2015 Open Forum

Presented by

RESPIRATORY CARE

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The Open Forum at the AARC Congress 2015 is an unique opportunity for attendees to experience the results of scientific studies performed by their colleagues. Respiratory Care is proud to present this year's Open Forum. Once again, respiratory care professionals have stepped forward and analyzed the things they do with critical eyes. This year posters will be presented in one of 3 formats:

Editors' Choice – The top eleven abstracts in 2015. On the first two days of the Congress the Editors' Choice posters will be displayed by the entrance to the Exhibit Hall. On the third day, each presenter will discuss their findings in a 8-minute slide presentation, which will be followed by a 5-minute question and answer period.

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

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

Open Forum Sessions

Saturday, November 7

Poster Discussions #1 3:15 pm – 5:10 pm	Aerosols/Drugs
Poster Discussions #2 3:15 pm – 5:10 pm	Ventilators/Ventilation – Part 1

Sunday, November 8

Posters Only #1 10:00 am – 2:30 pm	Aerosols/Drugs Monitoring/Equipment O_2 Therapy Ventilation/Ventilators
Poster Discussions #3 10:00 am – 11:55 am	Management
Poster Discussions #4 10:00 am – 11:55 am	Neonatal/Pediatrics
Poster Discussions #5 12:30 pm – 2:25 pm	Asthma/Pulmonary Disease
Poster Discussions #6 12:30 pm – 2:25 pm	Airways Care
Poster Discussions #7 3:10 pm – 5:05 pm	Education
Poster Discussions #8 3:10 pm – 5:05 pm	Ventilators/Ventilation – Part 2

Monday, November 9

Editors' Choice 9:30 am – 12:13 am	Top 11 abstracts in 2015
Posters Only #2 10:30 am – a:30 pm	Airways Care Asthma/Pulmonary Disease Case Reports Education Home Care Management Neonatal/Pediatric Sleep/Pulmonary Rehab
Poster Discussions #9 10:00 am – 11:55 am	Monitoring/Equipment
Poster Discussions #10 12:45 pm – 2:40 pm	Ventilators/Ventilation – Part 3
Poster Discussions #11 1:00 pm – 2:55 pm	Case Reports; Diagnostics
Poster Discussions #12 3:10 pm – 5:05 pm	O_2 Therapy/Pulmonary Rehab

See pages OF74-OF79 for Open Forum Author Index

The Journal and the Open Forum organizers are not responsible for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions or ideas contained in the abstracts published here. Advances in the medical sciences occur every day and we strongly recommend independent verification of treatment modalities, diagnoses and drug usages.

2280777

UTILIZATION OF AN INTERFACE AND SKIN ASSESSMENT TOOL BY THE RESPIRATORY CARE PRACTITIONER TO REDUCE AND PREVENT HOSPITAL ACQUIRED PRESSURE ULCERS ASSOCIATED WITH NONINVASIVE VENTILATION.

Linda McKnight[1], Angela Rowe[2], Gary Lowe[1], Denise Willis[1]; [1]Respiratory Care Services, Arkansas Children's Hospital, Little Rock, AR; [2]3E/4E Surgical Units, Arkansas Children's Hospital, Little Rock, AR

Background: In 2013, one third of all hospital acquired pressure ulcers (HAPU) at Arkansas Children's Hospital (ACH) were device related. One of the primary offenders was the interface used while administering noninvasive ventilation (NIV) to our pediatric patients. As NIV is a commonly used respiratory adjunct when treating many acute and chronic pulmonary disorders, the conundrum remains as to how to prevent the interface from harming the patient's skin. The Pressure Ulcer Prevention (PUP) Team invited Respiratory Care Services to join efforts in planning effective strategies to reduce this potential harm from occurring. It was our hypothesis that developing partnerships and elevating caregiver roles would successfully reduce HAPU associated with NIV. **Methods:** The study was not deemed human subject testing by the local IRB. Two strategies were implemented: the introduction of an interface and skin assessment tool for the respiratory therapist (RT) for all patients receiving NIV and the implementation of an RT/RN model to jointly perform device and skin assessments at the patient's bedside. The RT tool included type of ventilator and interface, skin integrity assessment, interventions or barriers used, and physician notification if indicated. Any skin injury found causing a HAPU received immediate wound care measures and was reported as a serious safety event. **Results:** For 11 months, data were reviewed on 120 NIV patients. Reported HAPU prevalence measured 3% (4/120). Of four HAPU, one was Stage I and three were Stage II. Interface types were full face mask 69% (83/120), nasal devices 29% (35/120), with 2% (2/120) being unidentified. Ventilators included BIPAP Vision 74% (89/120), Servo *i* 23% (28/120), Trilogy 2% (2/120), and LTV 1% (1/120). Protective skin barrier was applied 70% (84/120) of the time. A randomized chart review of 60 patients found RT compliance in performing the intervention tool to be 82% (49/60). Lastly, implementation of the RT tool and the RT/RN collaborative attained a notable 60% (10 to 4) reduction in HAPU related to NIV as compared to prior year 2013-2014. **Conclusion:** Identifying the primary causes of device related HAPU at ACH enabled us to apply an appropriate RT intervention. This had a direct impact on administering NIV with less skin compromise. Further, the collaborative efforts of the RT/RN model in performing device and skin assessments increased surveillance and significantly decreased our HAPU prevalence.

Sponsored Research - None

2289040

RESPIRATORY PROCEDURES DONE PRIOR TO ONSET OF VENTILATOR ASSOCIATED EVENTS.

