients whose oxygen dose had not been altered for sleep do experience nocturnal oxygen desaturation while breathing their prescribed oxygen. Method: A retrospective chart review was conducted of 92 consecutive patients with a primary or secondary diagnosis of chronic obstructive pulmonary disease (COPD) who met reimbursement criteria for and were prescribed LTOT for continuous use. There was no difference in their "at rest while awake" and "during sleep" prescribed oxygen flow. A recording pulse oximeter (920M, Philips Respironics, Murrysville, PA) was provided. Patients were instructed to use their prescribed oxygen flow and to apply the pulse oximeter during sleep. Data was extracted using PROFOX Oximetry Software (PROFOX Associates, Escondido, CA). Results: The study group included 33 males and 56 females with a mean age of 73 (range 47 to 94). The study was completed by 89 of the 92 patients; three patients used the pulse oximeter but did not use oxygen during the study. Study times averaged 425 minutes (range 46 minutes to 745 minutes). Oxygen saturation of ≥89% was maintained throughout the study by 24.7% (22) of the patients; 16.9% (15) of the patients experienced oxygen saturation of ≤88% for ≤4 minutes; 58.4% (52) of the patients experienced oxygen saturation of ≤88% for 5 to 600 minutes. Conclusions: In the majority of patients in this sample, nocturnal oxygen prescriptions which did not vary from "at rest" measurements did not provide adequate oxygen saturation during sleep. This study supports published guidelines which state patients receiving LTOT should either have a nocturnal oxygen titration study or have their oxygen flow increased during sleep.

Sponsored Research - None



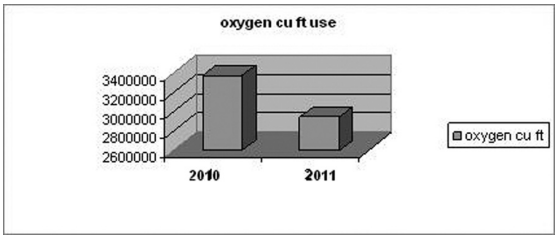
1127820

EVALUATION OF A HOSPITAL OXYGEN CONSERVING FLOWMETER.

Hal Herlong, Dave Smith, Fred Beteta, Holly Hartley, Yolanda Serrano, Kiumars, MD Saketkhoo; Respiratory, Presbyterian Intercommunity Hospital, Whittier, CA

Background: Presbyterian Intercommunity Hospital is an acute care 440 bed facility. The economy of today has continued to add additional pressure on providers to discover ways to conserve economically while continuing to provide high standards of care. We decided to engage in a trial of the 19MFA EasyPulse Flowmeter from Precision Medical Inc. The trial focused on evaluating the use of oxygen conserving technology within the hospital setting. Method: All patients requiring oxygen therapy via nasal cannula admitted and maintained in the new tower of the hospital over the duration of the trial. The 144 bed tower houses cardiac, respiratory, diabetic, and orthopedic surgical patients. Education was provided to all staff members that we concluded would have contact with the patients in the affected Tower. The default technique of oxygen administration in these patients was the pulse flow mode. Titration of oxygen dose was based on ordered acceptable SPO2 ranges. Any patient who was unable to maintain acceptable ordered SPO2 in the pulse mode was placed in the continuous mode. Results: Ninety days of daily monitoring of 1521 patients days, revealed 861 (57%) patients successfully used the conserving pulse mode, 543 patients (36%) used the continuous mode, and others 117 (6%) were not applicable due to their use of humidifier, 25 foot cannula, mask, or patient refusal (1%). Conclusion: The below graph reflects an 8% decrease in oxygen purchases for 3 months, even with a 2011 cost increase of $0.03 / 100 cubic feet. There was also a 2% increase in patient census throughout this period for the overall hospital which also had impact on the amount of consumed oxygen. There was a 10% increase in admissions to the emergency room over 2010 census for this same period, which also affected the total purchase of oxygen for the hospital. In spite of this, we were still able to record a decrease in total oxygen consumption through the use of the EasyPulse flowmeter.

Sponsored Research - None



Oxygen Cubic Feet

1121857

PULMONARY REHABILITATION CORRECTS OXYGEN PRESCRIPTIONS IN CHRONIC LUNG DISEASE PATIENTS.

Arianna M. Villa, Alben Lui, Trina Limberg, Catherine Larsen, Maria Baylon, Anne Mohney, Xavier Soler, Andrew Ries; Pulmonary Rehabilitation, UCSD Medical Center, San Diego, CA

BACKGROUND: Oxygen therapy is an important treatment for hypoxemic patients with chronic lung disease, vital to improving activity levels and mobility. During pulmonary rehabilitation (PR), oxygen prescriptions are often found to be incorrect, requiring alteration to meet the patient's oxygen needs. We retrospectively analyzed changes in exercise oxygen prescriptions for patients referred to our PR program. METHODS: A retrospective, observational study was conducted to assess exercise oxygen prescriptions in 60 hypoxemic patients with chronic lung disease before and after participation in the UCSD PR Program. Data collected included age, gender, and clinical information from the patient's medical records, including pulmonary diagnosis based on clinical impression or pulmonary function tests, if available. Oxygen data were obtained from the pre-PR evaluation and the post-PR discharge summary. Data collected included form of oxygen storage (gas vs. liquid), delivery mechanism [oxygen conservation device (OCD) vs. continuous flow], and flow rate (OCD setting vs. L/min continuous flow). Flow rates were classified as high (continuous flow rate 4 L/min or higher or OCD setting #4 or higher) or low (continuous flow 3 L/min or lower or OCD setting #3 or lower). RESULTS: Among the 60 patients, 43 were obstructed, 14 were restricted, and 3 had mixed disease. The number of patients prescribed supplemental oxygen with exercise before and after PR was similar. However, 5 patients had their exercise oxygen discontinued, while 4 had new prescriptions initiated. All were obstructed. The number of patients prescribed high flow oxygen with exercise nearly doubled after PR, both in obstructed and restricted patients. The number of patients using an OCD decreased by 6, most of whom were restricted patients who could not be adequately oxygenated by an OCD device. Patients using compressed gas increased from 47 to 51. CONCLUSIONS: Exercise oxygen prescriptions made prior to PR are often incorrect, and often insufficient to meet patients' needs. 22 of 60 (36.7%) hypoxemic patients required change to higher flow rates and systems that provide more oxygen. Compressed gas systems appear to be more prevalent, especially in those patients requiring high flow rates.

Sponsored Research - None

1148485

OPTIMAL OXYGEN TITRATION POINT IN FULL FACE MASK CPAP THERAPY.

Bernhart Hochleitner, Ron Sherman; The Reading Hospital and Medical Center, Reading, PA

OBJECTIVE: Optimal oxygen titration points during continuous positive airway pressure (CPAP) therapy with full face mask (FFM) have not been established. Our goal was to find the optimal oxygen titration point within a CPAP delivery system by analyzing oxygen concentrations. METHOD: An Invacare Polaris EX CPAP machine was used to deliver CPAP+5 via a Hudson RCI non-invasive vent circuit with an exhalation port proximal to the FFM. A hole was drilled in the front of a Respironics Performatrack FFM. A flow diverter was inserted into the hole and sealed with caulk. A micro-fuel cell T-7 was attached to the flow diverter and connected to a TED 191 oxygen monitor. This allowed for oxygen concentrations to be measured directly in the FFM. A respiratory therapist served as a volunteer by wearing the FFM during CPAP delivery and oxygen titration. Oxygen was titrated at three points along the CPAP delivery system; proximal to the Polaris EX, between the mask and exhalation port, and directly into the FFM. Titrated liter flows were 2, 3, 4, 5, & 6 L/min. Each liter flow was maintained for three minutes, respiratory rate was maintained at 12 BPM, and FiO2 was measured at beginning of each inspiration and the average recorded. The study was carried out over the course of one week with the same volunteer participating. RESULTS: The highest FiO2s were recorded with oxygen titrated directly into the FFM. Oxygen titrated proximal to the CPAP (PCPAP) machine had the next highest recorded FiO2s and oxygen titrated between the full face mask and exhalation port (FFMEP) provided the lowest recorded FiO2s. Results are expressed as L/min=FiO2. FFM titration results: 2=27, 3=34, 4=40, 5=48, 6=56. PCPAP titration results: 2=24, 3=27, 4=32, 5=39, 6=43. FFMEP titration results: 2=23, 3=26, 4=28, 5=31, 6=35. CONCLUSION: Our study is the first to confirm the optimal oxygen titration point within the described CPAP delivery system. The highest FiO2 measured was with oxygen titrated directly into a FFM, though actual FiO2 delivery to the lungs was not measured. There was a greater range in FiO2 delivery with FFM titration. It was theorized that this was due to the oxygen reservoir effect of the FFM and lack of exhalation port within the FFM which maintained oxygen concentrations. Variability in FiO2 was observed during the volunteer's respiratory cycle which was theorized to be due to gas mixing and oxygen/CPAP flow variability. Further study of these findings will be conducted.

Sponsored Research - None

1141185

EVALUATION OF BRONCHIAL PRESSURES AND TIDAL VOLUME USING THREE DIFFERENT ADULT HIGH FLOW NASAL CANNULA(HFNC) DEVICES.

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Background: Although there is a growing body of evidence supporting the use of High Flow Nasal Cannula (HFNC) in adults, little is known about the amount of positive airway pressure created with its use. The goal of our bench study was to determine if there was any Continuous Positive Airway Pressure (CPAP) created. Method: We used a PB 7200 (Covidien, Boulder CO) as our driver to simulate spontaneous breathing to one test lung of a dual test lung system (Dual Adult TTL, Michigan Instruments, Grand Rapids Michigan). The other test lung was attached via tubing to an intubation manikin's right main stem (Laedral, Wappingers Fall, New York). The left mainstem of the manikin was capped. Monitoring devices were placed In-line at the right main stem. These included a pressure transducer and a flow sensor connected to a NICO cardiopulmonary monitor (Philips Electronics, Andover, MA). The driver was set on CMV, rate-15, sine flow waveform at VT's of 400, 600, 800, 1000 mL's and peak flows of 30, 40, 60 and 80 LPM. The manikin was first open to room air with no pressure then with the mouth closed. We then applied CPAP 5, CPAP 5/PSV-5, and CPAP 0/PSV 5 to the manikin via NIPPV through a Drager Evita XL. Finally we applied HFNC therapy through the following devices: Optiflow (Fisher and Paykel, Irvine CA), Comfort Flow (Teleflex Medical, Durham NC), and Precision Flow (Vapotherm, Stevensville MD). We administered HFNC at flows of 30, 40, 60, 70 LPM. Measurements on HFNC were taken with the mouth open and closed. Results: See Table 1. Only CPAP 5, PSV 5, and CPAP 5/PSV 5 had marked difference compared to HFNC (P< 0.05). We did not observe any significant changes in measured tidal volumes between the modes. Conclusion: We concluded that there was no significant CPAP created with any of the HFNC devices with either mouth open or closed. We did find that there was an elevation in Bronchial Inspiratory Pressure with flows of 60 and 70 LPM with the mouth closed.

Sponsored Research - None

Table 1		Comfort Flow HFNC (LPM)				Fisher & Paykel HFNC (LPM)				Vapotherm HFNC (LPM)	
	Spontaneous Breathing	30	40	60	70	30	40	60	70	30	40
Bronchial Pressure cmH2O (mean ± SD) Mouth Open	-1.19 ± 0.64	-1.15 ± 0.67	-1.24 ± 0.63	-1.19 ± 0.70	-1.11 ± 0.64	-1.0 ± 0.69	-1.02 ± 0.61	-1.17 ± 0.70	-1.19 ± 0.71	-1.00 ± 0.55	-1.00 ± 0.55
Bronchial Pressure cmH2O (mean ± SD) Mouth Closed	-1.19 ± 0.71	-1.29 ± 0.85	-1.24 ± 0.78	-1.22 ± 0.74	-1.03 ± 0.82	-1.17 ± 0.77	-1.26 ± 0.81	-1.22 ± 0.88	-0.89 ± 0.92	-1.12 ± 0.68	-1.03 ± 0.62

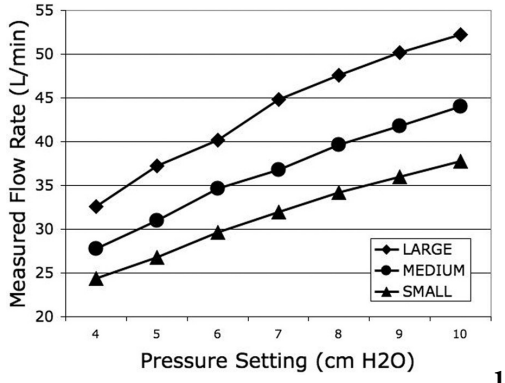
1148774

HIGH FLOW NASAL CANNULA OXYGEN THERAPY USING A SIMPLE MODIFICATION OF THE RESPIRONICS BIPAP VISION CIRCUIT.

Mark S. Siobal, Roberto Bautista; Anesthesia, SFGH/UCSF, San Francisco, CA

Background: High flow oxygen delivery by face mask using the Respironics BiPAP Vision has been previously described (Siobal RC Abstract 2005). Employing this simple modification to the Vision circuit also allows the delivery of high flow nasal cannula (HFNC) therapy at adjustable concentrations of oxygen. Method: With the device in the STD mode, IPAP and EPAP set to the same pressure, alarms for Low Pressure, Low Minute Ventilation, and Apnea disabled, with a pressure sensing line connected to the Plateau Exhalation Valve placed at the device outlet, the device delivers a constant flow rate at the approximate set FiO2 without any alarms. Flow measurements were performed at pressure settings of 4, 5, 6, 7, 8, 9, and 10 cm H2O using a Ventrak 1550 Respiratory Mechanics Workstation with the flow sensor positioned between the distal end of the circuit and Fisher Pakel HFNCs of varying sizes Results: Delivered flow rates between 24 and 52 L/min at pressure settings between 4 and 10 cm H2O were delivered with small, medium, and large HFNCs. Conclusion: HFNC therapy can be delivered with this simple modification to the Respironics BiPAP Vision circuit. Delivered flow rate is dependent on the pressure setting and the HFNC size.

Sponsored Research - None



1148992

NASAL HIGH FLOW (NHF) THERAPY IN DO-NOT-INTUBATE (DNI) PATIENTS WITH RESPIRATORY DISTRESS.

Steven Holets, Peter Gay, Steve Peters; Mayo Clinic, Rochester, MN

Background: Patients with DNI status, especially those with congestive heart failure (CHF) and chronic obstructive pulmonary disease (COPD), may benefit from non-invasive ventilation (NIV). NHF supplies heated and humidified high flow mixed gas through a nasal cannula which may provide effective support with greater ease of use and patient comfort. We proposed a pilot study to investigate the efficacy and feasibility of NHF administered to DNI patients transferred to the ICU for respiratory distress. Methods: With IRB approval we prospectively evaluated the use of NHF in DNI patients with primarily hypoxemic respiratory distress. We analyzed 50 consecutive patients admitted to a medical ICU and who received NHF. We excluded patients with PaCO2> 60 mmHg or pH < 7.28. The primary endpoint was the need for escalation to NIV as determined by the primary care physician. Patients served as their own controls and mean changes were compared for statistical significance (p< 0.05 threshold). Results: Patients included 25 men and 25 women, mean age 73 yrs. (range, 27-96). Underlying diagnoses (allowing multiple conditions) included pulmonary fibrosis (23), pneumonia (22), COPD (21), cancer (12), hematologic malignancy (6), CHF (3) and pulmonary embolism (2). Hospital mortality was 56% (28/50). NHF was initiated at FiO2 mean 0.67 (range, 0.30-1.0) and flow rate 42.6 L/min (range, 30-60). Mean O2 saturations went from 89.1% to 94.7% on NHF (p< .0001), and respiratory rate 30.6 per minute to 24.7 (p< .0001). In 8/50 patients (16%), we escalated to NIV, while 84% were maintained on NHF or eventually went to lower flow O2. The mean duration of NHF was 41.9 hours (range, 2-144 hours) Subjectively, NHF was well tolerated. Conclusion: NHF can provide adequate oxygenation for many patients with hypoxemic respiratory distress and may be an alternative to NIV for DNI patients. More widespread NHF use in the hospital ward area might help avoid ICU admissions. Direct comparison in a randomized controlled trial appears warranted. Disclosure: This study was supported in part by Fisher & Paykel.

Sponsored Research - Fisher & Paykel

1135241

COMPARISON OF ACCURACY OF FLOW AND OXYGEN CONCENTRATION IN FOUR OXYGEN BLENDERS.

Gary R. Lowe[1], Shirley Holt[3], Tracy Thurman[3], Mark Heulitt[2,3]; [1]Respiratory Care Services, Arkansas Children's Hospital, Little Rock, AR; [2]Dept. of Pediatrics, Critical Care Medicine, University of Arkansas for Medical Sciences, Little Rock, AR; [3]Arkansas Children's Hospital Research Institute, Little Rock, AR

Background: Respiratory therapists use oxygen blenders on a daily basis. Our institution utilizes both high-flow blenders (HFB) and low-flow blenders (LFB). HFB guarantee accuracy of F_IO_2 ± 3% for flow 2-100 LPM. LFB guarantee accuracy of F_IO_2 ± 3% for flow 0-30 LPM. We compared delivered flow rates and F_IO_2 of four blender types, and hypothesized that there would be no significant difference for flow and F_IO_2 between the HFB and LFB utilizing low liter flow ranges. **Methods:** A bench study was performed comparing set flow rates and F_IO_2 to delivered flow rates and F_IO_2 on five randomly selected blenders of the four blender types (three HFB and one LFB) in our institution. Flow rates were set at 0.25, 0.50, 0.75, 1.00, 1.50, and 2.00 LPM. F_IO_2 was set at 0.21, 0.50, and 1.00. Flow measurements were acquired using the Biopac MP-100 System and a 0-10 LPM calibrated pneumotachograph. Volume measurements were obtained through a computer by integrating the flow signal. Volume was verified with a calibrated syringe. All output signals were routed via an analog channel box into the Biopac MP-100 data acquisition unit converting them into digital signals that could then be processed by a computer. Signals were obtained at a rate of 1000 samples per second. Flow was measured and averaged over a 60 second period for each delivered flow rate. F_IO_2 was measured on two oxygen monitors within the system (mean of the two = delivered F_IO_2). One minute of equilibration time was allowed for each change in flow or F_IO_2. Percent error between set vs. delivered values were utilized for analysis. A t-test with significance (p< 0.05) was used to compare mean % error between the LFB and the HFB group. **Results:** There was a < 1% error in set vs. delivered F_IO_2 for all blender types. The mean % error for set vs. measured flow rates was less for the LFB (-4% ± 15 %) compared to the HFB group (-11% ± 19%), (p=0.001). **Conclusion:** There was < 1% error in delivered F_IO_2 for all blender types. This is within the manufacturer's guaranteed accuracy. However, the LFB system delivered set flows more accurately (< 10% error) when compared to the HFB systems (> 15% error). These results suggest that when using low flows a LFB system should be employed. This was a limited study, and further research needs to be completed on blender systems to ensure the accuracy of the flow rates.

Sponsored Research - None

Equipment Used in Experimental Design

Unit	Manufacturer	Location
Biopac MP-100 System	Biopac Systems, Inc.	Santa Barbara, CA
Pneumotachograph	Hans Rudolph, Inc.	Shawnee, KS
Calibrated Syringe	Hans Rudolph, Inc.	Shawnee, KS
Oxygen Monitors	Hudson RCI	Triangle Park, NC

1114775

SPIROMETRY FOR SENIORS (S4S).

Carisia Garcia, Helen Sorenson, Folsade L. Adepoju, Ryan Araiza, Margarita Camero; Respiratory Care, The University of Texas Health Science Center, San Antonio, TX

Background: Airflow limitation relating to chronic lung disease can lead to decreased mobility in older adults. Because onset is gradual many individuals may presume that their shortness of breath is related to aging and many go untreated or do not seek treatment until significant lung function is lost. Fortunately, when treated, many recover much of their lost mobility. Methods: Participants were recruited and had spirometry testing done assisted by respiratory care students using a portable spirometer and a disposable single use mouthpiece. The students screened patients over age 50 who wished to have testing done. Participants signed informed consent forms and were provided with counseling on their results. Those with abnormalities were referred to their physician. Faculty members were present to oversee the testing and to aid in interpretation. Results: Of the 39 seniors tested, 17 demonstrated abnormal results. Eight had been diagnosed previously with pulmonary disease while the other nine were referred for evaluation. None of the participants had previously been engaged in pulmonary rehabilitation. We anticipate the next phase of the project will address improved mobility in these seniors. Conclusion: Many seniors involved in the S4S project have expressed their gratitude for the services provided. Challenges included seasonal appointment availability for physician follow-up and scheduling conflicts. This community project was initiated by students who were members of the Lambda Beta Society, and have now graduated. Students newly inducted into Lambda Beta will continue this project, and expand on services offered to seniors at the local Senior Center.

Sponsored Research - The Scooter Store

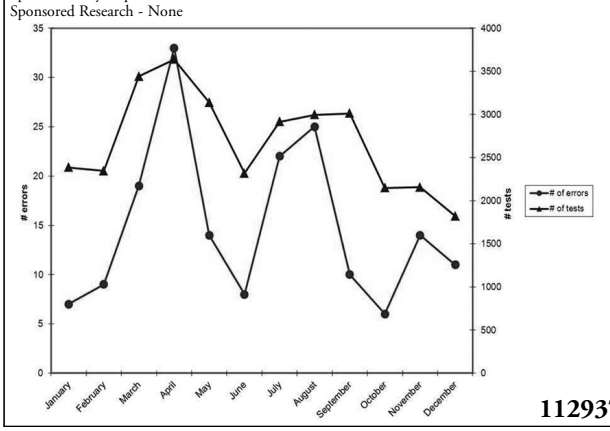
1126680

ERRORS DURING POINT OF CARE TESTING: IMPLICATIONS FOR PATIENT SAFETY.

Jenni Raake, Brandy Seger, Rick Amato; Division of Respiratory Care, Cincinnati Childrens Hospital, Cincinnati, OH

Background: Errors during point of care laboratory testing (POCT) have been identified as a major compromise to patient safety. Most often, POCT errors are related to patient misidentification. Our hospital uses the iSTAT POCT system which requires the Respiratory Therapists to type in a patient identifier when running a test. When the patient identifier is incorrect, results will either post to the wrong patient's chart or results will not populate the chart. Either condition leads to unsafe patient care. We examined our error rates to determine if Respiratory Therapy workload (patient volume, ventilator days, and number of point of care tests) correlated with an increase in point of care testing errors. Methods: We reviewed statistics from our Cardiac ICU, Newborn ICU, and Pediatric ICU for a one year period which revealed 27,289 patient days and 9,540 ventilator days. We also reviewed laboratory reports which showed the volume of POC tests (32,318) and the number of reported errors (178). Data was analyzed via Pearson's correlation coefficient using nQuery Advisor, version 6. Results: The results of our study showed little correlation between patient volume and the volume of errors ($r = 0.17$, $p - 0.59$). There was a positive correlation between the number of POCT errors and ventilator care volume ($r = 0.73$, $p=0.01$)) as well as the number of POCT errors and the volume of POC blood gases ran ($r = 0.78$, $p = 0.01$). Conclusions: Based on the results of our study, the greatest number of errors occured when respiratory therapists were managing both higher ventilator care workloads and performing a high volume of point of care tests. Attention to detail during patient data entry, especially during peak demands for Respiratory services, can help to avoid POCT errors and optimize safety in patient care.

Sponsored Research - None



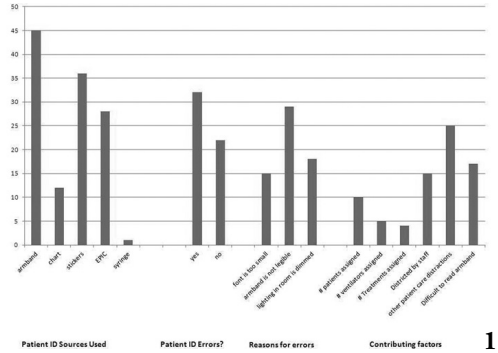
1129375

ERRORS MADE DURING POINT OF CARE TESTING: CONTRIBUTING FACTORS FROM THE BEDSIDE RESPIRATORY THERAPIST PERSPECTIVE.

Jenni Raake, Brandy Seger, Rick Amato, Scott Pettinichi; Division of Respiratory Care, Cincinnati Childrens Hospital, Cincinnati, OH

Background: Point of Care Testing (POCT) is one of the fastest growing markets. Rapid results have led to a high demand for POCT services, typically performed by the bedside Respiratory Therapist. Errors can occur during the testing process which affects results. Most commonly, errors occur with patient misidentification, and lack of knowledge or compliance regarding testing policies and procedures. Based on other studies, factors contributing to POCT errors include situations where the Respiratory Therapist has a high workload. We surveyed our Respiratory Therapists to determine if their perspective on contributing factors was due to their workload. Methods: We developed an 8 question survey using a commercially available survey website. Invitations to participate in the survey were distributed via email to the 153 Respiratory Therapists who perform POCT. Respondents were directed to the survey website to provide answers to the survey. The identity of those responding to the survey was anonymous. We received a 34% response rate (54 respondents). Results: 59% of staff report entering the wrong patient identification during POCT. While staff report 83% compliance rate with use of the patient's armband, they also report use of an open chart, a page of labels with the patient's name and ID number, or a syringe at the bedside with the patient's identification number. Reasons given for not using the identification on the patient's armband was due to legibility (54%), size of text on armband (87%), and lighting in the room (45%). Respondents indicated that patient care distractions (52%) and their overall workload (31%) were reasons for making errors during POCT. Conclusions: Based on our survey, Respiratory Therapists admit to patient misidentification errors during POCT. Methods to improve the utilization of the patient's armband such as increasing text size and legibility should be taken to reduce utilization of other non-approved patient identification sources, reducing the potential errors. Adopting automation through barcoding may also help to reduce errors at the Point of Care

Sponsored Research - None



1140219

ANALYSIS OF STAT LAB TURN-AROUND-TIMES BEFORE AND AFTER CONVERSION OF THE HOSPITAL INFORMATION SYSTEM.

Gary R. Lowe, Yolanda Griffin; Respiratory Care Services, Arkansas Children's Hospital, Little Rock, AR

Introduction: Many hospitals are currently transitioning patient information to electronic medical records (EMR). EMR offer many advantages including improved quality, error prevention, cost reduction, and increased efficiency. Our institution converted to a new hospital information system (HIS) to enhance our EMR capabilities. This report relates the impact on turn-around-times (TAT) of specimens processed in our Stat Lab, which reports blood gases, electrolytes, metabolites, and co-oximetries. **Methods:** This retrospective review compared Stat Lab TAT before and after conversion to the new HIS. Prior to conversion, Stat Lab personnel received instruction and specimen processing training sessions using a test mode. A staff member from each shift received additional training. Personnel practiced using a test mode. Data sampling was conducted 4 times monthly, representing 11% of all samples processed. Post-conversion data (collected monthly for 6 months) was compared to a 3 month pre-conversion average. Compliance was gauged using an internal benchmark with a goal of reporting 95% of all specimens processed within 7 minutes (min) from receipt in the Stat Lab. **Results:** The average TAT for 3 months prior to the conversion was 4.15 min. Compared to baseline, post-conversion average TAT ranged from a high of 7.1 min for 9/10 to a low of 4.1 min (back to baseline) for 3/11 (see table). For each of 6 months post conversion, the goal of processing 95% of specimens within 7 min was not achieved. There has been an upward trend, but the 95% threshold has not been attained. Causes included system issues like difficulty accessing open patient records, and ordering tests within 6 min of a previous order were automatically cancelled by the system. Also, personnel issues like using a previously assigned password and callbacks for missing data or incomplete orders caused delays. To further confound the observations, the Stat Lab was physically moved in 1/11 which negatively impacted TAT. **Conclusion:** Significant efforts were made to ensure that staff was adequately trained to handle problems anticipated post-conversion. Actual TAT appear to have recovered, however attainment of processing 95% of specimens within 7 min has not returned to pre-conversion levels. Despite training and actual experience, it has taken significant time to assimilate the new system. Consistent performance has not been achieved compared to pre-conversion averages, and monitoring will be continued.

Sponsored Research - None

Comparison of 3 month average pre-conversion TAT to Monthly Values Post Conversion

Ave. TAT 6/10-8/10 (Minutes)	Month	Actual TAT (Minutes)	% Increase	Difference (Minutes)	Difference (Seconds)
4.15	September	7.09	70.90%	2.94	176.55
4.15	October	4.93	18.86%	0.78	46.95
4.15	November	5.26	26.69%	1.11	66.45
4.15	December	4.81	15.78%	0.65	39.30
4.15	January	5.45	31.33%	1.30	78.00
4.15	February	4.11	-0.96%	-0.04	-2.40
4.15	March	4.08	-1.69%	-0.07	-4.20

1116451

COMPARISON OF METHODS FOR MEASUREMENT OF BLOOD GASES AND WHOLE BLOOD LACTATE LEVELS BETWEEN THE OPTI-MEDICAL CCA-TS PORTABLE BLOOD GAS ANALYZER AND THE ROCHE COBAS B 221 BENCHTOP ANALYZER.