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BACKGROUND: In 2013 the Centers for Disease Control and Prevention moved from ventilator associated pneumonia (VAP) surveillance to the construct of ventilator associated event (VAE) as a quality metric. Although suggested to be caused primarily by new onset of ARDS, pneumonia, atelectasis and pulmonary edema, little is reported about possible respiratory therapy procedures associated with VAE. METHODS: We conducted a chart review of all 224 patients identified as developing a VAE by our infection prevention group during 2013. The goal was to determine the frequency of various respiratory therapy procedures that may be associated with VAE in each of our 7 adult ICUs. During the 2-day period prior to and the day of the VAE we collected the frequency of in-house patient-transport, obtaining weaning parameters (including a MIP), adjusting the ETT (advance, withdraw), nebulizer treatments, bronchoscopy, extubation, intubation, mini-BAL, esophageal Doppler monitor study, and miscellaneous. The project was approved as a QA/QI project by our IRB. RESULTS: Patient transport was the most frequent procedure; 37% of VAE patients had at least 1 transport during the 2-day period prior to VAE (mean 0.94 transport/d). The ICU's with the highest rate were the Neuro-ICU (61% of their population had least 1 transport within the preceding 2 days, with a mean of 2.1 transport/d) and Trauma-Burn ICU (69%; 1.8/d). The next 2 highest procedure rates were for adjusting the ETT (28%) and parameters (25%). When stratified by VAE tier (VAC, infection related VAC, or possible/probable VAP), transport had a similar rate (~35-38% for all 3 levels) while parameters had a higher rate of IVAC (33%) and P-VAP (35%) than VAC (16%), and adjusting the ETT associated with higher rate of IVAC (40%), than VAC (23%) or P-VAP (25%). CONCLUSIONS: Each ICU and specific patient population most likely has its own risk factors for and prevention strategies against VAE. This was our first step in determining whether any routine procedures performed by respiratory therapists might be associated with VAE. Patient transport has been reported as a risk factor for VAP (Kollef). The ICUs with a high incidence of transport are developing a multidisciplinary workgroup to identify opportunity to improve the process. The importance of deep oropharyngeal suctioning prior to performing many of the procedures is being stressed (Chao; Tsai).

Sponsored Research - None

2293973

SCREENING OF EXERCISE INDUCED BRONCHOCONSTRICTION IN COLLEGE STUDENT-ATHLETES.

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Introduction: Exercise Induced Bronchoconstriction (EIB) can lead to long-term respiratory illness and even death. EIB prevalence rates are both high and variable in college athletes, ranging from 3 – 50%. Prevalence rates may be underestimated due to inaccurate reporting of symptoms. However, an effective tool for accurately screening EIB in the college athlete population has not been established. The purpose of this study is to investigate the prevalence of EIB in college athletes by a self-report questionnaire. As a result, add to the body of knowledge in the field of EIB for aiding in the development of an effective EIB screening tool. **Methods:** A self-report EIB questionnaire was administered to college athletes on eight different sports teams. Information collected was used to identify athletes who self-reported: 1) history of EIB and/or asthma, 2) respiratory symptoms during exercise, 3) medication use, and 4) concern about EIB. **Results:** Results have shown that 56/196 (28.6 %) athletes self-reported a history of EIB or asthma. Forty-six of 140 (32.9%) athletes had no history of EIB or asthma by self-report, but indicated symptoms of EIB during sports, training, or exercise. Over half (52%) reported a history of asthma/EIB or current EIB symptoms. Important to note was that only 14/56 (25%) of athletes with a history of EIB or asthma reported using respiratory medication. Nineteen of 196 (9.7%) athletes reported to be concerned EIB was adversely affecting their sports performance. **Conclusion:** College athletes self-report a high prevalence of EIB or asthma. Even though college athletes may not report a history of asthma or EIB, they indicate symptoms of chest tightness, coughing and/or wheezing during sports, training, or exercise. A majority of athletes reported a history of or current symptoms related to asthma/EIB. Most athletes who report a history of EIB or asthma are not using any respiratory medication. Lastly, athletes report concern about EIB adversely affecting their sports performance. More work is needed using a combination of standardized EIB testing and a screening questionnaire to develop a validated tool for accurately diagnosing EIB in college athletes.

Sponsored Research - None

2299741

ASSESSING THE PREVALENCE OF SLEEP APNEA AMONG COLLEGIATE FOOTBALL PLAYERS.

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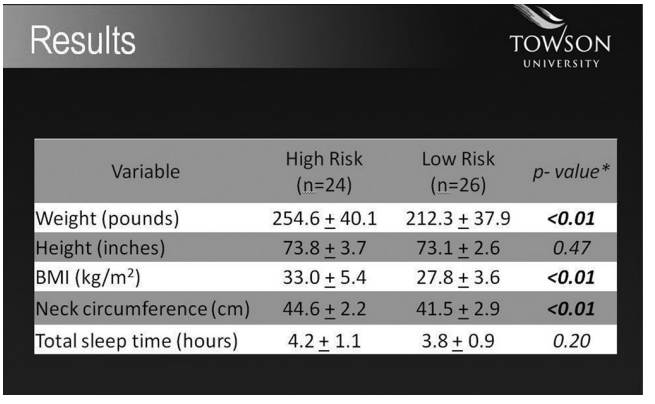
Background: Obstructive sleep apnea is a clinical disorder characterized by loud snoring, apneic episodes, excessive daytime sleepiness and chronic sleep disruption. Collegiate football players exhibit several risk factors for OSA, including: large neck circumference and high body mass index, although the prevalence of OSA in this cohort is unknown. Purpose: To estimate the prevalence of OSA in collegiate football players. Methods: The study was approved by the Institutional Review Board at Towson University and consent was given by the student athletes. The STOP-BANG questionnaire was administered at random to members of the Towson University football team and used to stratify the players into high and low risk for OSA. Those who completed the questionnaire were then evaluated for OSA during pre-season camp using a single-channel (finger pulse-oximetry) photoplethysmography (PPG)-based device. OSA was defined as an apnea-hypopnea index (AHI) ≥ 5. Results: Of 56 players who underwent overnight PPG monitoring, valid results were available for 51. Forty eight percent of the players were high risk [high risk; neck size: 44.6 ± 2.2 cm, BMI: 33.0 ± 5.4 vs. low risk; neck size: 41.5 ± 2.9 cm, BMI: 27.8 ± 3.6, both p's < 0.01). An AHI ≥ 5 was found in 2 (8.3%, 95% confidence interval (CI) 1.0 – 20.0%) high risk and 2 (7.7, 95% CI 1.0-18.4%) low risk players. Offensive lineman (2), a linebacker and a tight end accounted for the positive cases. Conclusion**:** Based on our sample, we estimate the prevalence of OSA among collegiate football players to be 8%, regardless of risk stratification. Given the strong link between OSA and cardiovascular disease, these data underscore the importance of screening and subsequent treatment of OSA in this highly conditioned, yet potentially vulnerable group of athletes. Disclosure: No conflicts of interest for all researchers affiliated with this study or financial relationships to disclose.