Daniel J. Grady, Terrence Smith; Respiratory Care, Mission Health System, Asheville, NC

Background: Blood lactate measurements and hyperlactatemia may be utilized as indicators of tissue hypoxia, mitochondrial disease, and acute lung injury. In addition, blood lactate has been found to significantly correlate with Oxygen delivery per minute. Increasingly, blood lactate measurements are available in blood gas analyzers. The purpose of this study was to evaluate the performance of the pH, PCO2, PO2, Lactate, tHb, and SO2 sensors of the OPTI CCA-TS blood gas system and to correlate whole blood measurements with the Roche Cobas b 221 benchtop analyzer. The project was reviewed and received exemption by the Institutional Review Board. **Methods**: Two standard reference cassettes were run once per day on two Opti Medical analyzers used in the study for daily quality control. In addition, three aqueous controls (Opti check level 1, 2, and 3 were run in duplicate on each day of the study on the same B-Lac cassettes used to collect the method comparison. A total of 52 (n = 52) heparinized, whole blood, patient samples were utilized for analysis in the Opti Medical analyzers immediately following blood gas analysis in the Roche Cobas b 221 analyzer. Samples were de-identified to prevent traceability to the patient. A sequence number was assigned to the sample to facilitate correlation between the OPTI CCA-TS results and the Cobas measurement. Each sample was tested in duplicate on the B-Lac cassette in the OPTI CCA-TS analyzer and compared against a single measure on the Cobas analyzer. **Results**: Regression analysis and Pearson's product-moment correlation were calculated for the pH, pCO2, PO2, Lactate, tHb, and SO2 results measured with the Cobas b 221 and OPTI CCA-TS system. Correlation results are summarized in the table below. **Conclusions**: The Opti Medical CCA-TS portable blood gas analyzer utilizes a principle of optical fluoresence and operates via disposable cassettes for blood gas and lactate measures; rather than using conventional blood gas electrodes. We conclude that the OPTI Medical CCA-TS system using the principle of optical fluorescence provided strong correlations with the the Cobas b221 blood gas analyzer for whole blood measures of ph, pCO2, pO2, SO2, Lactate, and tHB.

Sponsored Research - The study was sponsored by Opti-Medical.

Correlations between the Opti CCA-TS and the Cobas b221 Blood Gas Analyzers

Analyte	Correlation Coefficient	Sample Size
pH	0.98	52
pCO2	0.98	52
pO2	0.95	52
SO2	0.98	52
Lactate	0.95	52
tHb	0.84	52

1125183

THE USE OF INDIRECT CALORIMETRY MEASUREMENT FOR QUANTITATIVE ASSESSMENT OF PATIENT VENTILATOR/ASYNCHRONY.

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The Use of Indirect Calorimetry Measurement of REE & VO2ml/min for Quantitative Assessment of Patient Ventilator/Asynchrony Thomas Glass RRT, Beverly Mauer RRT, Jeremy Luedtke MD, Robert Welsh, MD, William Beaumont Hospital, Royal Oak, MI Background: The introduction of Indirect Calorimetry measurements in our Surgical Intensive Care Units was initially often met with an unusually high Resting Energy Expenditure (REE) with patients on APRV mode of ventilation. Once all possible technical variables were addressed, it was determined that the measurements were in fact accurate and that the patient's REE was elevated and appeared to be directly related to observed patient ventilator asynchrony. Once this suspected correlation between increased REE and patient/ventilator asynchrony was identified, we established a testing protocol for those patients who displayed at least one of the following criteria: 1) Delay or failure to wean 2) Graphic display of ventilator flow and/or pressure patterns consistent with asynchrony 3) Clinical display of increased respiratory effort. Methods and Materials: The Puritan Bennett 840 Ventilator was in use with all patients included in the study. The test equipment used for Indirect Calorimetry was the MedGraphics Ultima. The 840 ventilator was connected to a Bio-Med Devices Oxygen/Air blender during testing procedures to facilitate the stabilization of FIO2. The criteria for acceptable data reported during the study were: REE, VCO2 and VO2 covar <10% for 25 minutes or an REE, VCO2 and VO2 covar < 5% for a 10 minute period. The testing procedures were conducted following the AARC Clinical Practice Guidelines for Indirect Calorimetry. Data collection was performed on 33 patients initially on APRV mode, displaying ventilator asynchrony with an accompanying increased REE. Follow-up testing was performed after they had been switched to another mode. Conclusion: In addition to the well-established utilization of Indirect Calorimetry for nutritional support, we have found the same data to be of significant value in determining ventilator setting/patient compatibility. We are continuing to assess the application of this information to modify ventilator management were indicated.

Sponsored Research - None

Comparison of REE of Patients on APRV Verses Alternative Methods

Variable	N	Mean	Std Dev	Median
APRV REE	33	5202	1604	4991
non APRV REE	33	1752	483	1716
REE diff	33	3450	1395	3468

There was a statistcally significant difference between the APRV REE and the non-APRV REE using a paired ttest p<0.0001

1113514

SUCCESS RATE OF SPUTUM INDUCTION PERFORMED ON ADULT INPATIENTS DURING TREATMENT OF LOWER RESPIRATORY TRACT INFECTION.

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Background Sputum induction, using 3% hypertonic saline, is performed to enhance the removal of mucus when patients are not able to spontaneously produce a specimen. Sputum inductions are commonly ordered by prescribers to evaluate acid fast bacilli (AFB) or lower respiratory tract infection (LRTI). At a recent department meeting, Respiratory Therapists (RT) expressed concern about the efficacy and quality of inductions. We sought to validate these concerns. We implemented a quality improvement project aimed to determine the efficacy and quality of sputum induction procedures and determine if action steps were needed to enhance patient care. Methods We identified all sputum induction charges during calendar year 2010 from an administrative billing file. A medical record review evaluated procedure efficacy and quality. Efficacy was defined as a procedure resulting in sputum production and transport to the lab. Quality was defined as sputum production with gram's stain result of ≥10 polymorphonuclear white blood cells and <10 squamous epithelial cells. Pediatric patients and collection for AFB identification were excluded. A meeting with respiratory therapy, infectious disease physician and antimicrobial stewardship pharmacist evaluated the results. Results From 1/1/2010 to 12/31/2010 there were 131 charges for sputum induction. Fifty patients were excluded (AFB testing; n=42, patient < 18 years old; n=4, improper charge; n=3, induction on the same calendar day; n=1). Eighty-one patients had orders for induced sputums. Induction was effective in 75.3% (n=61/81) cases. The microbiologically useful (quality) success rate of the effective sampling was 43% (26/61). Programming in our eMR was created to increase use of RT-induced sputums after consensus was reached during an inter-disciplinary meeting. Conclusion RT-induced sputum samples provide high quality specimens in lower respiratory tract infections. This method may provide useful information to prescribers when making therapeutic decisions.

Sponsored Research - None

1125343

COMPARISON OF THE AEROCRINE MINO EXHALED NITRIC OXIDE DEVICE WITH THE SIEVERS ENO ANALYZER IN PATIENTS.

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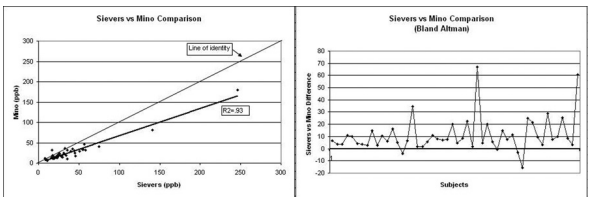
Background: Exhaled nitric oxide (ENO) is a biomarker of airway inflammation and is a relatively new clinical testing modality. ENO is measured by having the subject inhale maximally and then exhale their breath through a patient-interfaced mouthpiece to the ENO analyzer at a target flow rate. We recently reported our clinical experience with this test and the marked increase in utilization in our clinical practice1. Secondary to the increased utilization is the need to evaluate new devices as they come to market. The Aerocrine Mino is a new portable device which is easier to use from both a practical and technical aspect when compared to our current Sievers testing unit. The American Thoracic Society (ATS) and European Respiratory Society (ERS) have set forth testing guidelines2. The ATS-ERS recommendations include performing 3 acceptable and repeatable maneuvers and reporting the mean of these data, whereas the Aerocrine Mino device only requires a single maneuver after performing numerous practice maneuvers to fine tune the testing technique. There is a significant reduction in the cost per test if this new device proves to be accurate. Hypothesis: The data measured by the Aerocrine Mino device is comparable to the Sievers Nitric Oxide Analyzer (NOA 280i) which is considered the "gold standard". A single acceptable measurement following practice maneuvers is comparable to multiple acceptable measurements that are repeatable according to current ATS-ERS recommendations. Methods: 50 subjects (> 18 yrs) for whom exhaled nitric oxide is ordered as a clinical test will be used in the comparison. Both the Sievers and Aerocrine units will be calibrated according to manufactures recommendations prior to testing and compliance with pretest instructions with be evaluated by the testing technologist. The subjects will systematically alternate to either testing with the Aerocrine Mino or Sievers unit first to avoid testing bias. Results The Sievers mean value was 35.9ppb (SD 37.0), whereas the Mino was 24.8ppb (SD 25.5). The linear regression was R2=.93, and the Student t-test was p<.08. Conclusion: The data demonstrates that while there is not a statistically significant difference between the two instruments (p=0.08) there is a bias. The mean difference is 14 ppb with the Sievers reading higher than the Mino, which may effect the clinical decision making process. We would also recommend testing on the same unit if repeat tests are ordered

Sponsored Research - None



1135138

PREVALANCE OF OBSTRUCTION SEEN ON SPIROMETRY AT WELL-CHILD VISITS.

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Background: The 2007 NHLBI Guidelines for the Diagnosis and Management of Asthma recommend spirometry at least every 1 to 2 years for periodic assessment and monitoring of lung function for asthma management. A goal of therapy listed in the guidelines is to maintain (near) "normal" pulmonary function. The Pulmonary Function Testing Lab (PFT lab) and the Pediatric Primary Care Center (PPC) at Cincinnati Children's Hospital Medical Center (CCHMC) collaborated to schedule PFTs in all PPC children age 6 and older who had well child clinic visits and a history of asthma. Prior to this intervention, PPC patients did not have easy access to PFT testing. We hypothesized that a significant percentage of PPC asthmatic patients demonstrate airway obstruction when performing PFTs. Method: An improved scheduling system was implemented, consisting of a specific PFT visit type, linked to the PPC patients. This visit type could be tracked monthly for data analysis by both the PFT lab and the PPC physician. The PFT lab followed ATS/ERS guidelines for spirometry. Interpretable PFTs met ATS/ERS criteria for acceptable and repeatable trials. Results: Over a seven-month period (June 2010 through December 2010), the total number of PPC PFT appointments scheduled was 709. The completed appointments totaled 367 (52%); 342 (48%) were either "no-shows" or rescheduled. The completed PFTs revealed 220 (60%) were interpretable and 146 (40%) were un-interpretable. From the interpretable spirometry, 122 (55%) were normal spirometry and 96 (44%)-showed a degree of obstruction. Of these 96 that showed obstruction, 62 (65%) had a response to a bronchodilator. Conclusion: Collaboration among PFT lab, PPC center and central scheduling dramatically increased the number of patients that had spirometry performed during a well-child clinic visits. A large number (44%) of patients showed obstruction on PFTs and 65% had response to a bronchodilator. These results reinforce the importance of spirometry measurement during well-clinic visits to assist the PPC physicians in their management of patients with a history of asthma.

Sponsored Research - None

1135837

RELATIONSHIP BETWEEN BLOOD PRESSURE AND ITS EFFECT ON ARTERIAL SAMPLER FILLING TIMES DURING PERCUTANEOUS PUNCTURE IN HUMAN SUBJECTS.

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BACKGROUND: When obtaining an arterial blood sample via percutaneous puncture there is a risk of accidentally obtaining venous blood. Conventional methods of confirming arterial blood at the bedside such as blood color and pulsatile return can be misleading in patients with low blood pressure or hypoxemia. PURPOSE: To determine if the arterial sampler filling time can be an accurate indicator of obtaining an arterial blood sample in patients with various blood pressures. METHODS: This study included 38 human subjects; 22 were adult patients ordered for a medically-necessary arterial blood sample by percutaneous arterial puncture; 16 were normal, healthy adult volunteers who had a venapuncture performed using an arterial blood sampler to collect 1 – 2 mL venous blood. Prior to a staff respiratory therapist performing the ordered arterial puncture, we measured and recorded the patient's non-invasive arterial blood pressure. During the arterial and venapuncture procedures we measured the amount of time it took to fill the sampler and the volume of blood obtained. Pearson correlation coefficient was calculated to determine the relationship between mean arterial pressure and seconds of filling time per milliliter in the arterial group. A t-test for independent samples was calculated to determine if arterial sampler filling times are significantly different between arterial and venous groups. RESULTS: The Pearson correlation coefficient was -0.487 ($p = 0.022$). The mean sampler filling time was 15.1 secs/mL for the arterial group and 114.5 secs/mL for the venous group. The difference was significant ($p = 0.000$). CONCLUSION: Our results were consistent with Johnson's laboratory study showing a negative correlation between mean arterial pressure and sampler filling time. A respiratory therapist can use sampler filling time as an indicator of successful arterial puncture. Future studies should include a wider range of mean arterial pressures and a variety of samplers.

Sponsored Research - None

1148215

NON-BRONCHOSCOPIC BRONCHIAL ALVEOLAR LAVAGE (NB-BAL)- A SAFE AND LESS EXPENSIVE PROCEDURE COMPARED TO BRONCHOSCOPIC BAL IN DIAGNOSING PNEUMONIAS IN THE ICUS.

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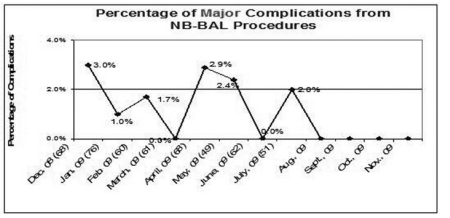
BACKGROUND: Critically ill patients who require mechanical ventilation (MV) are at risk of Ventilator Associated Pneumonia (VAP). Significant mortality and morbidity are attributed to VAP. While prevention of VAP is of great significance, optimal diagnosis for proper treatment without delay is critically important. Smear and culture results from upper airway secretions may give false positives which is estimated at 40 - 60%. Inaccurate culture results lead to inappropriate and unwanted antibiotic therapy and unnecessary cost. Non- Bronchoscopic Bronchoalveolar Lavage (NB-BAL) is a good diagnostic tool to identify pathogens in the lower respiratory tract, so appropriate treatment can be initiated. NB-BAL procedure consists of blind placement of a double lumen Catheter into the lung (Right or Left) in order to retrieve a bronchoalveolar lavage (BAL) fluid specimen. PROJECT: Northwestern Memorial Hospital is a level-one trauma center with 115 ICU beds. Ventilator days average 1200 per month. In the ICU's the current practice of obtaining a sputum specimen has either been via Fiberoptic Bronchoscopy (FB) or by Endotracheal Aspirate (ETA). FB is the most accurate and expensive of these techniques. Respiratory Care Practitioners were specially trained to perform NB-BAL using a BAL Catheter (Kimberly Clark). This procedure has gained widespread acceptance and popularity in our ICUs since its introduction in June 2005. RESULTS: 3907 NB-BAL specimens were collected from MV patients between June 2005 and April 2011. Major complications have been consistently low (0% - 5%) and minor complications have averaged < 15.0% (see graph). Most adverse events have been transient; and resolved shortly after completion of the NB-BAL procedure. The most common adverse events were: hypoxemia, arrhythmias, hypotension, hypertension, bronchial hemorrhage and coughing during procedure. NB-BAL is less expensive and more readily available because a skilled physician is not required. It is also less invasive than FB while providing quick assessment of PNA and VAP in the ICU setting. Average cost for RCP-led NB-BAL at our institution is ~ $700.00 per procedure, compared to $5000.00 for Bronch BAL led by a Physician-led team. The total cost for 3907 NB-BAL Procedures over a five year period was = $2.70 Million. Total Cost for Bronch BAL would have been = $15.70 Million ($5000.00 x 3907), a noteable difference of ~$13.0 Million.

Sponsored Research - None



1134075

COMMON CANISTER PROCESS AND THERAPEUTIC INTERCHANGE IMPLEMENTATION.

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Background: A multidisciplinary team of pharmacists, RTs and Quality Directors reviewed data and protocols currently in place at other sites. They devised a plan for the implementation of a common canister process, therapeutic interchange of respiratory medications, and new order sets for COPD patients. Objective: Monitoring of patient safety with the new common canister protocols, cost savings with a per puff charge structure for MDIs, cost savings for RT medications by using therapeutic interchange process and best practice care of the COPD patients with the new order sets. Methods: With the implementation of the common canister process, we decided to exclude ventilator and isolation patients and to require a one-way valved spacer for each patient using a CC. Patients all would have their own spacer which would improve medication delivery. CC use also allows for a per puff charge vs charging patients for the entire canister, thus reducing cost for the patient and facilities. Thorough cleaning with 70% Isopropyl Alcohol of the CC boot would be done before and after each patient use to cleanse the MDI before utilizing on another patient. RT would be in charge of this CC administration and cleaning. So far, 70 out of 71 canisters have showed no growth of any contaminants when swabbed. Follow up action was taken to re-educate the therapist involved and proper cleaning and re-testing showed no growth of any kind post teaching. Swab testing is being performed on a routine, random basis and results of this monitor are being shared with Infection Control teams, RT teams, Pharmacy Matrix and COPD team. All are very encouraged with the results and agree the process is working as planned. Together the common canister use and therapeutic interchange are expected to save the system nearly $500,000 annually in drug costs. The swab sampling of canisters verifies that this can be done safely for the patient. Conclusion: While we are early in our process, we are already convinced that CC is a viable and safe method of reducing costs, and has actually had an impact on the rate of missed medications in two of our facilties since RT has more ready access to the MDIs needed. In the past, some delays in getting MDIs to the units contributed to the treatment being missed or started late.

Sponsored Research - None

1148397

CONTINUOUS ALBUTEROL THERAPY IN A PEDIATRIC ACADEMIC EMERGENCY DEPARTMENT.

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Background: The use of continuous albuterol has been shown to a be safe and effective treatment for severe asthma exacerbations. Current asthma guidelines recommend patients with mild to moderate asthma exacerbation be treated with three 2.5-5 mg albuterol treatments with 0.5 mg atrovent within 1 hour of their arrival and to assess for response. For severe exacerbations, continuous albuterol therapy may be indicated. A literature review showed that the patients with the most severe airflow obstruction may benefit from the use of continuous albuterol. There is currently no data showing toxicity with continuous albuterol administration. The purpose of this review was to examine our current emergency department continuous albuterol practice. Methods: Pediatric patients placed on continuous albuterol (20 mg/hr) in the Duke ED from 2/21/2009 to 4/31/2011 were reviewed. Data tracked consisted of; the number of bronchodilator treatments received in the ED prior to initiation of continuous albuterol, concomitant corticosteroid administration, patient diagnosis, and disposition from the ED. Patients who received bronchodilator treatments but not continuous albuterol were not included in this study. Results: 135 pediatric patients who required bronchodilation therapy in the emergency department were included. 121 (89.6%) patients were admitted and 131 (97%) of patients received corticosteroids. Overall 128 (94.8%) were diagnosed as having reactive airway disease or asthma, 2 (1.5%) with cystic fibrosis, 2 (1.5%) with allergic reactions, and 3 (2.2%) with other diagnoses. 58 patients received 0 bronchodilator treatments prior to initiation of continuous albuterol, 52 patients received 1 or 2 bronchodilator treatments, and 25 patients received 3 or more treatments prior to initiation of continuous albuterol. Conclusion: In this group of patients immediate placement on continuous albuterol did not lower the overall admission rate. Patients receiving 3 bronchodilator treatments prior to initiation of continuous albuterol had lower rates of PICU admissions and higher rates of regular/CEU admission. Our results appear to support the existing guidelines.

Sponsored Research - None

# of Treatments Prior to Continuous Albuterol

	0	1-2	3 or more
Admission Rate	53/58 (91.4%)	45/52 (86.5%)	23/25 (92%)
Corticosteroids	56/58 (96.6%)	50/52 (96.2%)	25/25 (100%)
Diagnosis			
Asthma/RAD	53/58 (91.4%)	51/52 (98.1%)	24/25 (96%)
Disposition			
PICU	23/58 (39.7%)	18/52 (34.6%)	6/25 (24%)
Stepdown	12/58 (20.7%)	11/52 (21.2%)	6/25 (24%)
Regular/CEU	18/58 (31%)	16/52 (30.8%)	11/25 (44%)

PICU = Pediatric Intensive Care Unit
RAD = Reactive Airway Disease
CEU = Clinical Evaluation Unit 24 hour observation unit located within the emergency department

1149543

AEROSOL MEDICATION SCHEDULED DELIVERY ERRORS ON HOSPITALIZED PATIENTS.

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<p>**Background** Aerosolized medications delivered to hospitalized patients are discreet treatments which must be initiated by clinician intervention. Most of the medications delivered by aerosol have distinct durations of action and therefore must be delivered on a specific schedule for optimal effect. Deviation from this schedule could potentially adversely affect drug effectiveness, patient care, safety and outcome. This study's objective was to measure the number of time violations of the delivery of aerosol medication to hospitalized patients as compared to the expected schedule. <p>**Method** Delivery time of all regularly scheduled aerosolized (MDI/DPI/nebulized) medications given to adult patients was extracted from our hospital's bar-labeled medication delivery software from April 2011 to June 2011 and compared to the scheduled time. Time violations were considered when treatments were given greater than one hour prior or after scheduled times. We extracted medication type, aerosol type (ie. MDI/DPI vs nebulizer), patient location and time of recorded delivery then counted 1 hour pre and post violations. To compare proportions we used a two tailed two sample z test for proportions with significant set at $p<0.05$. <p>**Results** 10.0% of all aerosol treatments were time violations with 3.4% given early and 6.6% given late ($p<0.001$). MDI/DPIs have more time violations than nebulizers (13.3% vs 8.3%; $p<0.001$) with 35% early time violations ($p<0.001$ compared to late) which is similar to nebulized (32.6% early; $p<0.001$ compared to late). <p>**Conclusions** Aerosolized medications are important interventions to maintain or improve pulmonary dynamics, provide patient care and deliver non-pulmonary active medications. Time violations of regularly scheduled aerosolized medications can be considered medication errors. Violations of the scheduling of these medications could reduce efficacy and lead to clinical deterioration if given late or cause an adverse side effect if delivered early and stacked on previous treatments. Further studies are warranted to determine if our findings can be replicated and whether these time violations have a clinical or financial effect upon care of hospitalized patients.

Sponsored Research - None

1149848

QUANTIFYING AEROSOL DELIVERY IN NEWBORNS, INFANTS AND TODDLER USING DIFFERENT DRUG DOSAGES WITH HIGH FLOW NASAL CANNULA.

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BACKGROUND: There is little information in the literature quantifying aerosol drug delivery to children via high flow nasal cannula. The objective of this study was to quantify aerosol delivery with breathing patterns of term newborns, infants and toddlers at two different drug dose volumes using a vibrating mesh nebulizer with a pediatric high flow nasal cannula (HFNC). METHODS: An in-vitro lung model consisting of a SAINT infant upper airway with collecting filter at the trachea was attached to a breathing simulator using breathing parameters of Vt 25 ml, RR 40/min for term newborns, Vt 50 ml, RR 33 /min for infants, and Vt 100 ml, RR 24/min for toddlers. The I:E ratio was set at 1:2 in all runs. A vibrating mesh nebulizer (Aeroneb Solo, Aerogen) was placed at the inspiratory inlet of a heated humidifier (Fisher& Paykel) in which the temperature was held constant at 37 °C while oxygen was administered via heated wire circuit to a pediatric nasal cannula at 6 lpm. Albuterol sulfate (2.5 mg) was nebulized in two dose volumes (0.5 mL and 3 mL). Drug deposited on an absolute filter distal to the model's trachea was eluted and analyzed via spectrophotometry (276 nm). One-way ANOVA and paired samples t-test were used for data analysis ($p<0.05$). RESULTS: The percent (%) of nominal dose delivered to the trachea (mean± SD) and p values are presented in the table below. Delivered doses of albuterol ranged between 13. 8% and 17.7% with both dose volumes for the newborn and toddler. Greater deposition was observed with the 0.5 mL dose under infant parameters than with term newborn or toddler parameters ($p<0.05$). Increasing tidal volumes with decreasing respiratory rates did not correlate with increased delivered doses. CONCLUSION: In this simulated model of aerosol delivery via HFNC to newborns through toddlers, deposition was similar or greater with the smaller dose volumes used with the vibrating mesh nebulizer.

Sponsored Research - None

	Term Newborn	Infant	Toddler
2.5 mg/0.5 mL	17.66 ± 2.83	25.91 ± 3.62	13.80 ± 3.42
2.5 mg/3 mL	13.77 ± 0.98	17.43 ± 0.84	17.20 ± 0.15

1128319

RESISTANCE DETERMINATIONS OF A NOVEL AEROSOL DELIVERY ADAPTOR IN A NEONATAL MODEL.

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Backgound: Aerosolized medication delivery to the patient receiving ventilatory support is improved by optimizing placement of aerosol flow within the ventilator circuit. A novel technology has been developed to improve the delivery of aerosolized medications to neonates receiving ventilatory support. This technology includes a proprietary aerosol delivery adaptor designed to separate the aerosolized medication from ventilator bias flow, which in turn may result in improved aerosol medication delivery. **Objective:** To determine if the novel aerosol delivery adaptor increases respiratory system resistance in a ventilator circuit compared with a standard wye connector. **Design/Methods:** Utilizing various ventilator settings in a neonatal model, we assessed the resistive pressures of a standard patient wye connector (standard connector) and the novel adaptor. We assembled a neonatal testing system utilizing a Sechrist ventilator (Anaheim, CA), neonatal ventilator circuit, test lung, and Biopac MP150 (Goleta, CA). Testing was conducted on both the novel adaptor and a standard wye connector provided with the neonatal circuit. Testing was conducted at various ventilator settings with rates of 30 and 60 breaths/min, PEEP of 5 cmH_2O, PIP of 15, 25 and 40 cmH_2O. All test conditions were conducted in triplicate without and with a simulated aerosol flow rate of 7 L/min. To determine resistive pressure the following equation was used: R=P1–P2 (at a constant flow). **Results:** Table 1: **Conclusion:** The resistance was not different between the novel adaptor and the standard wye connector. Aerosolized medication delivery efficiency is also being assessed using the novel adaptor compared with current standard of care.

Sponsored Research - Discovery Labs, Inc.

Table 1

	Novel Adaptor			Standard Wye Connector		
Aerosol Flow (L/min)	0			0		
Rate (breaths/min)	30			30		
Peak Inspiratory Pressure (cm H_2O)	15	25	40	15	25	40
Mean Resistance [SD] (cm H_2O/L/sec)	3.29 [0.07]	3.45 [0.02]	2.01 [0.29]	3.49 [0.17]	3.46 [0.07]	1.87 [0.24]
Rate (breaths/min)	60			60		
Peak Inspiratory Pressure (cm H_2O)	15	25	40	15	25	40
Mean Resistance [SD] (cm H_2O/L/sec)	3.30 [0.08]	3.57 [0.03]	2.11 [0.33]	3.29 [0.17]	3.57 [0.14]	1.94 [0.28]
Aerosol Flow (L/min)	7			7		
Rate (breaths/min)	30			30		
Peak Inspiratory Pressure (cm H_2O)	15	25	40	15	25	40
Mean Resistance [SD] (cm H_2O/L/sec)	3.07 [0.15]	2.84 [0.21]	2.31 [0.23]	3.23 [0.21]	2.80 [0.17]	2.31 [0.40]
Rate (breaths/min)	60			60		
Peak Inspiratory Pressure (cm H_2O)	15	25	40	15	25	40
Mean Resistance [SD] (cm H_2O/L/sec)	3.08 [0.14]	2.96 [0.20]	2.42 [0.26]	3.08 [0.16]	2.90 [0.15]	2.52 [0.45]

1140398

AN IN-VITRO COMPARISON OF THE BREATH ACTUATED NEBULIZER WITH THE JET NEBULIZER AT TWO DIFFERENT DRUG DOSAGES.

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BACKGROUND: Although previous studies compared breath actuated nebulizers (BAN) with jet nebulizers (JN), the efficiency of these nebulizers at different drug volume has not been reported. The purpose of this study was to compare the amount of drug deposition of the jet nebulizer (JN) with the breath-actuated nebulizer (BAN) using two different drug volumes. **METHOD:** The JN (Salter Labs) and BAN (AeroEclipse, Monoghan/Trudell Medical) were powered with oxygen at 8 L/min using an in-vitro lung model consisting of an adult teaching manikin upper airway connected to a breath simulator with a collecting filter (Respirgard II) at the level of the bronchi. Spontaneous breathing parameters were V_T 450 mL, RR 20/min and I:E ratio 1:2. Albuterol dosages were 2.5 mg/3 mL and 2.5 mg/0.5 mL plus 0.5 mL normal saline (fill volumes of 3 mL and 1 mL, respectively). Drug eluted from filter with 0.1 HCl and analyzed with spectrophotometry (276 nm). Descriptive statistics and independent samples t-test were used for data analysis ($p<0.05$). **RESULTS:** Table below shows mean (± SD) of inhaled mass in mg of albuterol, % dose and time for both nebs and dose volumes. BAN delivers significantly more drug than JN at a fill volume of 3 mL ($p=0.028$) and 1 mL ($p=0.004$). Treatment time with BAN is significantly longer than JN at both fill volumes ($p=0.0001$ and $p=0.013$, respectively). Decreasing fill volume from 3 mL to 1 mL reduces inhaled mass by 45% with BAN and up to 64% with Salter, and treatment time is reduced by 90%, and 84%, respectively. **CONCLUSION:** Regardless of drug dosages used in this study, BAN is more efficient than JN. However, it was associated with longer treatment time. A reduction in fill volume decreases the amount of inhaled drug, and treatment time with both nebulizers.

Sponsored Research - None

	Jet Nebulizer (Salter)		BAN (AeroEclipse)	
	3 mL	**1 mL**	**3 mL**	**1 mL**
Inhaled Mass (mg)	0.39 ± 0.05	0.14 ± 0.03	0.79 ± 0.20	0.43 ± 0.07
Inhaled Mass ‰	15.83 ± 2.08	5.76 ± 1.28	31.97 ± 8.02	17.25 ± 3.05
Treatment Time (min)	2.35 ± 0.18	0.24 ± 0.07	11.19 ± 0.93	1.77 ± 0.61

1131449

ARE PATIENTS GENERATING APPROPRIATE INSPIRATORY FLOW FOR THEIR INHALED MEDICATIONS?

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BACKGROUND: Patients using dry powder inhalers (DPIs) and powered metered dose inhalers (MDIs) must use an appropriate inspiratory flow to properly self-administer their medications. We evaluated the inspiratory flows in a random sample of patients by using an inspiratory flow measuring device (IFMD). METHODS: The patient population for this study included adults 18 years or older who were currently using inhaled medications from MDIs and DPIs. Patients were asked to inspire through the IFMD and mimic their usual technique for inspiration (as if it was the device they used regularly). The measured flow was evaluated for appropriateness based on the manufacturer's recommended flow for the particular delivery device. We obtained the patients' age, gender, and pulmonary diagnosis. We also subjectively assessed the patients' technique and asked if their inhaled medication helped their breathing. RESULTS: Twelve patients were asked to participate and eleven completed the study (eight women and three men, all between ages 45 and 75 years). Eight patients were receiving a single inhaled agent; three were receiving two agents (each had an MDI and a DPI). This produced fourteen trials to check inspiratory flow. Eight patients had been using their medicine over a year; three had 1 to 3 months experience using the medication(s). Out of fourteen trials, only seven trials produced inspiratory flows in the proper flow range according to the manufacturer. The remainder had flows that far exceeded the recommended inspiratory flow. None of the trials showed inspiratory flows that were too low. Analysis of the amount of time using the inhaled medication showed that there was no correlation between time on the medication and ability to use it correctly. Two patients said that the medication "never helped" or "sometimes helped". Both were outside the acceptable range for their medication and there was a larger variance in proper technique for these patients as compared to those who were helped by their medication. CONCLUSION: Half of the patients tested were using inspiratory flow rates that were far too great. Experience did not appear to affect proper technique. Although this was a small trial, the findings are disturbing and point out the need for more careful instruction and monitoring of technique.

Sponsored Research - None

1150204

COMPARISON OF DRUG TEMPERATURES DURING TRANSPORT BY RESPIRATORY THERAPISTS USING THE ISOTHERMAL MEDIPAC DEVICE, LAB COAT POCKET, MEDICATION CARTS ON WHEELS, AND PYXIS MACHINES.

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Background: Joint Commission 2011 Standards for medication management require that "hospitals store medications according to the manufacturers' recommendations," which; generally corresponds to a temperature range between 68 and 77 degrees F for many Respiratory Care medications. The purpose of this study was to compare medication temperatures during different methods of drug transport by Respiratory Therapists. **Methods**: A total of 124 (n = 124) samples of 5.0 ml, unit dose, normal saline bullets were divided into four equal groups: Group 1: medications transported in scrub/lab coat pockets by Respiratory Therapists (n =31); Group 2: medications carried in the Isothermal MediPac device (n =31)(www.Outcome Solutions.net)after insertion of refrigerated gel pad, Group 3: medications transported in Carts on Wheels (COWS)n = 31 (Howard Hi-Prodigy Cart, Howard Medical) and Group 4(n = 31)medications stored in automated Pyxis machines. The saline medications were randomly placed in 7 Pyxis machines for a minimum storage time of 1 hour. For the 3 methods of transport, the saline samples were measured for temperature after a minimum transport time of 1 hour. Descriptive statistics and a student "t" test(alpha = 0.05) were calculated for each group. **Results**: One hundred per cent (100%) of the medication samples transported in the Isothermal MediPac devices (mean = 73.9, sd= 1.48)and in the Howard Carts on Wheels (mean = 73.7, sd= 1.27)were within the manufacturer recommended temperature range of 68-77 degrees F. Approximately 50% of the data for medication samples transported by Respiratory Therapists in pockets and 48% of the data for medications stored in the Pyxis machines were greater than the upper recommended limit of 77 degrees F. Statistically significant differences in medication temperature exist between drugs stored in the Pyxis machines, and medications transported in the Isothermal MediPac device ($p = 0.0006$) and the Howard Carts on Wheels ($p = 0.0001$). Drug temperature measurements which were outside the manufacturer recommended range of 68 - 77 degrees F were calculated as percentages for each group and are shown in the table below. **Conclusions**: The Isothermal MediPac device and the Howard Carts on Wheels maintained 100 per cent of the medication samples within the manufacturer recommended storage range for temperature, and saline medications were significantly cooler than those stored in Pyxis machines or carried in pockets.

Sponsored Research - None

Comparison of Drug Temperatures During Transport by Respiratory Therapists

Drug Transport Method	Mean and Standard Deviation	Sample Size	Percent of Data Within Recommended Range of 68-77 Degrees F	Approximate Cost per Unit
Therapist Pocket	x = 77.1 sd = 3.63	n = 31	48%	$ 20.00
Isothermal MediPac	x = 73.9 sd = 1.48	n = 31	100%	$ 29.00
Carts on Wheels	x = 73.7 sd = 1.27	n = 31	100%	$ 2,000
Pyxis Machine	x = 76.4 sd = 3.06	n = 31	52%	$ 20,000 to 75,000

1125211

COST REDUCTION USING AERONEB SOLO IN A MEDICAL ICU VENTILATOR POPULATION.

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BACKGROUND: Aeroneb Solo (Aerogen, Galway Ireland) is a vibrating mesh nebulizer designed specifically for ventilated patients which adds no flow to the ventilator circuit and is protected from contamination. Albuterol sulfate with ipratropium bromide is a common bronchodilator combination for our medical population with chronic respiratory disease. We previously used Combivent MDI over standard nebulizers, because standard nebulizers add flow to the ventilator circuit and increase the risk of circuit contamination. Sixteen Aeroneb Solo (SOLO) devices were purchased for use. We wanted to determine if implementing SOLO would result in clinical and/or cost benefits. METHODS: A performance improvement project was initiated to switch Combivent MDI to albuterol sulfate with ipratropium bromide by protocol using SOLO for ventilator patients in our mechanically ventilated medical population. We analyzed respiratory care electronic documentation for the first 5 months of using SOLO, November 2010 - March 2011 (SOLO period) and the prior year, November 2009 - March 2010 (PRE period). Clinical data as well as bronchodilator usage were analyzed. RESULTS: 471 and 455 ventilator patients were identified in the medical population during PRE period and SOLO period. Combivent MDI was used on 55% of the PRE patients and 20% of the SOLO patients. Standard nebulizer was used in 14% of patients in the PRE period and SOLO was used in 48% of patients in the SOLO period. In comparing patients using only Combivent MDI in the PRE period to patients using only SOLO in the SOLO period, there were no significant differences in average ventilator days, patients with air-trapping, patients with wheezing, airway resistance, age, tracheostomy placement or length of stay in hospital. See table for medication use and medication costs. One hundred twenty four canisters of Combivent MDI (costing $13,640) were still used in the SOLO period because of the limited number of SOLO devices available. CONCLUSIONS: There were no detectable changes in clinical outcomes measured when switching from Combivent MDI to bronchodilator therapy with SOLO. We noted a five month $57,854.24 drug cost reduction when converting from Combivent MDI to unit dose medication using the Aeroneb Solo. Due to the limited number of SOLO devices, Combivent MDIs were still used in the SOLO period. Further drug cost reduction could be realized with acquisition of additional SOLO devices.

Sponsored Research - None

Bronchodilator Cost Before and During Use of the AeroNeb Solo

	PRE Period (Nov2009-Mar2010)	SOLO Period (Nov2010-Mar2011)
Total Ventilator Patients	471	455
# (%) on MDI	257 (55%)	91 (20%)
# (%) on Neb	64 (14%)	218 (48%)
# Unit Dose Meds Used	2855	8391
# MDI Cannisters Used	658	124
Total (5 Month) Drug Cost	$72,836.80	$14,982.56

1134406

DELIVERY OF AEROSOLIZED ALBUTEROL USING A NOVEL AEROSOL DELIVERY ADAPTOR IN AN *IN VITRO* NEONATAL VENTILATION MODEL.

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Background: Aerosolized medication delivery to patients receiving ventilatory support is improved by optimizing placement of aerosol flow within the ventilator circuit. Currently, aerosol entrainment within the ventilator circuit is achieved either by placement of the nebulizer within the inspiratory arm of the circuit or introducing the aerosol between the wye connector and patient interface. A novel technology has been developed to improve the delivery of aerosolized medications to neonates receiving ventilatory support. This technology includes a proprietary aerosol delivery adaptor designed to separate aerosol flow from the ventilator bias flow. **Objective:** To compare the dose of aerosolized albuterol sulfate delivered to an artificial lung under various ventilator settings using a novel adaptor versus standard of care. **Design/Methods:** We assembled a neonatal testing system utilizing a Draeger Babylog® VN 500 ventilator, neonatal ventilator circuit, and test lung/lung simulator. TwinStar8 HME low volume filters were placed distal to the wye connector or novel adaptor and proximal to the test lung. Albuterol sulfate (0.5mg/mL) was aerosolized for 5 minutes at a flow of 2L/min of air using a Misty Finity® nebulizer. Five replicate filters were exposed to aerosolized albuterol at various ventilator settings (Table 1) using either the novel adaptor or a standard wye connector provided with the neonatal circuit. Emitted dose of the nebulizer was determined by exposing 3 filters to the aerosolized albuterol. Filters were collected, extracted and albuterol quantified using high performance liquid chromatography. **Results:** The emitted dose was 102.8 μg over the 5 minute aerosol period. The doses of aerosolized albuterol delivered during intermittent mechanical ventilation and CPAP are presented in Table 1. Only filters with albuterol levels at or above the assay limit of detection (<0.28 μg) were included in the statistical analyses (Table 1). Use of the novel adaptor resulted in a significant increase in albuterol delivery of 6- to 14-fold, depending on ventilator conditions. **Conclusions:** In this *in vitro* neonatal ventilation model, there was a significant increase in the delivery of aerosolized albuterol under all ventilatory conditions when using the novel adaptor compared with the standard wye connector. Use of this novel adaptor in infants receiving positive pressure ventilatory support may improve the delivery of aerosolized medications.

Sponsored Research - Discovery Laboratories, Inc.

Table 1

Table 1. Albuterol Doses Delivered (μg)

		IMV				CPAP
		15 breaths/min		40 breaths/min		5 cmH_2O
		PIP=12	PIP=20	PIP=12	PIP=20	
Novel Adaptor						
Sample size	n	5	5	5	5	5
Albuterol dose	Mean	4.01	5.24	8.77	14.44	24.92
delivered (μg)	SD	0.76	0.67	1.25	0.61	5.91
Wye Connector						
Sample size	n[a]	0	4	4	2	5
Albuterol dose	Mean	<0.28[b]	0.63	1.11	2.55	2.60
delivered (μg)	SD	-	0.19	0.11	0.49	0.49
***p*-Value[c]**		N/A	0.014	0.014	N/A	0.009

[a]Only values at or above LOD included in sample pool
[b]<0.28 μg/mL = below limit of detection (LOD)
[c] Comparison via Wilcoxon Rank Sum test when cell sizes ≥ 4
IMV=intermittent mandatory ventilation; CPAP=continuous positive airway pressure; PIP=peak inspiratory pressure

1140283

AEROSOLIZED ALBUTEROL PARTICLE SIZE DISTRIBUTION IN TWO AEROSOL DELIVERY SYSTEM CONFIGURATIONS UNDER NEONATAL VENTILATION CONDITIONS.

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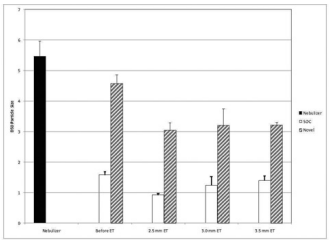
Background: Particle size is a critical factor in the efficient delivery of aerosolized medications to the target area of the lung. In infants receiving mechanical ventilation, particle size of aerosolized medications may be affected by the configuration of the aerosol delivery system and the ventilator circuit. A novel technology has been developed to improve the delivery of aerosolized medications to neonates receiving ventilatory support. This technology includes a proprietary aerosol delivery adaptor designed to separate aerosol flow from the ventilator bias flow. **Objective:** To compare the particle size distribution (PSD) of aerosolized albuterol sulfate at various locations in the ventilator circuitry using both the novel adaptor (NA) and the standard of care (SoC) T connector with a wye connector. **Design/Methods:** We assembled a testing system using a standard neonatal ventilator circuit, including humidification at 36°C, and a bias air flow of 6L/min. Albuterol sulfate (0.5mg/mL) was aerosolized for 5 min at a flow of 2L/min of air using a Misty Finity® nebulizer connected at either: the T connector in the inspiratory arm of the ventilator circuit or at the NA. SoC PSD measurements were made using white-light scattering and for the NA and nebulizer, PSD measurements were made using a Spraytec spectrometer. For the ventilator circuit systems (SoC and NA), PSD was measured at the ET tube connection point and at the tip of 2.5, 3.0, and 3.5 mm ET tubes. All measurements were done in triplicate and reported at the 50th (D50) percentile. Analysis of PSD for both the SoC and NA systems was done under 2L/min inspiratory flow through the ET tubes to mimic neonatal ventilation conditions. **Results:** D50 was larger as it exited the nebulizer compared with D50 measured after exiting both ventilator circuit systems. D50 was statistically significantly ($p<0.05$, Wilcoxon Rank-Sum) smaller in the SoC system compared with the NA system at the ET tube connection point, as well as at the tip of all tested ET tubes (Figure 1; mean±SEM). **Conclusions:** Aerosol particle size changes after traveling through a ventilator circuit. In addition, the configuration of the aerosol delivery system affects the degree of change in particle size. These findings may reflect impaction of larger particles in the circuit that result from the influence of different flow characteristics as well as the different "points of entry" of the aerosol between the two systems.

Sponsored Research - None



1146634

AEROSOL DELIVERY DURING HIGH FREQUENCY OSCILLATORY AND JET VENTILATION.

John Davies, Lee Williford, Renee Bartle, Randy Stallings, Robert Pagnanelli, Neil MacIntyre; Duke Medical Center, Durham, NC

BACKGROUND: Aerosol delivery during high frequency ventilation (HFV) has been sparsely studied. To address this, we assessed aerosol delivery during HFV using two aerosol devices – a vibrating mesh (VM)) and a prototype aerosol generating catheter (AGC). METHODS: Twenty two ex-vivo pig lungs were intubated and attached to: 1) a conventional ventilator (CV) (CareFusion, Yorba Linda, CA) (10 lungs); 2) A high frequency oscillator (HFO) (CareFusion, Yorba Linda, CA) (6 lungs); or 3) A high frequency jet ventilator (HFJV) (Bunnell, Salt Lake City, UT) (6 lungs). During CV and HFO, half of the aerosols were delivered with the VM (Aerogen, Galway, Ireland) and half were delivered with the AGC (Trudell Medical International, London, Canada). With HFJV, the VM was used in 2 lungs with the device placed in the circuit near the ventilator (Draeger Medical Inc., Telford, PA) and in 2 lungs with the device placed in the jet interrupter system. The AGC was used in 2 lungs during HFJV. Deposition was assessed by aerosolizing 10 millicuries of technetium-labeled DTPA followed by a 3 minute scan. Regions of interest were then drawn around the device/circuitry, the central airways, and lung parenchyma. Percent of total dose was calculated for each and paired t tests were used to compare deposition. RESULTS: See Table: CONCLUSIONS: With CV, central airways deposition was high with both devices but significantly higher with the AGC. Conversely, parenchymal deposition with CV was low with both devices but significantly higher with the VM. With HFO, parenchymal deposition was low with both devices while central airway deposition was quite high, especially with the AGC. During HFJV, the VM placed in the CV circuit produced virtually no central airway or lung parenchyma deposition. Placing the VM in the jet interrupter system greatly increased central airway delivery although parenchymal delivery remained very low. The AGC had similar parenchymal deposition but nominally higher central airway delivery than the VM with HFJV.

Sponsored Research - Trudell Medical International

TABLE (mean % +/- SD)

Condition	% deposition central airways	% deposition parenchyma
Conventional-vibrating mesh	21.1 (6.8)%*	4.6 (1.5)%*
Conventional-catheter	63.9 (18.0)%*	2.4 (0.7)%*
HFO-vibrating mesh	44.0 (13.2)%	0.3 (0.1)%
HFO-catheter	53.5 (0.7)%	0.3 (0.3)%
Jet-vibrating mesh in CV circuit	0%	0%
Jet-vibrating mesh in jet interrupter	48.0 (42.4)%	0.6 (0.8)%
Jet-catheter	58.0 (12.7)%	0.3 (0.3)%
* $P < 0.05$ between vibrating mesh and aerosol catheter		

1146900

AEROSOLIZED KL4 SURFACTANT IMPROVES GAS EXCHANGE AND SURVIVAL IN SPONTANEOUSLY BREATHING PIGLETS WITH HCL INDUCED ACUTE LUNG INJURY.

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Background: Surfactant therapy may be a useful treatment for acute lung injury (ALI) (Pediatric Pulmonol 2010;68:782). Use of aerosolized surfactant in ALI has not been investigated. Objective: Evaluate aerosolized surfactant (KL4; lucinactant, Discovery Laboratories, Inc., Warrington, PA) in treating piglets with HCl-induced ALI. Design/Methods: ALI was induced in spontaneously breathing piglets with intratracheal 0.2N HCl until PaO2 was ≤350 torr at FiO2 1.0. Piglets were randomized to receive 5.8 ml/kg (175 mg/kg) of endotracheal KL4 (ET KL4) with extubation to CPAP; aerosolized KL4 (AERO KL4; 60 minutes; 22.5 mg/min) while on CPAP; or CPAP alone (CPAP/control). Piglets were monitored for 3 hours; blood gases obtained every 30 minutes. Lung tissue was analyzed for IL-8 and total protein by porcine-specific ELISA and Bradford with group differences analyzed by ANOVA. Physiologic data were analyzed using 2 way ANOVA with Tukey LSD post-hoc testing for p values <0.05. Results: Both ET KL4 and AERO KL4 produced higher PaO2s ($p<0.001$) and improved survival ($p<0.05$) compared to CPAP. AERO KL4 was as effective as ET KL4, and produced the highest final PaO2 ($p<0.05$). IL-8/total protein ratios were lower in AERO KL4 versus CPAP ($p<0.03$). Conclusions: In spontaneously breathing piglets with ALI, AERO KL4 and ET KL4 resulted in better gas exchange and survival. AERO KL4 was as effective as ET KL4, and produced the highest final PaO2. AERO KL4 treated piglets had lower IL-8/total protein ratios than CPAP, suggesting less lung inflammation. This is the first successful use of aerosolized surfactant in an animal model of ALI.

Sponsored Research - Discovery Laboratories, Inc., Warrington, PA

Physiologic Data

	Baseline Data			3 Hours Data		
	Control (n=12)	ET KL4 (n=12)	Aero KL4 (n=12)	Control (n=8)	ET KL4 (n=11)	Aero KL4 (n=12)
pH	7.31±0.10	7.31±0.10	7.31±0.07	7.36±0.07	7.32±0.25	7.40±0.24
pCO2	48±13	48±14	49±8	49±10	45±24	45±27
pO2	218±81	216±69	232±56	137±140	192±145*	229±157*

*$p<0.001$ compared to controls

1121539

AEROSOLIZED ILOPROST IS A VIABLE ALTERNATIVE TO INHALED NITRIC OXIDE IN POST CARDIOTHORACIC SURGERY PATIENTS.

John Davies, Michael A. Gentile, Janice J. Thalman, Neil R. MacIntyre; Duke Medical Center, Durham, NC

Background: At the present time, inhaled nitric oxide (iNO) is only FDA approved for primary pulmonary hypertension of the newborn. However, iNO is frequently used "off label" to reduce pulmonary hypertension and right ventricular afterload in many adult cardiothoracic patients following surgery. Unfortunately, this off label use of iNO comes with an exorbitant price tag that respiratory departments often must finance. Aerosolized Iloprost, a potent pulmonary vasodilator, is now FDA approved for the specific treatment of pulmonary hypertension. The purpose of this study was to determine if Iloprost can potentially be a viable alternative to iNO in post cardiothoracic surgery patients. Methods: After Iloprost delivery guidelines were established, an IRB approved retrospective review was done in patients who were switched from iNO to Iloprost for a period of 16 months (10/2009 – 3/2011). The patients received 10mcg treatments of aerosolized Iloprost using a vibrating mesh nebulizer (Aeroneb Solo, Aerogen Ltd., Galway, Ireland). The end points were; 1) tolerance to Iloprost and 2) whether or not patients had to be switched back to iNO by the cardiothoracic ICU team. Results: A total of 64 patients post cardiothoracic surgery were switched over to Iloprost from iNO. The patient populations consisted of lung transplants (19), coronary artery bypass grafting and/or valve replacement (18), ventricular assist device placement (12), heart transplant (6), pulmonary thromboendarterectomy (3) and other procedures (6). Of the 64 patients, 58 tolerated Iloprost and met clinical goals. Six were returned (9%) to iNO therapy (3 lung transplants, 1 heart transplant, 1 ventricular assist device implant and 1 coronary artery bypass grafting). 1 patient received both iNO and Iloprost concomitantly. There were no untoward effects from the delivery of Iloprost in any patient. Conclusion: In this patient population aerosolized Iloprost appeared to be safe and was an effective alternative to iNO for controlling pulmonary artery pressures and reducing right ventricular afterload.

Sponsored Research - Aerogen supplied 2 nebulizers

1149624

THE EFFECT OF AN RT CONSULT ON EMERGENCY DEPARTMENT FLOW.

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INTRO: Cincinnati Children's Hospital Medical Center (CCHMC) is a 475 bed medical center with 12 clinical areas served by 198 Respiratory Therapists (RT). The Transitional Care Center (TCC) is a unique model that serves a population that requires special care and consideration. Most patients are trach and vent dependent and have been transitioned from the ICU to the TCC with intent to train caregivers for discharge to home. CCHMC saw 114,985 patients in the Emergency Department (ED) in 2009.. CCHMC considers patient flow to have a direct impact on patient safety, patient satisfaction, and as a contributor to staff satisfaction. To improve patient flow, better understanding of demand/capacity, better matching of resources, and better understanding of artificial variation-smoothing are needed to build a system of high reliability and enhance flow within the system. During the 1st quarter of 2010 the CCHMC Patient Center Flow Committee determined that the TCC had one of the worst ED discharge to unit admission times in the hospital. . An RT ED Consult program was developed to assist with decreasing wait time for a bed in the TCC. A data sheet recorded patient information and tracked the amount of time off the unit by the Respiratory Therapists. Our team tracked the time of TCC to ED notification, then time to consult and time of TCC admission. The goal was to provide this service without negatively impacting the care being provided to our current inpatients. Education was provided for the TCC RTs and the process was started on April 1, 2010 RESULTS: During the trial period April 2010-August 2010 we had a request for 25 consults. We were able to accommodate 22 of those requests (88%). Our results showed that the RTs performing consults took a mean of 18 minutes to complete the consult and return to the unit. Our targeted goal was under 25 minutes. This new process resulted in exceeding the hospital's goal of 40% of the admissions being less than one hour from the time of decision to admit. We did not track patient/family satisfaction but every family was informally interviewed by the TCC manager with no negative remarks/comments recorded for the process. DISCUSSION: The results of this test of change significantly impacted flow from the ED to the TCC. We look forward to expanding this program to other areas of the hospital and including a protocol for determining patient flow to the appropriate unit.

Sponsored Research - None

1150424

USE OF ROBOTICS IN RESPIRATORY CARE: A COST-BENEFIT ANALYSIS OF A COLLABORATIVE PILOT PROJECT.

Daniel J. Grady; Respiratory Care, Mission Health System, Asheville, NC

Background: The number of portable CPAP generators and non-invasive ventilators have exponentially grown in hospitals; causing difficulties in rapidly locating and tracking the equipment. One innovative solution for continuously tracking equipment location is through the use of mobile robots which use sonar, infrared, and laser sensing technologies to continuously navigate hospital floors via pre-programmed floor plans. The purpose of this study was to evaluate the cost and benefits to a Respiratory Care Department utilizing robotics for inventory control in a 400 bed acute care hospital. **Methods**: The Respiratory Care Department participated in a collaborative project to evaluate the cost and benefits of a robotics system to provide the following functions: (1)medication delivery to nursing units 24/7, (2)delivery/retrieval of IV pumps, and (3)inventory control of small portable equipment. The Respiratory Care staff (n = 33 full time FTE) were surveyed to determine mean time spent per shift locating CPAP and non-invasive ventilators, before and after implementation of the robotic system. Two Aethon "TUG" mobile robotic systems were pre- programmed with hospital floor plans and elevator locations/activation codes. The Biomedical Department tagged each CPAP machine and non-invasive ventilator with a radio-frequency tag. Floor plan templates were placed online in the hospital computer system, and Respiratory Care management and supervisory staff were trained to log into the floor plans to identify equipment locations. **Results**: Following implementation of the Aethon TUG Robotics system, the Respiratory Care staff had immediate access via the hospital computer to a dynamic, real-time, map of each hospital floor and unit showing the precise location of each CPAP machine and non-invasive ventilator. The robotics system reduced the average time spent attempting to locate equipment by a mean of 30 minutes per staff member and reduced salary cost associated with the old process for locating equipment by approximately $148,000 dollars per year. **Conclusions**: Implementation of the Aethon TUG continuous, mobile robotics system was highly successful in reducing both the time and salary expense associated with locating Respiratory Care equipment in a 400 bed hospital. The robotics system improved Respiratory Care staff satisfaction and efficiency associated with the process of inventory control of CPAP equipment.

Sponsored Research - None

Comparison of Costs and Efficiency Pre-and Post-Robotics Implmentation for Locating CPAP Equipment

	Pre-Robotics	Post-Robotics	Variance
Mean Time (mins/shift per staff locating CPAP Equipment	30 mins/staff per shift	1 min/staff/shift	(29 mins/staff per shift)
Salary Expense associated with Locating Equipment	$ 148,000	$ 2,970	($ 145,000)

1119424

A COMPARISON OF METRICS FOR A RESPIRATORY CARE DEPARTMENT IN AN 800 BED MEDICAL CENTER.