Sponsored Research - None



2300816

IMPACT OF AN INTERVENTION TO REDUCE THERAPY DELAYS FROM EMERGENCY DEPARTMENT TO MEDICAL/SURGICAL UNITS.

Jennifer Cockerham, Ryan Stecks, Randy Willis, Gary R. Lowe; Respiratory Care Services, Arkansas Children's Hospital, Little Rock, AR

Background: A study was performed to determine the success of an intervention to reduce the time period between bronchodilator (BD) therapy in the Emergency Department (ED) and either respiratory assessment (RA) or BD therapy upon admission to the Medical/Surgical Unit (M/SU). There were sporadic reports that asthmatics were not assessed or treated within an appropriate time frame due to delays in the admission process. The goal of this study was to reduce this time difference and any impact it had on length of stay (LOS). **Methods:** The study was not deemed human subject testing by the local IRB. Data were collected on 176 asthmatics (Group 1 [G1]) from 5/2013-3/2014. A test of change (TOC) was implemented during 5/2014 in which an order was obtained for Q2H PRN BD therapy while the patient was in the ED. This promoted timely RA and/or BD therapy during the time period between ED therapy and the M/SU therapy. These data were compared to post TOC data on 225 asthmatics (Group 2 [G2]) from 05/2014-03/2015. Data collection for both groups included the time from the last BD therapy in the ED to ED discharge, the time from ED discharge to RA or BD therapy in the M/SU, and the sum of these two time periods. LOS data were also collected on both groups. Mean times (hours: minutes) were noted and comparisons made using independent t-tests with significance set at $p<0.05$. **Results:** The mean time from ED therapy to RA or BD therapy in the M/SU for G1 was 3:19 (range: 0:29-8:08) compared to G2 which was 2:51 (range: 0:29-7:51); p=0.001. Mean LOS for G1 was 24:18 (range: 6:16-209:18) compared to Group 2 which was 22:57 (range: 4:55-127:19); p=0.47. For G1, 18% (32/176) were treated in the M/SU by 2H post ED BD therapy, 47% (83/176) by 3H, 73% (129/176) by 4H; compared to G2 with 30% (67/225) treated by 2H, 61% (138/225) treated by 3H, and 81% (182/225) by 4H. **Conclusion:** By initiating a change with physician ordering, we noted an improvement in asthmatics being assessed or treated even if a delay in the admission process from the ED occurred. The mean total time from ED therapy to RA or BD therapy in the M/SU was reduced by 28M. There was a 12% increase in asthmatics assessed or treated within 2 hours, a 14% increase seen within 3 hours, and an 8% increase within 4 hours. These improvements did not significantly impact length of stay. While there has been an improvement, there are still asthmatics that go for extended periods of time without a RA or BD therapy.

Sponsored Research - None

2302901

EVALUATION OF POSITIVE PRESSURE DELIVERED FROM A NON-PRESCRIPTION NASAL PATCH (THERAVENT™).

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Introduction: THERAVENT™ (Theravent, Inc. San Jose, California) is an over-the-counter expiratory flow resistor that uses a proprietary micro-valve type adhesive patch, applied to the nostrils for the purpose of reducing or eliminating snoring. Documentation of expiratory pressure generated by the device has not been validated. The purpose of this study is to determine if EPAP is generated with the device at various expiratory flow rates. Methods: A THERAVENT™ patch was applied to the nostrils of an adult mannequin face model with the mouth sealed shut. The mannequin's internal "oral pharynx" was connected to a 45-degree, 15 mm wide bore angle, with a Gas Sample Tee attached to a pressure line adapter for sampling. Two 22 mm oxygen adaptors were attached to the "T" on both ends with oxygen supply tubing connected to the calibrated Paux line of a Engstrom GE Carestation Ventilator (Madison, WI). Flow rates of 20 L/min, 25 L/min and 30 L/min were delivered through the THERAVENT™/Face model for intervals of 15 secs while pressures were recorded from the Paux line. Mean values and standard deviations for pressures delivered at three adult expiratory flow rates were compared using the one-way ANOVA test. Results: Mean values and standard deviations for measured pressure during flow rate changes are listed in the table below. The average pressure generated across all flows was 4.3 cm/H_2O. There is a statistically significant difference in measured pressure delivered through the resistor in the face of changing flow rates $p < 0.001$. Conclusion: As simulated adult expiratory flow rates are exhaled through the THERAVENT™ patch, low levels of expiratory pressure are generated and increase incrementally as flow rate increases.