Daniel J. Grady, Terrence F. Smith, Lynda Collar; Respiratory Care, Mission Health System, Asheville, NC

Background: Various metrics have been utilized by proprietary consulting companies to determine Respiratory Care department staff resources, productivity, and comparative cost reduction "opportunities". Metrics such as Total Patient Days, Billable Procedures by CPT Code, Average Daily Census, and others have been utilized by consulting firms to determine the number of Respiratory Care staff needed in a department. However, the American Association for Respiratory Care Uniform Reporting Manual has recommended that Relative Value Units be utilized as the metric to accurately determine staff resources required for the safe provision of services. The purpose of this study was to compare correlations between AARC Relative Value Units and various metrics for a Respiratory Care Department in an 800 bed medical center. **Methods**: We retrospectively analyzed 30 months of hospital financial data for a sample of 835 (n = 835) days to compare RVU in hours with each of the following metrics: Total Respiratory Care Procedure Volume, Billable Procedures (by CPT codes), Non-Billable Procedures, Total Patient Days, Average Daily Census, Total Inpatient Days, and Adjusted Discharges per Patient Day (or Outpatient Procedures). Descriptive statistics, regression analysis, and Pearson's correlation coefficient (R^2) were calculated for each of the above metrics and compared to AARC Relative Value Units (RVU). **Results**: We found very poor correlations between RVU and the following metrics: Total Patient Days, Total Inpatient Days, Average Daily Census, Non-billable Procedures and Adjusted discharges per patient day . Weak correlations were found between RVU and Total Respiratory Care Procedure Volumes and between RVU and Billable Procedures with CPT Codes. Correlation data are summarized in the table below. **Conclusions**: In summary, metrics other than RVU did not correlate well, and do not accurately reflect Respiratory Care Department activity. Since none of these alternative metrics accurately reflect workload intensity; and metrics provide data to drive crucial decisions such as staffing levels, productivity, and comparative expense reporting between hospitals, it is recommended that Relative Value Units be adopted as the metric for Respiratory Care Departments. It is further recommended that Relative Value Units be adopted as the metric by state licensing boards to ensure that staffing levels are adequate for safe delivery of services.

Sponsored Research - None

Correlations Between Relative Value Units and Various Alternative Metrics

Alternative Metric	Correlation Coefficient R^2	Sample Size (Days)
Non-Billable Procedures	**0.002**	**n = 835 Days**
Adjusted Discharges per Patient Day Outpatient Procedures	**0.10**	**n = 835 Days**
Total Patient Days	**0.28**	**n = 835 Days**
Total Inpatient Days	**0.28**	**n = 835 Days**
Average Daily Census	**0.34**	**n = 835 Days**
Total RC Procedure Volume	**0.57**	**n = 835 Days**
Billable RC Procedures By CPT Code	**0.61**	**n = 835 Days**

1106769

HEALTHCARE COST REDUCTIONS USING A DAILY, RVU-BASED, FLEX STAFFING SYSTEM FOR A RESPIRATORY CARE DEPARTMENT.

Daniel J. Grady, Terrence F. Smith; Respiratory Care, Mission Health System, Asheville, NC

Background: Multiple strategies have been attempted to achieve healthcare cost reductions. It is well known that salary expense is a large portion of the Respiratory Care operating budget. According to the Advisory Board, significant salary cost reductions have been documented using daily staffing adjustments based upon service volume. The purpose of this study was to evaluate the efficacy of a novel, customized, RVU-based, daily, flex-staffing system which was used for a Respiratory Care Department in a 400 bed hospital. **Methods**: A management engineer was consulted to assist in constructing a novel software program to determine staffing requirements for each shift based upon AARC Relative Value Units and completed Respiratory Care procedures. Prior year annual financial reports were analyzed to determine the top 10 procedures by volume. The shift supervisor entered the number of staff present and the procedures completed during the shift, and the program would automatically calculate the number of staff required. When overstaffing occurred, staff were rotated off. When understaffing occurred during high volume months, float pool staff were called in and overtime was authorized. The overall target of staffing each shift was to achieve a staffing variance less than 0.5 FTE. **Results**: The flex -staffing system was utilized for 10 months, and achieved salary cost reductions of $ 247,900, **which equated to a reduction of 5 FTE, without significant patient care issues related to staffing. The system was particularly effective for flex-staffing during a low- volume fiscal year in which the procedure volume for the department decreased by 26, 000 procedures, or 9.0%.** Conclusions: **Proper staffing levels are essential to maximize patient safety by minimizing missed treatments. The use of a daily, RVU-based, flex-staffing system provides internally validated information which makes staffing decisions data-driven, and the system may allow for significant reductions in health care salary costs based upon data for services delivered. Since this system was very effective for objectively determining staffing requirements for Respiratory Care services, it was modified for use in other procedure-based hospital services including, neurodiagnostic testing, pulmonary rehab, inpatient dialysis services, and sleep disorder center services.**

Sponsored Research - None

Healthcare Salary Cost Reductions for A Respiratory Care Department in a 400 Bed Hospital Using a Daily, RVU-Based, Flex Staffing System to Adjust Staffing with Procedure Volume.

Operating Budget Item	Actual	Budget	Dollar Variance	%Variance
Total Procedures	263,150	289,178	(26,019)	(9.0%)
Productive FTE	36.87	41.8	(5)	(11.8%)
Salary Expense	1,782,474	2,030,427	($247,953)	(12.2%)
Expense per Stat	7.88	8.18	(0.3)	(3.6%)
ProductiveManhours	63,891	72,658	(8,767)	(12.1%)
Productive Manhours per Stat	0.24	0.25	(0.01)	(3.4%)

1119098

ORGANIZATIONAL READINESS TO IMPLEMENT A SMOKING CESSATION INTERVENTION.

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Background: Health care organizations commonly engage in organizational change aimed at improving the quality of their operations, including implementation of new programs. Achieving successful and complete organizational change is challenging. Not all attempts to implement and sustain change are successful. Change experts and health care practitioners agree that successful implementation of change is critically dependent upon the organization's readiness for the change. The purpose of this study was to measure organizational readiness for implementation of an evidence-based smoking cessation intervention in a small, faith-based, not-for-profit substance abuse treatment program in a southern U.S. city. Methods: Organizational leaders and associates (n = 26) completed a survey battery. Readiness measurements included assessment of both general and specific organizational change conditions and an appraisal of leadership styles. Respondents rated the organization's capacity/ability to implement each of five evidence-based cessation components. The results were compared to conditions suggesting high organizational readiness and to national norms. Recommendations to remedy readiness gaps and an implementation plan were provided to the organization's leadership. Results: A majority (>60%) of the respondents agreed that organizational climate was conducive to general organizational change, but there was less agreement about member and institutional readiness. Regarding the specific change of adopting a cessation intervention, only 40% were knowledgeable about cessation in this special population. Most counselors (60%) believed they did not have adequate knowledge or skills to provide cessation counseling. Only 50% believed the organization had the capacity/ability to implement the Basic 5 A's. Other evidence-based components were rated less feasible. Leaders disagreed on their ability to provide some system strategies needed for implementation of evidence-based components. The predominant leadership style was "transformational". Conclusions: Results revealed several readiness gaps in key knowledge and resources that could sabotage implementation of a cessation intervention. However, leadership and operational strategies can be tailored to remedy these gaps. Organizations considering adoption of a cessation intervention should attempt to identify readiness gaps to help ensure successful implementation and sustainability of the proposed program.

Sponsored Research - None

1146478

READINESS FOR SMOKING CESSATION AMONG CLIENTS IN A SMALL,NON-PROFIT SUBSTANCE ABUSE TREATMENT PROGRAM.

Erna Boone[1], M. Kathryn Stewart[2], Paul G. Greene[3], Katharine E. Stewart[3], Deborah M. Bledsoe[4]; [1]College of Health Related Professions/Department of Respiratory and Surgical Technolgoies, University of Arkansas for Medical Sciences, Little Rock, AR; [2]College of Public Health/Department of Health Policy and Management, University of Arkansas for Medical Sciences, Little Rock, AR; [3]College of Public Health/Department of Health Behavior and Health Education, University of Arkansas for Medical Sciences, Little Rock, AR; [4]Better Community Developers, Inc., Little Rock, AR

Background: Tobacco use is the major preventable cause of morbidity and mortality in our country. The prevalence of cigarette smoking among substance abusers is twice as high as that of the general population. Quit attempts in this population can be successful and may actually result in better drug treatment outcomes. However, the readiness for a smoking cessation attempt among clients in small community-based substance use treatment facilities has not been well studied. The purpose of this study was to determine the readiness to make a quit attempt among clients in a small, faith-based, not-for-profit substance abuse treatment program in a southern U.S. city. Methods: Fifty (50) clients enrolled in either residential or aftercare substance abuse treatment completed a survey battery. Client readiness measurements included interest and willingness to make a quit attempt, beliefs about quit attempts while receiving treatment for substance abuse, level of depression and severity of nicotine addiction. Results: The results confirmed a very high smoking prevalence among the clients (98%). About half of the clients (53%) had either low or very low dependence on nicotine. The majority (79%) of the clients only had minimal or mild depressive symptoms. Very few (22%) recognized that smoking cessation would not interfere with drug abuse recovery. The majority did not believe in the effectiveness of smoking cessation interventions for those being treated for substance use. Very few clients had support from family and friends to make a quit attempt. More of the aftercare clients (75%) were in either the contemplation or preparation stage for smoking cessation than those clients in the residential program (58%). Conclusions: Effective smoking cessation interventions are needed for persons seeking treatment for substance use. Cessation readiness and client knowledge are key to the success of such programs. In this facility, aftercare clients may be more willing to make a quit attempt than residential clients. Clients are also either misinformed or unaware of the potential success rate of substance users making a cessation attempt. Tobacco treatment specialists providing cessation intervention to substance treatment clients should include education about tobacco dependence/treatment relative to this special population. They should also invite clients' family and/or friends to actively participate in the intervention.

Sponsored Research - None

1145714

THE INFLUENCE OF GLOBAL BUDGET SYSTEM ON THE MEDICAL RESOURCE UTILIZATION OF INTEGRATED DELIVERY SERVICES FOR VENTILATOR-DEPENDENT PATIENTS.

Hung Huei Ling; Chang Gung Memorial Hospital, Kaohsiung, Taiwan

Hsueh, Mei-Ling1, Huei-Ling Hung1,2, Herng-Chia Chiu2, Ming-Hsien Huang3, Yu-Hsiu Chung1, Ching-Wan Tseng1,2,4 Background The Integrated Delivery System(IDS) integrates different levels of respiratory care and consists of intensive care units, respiratory care centers, respiratory care wards, and home care, which has been implemented for 10 years in Taiwan. During the 10 years, the Bureau of National Health Insurance(BNHI) made some revisions to the IDS, among which the most influential one is believed to be the Global Budget System(GBS) which was implemented on July 1, 2002. Method This retrospective study aimed to investigate the affect of GBS on the medical resource utilization of IDS for ventilator-dependent patients (^21 days) by comparing the difference between the Group A:IDS(Integrated Delivery System) implementation Group B:IDS with GBS(Global Budget System) implementation for one to two years and Group C:IDS with GBS implementation for three to four years.The study subjects were patients selected from the BNHI from January 2001 to December 2008. A multiple linear regression analysis were utilized to investigate whether the medical resource utilization(total hospital stay, intensive care unit stay, days on ventilator, hospitalization expenses) for IDS patients was affected by the implementation of GBS. Result (1)The total hospital stay in Group C was more than Group A patients by 60.91days, achieving a significant correlation(P=0.015)(2)The intensive care unit stay was affected by the implementation of GBSwhich reduced by 7.64 days in the Group B than Group A patients(P=0.002)(3)GBS increased the days on ventilator more than 54.73 days in Group C by comparing with the patients in Group A(P=0.017)(4)The hospitalization expenses were also affected by GBS which were $266,298 higher for patients in Group C than those without GBS implementation in Group A(P=0.014). Conclusion It was observed that the accessibility to medical care for insured patients was unaffected by the implementation of hospital's GBS in the three groups.The medical resource utilization was however affected.The implementation of GBS reduced the length of intensive care unit stay and achieved the IDS goal of eliminating the predicament of hospital bed shortage for critically ill patients; but, also increased the number of days on ventilator and longer total hospital stay.

Sponsored Research - None

1134726

CONSIDERATION OF VENTILATOR SETTING ADJUSTMENTS ON REPORTED PRODUCTIVITY.

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Introduction: Productivity systems for respiratory practitioners require an accounting of the RCP workday and capturing key activities. The AARC Uniform Reporting Manual provides time standards that can be applied to counts of these activities in order to quantify the hours required. The AARC URM includes over 90 different activities with time standards; however it is not feasible to account for 100% of the different activities secondary to limitations or restrictions in many billing systems to capture non chargeable activities. Ventilator setting changes are included in the URM, however few departments are able to capture counts of this activity. We elected to determine the number of ventilator changes in a 24 hour period and determine the impact of the failure to capture these activities on productivity. Methods: Electronic ventilator flow sheets were reviewed on a daily basis over a 45 day period and the number of ventilator changes in primary parameters per patient day was recorded in a separate spreadsheet. Analysis was performed on the data to determine the average number of setting changes. The URM time standard of 9.12 minutes was applied to determine hours required per patient day. Results: 261 observations were made. The average number of ventilator changes was 2.71 per patient day. These activities accounted for 24.71 minutes of time for each patient day when the URM time standard is applied. Discussion: Considering we average 900 ventilator days per month, 24.71 minutes of time per patient day accounted for 370 hours of staff direct variable activity per month. While it may not be feasible to capture the number of ventilator setting adjustments performed, the number of these activities accounts for considerable RCP time and can be of value in the assessment of staffing needs. Department based productivity systems should account for time spent in setting adjustments in determining workload productivity targets. Managers should also consider this factor when benchmarking against centers that are capturing the actual number of ventilator changes in which they may be compared.

Sponsored Research - None

1145420

FACTORS INFLUENCING JOB SATISFACTION FOR RESPIRATORY CARE PRACTITIONERS.

Teri Fleming, Bill Pruitt; Univ of South Alabama, Mobile, AL

INTRODUCTION: Job satisfaction is important for keeping good employees, reducing turnover, and building a strong, professional department. The purpose of this project was to identify factors influencing job satisfaction of the respiratory care practitioner. METHODS: A multifactor survey was given to licensed respiratory therapists in the Gulf Coast region. Variables were compared with the t-test for significant differences. RESULTS: 5 hospitals participated in the survey. 54 surveys were completed by staff therapists, supervisors, and department managers (46% response rate). There were no significant differences in job satisfaction based on the level of education (associate's degree vs. bachelor's degree), length of time as a therapist (<15 years vs. 15 years or more), gender, credentials (CRT v RRT), or job classification in the department (staff therapist vs. supervisor or manager). There were significant differences in satisfaction based on age (those 40 years old or older were more satisfied) and primary duties (those working in critical care were more satsified). Surveys that selected multiple primary duties, such as critical care and floor therapy, were not used for this analysis. When analyzing age as a subgroup, the older therapists were significantly more satisfied with their workload and with their participation in decision-making. In this subgroup, a strong but not statistically significant difference was found in the promotion/ career advancement opportunities and in hourly pay. Therapists in the critical care setting were significantly more satisfied with their benefits (i.e. health insurance, sick and vacation time, retirement plan, etc.) and with their job security. When asked to give a single ranking to their overall job satisfaction, the floor therapy therapists showed a significantly lower score when compared to critical care therapists. CONCLUSIONS: Higher levels of career satisfaction among RCPs were shown to be associated with being 40 years of age or older and working in the critical care setting rather than with floor therapy. Pay, benefits, workload, decision-making, promotion/career advancement and job security are important in providing job satisfaction.

Sponsored Research - None

1150257

STATUS OF RESPIRATORY THERAPISTS IN SAUDI ARABIA: A NATIONAL SURVEY.

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BACKGROUND: Studies have shown that provision of respiratory care by dedicated and specialized professionals improves outcome and reduce cost of care. Respiratory care has been practiced as a specialty in Saudi Arabia since late 1970s when some military-affiliated hospitals introduced respiratory care services and sponsored scholarships to train Saudi nationals in Respiratory Care. The current status of respiratory therapists in Saudi Arabia in terms of number, supply, and demand has not been investigated. Therefore, we conducted this descriptive survey study to provide a general profile of respiratory therapists in Saudi Arabia. METHODS: A special questionnaire was designed to collect staffing, education, and demographic data. A list of government, military, and private hospitals was obtained from the Ministry of Health (MOH). Data were gathered from each hospital in the Kingdome of Saudi Arabia (KSA) provided that the hospital employs respiratory therapists. Data gathering was performed via self-administered questionnaire or telephone survey of RC department managers. RESULTS: out of the 411 hospitals surveyed, only 88 (21.4%) hospitals employ Respiratory Therapists. Out of the 88 hospitals that employ RTs, only 38 (43%) have RT departments. This study showed that there are 1477 active RTs in KSA, 371 (25%) of them are Saudi Nationals. About 60% of total RT workforce works in critical care units. Gender distribution is fairly shared out (53% female, 47% male). In terms of education, 70% of RTs hold Baccalaureate degree, 20% Diploma, and about 5.4% of RTs practice the profession without formal education. Only 15% of total RTs hold NBRC credentials. Geographical distribution of the workforce indicates that 50% of RTs are in the central province of the country. Respiratory care coverage of intensive care units as benchmarked against recommended standards is 53% of in central province, and as low as 13.6% in southern part of the country. Actual RT-to-ICU beds ratio was 1:9 in the central province, 1:37 in southern province, 1:20 in MOH hospitals, and 1:9 in semi-governmental hospitals. CONCLUSIONS & RECOMMENDATIONS: There is a severe shortage of Respiratory Therapists in KSA. We estimated a current need of 2428 Respiratory Therapists. Special academic programs must be designed for RTs who entered the field with inadequate training. There is a pressing need for a National credentialing system to ensure minimum standard of practice.

Sponsored Research - None

1149875

A RESPIRATORY THERAPIST LED INTERDISCIPLINARY INPATIENT COPD CARE PROGRAM CAN IMPROVE OUTCOMES IN PATIENTS HOSPITALIZED FOR A COPD EXACERBATION.

Gary Brown; Respiratory Care, Sanford Medical Center, Fargo, ND

BACKGROUND: The costs associated with providing hospital care to patients admitted with a COPD exacerbation is a growing concern nationwide. We decided to review our processes of providing inpatient COPD care and compare them to recently published adherence data with evidence-based guidelines1 (recommended care) to identify areas where we might improve outcomes. We also sought to determine the degree to which non-recommended care was prescribed in our facility. METHODS/MATERIALS: An audit of our processes of COPD care revealed that significant variance existed between the prevalence of our use of recommended care and recently published adherence data. In 2008, under the auspices of a multidisciplinary improvement team, we developed and implemented a novel Inpatient COPD Care Program intended to bring our care processes more in-line with published performance criteria. Our COPD Care Program consists of four inter-related components: (1) Development of a COPD Standing Order Set; (2) Development of a respiratory therapist (RT) directed COPD Medication Protocol; (3) Creation and use of RT Clinical Specialists to oversee and provide COPD care, and (4) Monitoring of selected clinical and economic outcomes. RESULTS: After one year, our prevalence of recommended care for COPD inpatients increased from 57% to 71%, surpassing the national mean of 68%. Further, our prevalence of non-recommended care decreased from 36% to 34%, well below the national mean of 44%. Finally, our prevalence of ideal care (patients receiving all recommended care and no non-recommended care) increased from 34% to 49%, exceeding the national mean of 33%. We also observed that while the average length of stay for all COPD patients remained relatively unchanged and within the Medicare geometric mean, the actual cost per patient day decreased. This resulted in a net increase in the hospital's margin for this patient population. CONCLUSIONS: An innovative, RT-directed inpatient COPD Care Program can increase the application of evidence-based care guidelines and improve clinical and economic outcomes. CLINICAL IMPLICATIONS: Improving clinical outcomes of COPD inpatient care can reduce the financial burden for acute care hospitals of this growing and expensive chronic medical condition. 1. Lindenauer PK, Pekow P, et.al. Quality of care for patients hospitalized for acute exacerbations of COPD. Ann Intern Med, 2006; 144:894-903.

Sponsored Research - None

1126734

PREVENTING AND TRACKING NON-INVASIVE VENTILATION (NIV) INTERFACE RELATED PRESSURE ULCERS AS A QUALITY MEASURE.

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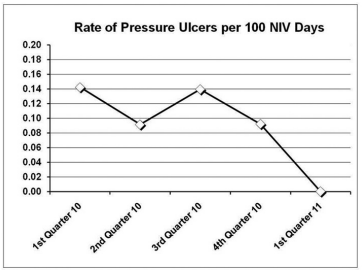
Introduction: In Washington state hospitals are required to report all stage 3 and 4 pressure ulcers to the Washington state Department of Health (DOH). NIV mask/prong related pressure ulcers fall under the category of device related pressure ulcers within the Washington DOH. If we report a device related pressure ulcer to the DOH, then we must do a thorough case review and submit an action plan to the DOH. Regular tracking of NIV mask/prong related pressure ulcers is currently used as a measure of clinical quality and patient safety in our hospital setting. In this abstract we report the methods and results of our program to measure and manage NIV related pressure ulcerations. Methods: NIV related pressure ulcerations are reported by bedside personnel via an electronic incident reporting system. Following this, NIV related pressure ulcers are tabulated for each quarter and indexed for each 100 NIV days in the hospital ([Pressure Ulcers ÷ NIV Days] x 100). These rates are compared quarter by quarter using ourselves as the benchmark, since there is no national data base currently tracking this metric. These findings are reported to the medical and nursing leadership of the various units. We report data for the period from 1st quarter of 2010 to the 1st quarter 2011. Results: Results are displayed in the graph below. Conclusion/Discussion: Our Respiratory therapists collaborate with nursing and utilize standard pressure ulcer prevention techniques before NIV therapy begins and continue to conduct regularly scheduled skin integrity checks. We conclude that our decreasing rate of NIV related pressure ulcers is related to several factors; 1) Standardized pressure ulcer prevention, 2) RT and nursing clinicians diligent attention to assessment of skin integrity during NIV system checks. We believe that the importance of device related pressure ulcer prevention will become more evident as the use of NIV continues to increase. We recommend that NIV mask/prong manufacturers begin to package skin protection with al their NIV interfaces to improve compliance with skin protection.

Sponsored Research - None



1136264

INTEGRAL ROLE OF RESPIRATORY THERAPISTS IN A COMPREHENSIVE PAIN MANAGEMENT PROGRAM USING END TIDAL CO2 MONITORING.

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BACKGROUND: A hospital-wide conversion to a new "smart" infusion pump system including capnography provided an opportunity to develop a comprehensive program to safely and effectively manage pain. Effective pain management is vital to patient satisfaction. Patient monitoring with end-tidal CO2 (ETCO2) is essential in reducing adverse events and preventing respiratory depression from pain medication overdose. METHOD: A multidisciplinary team of Respiratory Therapists (RT), Nursing, Pharmacists, and Physicians developed policies and procedures for the new system. The components of the program included utilizing the "smart" pump technology to prevent medication administration errors, identifying high risk patients using a modified STOP/BANG scoring, and providing ET CO2 monitoring for all patients receiving patient controlled analgesia (PCA) therapy and all high risk patients receiving intermittent intravenous opioids. Staff education for Nursing and RTs regarding patient monitoring focused on ETCO2 technology and patient assessment. Nursing response to alarm situations is to notify RT and work together to follow established protocols for clinical interventions. The importance of collaboration between the bedside nurse and RT is emphasized with shared responsibilities for the initiation of monitoring, frequency of checks, and its use with oxygen and CPAP/BiPAP devices. Educating the patient about the reasons for monitoring is critical in acceptance of the ETCO2 device. The impact of ETCO2 monitoring in preventing respiratory depression was measured by the number of adverse drug events related to PCA and opioid pain medications and the use of opioid reversal agent Naloxone. RESULTS: Comparison of the reported adverse drug events from different time periods are displayed in the table below. The data show a shift from severe (life-threatening) events to the mild (naloxone reversal) and moderate (multiple naloxone reversals or other intervention required) categories. This shift may be attributed to earlier recognition of respiratory depression and intervening before the patient progresses to a life-threatening event. CONCLUSIONS: Respiratory therapists play a central role in the implementation and success of a comprehensive, hospital-wide program of pain management. The use of end-tidal CO2 monitoring is an effective method for early detection of respiratory depression in patients receiving PCA and intermittent IV opioid pain medication

Sponsored Research - None

	2006 - 1st Qtr 2008		2010		Oct 2010-April 2011	
	Number	Percent	Number	Percent	Number	Percent
MILD	46	53%	35	49%	23	53%
MODERATE	30	34%	32	44%	19	44%
SEVERE	11	13%	5	7%	2	4%
TOTAL Reversals Given	87		72		44	

1148452

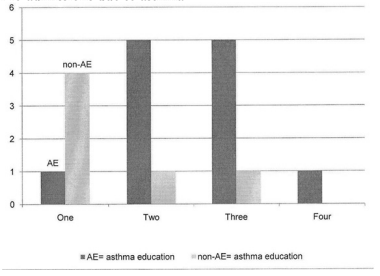
EFFECTIVENESS OF ASTHMA EDUCATION ON CHILDREN ASTHMA MANAGEMENT.

Yunige Park, David Chang; University of South Alabama, Mobile, AL

Background: Children and parents who have received asthma education experience hospital re-admissions due to asthma. This study was done to determine the relationship between asthma education and repeated hospitalization due to asthma. Method: A 10-question survey was developed using information in a published study. Participants of the study included patients admitted to a hospital with a diagnosis of asthma from January to March of 2011. The survey asked for the number of re-admissions due to asthma and if the patient or guardians received asthma education upon the initial admission. Pertinent information on knowledge of asthma management was gathered from the surveys. The patients or caregivers were also asked to answer the following questions: characteristics of asthma education, asthma triggers, locations of taking the medication, knowledge of type and frequency of medication, and questions about the proper use of MDI. Results: Age of patients ranged from 24 months to 18 years old. Of the 17 completed surveys, 12 received asthma education (AE) and 5 did not receive asthma education (non-AE) on their initial admission to the hospital. AE was provided by physicians, nurses, and respiratory therapists (RTs). RTs provided 53% of the AE to the patients among all three healthcare providers. All participants were knowledgeable about their asthma triggers and the place where they take asthma medications. Most of the patients identified cold weather, pollens, and dust as their asthma trigger. Three of the five (60%) non-AE participants and six of the 12 (50%) AE participants did not know the name and type of their medications. Data showed that approximately half of all participants did not know their medication information. There were 5 questions on the use of MDI. One non-AE (20%) participant and 5 AE (41%) participants correctly answered all questions. Discussion/Conclusions: The results in this study indicate that patients with AE were admitted to the hospital more often than patients with non-AE. This finding confirms the results of one published study. These findings suggest that further work is required to establish the efficacy and appropriateness of the treatment guidelines provided to asthmatic children and their parents. Although RTs provided 53% of AE to the patients among healthcare providers, RTs should be more involved in providing AE to children with asthma.

Sponsored Research - None

Number of re-admissions due to asthma



1130700

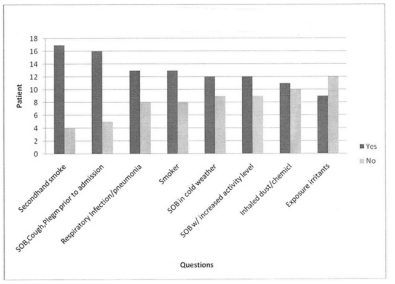
CAUSES OF COPD EXACERBATION IN A HOSPITAL POPULATION.

Thuy Nguyen, David Chang; University of South Alabama, Mobile, AL

Background: Chronic obstructive pulmonary disease (COPD)is a progressive condition that worsens with exacerbations. Some published studies indicate that the major causes of exacerbations include infections, smoking, air pollution, and other factors. No study has been done to document the causes of exacerbation for the patient population in a metropolitan area in a southeastern U.S. This study was conducted to determine whether factors associated with hospital admission for these patients have similar causes of exacerbation as the published studies. Methods: A total of 14 questions were developed to be used as a questionnaire for the study. The questions were based on published findings regarding to triggers of COPD exacerbation. Patients admitted to the hospital with COPD exacerbations were recruited from January 2011 to March 2011. A total of 21 patients participated in the study and were subjected to a questionnaire based interview during their hospitalization. Data regarding to their occupations, daily activities, exposure to pollution (chemical fumes or dust, or any indoor or outdoor pollutants) and smoking history (pack-years, exposure to second-hand smoke) were collected. Conditions involving shortness of breath, cough, or phlegm prior to admission, shortness of breath in cold weather, and shortness of breath when activity level is increased were recorded. Results: A total of 21 completed questionnaires were collected. The combined data (see figure) show that 13(62%) patients acquired respiratory infections or pneumonia prior to admission. Thirteen patients (62%) were current smokers while eight patients (38%) were nonsmokers. Seventeen out of 21 patients (81%) were exposed to second-hand smoke. Sixteen patients (76%) patients reported dyspnea and cough prior to admission. Twelve patients (57%) had short of breath in cold weather. Twelve patients (57%) encountered shortness of breath when activity level was increased. Eleven patients (52%) indicated that they had inhaled dust or exposed to chemical fumes at work. Nine (43%) were exposed to irritants including pets and cleaning products within their homes. Conclusions: The results show that second-hand smoke, infections, and smoking are the top three factors causing COPD exacerbations among the patients in this study. This information could be useful as an educational tool to the patients during their hospitalization.