Sponsored Research - None

Trial	30 L/min	25 L/min	20 L/min
1	6	4	3
2	5	3	2
3	6	4	3
4	6	4	3
5	6	4	3
6	6	3	3
7	6	4	3
8	5	4	3
9	6	4	3
10	6	4	3
MEAN	6	4	3
SD	0.422	0.422	0.316

2302954

IMPACT OF AN ELECTRONIC MEDICAL RECORD SCREENING TOOL AND THERAPIST-DRIVEN PROTOCOL ON LENGTH OF STAY AND HOSPITAL RE-ADMISSSION FOR COPD.

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Background: A disease management program can decrease readmission for patients with COPD. Effective disease management relies upon the identification of patients admitted with COPD in order to implement any management strategy. We previously implemented a therapist-driven protocol (TDP), but experienced difficulty in systematically identifying COPD patients. We sought to determine if a screening tool using the Electronic Medical Record (EMR) to identify COPD patients combined with a therapist-driven protocol would impact length of stay (LOS) or readmission rates. **Methods:** We used a historical control design to evaluate the effectiveness of our screening tool. The screening included a daily report generated from the EMR capturing emergency physician and admission notes for the free text term "COPD". Orders for medications used to treat COPD were also included in the tool. This report was reviewed for patients with COPD not already receiving regular inpatient respiratory care services. The patients identified were then evaluated at their bedside by a respiratory therapist. A previously created TDP combining patient assessment and measured FEV1 was used to calculate a score. Patients with less severe scores received medication reconciliation, assessment and brief education by respiratory care practitioners (RCP). Bronchodilator therapy was delivered by nursing. Patients with more severe scores received 24 hours of bronchodilator therapy delivered by RCPs in addition to the patient assessment, medication reconciliation and education. Efficacy was evaluated using ICD-9 discharge codes to identify patients with COPD and measure length of stay and re-admission rates within a 7 month period. Results: The pre-intervention time period occurred from December 2014 to June 2014 and post-intervention from July 2014 to January 2015. There were a total of 142 patients: 68 pre and 74 post-intervention. Mean LOS for primary diagnosed COPD decreased from 4.28 days to 3.04 days (p = .096). 30 day re-admission rates for COPD as the primary diagnosis decreased from 13.4% to 6.06% (p = .04).[1]Case mix index was similar in both groups.[1] Conclusion: A combined EMR-generated identification tool and a therapist-driven assessment and treatment protocol were associated with a trend towards decreased LOS and significant reduction in readmission rate for COPD. 1. UHC Patient Outcomes By Hospital; Seattle, WA;UW, Harborview: December2013 to June 2014: Accessed April 23,2015.

Sponsored Research - None

2302991

DOES THE SELECTION OF ENDOTRACHEAL SECURING DEVICES IMPACT THE NUMBER OF UNPLANNED EXTUBATIONS IN A NEONATAL POPULATION?

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Background: Unplanned extubations (UEX) represent a serious adverse event that can result in harm to our patients. Numerous endotracheal securing devices have been applied across patient populations in an effort to mitigate the potential for UEX events. Our current neonatal practice involves the application of two different securing devices. The choice of which device to use is at the discretion of the physician, nurse or Respiratory Therapist. The purpose of this study was to examine the incidence of UEX associated with each securing device in our neonatal population to assist clinicians in best practice choices for UEX mitigation. Method: This is a retrospective analysis conducted on all UEX reports for patients admitted to our neonatal intensive care unit between June 1st, 2014 through February 28th, 2015. During this period we observed 184 episodes of endotracheal airway support totaling 2882 days. The two securing devices used during this period were either Marpac tape or Neotech Neobar holders. A total of 24 patients involving 37 UEX events were reported through our risk management system during this period. The 37 incidents of UEX represent 20% of all ETT airway events. We reviewed each UEX report and the patient's record. During the chart review we extracted information associated with the size (weight-kg), age (GA weeks), endotracheal tube (ETT) size, cuffed versus uncuffed and securing device recorded at the time of the UEX and for the duration of the airway use. Results: Analysis of the UEX events are reported in Table 1. As shown, most of the patients (24/27) used both forms of securing devices during the patient's intubation duration. A total 17 (46%) UEX events occurred while using the Marpac tape. Conversely, 20 (54%) UEX events occurred while using the Neobar device. Although these numbers favor the use of tape, the difference is statistically significant. We were unable to analyze for difference between devices associated with patient size, weight, GA and tube selection as most of the study cohort (89%) employed both forms of securing device. Conclusions: Our preliminary analysis does not indicate any significant advantage in reducing unplanned extubations in this population based upon the type of securing device employed. Further analysis and observation is required to determine if other factors, such as secretions, sedation or activity, may be attributed to these events. Disclosure: None. This study was reviewed by the UM-IRBMed (HUM00099776).

Sponsored Research - None

Descriptive Statistics of Study Cohort (n=27)

Cohort Characteristics	Tape	Commercial Device	Significance (p=)
Total UEX events	17	20	0.485
Total device days	478	484	
Median (IQR) device days	8 (6,28)	15 (6,24)	0.181

2303159

CHARACTERIZATION OF RIBAVIRIN WITH SMALL PARTICLE AEROSOL GENERATOR AND MICROPUMP AEROSOL TECHNOLOGIES.