Sponsored Research - None

Findings reported by patients



1130703

IMPROVING DELIVERY OF EVIDENCE-BASED ASTHMA CARE: ASTHMA EDUCATION AND SPIROMETRY TRAINING FOR MEDICAL ASSISTANTS AT FEDERALLY QUALIFIED HEALTH CENTERS.

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Background: West Virginia (WV) ranks high in the prevalence of asthma in both adults (12%) and children (13%) [Behavioral Risk Factor Surveillance System 2009]. Federally Qualified Health Centers (FQHCs) serve the state's underserved and low socio-economic populations, both demographic risk factors for asthma. FQHCs serve 1 in 6 West Virginians. From 2006 to 2008, 2457 patients with asthma were identified across 8 WV FQHCs, but only 1747 (72%) had one or more office visits and just 58 (3%) had documented spirometry results. To empower patients to self-manage asthma symptoms effectively [WVAC 2010], patients should have 2 well visits/year and spirometry every 1-2 years [NHLBI 2007]. Methods: An asthma education program including spirometry training was developed to use at WV FQHCs thru hospital partnerships. Tools, best practices, and evidence-based guidelines were compiled from valid, reliable sources [Delivering High Quality Asthma Care: National Asthma Forum 2008; WVAC 2007; NHLBI EPR-3 2007; NHLBI Pace 2006]. The Cabin Creek Health System (CCHS) FQHC was identified due to strong leadership and successful diabetes self-management programs. Medical Assistants (MA) were trained in spirometry, evidence-based asthma care and patient education [ALA Asthma 101]. Patient education also included a personal asthma action plan. Nursing staff completed spirometry competency interventions prior to MA administering patient studies. An asthma patient registry was created within the electronic medical record (EMR) at CCHS, where benchmarks of Good Asthma Control were built as alerts in the EMR. Results: Asthma education for MA significantly improved asthma related knowledge (67% pre and 94% post, p<0.0001), and spirometry training markedly improved spirometry related knowledge (54% pre and 90% post, p<0.0001). During spring 2011, MA completed 165 spirometry tests. Thirty-four (34) patients had asthma visits. Each patient received a spirometry test, asthma education, and personalized asthma action plan. Conclusion: Providing education and spirometry training to MA at CCHS improved adherence to evidence-based guidelines, by teaching staff how to empower patients with self-management techniques. Future work includes training additional medical providers and expanding the registry.

Sponsored Research - None

1106888

GENDER DIFFERENCES IN THE CLINICAL PRESENTATION OF SARCOIDOSIS IN ESTONIA.

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Background: Sarcoidosis is prevalent in Northern European Countries including Estonia, but variation of its clinical presentation has not been sufficiently studied. Therefore, we currently analyzed gender variations in the Estonian sarcoidosis patients . Methods: All patients with a clinical-pathological diagnosis of sarcoidosis were recruited from the Tartu University Lung Clinic between February 2009 and April 2011 using their clinical records. The type of onset (acute vs. non-acute), the radiological stage, the clinician-estimated need to treat, the serum angiotensin converting enzyme (ACE) and Ca2+ levels were compared between male and female patients using Spearman's Chi-square test or Mantel-Haenszel test. Results: A total of 233 cases were included, significantly more females (135, 57.9%) than males (98, 42.1%) (p=0.0006). Acute vs. non-acute onset was found in 45 (33.3%) vs. 90 (66.6%) women and in 26 (26.5%) vs. 72 (73.4%) men, respectively, without a significant between-gender difference. Hypercalcemia (>1.29 mmol/L) was found in overall 72 cases (30.9%) and was significantly more prevalent in males than females (p=0.005). An increased serum ACE content (>52 U/L) was present in overall 109 cases (46.8%), in 52 (38.5%) females (20 acute, 32 non-acute) and in 57 (58.1%) males (16 acute, 41 non-acute). Men presented significantly more often with an increased serum ACE content (p=0.003), but no difference was found between males and females for acute/non-acute onset. A total of 199 (85.4%) cases were diagnosed at radiological stages 1 (43 cases, 27 women, 16 men) and 2 (156 cases, 84 women, 72 men). Only 24 (10.3%) patients had a radiological pattern of either stage 3 or 4. No visible thoracic findings (stage 0) were described in 10 cases (4.3%). There were no differences between the genders either for the summarized radiological presentation or for any of the particular stage. A total of 140 patients (60.1%) were needed for treatment, 86 (63.7%) women and 54 (55.1%) men without a significant between-gender difference. Conclusion: Not surprisingly, women were more likely to have sarcoidosis. But in our cohort, men have more frequently abnormalities of calcium metabolism and increased serum ACE level than women. The type of the onset, as well as the radiological stage of sarcoidosis, is similarly distributed among the genders in Estonia.

Sponsored Research - None

1132956

IMPLEMENTATION OF AN INDOOR AIR QUALITY ASSESSMENTFOR THREE SCHOOLS IN THE EAST CENTRAL HEALTH DISTRICT OF GEORGIA.

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Background: The asthma death rate in the East Central Health District (ECHD) of Georgia is significantly higher than that for the state and national death rates for children. A 2009 survey assessed the status and priorities for implementing asthma management strategies in ECHD schools using the National Heart Lung Blood Institute's "How Asthma Friendly is Your School" survey. Forty-one of the 112 (36.6%) schools returned the surveys. Only 14% of the schools reported having a written IAQ management plan. The purpose of this study was to assess schools for IAQ deficits and assist in the development and implementation of IAQ management plans. Methods: Superintendents of the seven school districts that participated in the 2009 study were asked to participate in this project. Three superintendents chose to participate and suggested a school from their district that had either a high number of asthmatic students or known air quality problems. The EPA's "IAQ Tools for Schools Action Kit" was selected to help the schools identify, correct and prevent IAQ problems. An initial walk thru of the school to identify deficiencies in IAQ caused by lack of cleanliness, pollutant sources, fragrances, air temperatures, humidity and CO2 levels is essential. An IAQ walk thru team was formed at each school. The team consisted of the principal, representatives from the maintenance, custodial or physical plant and GHSU investigators. Results: The CO2 levels were higher than recommended by the American Association of Heating Refrigerating and Air-conditioning Engineers (ASHRAE) in a significant number of the class rooms in each school. The causes for these increases included dirty filters, blocked air vents and ventilation systems that were turned off. IAQ problems included dust; ventilation problems; use of fragrances such as cleaning products or air fresheners in the class rooms; and items that harbor dust mites, dust and pollen such as curtains, stuffed animals, or rugs. See Table 1. Conclusions: The principals of each participating school have implemented policies to address the increased CO2 levels. A recommendation has been made to one school system to change the filters in the ventilation system more frequently and to use HEPA filters on the vacuum cleaners. The three schools will no longer permit unauthorized fragrance or cleaning products in classrooms. One school system has adapted an IAQ management plan that includes the use of green products only.

Sponsored Research - W.G. Raoul Foundation

Class Rooms with IAQ Issues: A Comparison of Three Schools

	Dust	Clutter	Fragrance	Cleaning Products	Furniture	Curtains	Food	Pesticide	AC Problems	Computer Problems	Hangings	Stuffed Animals	Rugs	Plants	Other
School 1	32	15	3	33	1	24	1	0	11	3	7	4	9	4	5
School 2	1	16	3	1	3	7	4	0	41	28	6	2	3	3	11
School 3	4	7	19	12	6	2	12	4	0	0	0	15	20	8	3
Total	37	38	25	46	10	33	17	4	52	31	13	21	32	15	19

1148069

THE ASTHMA AWARENESS PATCH PROGRAM FOR GIRL SCOUTS; AN EVALUATION OF EDUCATIONAL EFFECTIVENESS.

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BACKGROUND: The literature reports carefully designed educational programs can improve asthma knowledge, management practices and health outcomes. We used pre-post testing to determine if the curriculum provided in the Girl Scouts Asthma Awareness Patch Program improves knowledge of lung function in health and with asthma, asthma triggers, and recognition/management of an asthma exacerbation. We hypothesized that participants would have improved post-test scores following an interactive asthma educational program. **METHODS:** Girl Scouts aged 5-17 years from a four-county area in northeastern Ohio were recruited to participate in the Asthma Awareness Patch Program. Educational components were in compliance with the guidelines established by the National Heart, Lung, and Blood Institute's National Asthma Education and Prevention Program. Participants completed a demographic form and pre-test before, and a post-test and program evaluation immediately following, the program. Data were analyzed using the statistical package for Social Science (SPSS, version 17.0; Chicago IL). Descriptive statistics were used to report participant demographics. Cronbach's alpha analysis determined internal consistency and reliability of post-test items. T-tests were used to assess differences in pre-post scores, with a P value of < 0.05 considered statistically significant. **RESULTS:** Eighty-six girls between the ages of 5 and 16 years (Mean 8.97, $\pm$ SD 2.36) participated, 84% of which were Caucasian. Twenty-one percent of the participants were diagnosed and treated for asthma, 48% resided with an asthmatic and 72% knew someone with asthma. Post-test scores (mean 89.6, $\pm$ SD 9.0) were significantly higher, ($p < 0.001$) than pre-test scores (mean 62.5, $\pm$ SD 20.8), indicating substantive increases in knowledge as a result of the program. Cronbach's alpha raw score of 0.448 and a standardized score of 0.518 were realized. **CONCLUSIONS:** The assessment tool demonstrated moderate internal reliability. Participation in the program enhanced participants' knowledge of normal lung function, asthma pathophysiology, trigger identification and asthma treatment.

Sponsored Research - None

1130760

INPATIENT TOBACCO DEPENDENCE COUNSELING BY RESPIRATORY THERAPISTS IN A LARGE ACADEMIC MEDICAL CENTER; RECOMMENDATIONS, PATIENT SATISFACTION AND RT PERCEPTIONS.

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BACKGROUND: The Joint Commission mandates that hospitals have a tobacco-free policy that prohibits patients and visitors from tobacco use within and around the institution. The implementation of such policies, along with the discomfort of tobacco withdrawal, provides Respiratory Therapists (RT) the opportunity to proactively counsel patients about quitting, discuss proper use of tobacco pharmacotherapy and to provide referral for intensive treatment. Research supports that even brief tobacco interventions (BTI) can assist in quitting. METHOD: The implementation of a BTI consult service in a large academic medical center provided by a group of RTs trained in tobacco counseling was examined. BTI included asking about tobacco use, advising to quit, and referring to appropriate services. A retrospective chart review of the first 6 months of implementation was conducted. Patient satisfaction scores were explored using HCAHPS (Hospital Consumer Assessment of Healthcare Providers and Systems) survey results. RTs providing BTIs completed a survey which measured knowledge, attitudes and confidence. Data analysis was conducted using descriptive statistics, as appropriate. RESULTS: A total of 324 inpatients were referred, and most accepted counseling (95.7%). RTs assessed tobacco dependence and recommended pharmacotherapy for patients with no treatment (n=42) as well as recommended additional rescue pharmacotherapy (gum, lozenge) to assist in management of additional cravings (n=54). Patient satisfaction comparison was limited due to survey participation, but scores were very high overall. Therapists were confident and had positive attitudes regarding the service, but indicated a need to improve specific knowledge like pharmacotherapy. CONCLUSIONS: RTs contributed to better management of inpatients with tobacco dependence. Further research in this area regarding outcomes and tobacco cessation rates is recommended. Such evidence would support the RT's role of lung health expert and continued contribution to chronic disease self-management.

Sponsored Research - None

1149961

EFFECT OF ROFLUMILAST TREATMENT ON HEALTH-RELATED QUALITY OF LIFE IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE.

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Background: Roflumilast, a once-daily oral phosphodiesterase-4 selective inhibitor recently approved by the FDA, has been shown to reduce the risk of chronic obstructive pulmonary disease (COPD) exacerbations in patients with severe COPD associated with chronic bronchitis and a history of exacerbations. The purpose of this study was to investigate the effect of roflumilast treatment on health-related quality of life (HRQoL) in COPD patients, particularly COPD patients with a history of exacerbations. Method: Data was from Study M2-111 (OPUS) - a 52 week randomized, double-blind, placebo-controlled, parallel group phase 3 clinical trial of roflumilast 500 mcg once daily in patients with COPD. The St George's Respiratory Questionnaire (SGRQ) was used to measure HRQoL. For SGRQ, a change of 4 units was generally accepted as a minimal clinically important difference. A post-hoc analysis was performed on the overall patient population, subpopulation with a history of exacerbations and subpopulation with chronic bronchitis. In each treatment group, the number and proportion of patients who improved ≥4 units on the SGRQ total score at week 52 (last observation carried forward) were calculated and compared using chi-square test. Results: A total of 1,173 COPD patients were enrolled in the trial: 567 in the roflumilast group and 606 in the placebo group. The proportion of patients with improvements in SGRQ total score of ≥4 units was higher in the roflumilast group than in the placebo group in the overall population (36.45% vs. 33.33%, p = 0.2875) and subpopulation with chronic bronchitis (36.72% vs. 34.02%, p = 0.4630), though these differences did not achieve statistical significance. In the subgroup of patients with a history of exacerbations (821 patients: 389 in the roflumilast group and 432 in the placebo group), the proportion of patients with ≥4 unit improvement in SGRQ total score was 38.56% in the roflumilast group and 31.71% in the placebo group (p = 0.0399), indicating a relative improvement of 21.60% for patients in the roflumilast group. Conclusions: Analysis of this clinical trial data suggests that roflumilast provides a clinically meaningful and statistically significant improvement in HRQoL in COPD patients with a history of exacerbations.

Sponsored Research - This research was funded by Forest Research Institute, Jersey City, NJ

1136016

ASTHMA ATTITUDES AND BELIEFS FROM THE BROOKLYN COMMUNITY ASTHMA SURVEY.

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Background: The Brooklyn community has a high incidence of asthma and health care disparities within the African American community. A needs assessment was conducted to identify which knowledge and beliefs were present to inform future health education initiatives. Methods: Questionnaires based upon the Chicago Community Asthma Survey (CCAS) were administered at local health fairs to adults with and without asthma and parents of children with asthma. The CCAS contained questions related to asthma knowledge (true/false), beliefs (yes/no), attitudes (Likert scale with 1= never true and 5 = always true), and demographic information. The Cronbach's alpha for knowledge, belief, and attitude scales were .74, .80, and .87, respectively. Comparisons among the three groups for dichotomous questions were analyzed using the Chi Square Test of Independence and tested at $\alpha = .05$. Likert scale questions were analyzed using the Kruskal-Wallis test at $\alpha = .05$. Demographic variables were described through descriptive statistics. Results: A total of 278 questionnaires were collected from adults with asthma (n = 79), parents of children with asthma (n = 97), and adults without asthma (n = 102). Significant misconceptions identified were that a vaporizer is a good method of treating asthma (correct response rate in parentheses) (25.6%), asthma can be cured (53.1%), poor diet triggers asthma (53.8%), cough at night is a sign of asthma (60.5%), and the appropriate statement that cockroaches can trigger asthma (60.6%). Overall, parents of children with asthma were more knowledgeable than either adult group. There were no between group differences in any of the Likert scale attitude statements. Respondents strongly felt that the emergency room is the best place to treat asthma attacks (mean in parentheses) (3.95); and held slightly positive beliefs that people can become addicted to their medications (3.14) and people without health insurance do not get good asthma care (2.64). Respondents had an average age of 43 years, 73% female, and 76% African American/Caribbean, 14% Latino, 7% White, and 3% Other. Conclusions: Individuals who care for either their own asthma or their child's asthma had greater asthma knowledge than adults without asthma as expected. However, significant misconceptions about asthma management remain and must be addressed to improve asthma control in the Brooklyn community.

Sponsored Research - None

1126311

CAN EXPOSURE TO NAIL SALON CHEMICALS/DUST INCREASE THE RISK OF DEVELOPING OCCUPATIONAL ASTHMA?

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Background: Nail salon technicians (NST) are exposed to various inhaled agents (chemicals/dust) during work. This exposure may increase the risk of developing occupational asthma. Methods: A study group of 15 NST and an unmatched convenience group of 15 controls were recruited. A questionnaire was used to gather information from both groups on demographics, smoking history, respiratory symptoms, occupational exposure (and use of protective equipment for NST) as well as ventilation status in the nail salons. PFT and FENO measurements were done for all participants. Results: In the study group, three of the 15 participants had abnormal spirometry values; none of the 15 had high FENO values. For two study group participants, the FEV1 % predicted was 78 and 76 (> 80% is normal). One participant in the study group had a low FEV1% of 53 (>70% is normal). None of these participants had any respiratory symptoms or complaints (however, two study group participants with normal spirometry complained of a cough). FENO measured at less than 35 parts per billion (ppb) for all study group participants. (In steroid-naïve persons, respiratory symptoms and FENO >35 ppb has been suggested as compatible with a diagnosis of asthma). In the control group, 4 of the 15 participants had abnormal spirometry values and none had high FENO values. Three control group participants had low FEV1% predicted (79%, 68%, and 77%). One of the three also had a low FVC% predicted (71%). One control group participant had a low FVC% predicted (78%). None of these participants had any respiratory symptoms or complaints (however, one control group participant with normal spirometry complained of a cough). Discussion: Exposure to work place chemicals/dust can cause chronic or acute respiratory conditions. In the current study, results are inconclusive although participants in control group seem to have slightly more related respiratory symptoms than study group. Conclusions: This study data does not appear to support a conclusion that exposure to nail chemicals causes any occupational related respiratory disease.

Sponsored Research - None

1150030

RELATIONSHIP OF FEV1 AND COMPUTERIZED TOMOGRAPHIC EMPHYSEMA SCORES TO FUNCTION IN COPD.

Josh Boyd, Yuhchin Huang, Neil MacIntyre; Duke University, Durham, NC

BACKGROUND: COPD is a disease that can involve both the airways as well as alveolar structures. Conceptually, the spirometric forced expiratory volume in one second (FEV1) represents the airway or bronchitic component of COPD, while an emphysema score from a computerized tomographic (CT) scan represents the alveolar destructive component of COPD. HYPOTHESIS: We hypothesized that these two indices of COPD would correlate differently with various markers of function in COPD. METHODS: We analyzed 124 subjects in our database of COPD patients who were studied as part of the multicenter COPDGene project. We performed simple and stepwise multiple linear regression correlations of FEV1 (percent predicted) and emphysema score (visual scoring system ranging from 1-4 in 6 lung regions) with the following indices of function: Six minute walk distance (6MWD), change in SpO2 during the walk (dSpO2), diffusing capacity for carbon monoxide (DLCO), and a resting arterial CO2 calculation (CO2). RESULTS: Mean (range) for the measured values were: FEV1 48% (11 to 122%), Emphysema score 8.9 (0 to 22), 6MWD 1107 ft (56 to 1786 ft), dSpO2 -2% (-16 to +5%), DLCO 13.3 (4.8 to 25), CO2 46 torr (34 to 68 torr). FEV1 strongly correlated with all four functional measurements (P values ranged from .006 to .0001). Emphysema score correlated slightly better than FEV1 with dSpO2 and DLCO. However, this score did not correlate with 6MWD or CO2. CONCLUSIONS: These analyses suggest that the bronchitic component of COPD is highly correlated with all four measurements of function. In contrast, the emphysema score is largely correlated with only gas exchange parameters and appears to have less impact on exercise ability or control of breathing.

Sponsored Research - None

1134114

EVALUATION OF A VOLUME TARGETED NIV DEVICE:BENCH EVALUATION OF THE BREATHE TECHNOLOGIES NON-INVASIVE OPEN VENTILATION SYSTEM (NIOV™).

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Introduction: Early ambulation in the ventilated patient is gaining wider acceptance. We evaluated a new portable (1 lb), gas powered, volume ventilator designed for NIV via a proprietary nasal pillows interface (Breathe Technologies, CA). Description: The Breathe system uses gas power from a high pressure oxygen source to deliver patient triggered tidal volumes (VT) and supplemental oxygen through a low profile non-invasive interface using nasal pillows. The interface contains two high velocity nozzles and air-entrainment ports to augment the patient's inspired tidal volume and fraction of inspired oxygen (FIO2). Methods: We developed a model to approximate a patient's nose, upper airway and trachea. The model was connected to a test lung (ASL5000, Ingmar Medical, Pittsburgh, PA) via 22 mm ID corrugated tubing. The nasal pillows were adjusted in the nares using a lanyard. cannula. No strap or external pressure was used to attach the appliance to the model. The ASL was set to represent a normal patient, a patient with COPD and a patient with interstitial lung disease (ILD). This was accomplished by varying compliance (100 ml/cmH20, 125 ml/cmH2O, and 50 ml/cmH2O), resistance (5 cmH2O/L/s, 10 cmH2O/L/s, and 5 cmH2O/L/s), respiratory rate and VT (15 bpm x 364 ml, 15 bpm x 387 ml, and 20 bpm x 282 ml), and effort (muscle pressures of -5 cmH2O, -9 cmH2O, and -8 cmH2O). The Breathe ventilator was set at delivered volumes of 100 ml, 150 ml, 200 ml, and 250 ml. Baseline data was also collected without the appliance connected. Data was collected at 512 Hz for 15 breaths at each condition. Delivered VT, inspired oxygen concentration (FIO2), inspiratory flow (V), and peak inspiratory pressure (PIP) were recorded for each breath. Data for a minimum of 10 breaths were used to calculate mean ± SD. Results: The table demonstrates the data at baseline, set VT of 100 ml, and 250 ml. Conclusions: The Breathe volume ventilator delivered an augmented simulated patient tidal volume of 362 to 823 ml, augmenting the simulated patient's spontaneous tidal volume by up to 459 ml, depending on ventilator settings and ASL lung conditions. Delivered FIO2 ranged from 0.36 to 0.45 and was also dependent on ventilator settings and ASL lung conditions. The PIP, delivered VT's, and measured FIO2 support the hypothesis that this system can augment minute ventilation and supply supplemental oxygen in spontaneously breathing patients with a simple, non-invasive interface.

Sponsored Research - Breathe Technologies sponosred this research.

	Baseline				Set VT = 100 ml				Set VT = 250 ml			
	VT	FIO2	PIP	Flow	VT	FIO2	PIP	Flow	VT	FIO2	PIP	Flow
Normal	364±2	0.21	-	40 ± 0.4	443±16	0.38	1.4±0.4	43±6	823±3	0.43	6.6±0.1	80±.4
COPD	387±0.1	0.21	-	50 ± .04	405±3	0.36	2.5±0.1	50±.6	705±3	0.43	9.5±0.1	77±.2
ILD	282±2.6	0.21	-	32 ± 0.4	362±6	0.40	1.8±0.1	40±1.6	699±6	0.45	9.2±0.1	75±.7

VT= tidal volume in ml, FIO2= inspired oxygen, PIP=peak inspiratory pressure in cmH2O, Flow = peak flow in L/min

1143552

PATTERNS OF TIDAL VOLUME DELIVERY DURING MECHANICAL VENTILATION: A RETROSPECTIVE REVIEW OF 2004-2010.

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BACKGROUND: It has been shown that VT and Pplat limitation can improve mortality in ALI/ARDS patients and it has been suggested that these settings may influence causation of lung injury in patients without lung injury. STUDY OBJECTIVES: To determine: 1) tidal volume dose (mL/kg PBW), 2) VT vs Pplat relationship, and 3) PEEP levels used over a 7-year period. METHODS: A retrospective review of a department database from 2004 through 2010. Data included patient gender and height, ventilator settings, and airway pressures. PBW was calculated from ARDSnet formulas and used to express VT in mL/kg of PBW. Data from the first full day of MV was analyzed. RESULTS: Mean VT decreased each year. Mean VT for all 6 ICU's was <10 mL for 50% in 2004, <9 mL/kg for 83% in 2007 and <8 mL/kg for 83% in 2010. Females were consistently ventilated with larger VTs than males by 8-13%. Mean Pplat remained relatively constant. PEEP levels increased slightly each year; only 5% of patients had >8 cmH2O on day-1 in 2004 vs >20% from 2007-2010. The % of patient with VT <10 mL/kg & Pplat <30 increased each year. CONCLUSION: VT declined each year. To help ensure clinician awareness of the specific VT delivered, therapists are required to chart VT in mL/kg of PBW. We are moving to computerized ventilator documentation where this value is auto-calculated.

Sponsored Research - None

	VT (mL/kg PBW)			Pressure (cm H2O)		Pts w/ VT<10 & Pplat<30
	All	Male	Female	Pplat	PEEP	
2004	9.6+1.8	9.1+1.6	10.3+2.0	20+5	5+2	58.1%
2005	9.3+1.7	8.9+1.4	9.8+1.9	21+5	6+2	63.4%
2006	8.9+1.8	8.4+1.6	9.5+1.8	21+6	6+3	70.5%
2007	8.4+1.7	8.0+1.5	8.9+2.0	20+5	7+3	83.9%
2008	7.9+1.4	7.6+1.2	8.2+1.7	20+5	6+3	93.8%
2009	7.7+1.6	7.5+1.4	8.1+1.8	19+5	7+3	94.6%
2010	7.7+1.4	7.4+1.2	8.1+1.5	19+5	7+3	96.9%

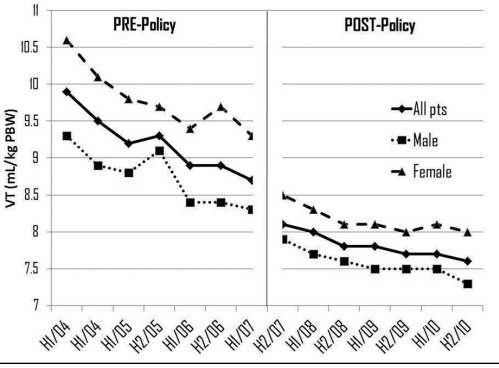
1149649

DOCUMENTING VT IN ML/KG PBW: IMPACT BY GENDER.

Carl Haas, Mark Konkle, Allan Andrews, Kimberly Bauser, Ric Eakin, Sue Henning, Paul Loik; UH Respiratory Care, Univ of Michigan, Ann Arbor, MI

BACKGROUND: Ventilator settings can influence patient outcome. After ARDSnet showed that a VT of 6 mL/kg of predicted body weight (PBW) while maintaining Pplat ≤30 cmH2O improved survival in ALI/ARDS patients, we laminated a chart on the ventilator flow-board to help therapists calculate mL/kg on ALI/ARDS patient. Reports suggest that females are ventilated with larger VT's (in mL/kg PBW) than males. In June 2007 therapists began documenting VT in mL/kg once per shift and with major VT changes. STUDY OBJECTIVES: To determine whether documenting VT in mL/kg PBW impacted the size of delivered VT and pattern of delivery by gender. STUDY DESIGN: A retrospective review of a departmental database for 14 quarters prior to and 14 quarters following policy change. Data included patient gender, height, and ventilator settings. PBW was calculated from ARDSnet formulas and used to compute VT in mL/kg of PBW. Data from the first full day of MV was analyzed. RESULTS: A mean VT of 9.2 mL/kg PBW was used in the PRE-period vs 7.8 in the POST-period. Females received a 12% (range 11-22%) larger VT than males in the PRE-period vs 8% (range 7-10%) in the POST-period. Although VT decreased for both genders, it was more pronounced for females. Graph shows data by half year. CONCLUSION: Awareness of VT size in mL/kg PBW appeared to be associated with a reduced absolute VT for both genders (more so for females). Although a larger VT was still used for females, the difference between genders was less.

Sponsored Research - None



1149570

ANALYSIS OF TWO DIFFERENT VENTILATION STRATEGIES DURING INTERVENTIONAL RIGID BRONCHOSCOPY.

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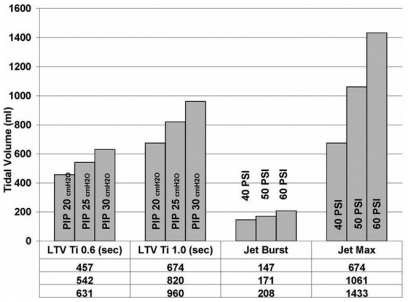
Background: The method of ventilation during interventional rigid bronchoscopy is a variable that can dictate the success of the procedure. Traditionally, the manual jet ventilator is used during this procedure. Manual jet ventilation requires ongoing arbitrary manipulation of the device which can be time consuming and may result in inconsistent ventilation. Considering the problems of the jet, we have explored the use of the Pulmonetics LTV 1200 (LTV), a turbine driven mechanical ventilator during this procedure. This study compared the variability in tidal volume (Vt) delivery when using the jet ventilator and the LTV during rigid bronchoscopy. Method: The Laerdal AirMan was attached to a Michigan Test Lung TTL (Michigan Instruments Inc.) to act simulated patient with realistic trachea. The compliance of the test lung was set to 40 cm H2O/L with a fixed airway resistance of 5 cm/H20/L/sec. The Storz 14-33 Rigid Bronchoscope was advanced into the manikin's upper airway and stabilized 7cm past the vocal chords. The NICO Management System (Novametrix Medical System Inc.) was used to obtain the exhaled tidal volume. The Vt observed during jet ventilation was obtained during "Burst" breaths (full depression of the flow lever that last less than one second) and "Max" breaths (depression of the flow lever until chest pressure stabilized) at 3 different working pressures (40, 50, and 60 PSI). The Vt observed during ventilation with the LTV was obtained using pressure control ventilation with 3 different set peak inspiratory pressures (20, 25, and 30 cm H20), 2 different inspiratory times (0.6 and 1.0 seconds), and PEEP of 0. Results: The average Vt difference from Burst to the Max breaths when employing the jet ventilator was 615mL with a standard deviation +/- 622mL. The average Vt difference from 0.6 second inspiratory time to a 1.0 second inspiratory time when employing the LTV was 681ml with a standard deviation +/- 194mL. See Graph for additional data. Conclusion: Inspiratory time has a greater effect on the Vt delivery than the pressure setting for both the LTV and jet ventilation. The jet ventilator demonstrated a greater variation in Vt than the LTV which could result in underventilation or volutrauma over the range of inspiratory times tested.

Sponsored Research - None



1135328

BENCH STUDY OF TWO BATTERY BACKUP UNITS FOR THE 3100B.

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Background: HFOV has been an accepted method of low tidal volume ventilation for several years. The SensorMedic 3100 B is the only device that is FDA approved to provide this form of ventilation for the adult population. One well known problem with this device is that it doesn't have a back up battery that allows the unit to maintain ventilation during brief power outages. Many medical facilities have considered using external uninterrupted power source (UPS) to fix this issue. The UPS is a device that provides emergency power to a designated appliance by using a previously charged battery. In this bench study we evaluated the ability of two commercially available UPS units with and without an AC power source. We also evaluated how long these UPS unit's battery sources would provide power to the 3100B during low, medium and high clinical settings. Methods: We used a Michigan TTL test lung with the compliance set at 30 ml/cm H20 and a 5 cm H20/L/sec airway resistance. Two commercial grade battery backup power sources were evaluated: APC Back UPS Pro 1500 (APC) and the Tripp Lite OmniSmart 350 (TLOS). Both batteries were recently purchased and were not used prior to this study. The UPS function was observed with AC power available and with the backup battery power activated. Each objective was observed at following 3100B clinical settings: Low (MAP 20, Power 4.0, It 33% and Hz 5), Medium (MAP 30, Power 6.0, It 33% and Hz 4) and High (MAP 40, Power 10.0, It 50% and Hz 3). The battery backup time (BBT) was observed from AC power removal until the HFOV unit depressurized and failed to ventilate. A total of 3 trials where performed at each clinical setting. Both UPS devices were charged for a minimum of 24 hours between trials. Results: The APC performed normally with AC power under all clinical settings. The TLOS worked normally during the Low and Medium clinical settings. The TLOS spontaneously switched to the battery backup mode in all of the High clinical settings trials. Both units were able to provide adequate emergency BBT. The APC provided the longest BBT during Medium and Low clinical setting trials. See the attached table for additional information. Conclusion: Although both UPS systems provided adequate BBT, the TLOS was unable to remain under AC power during the High HFOV clinical setting trials. The APC unit was able to perform in all clinical conditions while providing adequate battery back time for emergency power loss.

Sponsored Research - None

Battery Backup Time (BBT) at 3 Different HFOV Settings

				APC	TLOS
MAP (cm/H20)	Power	It (%)	Hz	BBT	BBT
20	4.0	33	5	30.9 min +/- 0.49	21.8 min +/- 0.54
30	6.0	33	4	23.7 min +/- 0.16	14.7 min +/- 0.1
40	10.0	50	3	6.2 min +/- 0.25	6.0 min +/- 0.1

1125272

A BENCH STUDY TO EVALUATE DRAGER APRV WITH AUTO RELEASE UNDER VARYING COMPLIANCE AND RESISTANCE.

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BACKGROUND: The Drager Evita Infinity V500 ventilator has an AutoRelease in Airway pressure Release Ventilation (APRV) mode that allows the operator to set an inspiratory trigger for inspiration for mandatory breaths which results in the transition to Phigh as a percent of peak expiratory flow (%PEF). This setting determines Tlow which is the release time (expiratory time) and indirectly the intrinsic PEEP (PEEPi) and End Expiratory Lung Pressure (EELP). APRV is an open lung strategy to recruit and maintain open alveoli with out the use of set PEEP which may retard expiratory flow and ventilation. The purpose of this study was to determine the effects of % PEF when set by AutoRelease on end expiratory lung pressure (EELP), exhaled tidal volume (VT) and mean airway pressure (mPAW) under varying conditions of compliance and resistance. METHODS: A passive patient was simulated using a Michigan Test Lung (TL). The ventilator was set initially at Thigh=5.0 sec., Tlow=0.5 seconds, Phigh=30 cm H2O, Plow=0 cm H2O. Baseline measurements were made of mPAW, VT, EELP and PEEPi . Measurements were repeated with the AutoRelease set at 50% and 70% under varying conditions of compliance and resistance. The TL was set to simulate four patients using combinations of resistance (R) and compliance (C). These included equivalent (1) C=0.05L/cmH2O and R=9mmID, (2) constant R=9mmID and variable C=0.02L/cmH2O, (3) constant C=0.05, and variable R=5mmID, and (4) variable C=0.02L/cmH2O and variable R=5mmID. RESULTS: See Table 1 CONCLUSION: Intra-comparisons under varying simulated compliance and resistance had little effect on mPAW from 50% -70%. There was a larger change seen on Vt and minute ventilation using Auto release from 50% to 70% under the simulated patient's with various changes in compliance and resistance. Even though mMAP was fairly stable, there were large variations in EELP. * One problem with Auto Release we were unable to measure PEEPi due to the ventilator releasing PEF to baseline to measure trapped lung volume. This has the potential for inadvertent lung de-recruitment. Sponsored Research: Ventilator was loaned for the period of study.

Sponsored Research - Drager Ventilator was loaned for the bench study

Table 1. Data comparisons of 50% vs. 70% Auto Release of the four varying lung conditions

Auto Release	50%		70%		50%		70%
1	mPAW	27cmH2O	28cmH2O	2	mPAW	28cmH2O	28cmH2O
	Vt	1396mL	1164mL		Vt	681mL	600mL
	Ve	14.9L	12.9L		Ve	8.21L	7.6L
	EELP	5cmH2O	9cmH2O		EELP	1.2cmH2O	4cmH2O
3	mPAW	22cmH2O	24cmH2O	4	mPAW	26cmH2O	27cmH2O
	Vt	1324mL	1009mL		Vt	569mL	448mL
	Ve	11.9L	9.91L		Ve	6.0L	5.01L
	EELP	6cmH2O	12cmH2O		EELP	5cmH2O	10cmH2O

1150184

TIDAL VOLUME IS INDEPENDENTLY ASSOCIATED WITH OUTCOME IN CRITICALLY ILL PATIENTS RECEIVING MECHANICAL VENTILATION.

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BACKGROUND: High tidal volume has been associated with poor outcome in patients with acute lung injury [ALI] or Adult Respiratory Distress Syndrome [ARDS]. Use of high tidal volumes has been associated with elevation in biomarkers of lung injury, prolongation of duration of mechanical ventilation as well as increased mortality. There are few studies that document the effect of high tidal volumes in patients who are not admitted with a diagnosis of ALS/ARDS. METHODS: Retrospective review of tidal volumes during mechanical ventilation, patient ideal body weight and APACHE IV outcome data was performed on patients admitted to our medical intensive care unit. RESULTS: Tidal Volume (TV) of 8mL/kg predicted body weight (PBW) was used to divide the patients in two groups. Of 677 ICU admissions, 572 received TV of more than 8mL/kg at some point during their ICU stay as opposed to 105 patients whose TV remained less than 8 mL/kg PBW. Patients who received TV of more than 8mL/kg had significantly higher ICU mortality compared to those with lower tidal volumes (26.8% versus 17.6%; p-value = 0.05). Patients in higher TV group also had significantly longer ICU stays. Hospital length of stay, or functional status at the time of discharge did not show a statistically significant correlation with the tidal volume. CONCLUSION: Based on our retrospective analysis, we recommend careful monitoring to maintain low tidal volumes in mechanically ventilated patients including those with non-respiratory critical illness.

Sponsored Research - None

1144631

AGREEMENT BETWEEN RESPIRATORY SYSTEM COMPLIANCE OBTAINED BY TRADITIONAL METHOD VERSUS ESOPHAGEAL PRESSURE MONITORING.

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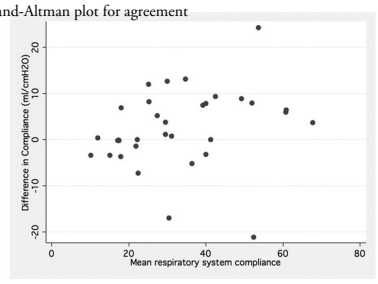
Background: Patients with ARDS may benefit from the use of esophageal pressure monitoring (EPM) to guide ventilator management. Using esophageal pressure (PES) as a surrogate for pleural pressures, end-inspiratory and end-expiratory transpulmonary pressures can be calculated, allowing targeting of tidal volume and PEEP to specific goals. It is unknown if PES is a valid surrogate for pleural pressures during critical illness. We considered that if EPM measurements are representative of pulmonary mechanics then they would agree with a known standard, such as respiratory system compliance (CRS). CRS is available during standard patient-ventilator systems check and can also be calculated from transpulmonary values. We hypothesized that there would be good agreement between the two CRS. Methods: We performed a retrospective review of a convenience sample of patients known to have had EPM, abstracting patient characteristics, ventilator monitoring data, and confirmation of proper placement of esophageal catheter by CXR from the medical record. CRS from EPM was calculated using 1/CRS = 1/ (ΔVT/ end-inspiratory transpulmonary pressure – end-expiratory transpulmonary pressure) + 1/ (VT/ ΔPES). Data was analyzed from six ventilator checks with complete information for each patient after balloon placement. Agreement was determined by Bland-Altman plot and Kappa (k). Correlation was determined using Pearson correlation (r) Results: Forty-six patients who had EPM were identified; the decision to place the esophageal balloon was made by the physician intensive care team. Ten patients were excluded due to improper balloon placement and three did not have complete data. Agreement between compliance measurements at the first ventilator check was poor; only 9 of 34 measurements were within 10%; (kappa = 0.00). Correlation was modest (r=0.693). The Bland Altman plot demonstrated poor agreement across the range of compliance measurements. Data from remaining ventilator checks were similar. Conclusion: Although correlated, the lack of agreement suggests that EPM CRS and traditional CRS measurements are not interchangeable. More research is needed to support the validity for PES as a surrogate of pleural pressure.

Sponsored Research - None

Figure 1. Bland-Altman plot for agreement



1150098

NONINVASIVE POSITIVE PRESSURE VENTILATION USAGES: A SURVEY OF RESPIRATORY THERAPISTS.

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Background: Increasingly, respiratory therapists (RTs) apply Noninvasive Positive Pressure Ventilation (NPPV) for patients with terminal or end-stage disease at the end of life. A task force on the palliative use of NPPV sought to improve the understanding of the goals of NPPV with a three category approach: Category 1- to restore health in patients who want subsequent intubation and invasive mechanical ventilation if necessary and indicated; Category 2- to restore health in patients who do not want intubation and invasive mechanical ventilation; Category 3- to maximize comfort at end of life. For each, the task force recommended: (a) eliciting patient preferences and goals, (b) communicating a rationale, and (c) outlining parameters for success and failure. The purpose of this study was to examine the extent that RTs report the implementation of the task force's recommendations and are comfortable with each category, as well as correlates of their comfort with Category 3 NPPV. Method: RTs in five hospitals were invited to complete a questionnaire. For each category of NPPV usage, the questionnaire elicited the frequency of implementation of the task force's recommendations and the RTs comfort administering it. Responses were reported on a scale of 0-10 (0 = "Not at All;" 10 = "Most Possible"). Descriptive, paired-t, and regression analyses (alpha < .01) were performed. Results: Of 234 RTs eligible for the study, 165 (71%) participated. A majority (56%) lacked training in care at the end-of-life. On a 0-10 scale, the mean comfort level for administering NPPV progressively decreased: Category 1 = 8.7; Category 2 = 8.3; Category 3 = 6.1. Compared to Categories 1 and 2, the frequency of eliciting patient preferences and goals, communicating a rationale, and outlining parameters for success and failure were each lower for Category 3 ($p < .01$). In a multivariable regression, only outlining the parameters for success and failure was correlated with increased comfort with administering Category 3 NPPV ($p < .01$). Conclusion: The study results suggest that compared to Categories 1 and 2, the task force's recommendations for NPPV usage are implemented for Category 3 to a lesser extent. Moreover, RTs appear to be less comfortable administering Category 3 when parameters for success and failure are lacking. An opportunity exists to improve NPPV usage through protocols and education that focuses on NPPV usage at the end of life.

Sponsored Research - None

1138315

A STATEWIDE SURVEY OF PATIENT SAFETY ISSUES RESULTING FROM NON-RESPIRATORY THERAPISTS ADJUSTING MECHANICAL VENTILATOR CONTROLS IN ACUTE CARE HOSPITALS.

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Background: Mechanical ventilator control settings are sometimes adjusted by healthcare practitioners other than Respiratory Therapists. As follow up to patient care issues brought before the the North Carolina Respiratory Care Board (NCRCB), patient safety issues associated with this practice were investigated by addressing the following questions: (1) Does the practice of changing ventilator controls; without communication or written orders to Respiratory Therapists; result in patient safety issues? (2) What are the statewide scope, depth, and cost of patient safety issues associated with this practice? **Methods**: A voluntary, anonymous survey was developed and sent to all 4,348 licensed Respiratory Therapists in the state of North Carolina. The survey focused on ventilator control changes made in the acute care hospital setting, and excluded the operating room and recovery room areas. A separate request was sent to all Respiratory Care Department Medical Directors for completion. **Results**: A total of 533 (n= 533) licensed Respiratory Therapists completed the survey, for a state-wide 12% response rate. Reported patient safety issues are summarized in the table, which follows this abstract. **Conclusions**: This survey has identified serious patient safety, communication, cost, and competency issues associated with the practice of changing mechanical ventilator control settings without prior communication/written orders to RCP's. The safety issues are significant and identified possible patient harm. As a result of the magnitude of these findings, the NCRCB has initiated the process of developing a position statement which restricts the changing of ventilator control settings. Presentation of this preliminary data represents a first step in the development of this "Hands Off" position statement. Further, it is recommended to expand this survey nationwide to further evaluate the cost, depth, and scope of patient safety issues associated with this practice.

Sponsored Research - None

Patient Safety Issues from Non-Respiratory Therapists Adjusting Mechanical Ventilator Controls

Patient Safety Issue	Statewide Frequency Reported Within Past Year	Percentage of Responses
Inadequate Inspiratory Flowrate	n= 90	21%
Incorrect Inspiratory Time	n= 106	26%
Incorrect Expiratory Time	n= 58	13%
Inadvertent PEEP and Gas Trapping	n=87	21%
Patient/Ventilator Asynchrony	n= 144	34%
Patient experienced Acute Respiratory Distress	n=85	21%
Pneumothorax or Barotrauma	n= 10	2.0%
Incorrect Alarm Settings	n= 196	47%
Cardio-Pulmonary Arrest	n= 5	1.2%

1106810

IMPACT OF INCREASED STAFFING AND DEDICATED RESPIRATORY TEAM ON LIBERATING PATIENTS FROM MECHANICAL VENTILATION.

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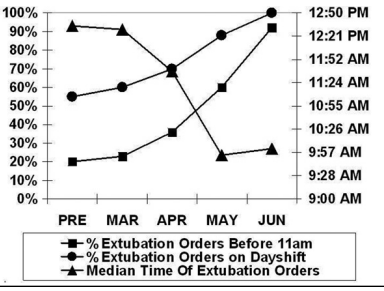
BACKGROUND: Our 22 bed surgical/shock/trauma intensive care unit (SICU) has frequent ventilator transports that pull RCPs away from the bedside. Our entire staff previously rotated through our SICU, which may have contributed to reduced continuity of care and less RCP interaction with the SICU physicians. In an effort improve care in SICU for ventilated patients, we increased respiratory staffing to cover transports and dedicated a team of RCPs to the SICU. We wanted to determine if increased staffing with a dedicated team would result in improved outcomes for liberating ventilator patients. METHODS: A performance improvement pilot including a dedicated SICU team with increased staffing was approved by administration. We began to monitor SICU for changes in ventilator outcomes. The monitored metrics in SICU included: ventilator patients, ventilator days, average time on the ventilator, performance of spontaneous breathing trials (SBT), RCP attendance of physician rounds and timing of extubation orders. We collected data for the 3 months prior to the pilot (PRE) Nov 2010 - Jan 2011. We also collected data during the pilot (March 2011 into June 2011). IRB approval was granted to collect the data from the electronic medical record. RESULTS: With the dedicated SICU team including increased staffing to cover SICU ventilator transports, RCPs attendance of physician rounds increased from 48% (PRE) to 100% three months into the pilot. Percentage of patients getting an SBT that meet criteria rose from 65% (PRE) to 100% three months into the pilot. Average number of ventilator days per patient has decreased from 6.4 days (PRE) to 4.5 days three month into the pilot. The percentage of extubation orders written before 11 am, as well as the percentage of orders written by the end of day shift have increased (see chart). The median time that extubation orders are written has moved from ~ 12:30pm (PRE) to ~ 10:00 am three months into the pilot. (see chart). CONCLUSIONS: A dedicated SICU team with staffing coverage for transports has resulted in: 1)increase RCP attendance of physician rounds 2)increased numbers of SBTs performed 3) a trend of reduced ventilator days per patient and 5) extubations being ordered earlier in the day. For a large SICU with frequent ventilator transports, a dedicated team with staffing for transports will enable better communication between RCPs and physicians on rounds and more efficient ventilator liberation efforts.

Sponsored Research - None



1148192

EVALUATION OF THREE NEW GENERATION PORTABLE VENTILATORS.

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Background: Portable ventilators are increasingly utilized in the intra and inter-hospital transport of patients. These ventilators continue to increase in performance and features while decreasing in size. We evaluated three portable ventilators; Impact EMV, CareFusion LTV 1200, and Newport HT 70, in terms of triggering, delivered tidal volume (VT) accuracy, battery life, delivered FIO2 accuracy, and gas consumption. Methods: Triggering was tested using a dual chamber test lung with one side representing a spontaneously breathing patient using a weak, normal, and aggressive effort driving the other side representing the ventilators' response to patient effort. Delivered VT and FIO2 accuracy were evaluated across a range of operation. To determine gas consumption, the ventilators were attached to an E type oxygen cylinder and operated at an FIO2 of 1.0 until the tank was depleted. Battery duration was tested by operating each ventilator at an FIO2 of 0.21 until the device ceased to deliver breaths. Results: Differences remain among devices in several aspects of the testing protocol. Gas consumption ranged from 9.7 - 15 lpm. Battery life ranged from 95 – 625 minutes. Triggering performance varied among devices but was consistent breath to breath within the same device. FIO2 accuracy varied widely at the low range on the 50 ml VT setting with one device and at the high range on both the 50 ml and 500 ml VT settings with another. The figure below shows the delivered VT at 50, 100, and 400 ml settings using an FIO2 of 1.0 and 0.21. Conclusions: Manufacturers continue to improve the performance of portable ventilators. All the ventilators we tested performed well on VT delivery across a range of settings using both the internal drive mechanism (FIO2 0.21) and compressed oxygen (FIO2 1.0). Two of the ventilators were unable to deliver accurate FIO2 across the range of tidal volumes.

Sponsored Research - None

V_T/FIO_2	50/0.21	50/1.0	100/0.21	100/1.0	400/0.21	400/1.0
LTV 1200	58 ± 1.2	54 ± 1.1	96 ± 1.7	95 ± 1.4	385 ± 2.5	382 ± 2.1
EMV	51 ± 1.1	49 ± 1.2	96 ± 1.0	92 ± 2.4	387 ± 2.1	383 ± 5.8
HT 70	58 ± 1.9	53 ± 1.4	105 ± 2.6	102 ± 1.8	400 ± 1.6	371 ± 2.3

1135127

EFFECTS OF BIAS FLOW ON CARBON DIOXIDE ELIMINATION DURING PEDIATRIC HIGH FREQUENCY OSCILLATORY VENTILATION.

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Background: Bias flow is the continuous flow of gas provided during high frequency oscillatory ventilation (HFOV). Bias flow is set during HFOV based on patient size and mean airway pressure, 20 liters per minute is the recommended starting point. Increased bias flow may improve patient comfort with regard to spontaneous respirations during HFOV, but CO2 retention is a potential concern. There are limited data demonstrating that bias flow does not impact CO2 clearance during HFOV in animals, but there are no studies in humans. We hypothesized that increased bias flow in pediatric patients receiving HFOV via the 3100A Oscillator would not impact CO2 elimination. Method: Following IRB approval and informed consent from each patient's family, eight pediatric patients receiving HFOV were treated with varying levels of bias flow. Each patient was treated with 12, 24, and 36 liters per minute (lpm) of bias flow in a randomized fashion. At each bias flow setting, data were collected after one hour at a fixed power. Additional data were collected at each bias flow after one hour with a fixed amplitude. The remainder of the HFOV settings remained constant throughout the six hour study. An arterial blood gas sample was obtained hourly and hemodynamics were monitored throughout the study. Results: Data were collected on 8 patients. Mean PaCO2 was 57 torr (5, 95%ile; 37, 89). Controlling for both power and amplitude, there were no significant changes in PaCO2 as bias flow varied between 12, 24, and 36 lpm (p=0.22). There were also no changes in PaO2 or mean airway pressure at each bias flow setting (Table 1). No clinically significant changes in cardiac output, heart rate, or patient stability were noted during the study. Conclusion: Changes in bias flow during HFOV do not affect CO2 elimination. Clinical investigation continues in children with ALI/ARDS being managed with HFOV to assess the impact of bias flow on gas exchange and patient comfort.

Sponsored Research - None

Mean values at set bias flows of 12, 24, and 36 liters per minute.

Bias Flow (lpm)	12	24	36
	Mean (5, 95%ile)	Mean (5, 95%ile)	Mean (5, 95%ile)
PaCO2 (mmHg)	53 (36, 84)	59 (39, 95)	58 (37, 99)
PaO2 (mmHg)	71 (37, 139)	81 (35, 136)	80 (36, 170)
pH	7.40 (7.30, 7.62)	7.35 (7.25 - 7.45)	7.36 (7.23, 7.52)
Transcutaneous CO2	57 (37, 36)	64 (43, 97)	62 (32, 93)
Mean airway pressure (cm H2O)	23 (18 ,28)	23 (18, 28)	23 (19, 27)
Amplitude	40 (28, 61)	37 (29, 61)	38 (29, 62)
Power	3 (2, 7)	3 (2, 6)	3 (2, 6)
Frequency (Hz)	8 (6, 10)	8 (6, 10)	8 (6, 10)

1134212

EFFECTS OF AN INTERPROFESSIONAL CLINICAL SIMULATION ACTIVITY ON STUDENT CONFIDENCE LEVELS OF INTERPROFESSIONAL TEAM COLLABORATION SKILLS.

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Background: Interprofessional (IP) collaboration is essential to quality health care delivery. An obstacle to collaboration is traditional educational methods which isolate students in their curricula.1,2 Objective: Assess the effectiveness of an IP activity on the student's IP competencies. Methods: A mass casualty simulation exercise was presented to an IP team consisting of a physician assistant (PA), nursing (RN) and respiratory therapy (RT) student. Prior to and following the exercise, students completed a self-measure of confidence, (0 - 10), on 14 IP collaboration skills using a validated questionnaire.3 Statistics: 3 x 2 mixed design ANOVA, between-subject variable was groups, within-subject variable was time, (pre vs. post activity). Results: Table 1 displays overall and each groups' mean confidence levels pre & post simulation. F test results indicate an overall significant effect of time $F(1,39)=514$, $p<0.001$. There was a significant effect within the groups $F(2,39)=3.58$, $p=0.037$ and time of testing by group interaction, $F(2,39)=31$, $p<0.001$, revealed significant improvement. Discussion: The students' confidence level increased significantly post simulation, as a whole, within groups, and due to group interaction; peer coaching may have been a contributing factor for the latter improvement. These results indicate that the integration of an IP clinical simulation practice activity promotes the students' confidence in their ability to provide collaborative care. This may be due to two factors; 1)The student has the ability to contribute and is hesitant to do so but, when in a low risk environment is more confident or, 2)Peer coaching and hands on collaboration helps the student develop their IP competencies. The analysis of this activity suggests that this type of simulation may be useful in the preparation of a health care student to meet the requirements of a collaborative work place environment. 1. Hall, P. Interprofessional teamwork: Professional cultures as barriers. J Interprof Care. 2005 May;Supp1:188-96. 2. Hammick M, et. al. A best evidence systematic review of interprofessional education. BEME Guide no.9. 2007;29:735-51. 3. Mann K, et.al. Self-Efficacy Measure of Interprofessional Practice Competencies for Students. In: "Seamless Care" Interprofessional Education Study.

Sponsored Research - None

Table 1. Means of confidence levels of interprofessional practice competencies pre & post simulation activity for each group of team members and all participants combined

Group	n	Pre-Simulation Mean	Post-Simulation Mean	Acroos Time Mean	% Change Pre-Post
PA	37	8.3	8.8	8.55	+ 6
RN	21	7.9	9.3	8.6	+ 18
RT	9	8.1	9.3	8.7	+ 15
All Groups	67	8.1	9.1		+ 12

PA, physician assitant; RN, nursing; RT, respiratory therapy; n, number of participants

1150315

CHANGING CPR TO A RESUSCITATION BUNDLE FORMAT IMPROVES INCIDENCE AND OUTCOMES IN INPATIENT CARDIOPULMONARY ARREST.

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Background: Despite the continuing advancements and knowledge regarding cardiopulmonary arrest (CPA), survival to hospital discharge remains poor. Current training models appear inadequate in achieving and maintaining CPR competency. Traditional CPR is standard for inpatient or outpatient individuals however inpatient resuscitation may require an augmented approach, while early recognition and intervention may prevent CPA. Objective: To evaluate the effectiveness of a novel inpatient resuscitation training program. Methods: This study was conducted in an urban, university-affiliated system with two inpatient facilities. A resuscitation "bundle" was introduced in Spring 2007 and included the following components: 1) a novel inpatient CPA treatment algorithm; 2) an institutional education model emphasizing scientific rational behind the algorithm, provider-specific roles, the use of human patient simulators, and more frequent training sessions with content modification based on performance improvement data; 3) a rapid response team; and 4) new defibrillators capable of monitoring real-time CPR process data, ECG filtering, and continuous capnometry. Our inpatient registry of resuscitation events was used to quantify the rate of CPA and survival to hospital discharge before and after implementation of the resuscitation bundle. Multiple logistic regression analysis was used to adjust for covariates including: age, gender, location, initial rhythm, and co-morbidities. Results: A total of 188 CPA's in the 24-month pre-bundle period and 138 CPA's in the 21-month post-bundle period were observed. The incidence of CPA's in non-ICU inpatient areas decreased from 2.9 to 1.4 per 1,000 patient discharges. The incidence of CPA's in ICU areas did not change (2.0 per 1,000 patient discharges). Survival to hospital discharge following CPA increased in non-ICU areas from 21% to 42% and ICU areas from 23% to 31% ($p < 0.05$ for all comparisons). Arrest-related deaths decreased from 2.14 to 0.83 deaths per 1,000 patient discharges in non-ICU areas and 1.57 to 1.40 deaths per 1,000 patient discharges in ICU areas. Conclusions: A novel, inpatient-specific resuscitation bundle appears to decrease the incidence of CPA and increase survival to hospital discharge.

Sponsored Research - None

1147782

HOSPITAL-INITIATED IMPLEMENTATION OF THE 5 A'S FOR SMOKING CESSATION BY RESPIRATORY THERAPISTS.