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Introduction: Ribavirin is a broad-spectrum antiviral drug that can be administered by inhalation. Despite advancements in oral delivery of this medication, there has been a renewed interested in delivering ribavirin via the pulmonary system. While data is not conclusive that inhaled ribavirin improves outcomes, we set out to determine if delivery by a newer generation nebulizer (vibrating mesh micropump) was as effective as the standard of care SPAG system. **Methods:** We compared the physicochemical makeup and concentrations of the ribavirin pre and post nebulization. An Andersen Cascade Impactor was used to determine particle size distribution and an absolute filter was used measure total aerosol output and inhaled dose during mechanical ventilation and spontaneous breathing. Ribavirin was analyzed and quantified using HPLC/MS. **Results:** Ribavirin was found to be stable in both 0.9% aq NaCL and sterile water with an R^2 of 0.96, identical coefficients of variation with no difference in drug concentration pre and post nebulization with the micropump. Figure shows drug deposited on each stage of the impactor. The SPAG MMAD (1.84 µm) was smaller than the micropump (3.63; p=0.02). but there was no significant difference in proportion of drug mass in the 0.7 to 4.7 µm particle range. Inhaled drug delivery was similar with SPAG and VMM in both spontaneously breathing (p=0.77) and mechanical ventilation (p=0.48) models. **Conclusion:** Our findings support that the vibrating mesh micropump nebulizer may provide an effective alternative to the SPAG in administration of Ribavirin both on and off the ventilator. Further clinical studies are needed to compare efficacy.

Sponsored Research - Boston Children's Hospital was provided an unrestricted research grant to purchase drug and supplies to conduct the study.

Stage	Size (micron)	Micropump (mean)	SPAG (mean)	Standard Error	P value
Throat	> 9	452.5	240.9	79.0	0.12
1	9	2754.3	69.6	530.2	0.04
2	5.8	2778.2	104.7	508.2	0.03
3	4.7	2485.3	561.0	901.5	0.16
4	3.3	6121.9	1910.4	1752.5	0.14
5	2.1	4525.4	2612.4	1565.2	0.35
6	1.1	4120.3	2380.1	1013.1	0.23
7	0.7	958.3	2124.4	1272.6	0.46
8	0.4	336.6	1652.3	122.5	0.009

2303209

HIGH PRIORITY VENTILATOR ALARMS THAT RECEIVED NO INTERVENTION: AN ANALYSIS OF VENTILATOR ALARM INFORMATIVENESS IN INTENSIVE CARE UNITS.

Jefferson H. Mixell, John S. Emberger, Francis A. Gott; Respiratory, Christiana Care Health System, Newark, DE

BACKGROUND Data describing ventilator alarm management in intensive care units (ICUs) are limited. Effective alarm management is an important goal for The Joint Commission and for patient safety. One of the key elements of performance for effective alarm management is identifying necessary alarms versus alarms contributing to noise and alarm fatigue. We wanted to determine the amount of time ventilators were alarming, but received no intervention. **METHODS** We retrospectively gathered electronic ventilator alarm and event data without patient identifiers, for adults and neonates ventilated with a Drager Evita Infinity V500 ventilator in an ICU during April 2015. The data was analyzed for event, priority, date, time, and duration of alarm using Microsoft Access and Excel. The three most common ventilator alarms, comprising more than 80% of all high priority alarms, were compared. Alarms that were not followed by any intervention within 10 minutes were reported as average time alarming in seconds and number of alarm events. **RESULTS** Forty eight ventilator logbooks were analyzed representing medical (n=17), surgical (n=10), neurological (n=10), and neonatal (n=11) ICUs and a total of approximately 200 days of mechanical ventilation. **CONCLUSIONS** Ventilator alarms are created and set to signify a change in a patient condition that requires the attention of the clinician. In our population, low minute ventilation and high respiratory rate alarms are the longest high priority alarms that received no intervention. Airway pressure high are the shortest alarms with no interventions and were common especially in the Medical ICU. Alarms without intervention contribute to alarm fatigue and ICU noise. Future studies should investigate the implementation of an alarm delay that allows for brief changes in ventilation that may not be important without sounding a high priority alarm.

Sponsored Research - None

Alarms Not Followed By a Ventilator Intervention

Most Common Adult Alarms	**Airway Pressure High**	**MV Low**	**Respiratory Rate High**
Medical ICU, avg seconds (n)	2.6 (1380)	14.8 (390)	18.7 (266)
Surgical ICU, avg seconds (n)	2.7 (161)	14.3 (574)	23.4 (224)
Neurological ICU, avg seconds (n)	3.8 (210)	14.3 (371)	15.2 (60)
Most Common Neonatal Alarms	**MV Low**	**Disconnection?**	**Airway Obstructed?**
Neonatal ICU, avg seconds (n)	9.9 (223)	6.5 (178)	4.0 (106)

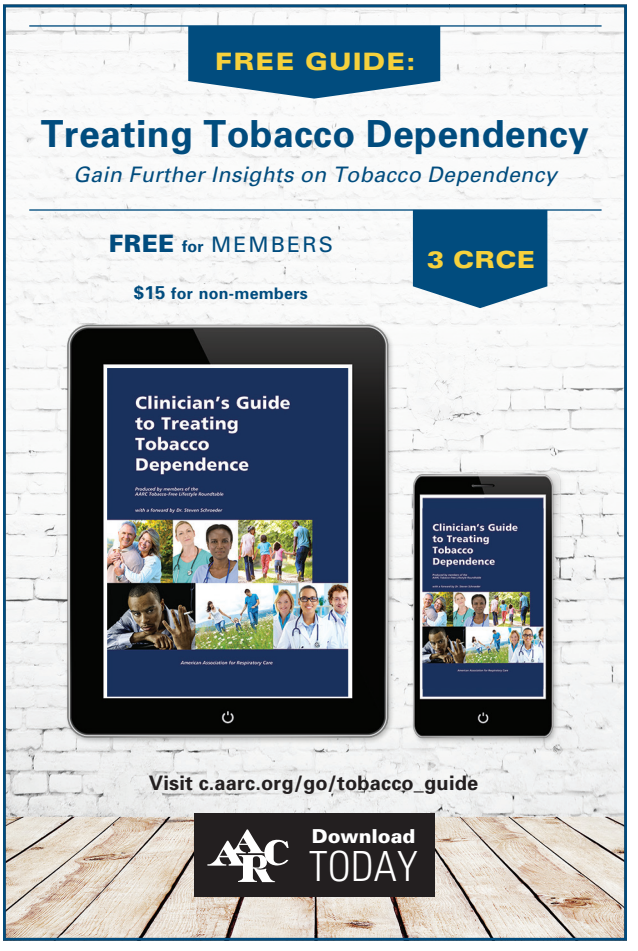
2303244

ACCIDENTAL EXTUBATIONS IN THE NICU.