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Background: Smoking is the leading preventable cause of death and diseases. Related health care costs are unsustainable. The Clinical Practice Guideline for the Treatment of Tobacco Use and Dependence (CPG) recommendations (5 A's: Ask about smoking status; Advise to quit; Assess willingness to quit; Assist quit attempt; Arrange follow-up) increase quit rates and are cost-effective. When linked to cessation programs, hospital-initiated implementation of the 5 A's is effective. However, the extent to which hospital-based respiratory therapists (RTs) implement the 5 A's and make referrals to cessation programs is unknown. The study purpose was to examine smoking cessation practices of hospital-based RTs. Method: RTs in five hospitals were invited to complete a questionnaire. The questionnaire elicited smoking cessation training, familiarity with the CPG, perceived importance, motivation and self-efficacy to help smokers quit, outcome expectancies, and frequency of implementation of the 5 A's. Responses were reported on a scale of 0-10 (0 = "Not at All;" 10 = "Most Possible"). Descriptive and regression analyses (alpha < .05) were performed. Results: Of 286 RTs eligible for the study, 202 (71%) participated. A large majority (81%) lacked smoking cessation training. On a 0-10 scale, the mean perceived importance of smoking cessation (7.8) and motivation to help smokers quit (7.3) were relatively high, but familiarity with the CPG was low (2.1). The RTs' frequency of implementation of the 5 A's progressively decreased: Ask = 7.2; Advise = 6.5; Assess = 5.5; Assist = 4.5; Arrange = 1.8. In regression analyses, increased familiarity with the CPG predicted increased implementation of the 5 A's ($p < .01$). Smoking cessation training ($p = .02$) and increased familiarity with the CPG ($p < .01$) predicted increased referrals to a cessation program. Conclusions: The American Association for Respiratory Care task force, 2015 and Beyond, projected that hospital-based respiratory therapists will provide more preventive care; our study results suggest that an opportunity exists to improve smoking cessation practices. Academic and continuing education programs need to include training that focuses on the CPG, and respiratory care departments should consider developing systematic plans to implement the 5 A's and refer smokers to cessation programs.

Sponsored Research - None

1140575

TOBACCO USE AMONG LESBIAN, GAY, BISEXUAL, AND TRANSGENDER ATLANTANS: A COMMUNITY NEEDS ASSESSMENT.

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Background: Data on cigarette smoking prevalence among Lesbian, Gay, Bisexual, and Transgender (LGBT) populations in the United States have recently been reported by a small number of sources. The American Lung Association recently created a comprehensive report to assist researchers, providing a variety of historical and statistical data. LGBT smoking rates are disproportionally higher than the general population. Recent smoking rates range from 38% to 59% among LGBT youth and from 11% to 50% among adults, while the national smoking rates range from 28% to 35% for youth and approximately 28% for adults. Smoking rates among Lesbians are reported to be up to 200% higher than straight women. This study sought to answer the question: What are the primary factors that lead to high smoking rates among LGBT Atlantans? Methods: Both quantitative and qualitative data were collected. Four focus groups were conducted with former smokers, nonsmokers, and current smokers to determine tobacco-related knowledge, attitudes, and behaviors, and reasons LGBT community members initiate and continue tobacco use. Survey data was collected from 685 individuals at six different local events. Thematic analysis was utilized to analyze focus groups, while descriptive statistics were utilized to analyze survey data. Results: There was a lack of awareness among focus group and survey participants that smoking rates within the LGBT community are higher than the general population. Focus group participants cited peer influences as reasons they initiated and continue to smoke, noting that the LGBT community is more tolerant of smoking than mainstream society. Additionally, the strategy of offering LGBT specific cessation programs was highly supported among current and Ex-Smokers. Survey respondents did not rate tobacco as a high priority health issue for the LGBT community. Conclusions: Findings from this study clearly shows that tobacco use is a serious issue for the LGBT community. While community members are familiar with the harmful consequences of tobacco use and second-hand smoke, they are generally not aware that they are disproportionately affected by it. Project activities identified a number of innovative strategies that can be effective in increasing awareness, reducing tobacco use, and encouraging other behaviors that will reduce chronic disease and promote overall wellness within the LGBT community.

Sponsored Research - None

Demographics of Focus Group Participants

Focus Group	Black Gay males	White Gay Males	Black Lesbians	White Lesbians	Transgender
Former Smoker (10)	3	2	2	2	1
Current Smokers (8)	4	2	_	1	1
Current Smoker (8)	1	4	_	3	-
Non Smoker (10)	3	2	1	4	-

1148754

DEVELOPMENT AND VALIDATION OF THE UNIVERSITY OF DAMMAM RESPIRATORY CARE EDUCATIONAL ENVIRONMENT MEASURE (UDREEM).

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Background: Educational Environment is defined as the climate of the institution as experienced by students that has direct or indirect influence on the learning process. A positive and supportive environment is an essential requirement for successful learning. Students who perceived their learning environment as positive are more likely to develop effective learning strategies, and adopt deep learning approach. Currently, there is no validated instrument dedicated to measure educational environment of Respiratory Care (RC) Educational programs. Therefore, we conducted this research project to develop and validate an assessment tool to measure educational environment of RC educational programs. Methods: Potential items of the instrument relevant to RC educational environment construct were generated by the research group based on a comprehensive literature review and assessment for content validity by multiple focus groups of RC educationalists. The resulting items were pretested on 20 RC interns for face validity and readability. The resultant seventy one- 5 points items Likert scale instrument was then field tested on 212 students from the three RC programs in Saudi Arabia, and was subjected to principle factor analysis (PFA) with varimax rotation. Prior to PFA, factorability of the items were assessed by inspecting the item correlation matrix, Kaiser-Meyer-Olkin, and Bartlett's test of Sphericity. The five domains were also confirmed by Horn's parallel analysis (HPA). Items with factor loading < 0.35 were deleted. Cronbach's alpha was used to assess internal consistency reliabilities. Results: An initial pool of 105 items was generated. Item reduction and PFA resulted in total of 60 items with five domains (Eigenvalues ≥1.8) explaining 60% of the total variance, namely perception of: clinical training, teaching and learning, program management, laboratory teaching, and RC profession. Kaiser-Meyer-Olkin was 0.8 and Bartlett's Test of Sphericity was significant ($p < 0.05$). Results of HPA confirmed the 5 domains. The reliability estimates was satisfactory, item-internal consistency was over 0.35 and Cronbach' alpha ranged from 0.58 to 0.88. Conclusions: This instrument is the first assessment tool developed to measure RC educational environment. Psychometric evaluation of the instrument indicates adequate validly and reliability. UDREEM instrument can be used as part of quality assurance process of RC academic programs.

Sponsored Research - None

1149946

PERFORMANCE IMPROVEMENT PROJECT: THE EFFECT OF MANDATORY BIPAP WORKSHOP ON A RESPIRATORY CARE DEPARTMENT.

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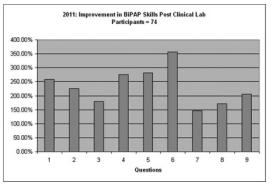
Background: The two most important goals of Non-Invasive Positive Pressure Ventilation (NIPPV) for a pediatric patient are to ensure patient comfort and to effectively deliver prescribed therapy. Our hospital's Respiratory Care Department is continuously looking for areas in which to improve quality outcomes and elevate our patient satisfaction. A "BiPAP Workshop" was a hands-on, mandatory education, developed for all RTs and Sleep Technicians in the hospital. The goal of the workshop was to create consistency in prevention of skin breakdown, choosing the appropriate mask,correctly assessing the presence and proper placement of the exhalation port in the circuit and in providing nebulizer treatment in-line with NIPPV. Method: RTs signed up in groups of five for effective hands-on instruction, which took place in a virtual lab. Each RT took a pre-workshop evaluation. Education was presented three ways: didactically, demonstration and return demonstration. Topics covered were: skin prep, skin barrier options, proper measuring for nasal vs. full face mask, need for only one location for exhalation port and in-line nebulizer placement. Then, each group was asked to prepare the mannequin with the appropriate skin barrier device, choose appropriate mask, decide whether or not to add a disposable exhalation device (DEP), place the patient on 12/6 with a back-up rate of 10 and assess the patient. Results: The most common discussion among groups involved the skin barrier, the fact that a DEP in not always indicated and placement of a nebulizer in-line. The results of the post workshop assessment demonstrated 150%-350% improvement in understanding. Of additional benefit was the initiation of several process improvements, suggested by workshop participants. There have been no cases of skin breakdown secondary to BiPAP application since the workshop (6+ months). Conclusions: The benefits of a hands-on workshop are immeasurable. Improved consistency in all categories of education has positively impacted the quality of care provided to an NIPPV pediatric patient.

Sponsored Research - None



Evaluation Questions:
1. Describe what types of patients would benefit from BiPAP via the Focus
2. Describe what types of patients would benefit from BiPAP via the V60.
3. Understand the need for one exhalation port.
4. Determine which skin barrier to use for any given patient.
5. Perform a skin assessment at the required frequency and size/cut the appropriate skin
6. Choose the appropriate BiPAP interface dependent on patient.
7. Correctly size and secure a BiPAP mask..
8. Identify when a patient needs to be transitioned from a nasal mask to a full face mask.
9. Troubleshoot effectiveness of BiPAP settings and device.

1150212

THE MOBILE CLASSROOM: ASSESSING STAFF SATISFACTION WITH ONLINE TRAINING.

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Introduction: Our institution initiated a change in the cardiopulmonary arrest record to facilitate compliance in documentation of arrest situations. The challenge for hospital educators was to introduce staff to this new form in a timely and efficient manner. An online method of content delivery was utilized instead of more traditional methods. **Hypothesis:** Developing online training modules which integrate the needs of different learning styles will return a higher rate of student satisfaction. **Methods:** The evaluation contained 10 questions (8-Likert Scale, 1-multiple choice and 1 open-ended). After administrative review, the IRB determined the project was not human subject research. The evaluation was then distributed to 940 hospital staff. Prior to the evaluation, staff accessed an 11-minute online training module detailing documentation requirements for a new cardiopulmonary arrest record. This module utilized a screen recording software which enabled staff to see the new arrest record and follow along as it was filled out section by section. This software also provided voice narration and visual cues to highlight training points. **Results:** Of the 940 staff members asked to complete an evaluation of the online training program, 633 responded (67%). Respondents were confident they could correctly document on the new cardiopulmonary arrest record (90%), and that all sections of the record had been adequately explained (91%). They indicated adequate examples of documentation were provided (90%), and that their personal learning style had been met (87%). Respondents agreed that learning at their own pace increased their retention of information (90%), and preferred the learning style provided in this module (87%). They were also satisfied with the manner in which the material was presented (87%), and that this training method was an efficient method of learning (88%). Respondents preferred the online training module over other traditional teaching methods (slide and/or lecture-based presentation) (65%). **Conclusion:** Technology skills possessed by hospital staff are pushing today's classroom into forums that can be accessed on demand, and provide them with content designed with the adult learner in mind. It is crucial that staff is engaged in their learning if they are to be successful in adapting to changes. In using this online training module, we found a majority of staff responded positively to this method of presentation.

Sponsored Research - None

1127443

INTER-RATER RELIABILITY OF A RESPIRATORY THERAPY PRECEPTOR TRAINING PROGRAM.

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Background: Although most respiratory therapy (RT) programs rely heavily on the preceptor model to provide clinical education, there is currently no standardized training program for clinical preceptors. The new accreditation standards issued by the Commission on Accreditation for Respiratory Care (CoARC) in June 2010 mandate that respiratory therapy programs provide evidence of inter-rater reliability among preceptors who perform student evaluations. A review of the literature revealed that both hospital RT managers and directors of RT education programs agree that standardized preceptor training is needed in order to provide students with consistent clinical experiences. The purpose of this study was to develop a standardized clinical preceptor training program that can be used by RT departments in preparing instructors to deliver effective clinical education and by RT education programs to meet the CoARC requirement regarding inter-rater reliability. Method: The authors developed clinical training modules on two broad topics, principles of adult education and student evaluation and feedback, that included videos illustrating both effective and ineffective implementation of these subjects. Modules were evaluated by 12 RT preceptors at The Ohio State University Medical Center in order to determine inter-rater reliability based on percentage agreement. Three RT educators individually evaluated preceptor responses. Results: Twelve RT preceptors evaluated five videos and identified 23 ineffective behaviors. Three experienced RT educators then categorized preceptor responses. Inter-rater reliability for the 23 ineffective behaviors identified by preceptors was as follows: 100% for 12 behaviors, 92% for eight behaviors, 83% for one behavior, and 75% for two behaviors. Conclusions: The study revealed that the RT clinical preceptor training modules evaluated have a high degree of inter-rater reliability. Further, these modules can serve as the foundation for a more comprehensive preceptor training program that could be used nationally to fulfill an important RT education program accreditation requirement.

Sponsored Research - None

1130516

A RETROSPECTIVE COMPARISON OF TRADITIONAL AND HYBRID FORMAT OF COURSE DELIVERY ON STUDENTS' LEARNING AND PERCEPTIONS OF TEACHING EFFECTIVENESS IN RESEARCH METHODOLOGY.

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BACKGROUND: A growing number of courses in higher education are adopting a hybrid format of course delivery that includes both online and traditional face-to-face approaches. The purpose of this study was to compare traditional and hybrid format of course delivery on students' learning and perceptions of teaching effectiveness in a research methodology course. METHOD: An undergraduate level research methodology course, which was taught in the traditional format in 2007 and 2008, was converted to a hybrid course which consisted of 50% online and 50% traditional format of course delivery using the same curriculum as the traditional course. This study consists of a retrospective analysis of 114 respiratory therapy students (57 students in each group) at Georgia State University from 2007 to 2010. The same instructor taught the research methodology course in both formats. Students' final grades and their faculty evaluations on teaching effectiveness of the course and the instructor were compared using the independent sample t –test at the level of 0.05. RESULTS: The table below presents the means and standard deviations for students' final grades and their evaluations of teaching effectiveness. The results of this study indicate that there is no significant difference between the traditional and hybrid format of course delivery in student learning (p=0.098), as well as student perceptions of teaching effectiveness of the course (p=0.490) and instructor (p=0.808). CONCLUSIONS: The hybrid format of course delivery is as effective as the traditional format in knowledge acquisition and student satisfaction of an undergraduate level research methodology course in respiratory therapy education.

Sponsored Research - None

	Students' Final Grades	Teaching Effectiveness of the Course	Teaching Effectiveness of the Instructor
Traditional	91.68 ± 5.45%	4.15 ± 0.21	4.15 ± 0.20
Hybrid	93.39 ± 5.52%	4.02 ± 0.05	4.20 ± 0.14
p value	p=0.098	p=0.490	p=0.808

1114638

SIMULATION: AN EFFECTIVE NON-INVASIVE POSITIVE PRESSURE VENTILATION EDUCATION METHOD FOR RESIDENT PHYSICIANS?

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Background: Strong resident knowledge base and effective multi-disciplinary communication is crucial to safe delivery of non-invasive positive pressure ventilation (NIPPV) in the pediatric population. Simulation was chosen as the educational tool to address both of these issues. This study commenced to gather feedback on the simulation. Methods: A program simulating pediatric obstructive sleep apnea requiring NIPPV was piloted in the resident education program on a 24 bed pulmonary unit. A scenario, based on specific learning objectives and an actual patient incident, was designed for resident physicians, nurses, respiratory therapists and scripted confederate patient's mother role. Post-simulation debriefings focused on key learning points and multidisciplinary communication. A 19 question survey evaluating the simulation was developed and distributed via Zoomerang online software to all who attended the NIPPV simulation from May 2009 through March 2011.The survey sample contained 34 post graduate year (PGY) 1 residents, 32 PGY 2 residents, 18 PGY 3 residents, 10 respiratory therapists, and 5 nurses. Results: 20 PGY 1 residents, 5 PGY 2 residents, 7 PGY3 residents, 1 PGY1 fellow, 8 respiratory therapists, and 2 nurses responded. 35% of respondents had extensive (>5 times) simulation experience, 56% limited (1-5 times) and 9% had none. 84% (29% strongly agree, 55% agree) thought learning objectives were clear or became evident during debriefing. 78% (22% strongly agree, 56% agree) felt signs and symptoms of Obstructive Sleep Apnea were well described and demonstrated. 91% (43% strongly agree, 48% agree) found the discussion of group performance to be helpful. 90% (34% strongly agree, 56% agree) considered the scenario to be a good illustration of the need for effective multidisciplinary communication. 91% (36% strongly agree, 55% agree) found the discussion of NIPPV modes/interfaces to be helpful. 92% (46% strongly agree, 46% agree) thought facilitators were supportive and created a safe learning environment. Conclusion: Simulation based education is perceived to be an effective tool to increase knowledge of NIPPV and illustrate the need for multidisciplinary communication.

Sponsored Research - None

1135651

UTILIZING HIGH FIDELITY SIMULATION AS A COMPREHENSIVE EXPERIENTIAL TEACHING TOOL IN RESPIRATORY CARE.

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Background: In the past, obtaining proficiency in high risk-low volume emergency procedures was gained only through real clinical experience. In efforts to prepare for situations that may lead to sentinel events, a high fidelity simulation was developed as a departmental competency. Method: The focus of the simulation was emergency management of a dislodged ETT, where the therapist would extubate and effectively bag mask ventilate the patient. Prior to the start of the simulation, therapists were introduced to the layout of the ICU room, available resources, and the interactive environment but were not informed of the scenario. The METI-HPS (METI Learning, Sarasota, FL) was utilized as the high fidelity patient. The simulation was videotaped, allowing each participant to review their performance. An hour was allocated for each participant to complete the simulation which consisted of a briefing, simulation run, and debriefing. Therapists were then asked to complete a survey. Results: 67 therapists completed the simulation. Providing an online survey at the end of the simulation ensured 100% participation in completing the survey. 100% of the participants thought that utilizing high fidelity simulation has the ability to improve patient care. 97% of therapists felt that they are better equipped to deal with the same clinical emergency in an actual ICU setting. Using high fidelity simulation, 100% of the participants felt that it enhanced their continuing education and 94% felt that simulation learning was their preferred learning style. Additional Findings: The impact and effectiveness of the simulation training created a larger teaching agenda than expected. This agenda included: airway management, patient assessment, waveform analysis, capnography, hospital policies and the new AHA guidelines. Conclusions: Participants reported increased confidence their ability to approach this type of high risk-low volume emergency situation. The reduction of sentinel events was not directly measured however, therapists felt better prepared in their prevention. Key Terms: experiential learning, high fidelity simulation, sentinel event

Sponsored Research - None

1128875

ADVANCED EDUCATIONAL & LEADERSHIP DEVELOPMENT FOR RESPIRATORY CARE PROGRAMS.

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BACKGROUND:Many advanced positions in RC are in management, education, sales, & research. While most advanced degrees in business offer some management training, for many higher level positions leadership training has become increasingly demanded by today's employers. When it comes to change, good leadership requires an understanding of the importance of perception & how it influences people's attitudes & behaviors. Leaders need to find ways of connecting with the heart & not just the head (Aaron & Nelson, 2008). Being an effective leader in RC requires someone to possess a high level of emotional intelligence & innovative thinking. The focus of this project was to survey therapists both locally & nationally to determine the leadership potential, interest, & coursework curriculum requests within the community. METHODS:A 10 question survey was distributed electronically through Question Pro™. The survey link went out via email request through a Tri-State RC Leadership email distribution list & an email distribution list on the management section of the AARC. RESULTS: There were 44 local & 187 national respondents. 67.86% locally& 34% nationally of those have 20+ years of experience in RC. An associate's degree was the most common highest level of education at 53.57%. Traditional management made up 50%, educator was 31.25%, & clinically advanced therapists made up 18.75% of the survey group. Only 14% didn't feel that an on-line degree would be as effective as traditional classroom degrees. 67.7% ranked management training the most important for advanced coursework for respiratory professionals. Of the 5 different management coursework recommendations, leadership skills, was ranked as most important by 59.35% of respondents. 61.54% of the respondents stated that advanced education would make them a more effective leader. 57.50% ranked credibility of the program more important than curriculum, price, &/or admission criteria. CONCLUSION: Data support that therapists desire advanced education & a majority feel it would make them a more effective leader. Management training is the most desired coursework type & leadership training was the most valued management skill desired. When selecting an on-line program credibility is more important than price, curriculum, &/or admission criteria. When developing a RC educational program it may be beneficial to give consideration to these findings to help design a successful program.

Sponsored Research - None

Ranked Order of Importance (1-5) Most Useful Management Training for RC

	1	2	3	4	5
Time Management	8.13%	13.01%	22.76%	33.33%	22.76%
Presentation Skills	1.63%	7.32%	21.95%	23.58%	45.53%
Leadership training	59.35%	22.76%	11.38%	4.07%	2.44%
Delegation Skills	4.07%	12.20%	28.46%	29.27%	26.02%
Performance Management	26.83%	44.72%	15.45%	9.76%	3.25%

1137990

IDENTIFYING AND UNDERSTANDING BARRIERS TO ADVANCED DEGREES FOR RESPIRATORY THERAPISTS.

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Background: There are two different educational choices for potential respiratory therapy students: the Associate Degree of Applied Science (AAS) and the Baccalaureate Degree of Science (BS). While many choose the less time consuming AAS, an increased number of opportunities for advancement exist for those therapists holding the BS. The purpose of this study was to determine the background of the therapist holding the AAS and the barriers this therapist encounters in the pursuit of the BS in respiratory therapy. Methods: Study participants were credentialed respiratory therapists who responded to either a web-based survey or face-to-face survey in a six month period. The structured survey utilized closed and open ended questions regarding demographic, employment and professional data as well as barriers to advancement of education. The study employed SPSS™ statistical software to calculate descriptive statistics as well as content analysis for the open-ended, qualitative responses. Results: Analysis of descriptive data shows that of the 71 participants (54 female, 17 male), 51% of respondents hold the RRT designation and 77.5% hold either a certificate of completion or AAS degree. Statistical significance of a correlation between degree and income could not be shown ($p > 0.05$). 58% of those surveyed reported that their respective employer places a value of 8 (maximum 10) or more upon staff obtaining an advanced degree. A content analysis of the open-ended questions yielded three themes to barriers of pursuing advanced degrees by respiratory therapists (assuming full financial support): lack of time, family obligations and anxiety about returning to college. Conclusions: Although respiratory therapists' impression of employer desire for obtaining an advanced degree is high, financial compensation for such a degree is not evidenced with this data. Both employers and educational institutions have responsibility in addressing these barriers and promoting advanced degrees among respiratory therapists.

Sponsored Research - None

1147154

PERSPECTIVES ON PASSING THE CERTIFYING EXAMINATION FOR RESPIRATORY THERAPISTS.

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BACKGROUND: The Certified Respiratory Therapist (CRT) examination has evolved in over 40 years to be used for assuring minimal competency, for licensing respiratory therapists, for accrediting respiratory therapy educational programs, and as an outcome measure to study educational programs. The purposes of this paper are to describe the trends from 1988 to 2010 of new candidate performance and passing scores on the examination. METHODS: I reviewed 33 school score reports of the CRT examination spanning 1988 to 2010 provided by the NBRC, recorded and plotted minimum scaled score, minimum raw score, new candidate scaled score, new candidate raw score, and new candidate pass rate. I computed the minimum percent raw passing scores and correlation coefficients between minimum raw scores, new candidate raw scores, new candidate scaled score, and new candidate pass rates. RESULTS: From 1988 to 2010 new candidate raw scores declined by approximately 15%. The minimum raw passing score has declined to 86 (61% correct). Scaling the scores by a magnitude up to 14 points has preserved new candidate pass rates in the 70% - 80% range. The Pearson correlation coefficient between minimum passing raw scores and new candidate raw scores was 0.862 ($p < 0.01$), between minimum passing raw scores and new candidate scaled scores was -0.43 ($p < 0.05$), between minimum passing raw scores and new candidate pass rate was -0.654 ($p < 0.01$). CONCLUSION: The decline in new candidate raw scores has been masked by scaling and may indicate problems in the respiratory therapy educational system that have been unnoticed. The declining minimum raw passing score may indicate a lower standard of competency assurance for licensing. Articles and reports using CRT examination results should clearly indicate whether raw or scaled scores are being studied. Similar analyses should be performed for the written registry (WRE) and clinical simulation (CSE) examinations.

Sponsored Research - None

1148214

HEALTH LITERACY: THE CURRENT STATE OF PRACTICE AMONG RESPIRATORY THERAPISTS.

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BACKGROUND: Nearly 50% of American adults lack adequate health literacy skills needed to understand and act on health information, leading to adverse health outcomes. Healthcare professionals do not systematically assess their patients' literacy skills, possibly due to a lack of awareness, knowledge, training, or time. The purpose of this research was to assess health literacy knowledge and experience among respiratory therapists (RTs) in North Carolina. METHODS: Health literacy knowledge and experience of RTs were assessed using the Revised Health Literacy Knowledge and Experience Survey instrument. The survey instrument was made available through a web-based survey tool to RTs with an available email address currently working in a healthcare setting. Participation in the study was voluntary. Data were analyzed using psychometric and multivariate statistical methods. RESULTS: A total of 335 RTs participated in the study. Evidence of reliability and validity of the results were obtained through item analysis and confirmatory factor analysis. For item analysis, item difficulty ranged from 0.12 to 0.96 with positive point-biserial coefficients of correlation for all items in the health literacy knowledge section. Confirmatory factor analysis suggested a reasonably good fitting model to the health literacy experience data, Satorra-Bentler scaled chi-square (28, $N = 324$) = 57.3, $p < 0.001$, Root Mean Square Error of Approximation (RMSEA) = 0.057, Normed Fit Index (NFI) = 0.97, Comparative Fit Index (CFI) = 0.98, Goodness of Fit Index (GFI) = 0.96. Knowledge gaps were most evident in basic facts on health literacy and health literacy screening (see table). Study participants had limited health literacy experiences in activities related to the evaluation and presentation of health care information. Regression path analysis revealed a statistically significant but small relationship between health literacy knowledge and core health literacy experiences, $R2 = 0.04$ ($N = 329$, $p = 0.01$). Basic facts on health literacy and guidelines for presenting patient information each had significant relationship with core health literacy experiences. CONCLUSION: The results suggested that the respiratory therapists in this study have gaps in health literacy knowledge and limited experience in assessing and implementing strategies to address low health literacy among their patients.

Sponsored Research - None

Overall Percent of Correct Responses for the Revised Health Literacy Knowledge Five Content Areas

Content Area	Overall Percent of Correct Responses
Basic Facts of Health Literacy	42.8%
Consequences of Health Literacy	66.3%
Health Literacy Screening	58.6%
Guidelines for Patient EducationInformation	64.7%
Evaluation of Interventions	72.9%

1148545

DEVELOPING AN ASTHMA ACTION PLAN AND IMPROVING DOCUMENTATION COMPLIANCE SPECIFIC TO THE EMERGENCY ROOM.

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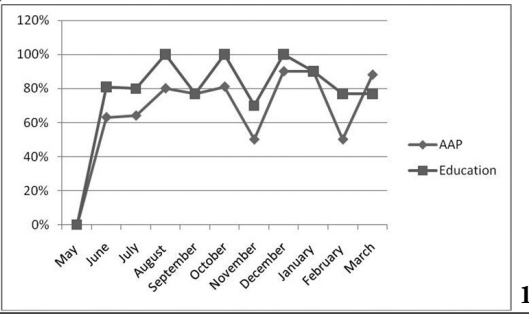
Developing an Asthma Action Plan and Improving Documentation Compliance Specific to the Emergency Department Background: Over the past three years the asthma action plan has been one of the primary educational tools provided to patients and families in an effort to help them better manage the disease at home. We have found that patients seen in the emergency room are not always well controlled and need to be seen by the primary care physician for ongoing management of asthma. In recognizing this challenge, we found that it may be beneficial to develop an action plan that would be specific to the medications the patient is discharged home from the emergency room on, specifically with the acute medication. Methods: To increase education done in the emergency room we provided therapists continuing education surrounding educating families and documenting education. The asthma action plan we were using in the beginning of this process was the same one that is used in the inpatient setting. Many of our patients seen in the emergency room do not yet have diagnoses of asthma. Due to this, physicians were prescribing the patient a quick relief inhaler and stressing follow up for symptoms. We evolved the action plan to leave out the diagnosis of asthma and encourage follow up with the primary care physician or clinic; this put families and the medical team at ease because we were able to provide education to families, and teach them how and when to use an inhaler. The role of the respiratory therapist was to complete the action plan and provide education to any family being sent home with an inhaler. A random monthly chart audit was completed on patients who were seen in the emergency room and managed for asthma symptoms. The number of patients audited varied due to varying patient acuity and patient census. Results: Over the course of the past 10 months, with assertive education with staff and modifications in the asthma action plan we have increased completion of "asthma" action plans from 0 percent to an overall average of 73 percent. Additionally, we improved the amount of documented education from 0 percent to an overall average of 85 percent. Conclusion: We have been able to provide families with asthma education. To do this we have educated staff, performed chart audits and followed up with staff to address their concerns. We evolved the action plan in order to better serve the emergency room patient population.

Sponsored Research - None



1149899

COMFORT EVALUATION OF NONINVASIVE RESPIRATORY MONITORING INTERFACES.

Jonathan B. Waugh, Chad A. Epps; Clinical and Diagnostic Sciences, University of Alabama at Birmingham, Birmingham, AL

Background: Respiratory rate (RR) is an established vital sign and a parameter for monitoring patient ventilation status. Many patient populations (postoperative, patient controlled analgesia, procedural sedation and analgesia, labile respiratory drive) benefit from electronic monitoring of respiratory frequency. Noninvasive monitoring of RR can be accomplished using several different technologies with programmable alarms. It is known that the comfort of noninvasive monitors influences patient compliance (Ayhan H. J Adv Nurs 2009;65(5):1237-47 and Costello RW. Thorax 1995:50(4):405-406). Our aim was to evaluate the comfort of two respiratory frequency monitoring device interfaces (Masimo® Rainbow Acoustic Sensor™ (RAS) and Oridion® Smart Capnoline® H Plus) by participants using a written rating scale. The purpose of this study is to determine the comfort rating for each device and if there is a difference in the comfort ratings for the two respiratory frequency monitoring devices. Method: The Masimo Rainbow Acoustic Monitoring™ option on the Rad-87™ monitor measures RR using an adhesive acoustic sensor on the neck. The Oridion Microstream® capnograph measures RR by detecting changes in exhaled carbon dioxide at the nostril (nasal/oral sampling Smart Capnoline H Plus in this case). In this ongoing IRB-approved study, 10 healthy, adult volunteers (ages 20-37 yrs., 30% male) were observed wearing each interface for 20 minutes (10 min with 2 L/min gas flow via nasal cannula, 10 min without). At the conclusion of each 20 minute session participants completed a seven question rating instrument. Participant comfort was measured using a rating scale incorporating the descriptive analogue technique from ergonomics research principles described by D.J. Oborne (Applied Egronomics 1976;7(4):201-204). Variables were analyzed using the Wilcoxon Signed Rank test, with subjects serving as their own control. Both devices are FDA-cleared for market. Results: A summary of the results is given in Table 1. Conclusions: The ability to achieve significant differences with the more conservative threshold of a nonparametric test indicates continued measurement is merited to allow for parametric analysis. Four of the seven questions rating aspects of comfort indicated the Smart Capnoline H Plus may be more comfortable for monitoring RR with spontaneously breathing patients which could have implications for patient compliance.

Sponsored Research - This study was sponsored through our university's Office of Sponsored Projects with the required oversight of the Conflict of Interest Board to ensure research integrity.

Table 1. Summary of Results

		Capnoline (mean/SD)	RAS (mean/SD)	p-value
Ques 1	Hours until change wanted? (↑ = better)	27.6/26.5	21.1/25.4	0.043
Ques 2	Wear this device how long? (↑ = better)	2.6/0.7	2.2/0.6	0.046
Ques 3	Presence of others? (↑ = better)	3.6/0.5	3.5/0.7	0.317
Ques 4	Uncomfortable after how long? (↑ = better)	4.9/1.4	3.8/1.6	0.034
Ques 5	Difficulty with Activity? (↓= better)	1.9/0.3	2.1/0.6	0.157
Ques 6	Would it affect sleep? (↓ = better)	1.6/0.5	2.0/0.8	0.157
Ques 7	Less comfortable w/nasal gas flow? (↓ = better)	1.1/0.3	2.2/1.0	0.016

1152056

IMPLEMENTATION OF CONTINUOUS CARDIAC MONITORING WHILE WEANING PATIENTS REQUIRING PROLONGED MECHANICAL VENTILATION RESULTS IN A REDUCTION IN MORTALITY.

Laura Kaszer, Lauren Bruwer, Edward Hoisington, Molly Loy, Alicia Burkle, Jafar Abunasser, Madhu Sasidhar; Cleveland Clinic, Cleveland, OH

Background: Early identification and response to changes in vital signs and cardiac rhythm may lead to improved outcomes. We describe the use of continuous physiological monitoring in conjunction with a central monitoring unit (CMU) in a ventilator weaning unit. The institution of continuous monitoring resulted in early problem identification and intervention as well as a decrease in mortality. Methods: A retrospective review of patient charts before and after implementation of continuous bedside and remote monitoring was performed. Continuous physiological monitoring including cardiac rhythm(EKG), pulse oximetry (SpO2), and end tidal carbon dioxide (EtCO2) was instituted in late 2009. When a significant and acute change in patient physiology was identified, the central monitoring unit notified nurses through the use of dedicated crisis phone lines. This study included 109 patients before and 57 patients after implementation of monitoring. Results: The mortality rates for 2008 and 2009 were 3.7 % and 5.45%, respectively. This decreased to 0% (2010) following institution of monitoring and remains at 0% for 2011 year-to-date. The number of calls to the Acute Medical Emergency Team (AMET) from the unit increased following continuous monitoring, mostly as a result of early detection of hypoxia and/or cardiac arrhythmias. During a twelve month period of data collection following institution of continuous monitoring, we identified 118 CMU calls to the floor for Rhythm/Rate Change, 329 calls for no telemetry/leads fail/lead off, and 290 calls related to apnea, abnormal blood pressure, cardiac arrhythmia, SPO2 or ventilator alarms. Conclusions: The combination of continuous cardiac monitoring, continuous pulse oximetry monitoring, and end tidal CO2 monitoring significantly reduces mortality and in-hospital complications in the patient who is weaning from prolonged mechanical ventilation.

Sponsored Research - None

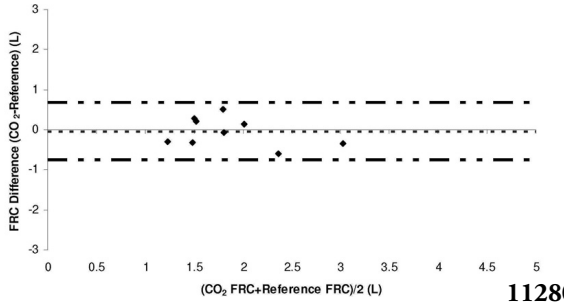
1149234

CLINICAL ASSESSMENT OF CARBON DIOXIDE REBREATHING FUNCTIONAL RESIDUAL CAPACITY MEASUREMENT.

Lara Brewer, Joseph Orr; Anesthesiology, University of Utah Health Sciences, Salt Lake City, UT

Background: There is a need for an automated bedside functional residual capacity (FRC) monitoring system that can continually track the size of a patient's end-expiratory lung volume during mechanical ventilation without necessitating a step change in inspired oxygen (FIO_2). Such a system would be useful for measuring FRC in patients who cannot tolerate a change in FIO_2 because they require high levels of oxygen to maintain arterial oxygen saturation. We have developed a method for FRC monitoring that does not require step increases or decreases in FIO_2. The FRC measurement signals are provided by a volumetric capnometer (partial pressure of end-tidal carbon dioxide ($PetCO_2$) and volume of CO_2 eliminated (VCO_2) ($NICO_2$, Philips-Respironics, Wallingford, CT). The CO_2 washout observed during the single-breath transition from steady-state partial rebreathing to non-rebreathing is automatically actuated by the rebreathing loop of the $NICO_2$ monitor once every three minutes. This small observational study was designed to assess the accuracy, precision and repeatability of the proposed FRC measurement system. Methods: Accuracy and precision of FRC measurements were assessed by comparing the CO_2 rebreathing FRC values to the reference method, multiple breath nitrogen washout, in nine intensive care patients whose lungs were under mechanical ventilation. Repeatability was assessed by comparing subsequent individual measurements. Results: Compared to the reference method, the accuracy (bias) was -0.05 L and precision (1 SD of the differences) was 0.34 L (-2.6% ± 17.5%) (Figure 1). The difference between repeated measurements was 0.020 ± 0.42 L (mean ± SD) (1.1 ± 23.4 %), n=58. Conclusions: The CO_2 rebreathing method for FRC measurement provides acceptable accuracy and repeatability compared to the reference method during mechanical ventilation. These results indicate it should be possible to detect clinically important changes in FRC and automatically track the changes over a time course of hours or days. The precision of the measurement could likely be improved by averaging several measurements. Further study of the CO_2 rebreathing FRC method is needed to learn how accurate the method is for extremely injured lungs. Since both FRC and cardiac output can be monitored noninvasively by the $NICO_2$ monitor during mechanical ventilation, the measurements may be useful for guiding ventilator setting changes such as adjustments to positive end-expiratory pressure (PEEP).

Sponsored Research - Philips-Respironics



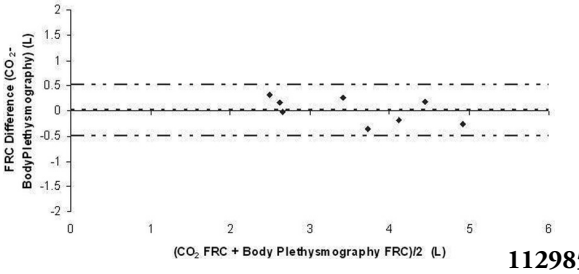
1128080

ACCURACY OF AUTOMATED CARBON DIOXIDE REBREATHING FUNCTIONAL RESIDUAL CAPACITY MEASUREMENT.

Lara Brewer, Joseph Orr; Anesthesiology, University of Utah Health Sciences, Salt Lake City, UT

Background: Functional residual capacity (FRC) volume is critical for both the delivery of oxygen to the body and the removal of carbon dioxide from the tissues since it provides the mechanism for gas exchange between the lungs and the blood. During mechanical ventilation, anesthesia, and lung pathophysiology, the volume of the FRC is compromised, which leads to reduced gas exchange. Knowledge of FRC size is useful during adjustment of positive end-expiratory pressure and other ventilator settings in which FRC volume is affected. Several systems have been proposed for FRC measurement based on step changes in inspired oxygen. However, there remains a need for an automated bedside FRC measurement which can be used for patients who cannot tolerate a change in inspired oxygen fraction to complete a measurement. We evaluated accuracy of a novel FRC measurement technique based on partial CO_2 rebreathing which can be used at any fixed level of inspired oxygen. Methods: For eight healthy volunteers, accuracy and precision of CO_2 rebreathing FRC measurements were assessed by comparing the CO_2 rebreathing FRC values to the reference method, body plethysmography. Results: Compared to body plethysmography, the accuracy (mean error) was 0.01 L and precision (1 SD of the differences) was 0.26 L (0.4% ± 7.0%) The limits of agreement were between -0.49 and 0.52 L (-13.4 to 14.2%) (Figure 1). Linear regression analysis showed an r^2 of 0.92 and a slope of 0.99. Conclusions: The novel CO_2 rebreathing FRC measurement showed acceptable accuracy and precision compared to the clinical gold standard, body plethysmography, for spontaneously breathing volunteers in this small study. Based on these results, it appears the automated bedside method may provide accurate FRC measurements during stable ventilation. The CO_2 rebreathing FRC measurement does not require a step change in inspired oxygen and is therefore useful for patients who cannot tolerate an increase or a decrease in the prescribed inspired oxygen fraction. There is potential for the novel CO_2 rebreathing method to also be used with circle breathing systems which are common in the operating room. Circle breathing systems cannot initiate a step change in oxygen and are therefore not compatible with nitrogen washout FRC measurement systems. Further testing is warranted to evaluate how accurate and repeatable the CO_2 rebreathing method is during mechanical ventilation and for patients with significant lung injury.

Sponsored Research - Philips-Respironics



1129858

ACCURACY EVALUATION OF NM3 VOLUMETRIC CAPNOMETRY SYSTEM.

Joseph Orr, Lara M. Brewer; Anesthesiology, bioengineering laboratory, University of Utah, Salt Lake City, UT

Background: Volumetric capnometry combines the flow and CO_2 signals to report the parameters in addition to end-tidal CO_2 including airway dead space and CO_2 excretion (VCO_2). Accurate VCO_2 measurement requires that the flow and CO_2 signals be exactly aligned in time and that both signals have sufficient frequency response times. Precise measurement of VCO_2 is needed for accurate calculation of parameters derived from VCO_2. For example, cardiac output measurement using the partial CO_2 rebreathing method relies on accurate VCO2 measurement. Accurate VCO_2 measurement is difficult to achieve because the accuracy is affected by the lung compliance, airway dead space (before and after the sensors), breath rate and tidal volume. Methods: We tested the accuracy of a new volumetric capnometry system (NM3, Philips, Carlsbad CA) using a bench lung model. We ventilated a test lung (TTL, Michigan Instruments) using a Siemens 900C ventilator. The test lung was modified to include a mixing fan within the lung. CO_2 was infused into the test lung at flow rates between 100 and 400 ml/min at 50 ml/min increments using a digitally controlled mass flow controller (Alicat model 1-SLPM-D, Alicat Scientific, Tucson AZ). We repeated the tests under nine conditions of varying lung compliance, respiratory rate, tidal volume and added dead volume. The volumetric capnometry flow and CO_2 sensors were placed between the test lung and the ventilator Y adaptor. Simulated lung compliance was selected by adjusting the spring on the test lung. Dead volume was simulated by adding sections of expandable tubing between the lung and sensors, or between the sensors and the Y adaptor. Results: The table shows the average percent error in the measured VCO_2 at each simulated VCO_2 and lung test condition. The average error across all the tests was -0.07 percent of reading with a standard deviation of the error of 0.95 percent of reading. The highest percent error (5.2%) in measured VCO2 was observed when the simulated VCO2 was very low and the tidal volume was very large. Conclusion: The combined on-airway flow and CO_2 sensors offer a significant advantage over side-sampling systems. Extremes of airway pressure and flow did not result in error caused by dyssynchrony between the flow and CO_2 signals. Furthermore, the step responses of both signals were adequately fast and matched to provide excellent VCO_2 accuracy across a wide range of simulated VCO_2 values and simulated conditions.

Sponsored Research - Research Funding and test instrument were provided by Philips/Respironics

	Compliance = 15, RR = 10, TV = 800, dead volume = 100 ml	Compliance = 20, RR = 10, TV = 800, dead volume = 100 ml	Compliance = 50, RR = 10, TV = 800, dead volume = 100 ml	Compliance = 100, RR = 10, TV = 800, dead volume = 100 ml	Compliance = 50, RR = 10, TV = 800, Dead volume = 200 ml	Compliance = 50, RR = 10, TV = 800, Dead volume = 300 ml	Compliance = 50, RR = 10, TV = 800, Dead volume = 300 ml	Compliance = 50, RR = 20, TV = 400, Dead volume = 100 ml	Compliance = 50, RR = 6, TV = 1200, Dead volume = 100 ml
VCO2 = 100 ml/min	-0.87%	1.17%	1.45%	0.97%	-1.21%	0.75%	-0.04%	-3.67%	5.20%
VCO2 = 150 ml/min	0.17%	0.89%	1.74%	0.02%	-0.67%	0.89%	-0.83%	-1.36%	4.25%
VCO2 = 200 ml/min	-0.24%	1.56%	1.71%	-0.30%	-0.45%	0.59%	-1.59%	-2.14%	4.15%
VCO2 = 250 ml/min	0.08%	1.15%	1.99%	0.41%	-0.87%	0.18%	-0.65%	-3.01%	4.89%
VCO2 = 300 ml/min	-1.12%	0.49%	1.09%	0.78%	-1.83%	-0.64%	-1.25%	-2.13%	4.38%
VCO2 = 350 ml/min	-2.66%	-0.71%	0.82%	-0.15%	-2.09%	-2.29%	-3.29%	-2.95%	3.98%
VCO2 = 400 ml/min	-1.80%	-1.11%	1.32%	-0.90%	-2.43%	-4.16%	-3.67%	-1.91%	3.35%
Average	-0.92%	0.49%	1.44%	0.12%	-1.36%	-0.67%	-1.61%	-2.45%	4.31%
Standard Deviation	1.04%	1.02%	0.41%	0.65%	0.76%	1.89%	1.37%	0.79%	0.60%

1129967

WAVEFORM SIMULATOR FOR EVALUATION OF CAPNOMETER PERFORMANCE.

Christina Long, Joseph Orr, Lara M. Brewer; Anesthesiology, Bioengineering Laboratory, University of Utah, Salt Lake City, UT

Introduction: Capnometers are currently tested for minimum performance standards using tanks containing fixed concentrations of CO_2 flowing at constant rates. These testing protocols do not test for a capnometers's ability to accurately calculate clinical parameters such as respiratory rate and end-tidal CO_2. Ideal standards should test capnometers with changing flow rates and frequencies of respiration, as well as with capnograms that have complex shapes and trends. This paper presents a capnometry simulator that has the ability to overcome the limitations of current testing protocols by reproducing clinically recognized time-based capnograms. Methods: Our simulator consists of: 1) 100% CO_2 and O_2 gas sources, 2) a simulator enclosure, 3) a reference capnometer, and 4) a computer with stored capnograms. The concept of the simulator is to continuously change the flow rate of CO_2 being injected into a constant flow of O_2, in order to create varying CO_2 partial pressures over time that mimic capnograms. The CO_2 flow rate is computer controlled through a variable orifice solenoid valve that outputs higher flow rates for higher input currents. Its response is non-linear and requires calibration before use. Once the CO_2 is injected into the O_2 stream, the mixed gas is diverted to the reference capnometer, which is used to calibrate the CO_2 valve and measure the performance of the simulator. The reference capnometer used in this study was the NICO2 (Phillips Respironics, Wallingford, CT). Five capnograms were used to simulate different CO_2 levels, respiratory rates, and waveform shapes and trends. These files include waveforms from intensive care unit (ICU), operating room (OR), new born, pediatric, and sedated adult patients. Results: The average statistics for five minute simulations were root mean squared error (RMSE) = 1.99 mmHg, normalized root mean squared error (NRMSE) = 3.77%, mean absolute error (MAE) = 1.40 mmHg, and R^2 = 0.989. Conclusion: The results show that our simulator can accurately reproduce time-based capnograms from clinical settings. With further research and optimization, this device can potentially standardize and improve testing methods used for capnometry. As part of future work, additional capnometers will be tested and compared to the one used in this study.

Sponsored Research - None

	Root mean squared error (mmHg)	Normalized root mean squared error (%)	Mean Absolute Error (mmHg)	R squared
Adult ICU	1.34±0.14	3.01±0.31	0.98±0.12	0.996
Adult OR	1.37±0.03	3.66±0.11	1.08±0.03	0.996
Pediatric OR	3.89±0.38	4.34±0.44	0.87±0.04	0.980
Newborn ICU	1.26±00.7	3.35±0.15	0.87±0.04	0.980
Sedated Adult	2.07±0.07	4.50±0.08	1.46±0.08	0.988

1130051

THE EFFECT OF BLOOD PRESSURE ON RCP ULTRASOUND GUIDED ARTERIAL CANNULATION SUCCESS RATES.

Andrew Miller, Andrew Almond, Jhaymie Cappiello, Michael Gentile, Janice Thalman, Neil MacIntyre; Duke University Hospital, Durham, NC

Background: Conventional radial arterial line placement requires locating the desired vessel by palpation. The use of ultrasound guidance for radial artery cannulation has been shown to improve success rates, reduce the overall time to successful cannulation, and to facilitate training. We sought to analyze systolic blood pressure, pulse pressure, and palpable pulse strength in relation to ultrasound guided radial artery cannulation success rates. Methods: RCPs certified in arterial line insertion were trained in radial artery catheterization using ultrasound by Emergency Medicine physicians. After obtaining IRB approval for this study, patients were enrolled based on the need for an arterial line placement. The catheters used were Sharps Radial Artery Catherization Set with a 20 gauge catheter, 22 gauge introducer wire, and spring wire guide with integral needle protection. The ultrasound devices were the Sonosite iLook and the Sonosite MicroMaxx. Data recorded included strength of pulse, systolic and diastolic blood pressure, number of attempts (3 or less punctures per attempt), successful/unsuccessful artery cannulation. Catheterizations were performed according to institutional policy and procedure. Results: This review covers a 28 month period (12/08- 4/11). The age of the patients was 56 ± 14 years. Their systolic blood pressure was 101.5 ± 31.5 mmHg. There were a total of 108 attempts at cannulation with 92 arteries successfully cannulated. Conclusion: Blood pressure and pulse pressure are not reliable predictors of success for ultrasound guided radial artery cannulation. Palpable pulse strength is the strongest predictor of success.

Sponsored Research - None

Ultrasound Guided Arterial CannulationsSystolic BP	Success Rate	Pulse Pressure	Success Rate	Pulse Strength	Success Rate
Less than60 mmHg	85.7% (6/7)	Less than15 mmHg	50% (1/2)	Not palpable	76.7% (33/43)
Between 60-80 mmHg	92.0% (23/25)	Between15-30 mmHg	84.2% (16/19)	Weak	88.4% (38/44)
Between 80-100 mmHg	81.5% (22/27)	Between 30-45 mm Hg	87.5% (35/40)	Normal	100% (21/21)
Between100-120 mmHg	78.9% (15/19)	Between 45-60 mmHg	87.5% (21/24)		
Greater than120 mmHg	88.9% (24/27)	>60 mmHg	85.0% (17/20)		
Total	85.7% (90/105)		85.7% (90/105)		85.2% (92/108)

Success Rate = Successful attempts/Total attempts

1146527

A PILOT BENCH STUDY COMPARING THE ACCURACY OF THE NEO-TEE INFANT T-PIECE RESUSCITATION CIRCUIT WITH EXISTING T-PIECE CIRCUITS AND DEVICES.

John T. Gallagher, Kathleen M. Deakins, Timothy R. Myers; Rainbow Babies & Children's Hospital, Cleveland, OH

Introduction: In recent years, t-piece resuscitators have been successfully implemented in clinical practice for manual ventilation of infants in some delivery rooms and Neonatal Intensive Care Units. The Neo-Tee (Mercury Medical, Clearwater, FL), introduced in 2010, is a disposable t-piece resuscitator that operates from a standard flowmeter. Removing the adjustable PIP controller from the Neo-Tee allows the circuit to be used on an existing resuscitator such as the NeoPuff (Fisher and Paykel, Auckland NZ). The purpose of this study is to compare the accuracy of the Neo-Tee circuit versus other commercially available t-piece circuits using the Neopuff. Methods: Four circuit brands: the Neopuff, NeoPEEP (Neoforce, Ivyland PA), GE Resuscitator (GE Healthcare, Wauwatosa, WI) and the Neo-Tee were individually connected to the Neopuff Infant Resuscitator. The circuit T was connected to the NICO 2 breath monitor (Philips Respironics, Wellington, CT) and an infant test lung (Infrasonics, San Diego, CA) with a known compliance of 1 mL/cmH2O. Each circuit was evaluated at ten different pressures ranging from 15/5 to 40/5 cmH20 as set and verified on the Neopuff. Breaths were manually cycled 10 times at each setting for stabilization of pressures. Using the NICO 2 monitor, pressures were measured at each setting on all four types of circuits using flow rates of both 8 LPM and 10 LPM. To determine accuracy, set and measured pressures were compared using the Wilcoxon rank sum test. Error was calculated as the difference (set pressure – measured pressure). Mean and standard deviation was calculated for errors across all pressures. Results: At flow rates of both 8 LPM and 10 LPM, there was no significant difference between measured and set pressures in any of the four circuits tested. Mean errors, standard deviation of errors, and p-values are listed for each circuit in the table below. Conclusion: The Neo-Tee circuit and all other circuits tested accurately delivered pressures when used with the NeoPuff infant resuscitator.

Sponsored Research - None

T-Piece Circuit Evaluation

	Measured Peak Inspiratory Pressures (cmH_2O)			
Circuits	*8 LPM Flow Rate*		*10 LPM Flow Rate*	
	Mean Error ± Std Dev	P-Value	Mean Error ± Std Dev	P-Value
Neo-Tee	2.7 ± 1.16	0.27	2.1 ± 1.10	0.12
NeoPEEP	2.3 ± 1.57	0.79	2.2 ± 1.23	0.44
NeoPuff	1.9 ± 1.20	0.37	2.0 ± 1.33	0.37
GE Resuscitator	2.0 ± 1.05	0.31	1.6 ± 1.17	0.21

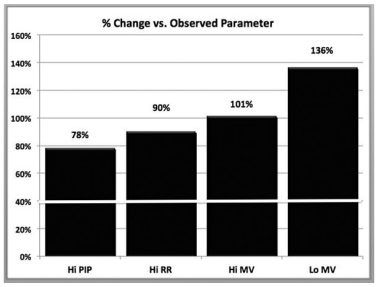
1149846

MECHANICAL VENTILATOR ALARMS: WILL THEY EVER GO OFF?

Ruben D. Restrepo[1,2], Taha T. Ismaeil[2], Mansour Al Alaiwah[2], Adil Al-Otaibi[2]; [1]Respiratory Care, UTHSCSA, San Antonio, TX; [2]Respiratory Care, King Saud Abdulaziz University - Health Sciences, Riyadh, Saudi Arabia

Background: Ventilator alarms are a critical component of patient's care and safety in the ICU. The presence of almost 40% ICU false negative alarm events can be overwhelming and cause either alarm desensitization of clinicians or laxity on the way the alarms are set, or both. Unfortunately, these actions lead to lack of response to real event or a dramatic reduction on the number of alarm events since the limits are simply too hard to reach even in situations when the patient is seriously decompensated. There is very limited data on how RTs set the alarm limits for patients in the ICU. We wanted to evaluate how these limits deviate from both the observed ventilator parameters and from the recommended limits in adult ICUs. Methods: Prospective observational study at a university-affiliated, 1000-bed hospital in Riyadh, Saudi Arabia. We collected data in a total of 8 adult ICUs. Respiratory therapy students, under direct supervision of faculty and staff, recorded high (Hi) and low (Lo) alarm settings for all mechanically ventilated patients in the ICUs (n= 31) during the first ventilator check of day shift. The alarm settings selected for analysis were high respiratory rate (Hi RR), high peak inspiratory pressure (Hi PIP), and high and low minute volume (Hi MV, Lo MV), as they represent the most commonly monitored alarms. Results: The mean value recorded for the observed parameters was: RR 23.3 (SD 6.1) breaths/min; PIP 24.9 (SD 6.8) cm H2O; MV 9.9 (SD 2.5) L/min. Every alarm limit recorded was significantly distant from the observed parameter (range: 90%-136%). When a 40% alarm limit above and below the observed parameter was selected, the percent deviation from this new limit ranged between 38% (Hi PIP) and 96% (Lo MV). Conclusion: Ventilator alarm settings in our study were in complete disconnection with the observed parameters or any recommended limits on patients receiving mechanical ventilation. Although false alarms can clearly affect efficiency in the ICU environment, it is critical that alarm limits are set appropriately to detect changes in patient's condition that may require intervention. Future Direction: As part of a quality and improvement project, RT students from KSAUH will present this data to the RT department at National Guard Health Affairs and will conduct a follow-up study 3 months later.

Sponsored Research - None



1125522

EFFECTS OF ADDING PEEP AND OXYGEN FLOW ON DELIVERED FIO2 IN THE IPV BREATHING CIRCUIT.

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Background: Intrapulmonary Percussive Ventilation (IPV) is an airway clearance modality designed to enhance the removal of secretions, resolve atelectasis and improve ventilation and oxygenation using high frequency, low volume positive pressure breaths delivered to the airway via a percussionator. The IPV 1C (Percussionaire, Sandpoint Idaho) is pneumatically driven by a 100% FiO2, 50 psi gas source gas, with an estimated FiO2 delivered at 21-80%. An external positive end expiratory pressure (PEEP) valve can be added to increase baseline and mean airway pressure during the treatment. The IPV 1C utilizes an entrainment port that dilutes delivered FiO2 at the patient connection. The purpose of this study was to determine if adding an external PEEP valve or a tubing reservoir with additional oxygen flow has an effect on the delivered FiO2. Methods: A 0.5L Breathing Bag (GE; Vital Signs) was connected to the distal end of IPV breathing manifold, Oxygen concentration was measured using an Analytical Industries Inc. All 2000M oxygen monitor (calibrated to 21% and 100%) at the patient connection, with a PEEP of 0, +5 and +10 cmH2O; and when adding a 50mL corrugated tubing reservoir with 5 LPM & 10 LPM of oxygen flow to the entrainment port of the IPV breathing circuit. Data were collected in raw values representing percent FiO2 mean values and standard deviation at 0,+5 and +10 cmH2O PEEP with 0, 5, 10 LPM bleed-in oxygen. ANOVA tests were used to determine the significance of change in FiO2 as both PEEP and bleed-in levels were changed. Results: There is a significant difference in delivered FiO2 between PEEP levels in each category of oxygen bleed-in ($p<0.001$). Likewise, the delivered FiO2 changed significantly as the amount of oxygen bleed-in was increased, regardless of the amount of PEEP being used ($p<0.001$). Conclusions: In situations where high FiO2 is needed, adding oxygen flow to the IPV IC breathing circuit air entrainment port, with or without an external PEEP valve attachment increases FiO2 better than adding external PEEP alone.

Sponsored Research - None

Measured mean and standard deviation (SD) values for % FiO2 when adding oxygen flow via reservoir and PEEP to an IPV breathing circuit.

	No O2 added	5 LPM O2	10 LPM O2
	Mean (SD)	Mean (SD)	Mean (SD)
PEEP 0	73 (0.34)	85(0.39)	93 (0.33)
PEEP+5	80 (0.33)	89 (0.47)	95 (0.54)
PEEP+10	88 (0.57)	93 (0.58)	97 (0.11)

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