Kevin Crezee, Rick Carter; Respiratory Care, Primary Childrens Hospital, Salt Lake City, UT

Background: Accidental Extubation's (AE) AE's have been associated with increased; ventilator days, risk of infection, CPR and resuscitation medication usage. Historically Primary Children's Hospital (PCH) has maintained an AE rate lower than the national average. It was considered as a measure of the quality of care we provided. Recent hospital-wide efforts to reduce serious safety events led an interdisciplinary group to define steps in an effort to eliminate AE in our NICU. *Steps to reduce risks of AE*: Established standardized guidelines detailing airway management of patients with ETT or Trach to ensure common understanding and identify best practices for the following practices: •2 providers required when moving patients. •Head and airway position during chest x-ray. •ETT tube securing method and depth. •Securing of airways for new admits and post-operative patients. Established a post-op hand off to empower respiratory therapists and anesthesia to address airway concerns. Implemented an accidental extubation assessment tool to identify contributing factors. An AE huddle data tool was utilized in post AE event review by care providers (MD, NNP, RT and RN) for defined standard compliance and risk factors. The huddle form are reviewed and analyzed by an AE team to identify opportunities for improvement and provide direct and timely feedback to caregivers. Analysis of data is shared in; group communication, quality reporting, and presentations at key stakeholder meetings. **Method:** A quality improvement initiative reviewed patients that experienced an Accidental Extubation between 1/2013 and 12/2014. 67 AE events were identified. A de-identified data set was used for analysis. 46 AE events in 2013 as baseline and 21 AE events in 2014 post implementation. A two-tailed comparison was used for statistical analysis. **Results:** A 64% decrease in total AE events from 46 to 21 (P = <0.0001). A 50% decreased in the number of AE events per month (3.8.to 1.9). The AE rate decreased 53% from 1.15 to 0.54 per 100 ventilator days. **Summary:** The development of both a core and quality review process provided valuable information for post event review, education, practice changes and post event care. In our NICU, these changes have significantly improved the AE rate through improved team work, accountability and communication amongst members of the clinical medical team.

Sponsored Research - None



2266816

THE UTILIZATION OF HIGH FLOW OXYGEN TO ADMINISTER INHALED PULMONARY VASODILATORS IN POST-OPERATIVE LEFT VENTRICULAR ASSIST PATIENT POPULATION TO FACILITATE EXTUBATION.

Kenneth Miller, Timothy Misselbach, Barbara Ebert; Respiratory Care, Lehigh Valley Health Network, Bath, PA

Intro: A left ventricular assist device (LVAD) is a type of mechanical circulatory support device . It is a mechanical pump that is implanted in patients who have heart failure to help the heart's weakened left ventricle pump blood throughout the body. The LVAD may provide blood pressure support; maintain or improve other organ function by improving blood flow to the kidneys, liver, brain and other organs; and when used as destination therapy or bridge-to-transplant, improve the patient's strength and ability to participate in activities such as cardiac rehabilitation; and allow the patient to be discharged from the hospital. Often patients post LVAD procedure requires mechanical ventilation and inhaled pulmonary vasodilators to minimize right ventricular failure and stunning. **Methods:** Historically, LVAD patients required mechanical ventilation until twelve-twenty hours of nebulized Epoprostenol administered was completed. Often patients required unnecessary sedation and other interventions to maintain ventilation despite stable gas exchange and pulmonary mechanics. To address this issue of prolonged ventilation, patients who have stable gas exchange, hemodynamic status, and pulmonary mechanics were extubated and placed on high flow oxygen (HFO) via Optiflow (Fisher Paykeal) to complete the remaining administration of nebulized Epoprostenol. Nebulization was provided by the Aeroneb (Aerogen) placed distal to the active humidifier via the Optiflow. **Results:** Compared to historically data the ventilatory duration of the LVAD patients was reduced by 9.7 hours without any noted complications. (Table 1) **Conclusion:** Based on our clinical data high flow oxygen is a feasible option to provide the administration of inhaled pulmonary vasodilator and help facilitate ventilatory liberation. It is safe and effective to provide administration of nebulized pulmonary vasodilators.

Sponsored Research - None

Table 1

	Ventilator Duration-Mean	Re-intubation
Pre-HFO (10)	16.6 hrs	1/10
Post-HFO (9)	6.9 hrs.	0/9

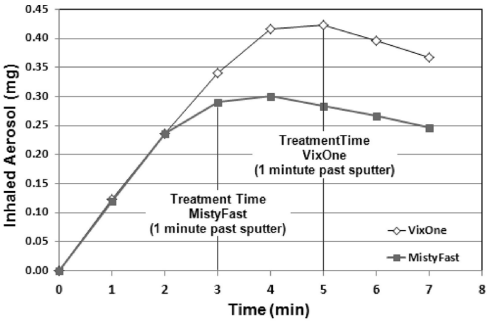
2299425

COMPARISON OF VIXONE AND MISTYFAST SMALL VOLUME NEBULIZERS.

Sue Gole, Robert L. Chatburn; Respiratory Institute, Cleveland Clinic, Cleveland, OH

BACKGROUND Small volume nebulizers deliver varying amounts of medication dosages with different treatment times. The factor that affects dosage (inhaled aerosol) the most is output aerosol. Output aerosol includes a combination of both inhaled and wasted aerosol particles (Respir Care 2007;52(8):1037-1050). Efficient nebulizers increase deposition in the lungs. Less efficient nebulizers increase wasted medication. The purpose of this study was to compare the treatment times and inhaled aerosol of two brands of nebulizers. **METHODS** We evaluated the VixOne (Westmed) and the MistyFast (Air Life). Three nebulizers of each brand were tested. Breathing was simulated using an ASL 5000 (Ingmar Medical) lung simulator; sinusoidal flow pump, tidal volume 500mL, frequency = 15/min. The nebulizers were charged with 3 mL of normal saline. Source oxygen flow was set at 10 L/min for the VixOne and 9 L/min for the MistyFast per manufacturers' recommendations. Aerosol was collected on a HEPA filter and inhaled aerosol was defined as the mass of water collected in the filter over the treatment time (Chest 1997; 111:1361-65*)*. Treatment time was defined as the period from the start of nebulization to one minute past the first occurrence of sputter. Mean inhaled aerosol values were compared using t-test with $P < 0.05$ indicating significance. **RESULTS** Summary data are shown in the figure below. The inhaled aerosol was greater for the VixOne (3.7 vs 2.5 mg; P = 0.008). CareFusion marketing data for inhaled respirable mass of drug/breath for VixOne vs MistyFast was 3.7 vs 5.1 micrograms/breath. Treatment times from this study were used to calculate total respirable mass/treatment for VixOne vs MistyFast: 278 vs 230 micrograms. **CONCLUSIONS** Total nebulizer treatment dosage requires data for both treatment time and inhaled respirable mass. The VixOne delivers a larger dosage of drug but is slower than the MistyFast. **DISCLOSURE** Chatburn is a consultant for IngMar Medical.

Sponsored Research - None



Nebulizer	Neb. Time (min)	Initial Charge (mL)	Inhaled Aerosol (mL)	Output Aerosol (mL)	Output Rate (mL/min)	In. Aer. Rate (mL/min)	Wasted Aerosol (mL)	Neb. Effic. (%)	Delivery Effic. (%)	System Effic. (%)
VixOne	5.0	3.0	0.42	2.06	0.41	0.08	1.63	68.6	20.6	14.1
MistyFast	3.0	3.0	0.29	1.59	0.53	0.10	1.30	52.9	18.3	9.7

2300387

COMPARISON OF AEROSOL DELIVERY DURING NON-INVASIVE VENTILATION USING THE HAMILTON G-5 VENTILATOR DUAL LIMB CIRCUIT AND THE RESPIRONICS V-60 SINGLE LIMB WITH EXHALATION PORT.

Philip Delcore, William R. Howard, Susan Lagambina, Paul F. Nuccio; Respiratory Care, Brigham and Women, Boston, MA

Background: With NPPV we occasionally need to deliver continuous inhaled medication such as Veletri or Albuterol. The V-60 (Philips Respironics Inc, Murrysville, PA) and Hamilton G5 ventilator (Hamilton Medical, Reno, NV) can both be used in this capacity. We wanted to compare delivered medication to the patient using a dual limb and single limb circuit. **Methods:** The G5 ventilator was connected using an RT-210 adult circuit (Fisher & Paykel Healthcare Ltd, Auckland NZ) to a CPR head (**Simulaids, Inc., Saugerties NY)** and Respironics small Image 3 W/Headgear-Disp-Dom mask (Respironics Inc, Murrysville, PA). Behind the oral head opening a Portex #2873 filter, (Smiths-Medical, Keene, NH) was attached. A a 2nd filter was then connected to an ASL-5000 breathing simulator (IngMar Medical Ltd, Pittsburgh, PA). An Aerogen Solo nebulizer (Aerogen, Galway, IE) was attached to a Fisher & Paykel MR-290 humidifier chamber inlet. The G5 ventilator settings were: NIV mode, PSV=5, 10, and 15 cmH_2O, PEEP=5 cmH_2O. The V60 was attached to the same CPR resuscitation head and filter assembly using a small Performatrak full mask w/cap-strap HGR, DOM (Respironics Inc, Murrysville, PA) and an RT-219 patient circuit, (Fisher & Paykel Healthcare Ltd, Auckland, NZ). The circuit was connected to the same Aerogen Solo nebulizer. Settings for the V60 were: ST Mode IPAP=10, 15, and 20 cmH_2O with EPAP=5 cmH_2O (equivalent settings tested with the G5) with EPAP=5 cmH_2O. The filters were weighed before each test with a Sartorius Practum 213-1S digital scale, (Data Weighing Systems, Elk Grove, IL). Four mL of 10% saline was aerosolized to completion with each test with each filter re-weighed upon completion. The data was analyzed with Excel Data Analysis ToolPak, (Microsoft, Seattle, WA), for mean difference (MD) in the filter weight(± SD) and paired t-tests performed ($p \leq 0.05$). **RESULTS:** The average weight gain for the G5 and V60 were 0.11 and 0.07 grams respectively. The MD (±SD) in filter weight gain of the G5 compared to the V60 was 0.04 (±0.03) ($p < 0.05$). **Discussion:** Both machines lose medication through mask leaks and the exhalation port. During our tests we averaged for the G-5 28.4% and the V-60 9.2L/m leaks. Our results show that the G5 will deliver a statistically significant more amount of drug. This is possibly due to the way the V60 maintains pressure throughout the breath cycle, using a constant flow letting more medication escape through the exhalation port.

Sponsored Research - None

2300388

AEROSOL DELIVERY WITH MAXVENTURI HIGH FLOW NASAL CANNULA AT DIFFERENT FLOWRATES.

Philip Delcore, William R. Howard, Susan Lagambina, Paul F. Nuccio; Respiratory Care, Brigham and Women, Boston, MA

Background: Inhaled epoprostenol delivered through a heated humidified high flow nasal cannula, (HFNC), system can be used for the treatment of pulmonary hypertension, right sided heart failure, and to help improve overall oxygenation. Occasionally to maintain adequate oxygenation during aerosol administration a higher flow rate is required. We wanted to determine if there would be a significant difference in medication delivery to the patient at higher flows. **Methods:** A MaxVenturi, (Maxtec, Salt Lake City, UT), was connected to an RT 202 adult breathing circuit, (Fisher & Paykel Healthcare Ltd, Auckland NZ), An OptiFlow size medium OPT544 HFNC (Fisher & Paykel Healthcare Ltd, Auckland NZ), was fitted to a LifeForm adult airway trainer, (Model LF03699U, Nasco, Fort Atkinson, WI). An Aerogen Solo nebulizer, (Aerogen, Galway, IE), was attached to the dry side of a Fisher & Paykel MR-290 humidifier. At the end of airway trainer's trachea a Portex #2873 filter, (Smiths-Medical, Keene, NH) was attached. The final connection was to an ASL-5000 breathing simulator, (IngMar Medical Ltd, Pittsburgh, PA). The ASL 5000 was set to spontaneously breathe at a RR = 15 BPM and VT = 580 mL. The filter (and all filters used in subsequent tests) were weighed before each test with a Sartorius Practum 213-1S digital scale, (Data Weighing Systems, Elk Grove, IL). 4 mL of 10% saline was aerosolized to completion with each test. Each filter was re-weighed upon completion of nebulization. Flows through the system tested were 20, 30, 40, and 50 L/m. FiO2 was constant at 100%. The data was analyzed with Excel Data Analysis ToolPak, (Microsoft, Seattle, WA), for mean difference (MD) in the filter weight (± SD) and paired t-tests performed ($p \leq 0.05$). **RESULTS:** The overall MD (± SD) in post-test filter weight gain compared to pre-tested weight was 0.03 gms (± 0.014 gms), ($p < 0.01$). However, using the lowest flowrate of 20 L/m compared to 30, 40, and 50 L/m, the MD (± SD) in filter weight was -0.01 gms (± 0.003), - 0.028 gms (± 0.002), and -0.032 gms, (± 0.004) ($p < 0.05$), respectively. **DISCUSSION:** Our results show that at higher flow rates using this system, patients will receive a significant lower amount of medications. If your goal is to deliver inhaled medication, using a lower flow rate would be optimal.

Sponsored Research - None

2301724

AEROSOL DELIVERY DURING ADULT MECHANICAL VENTILATION WITH INCREASINGLY SMALLER TIDAL VOLUMES.

Philip Delcore, William R. Howard, Susan Lagambina, Paul F. Nuccio; Respiratory Care, Brigham and Women, Boston, MA

Background: During ECMO runs we are occasionally asked to ventilate patients using low tidal volumes to protect from volume trauma. In some of these cases extremely low volumes, less than dead space, (VD), are used. We wanted to determine if added anatomical VD would affect the delivery of inhaled medication while maintaining the same overall minute volume. **Methods**: A Puritan Bennett 840 ventilator (Covidien, Mansfield, MA), was connected to an RT-210 adult ventilator circuit, (Fisher & Paykel Healthcare Ltd, Auckland New Zealand). An Aerogen Solo nebulizer, (Aerogen, Galway, IE), was attached to a Fisher & Paykel MR-290 humidifier chamber inlet, (Fisher & Paykel Healthcare Ltd, Auckland NZ). At the wye of the ventilator circuit a Portex #2873 filter, (Smiths-Medical, Keene, NH) was placed and attached to an ASL-5000 breathing simulator, (IngMar Medical Ltd, Pittsburgh, PA). Ventilator settings tested: AC mode, RR = 10 BPM and VT = 400 mL, RR = 20 BPM and VT = 200 mL, RR = 40 BPM and VT = 100 mL, RR = 80 BPM and VT = 50 mL. Settings for each test: I:E = 1:2, FiO_2 = 100%, and PEEP = 5 cmH_2O. The filters were weighed before each test with a Sartorius Practum 213-1S digital scale, (Data Weighing Systems, Elk Grove, IL). 4 mL of 10% saline was aerosolized to completion and the filter re-weighed. In a 2nd phase of this test, 12 inches of corrugated tubing was added to the end of the circuit wye to simulate approximately 100 mL of VD. A 2nd filter was placed distal to the corrugated tubing and the tests were repeated at the same ventilator settings. The filters re-weighed upon completion. The data were analyzed with Excel Data Analysis ToolPak, (Microsoft, Seattle, WA), for mean difference (MD) in the filter weight (± SD) and paired t-tests performed ($p \leq 0.05$). **RESULTS:** In the 1st phase of this test with no added VD, the MD (± SD) in post-test filter weight compared to pre-testing weight was 0.69 gms (± 0.24 gms), ($p < 0.01$). With the addition of VD, the MD (± SD) was 0.25 gms (± 0.18 gms), ($p < 0.01$). **DISCUSSION:** Our results show that there is a direct relationship of decreasing VT to the amount of medication delivery to the patient while achieving the same overall minute volume. Therapeutic benefit may be compromised (bronchodilation or managing pulmonary artery pressures) at lower tidal volumes.

Sponsored Research - None

2302096

COMPARISON OF NEBULIZERS IN A SIMULATED ADULT LUNG MODEL WITH AND WITHOUT EXHALED HUMIDITY DURING NONINVASIVE POSITIVE PRESSURE VENTILATION.

Arzu Ari, Khalid Alwadeai; Georgia State University, Atlanta, GA

BACKGROUND: Although aerosol therapy is commonly used for the treatment of patients receiving noninvasive ventilation (NIV), the efficiency of nebulizers during NIV is not well understood. The purpose of this study was to compare delivery efficiency of the jet nebulizer (JN) and mesh nebulizer (MN) in an adult lung model with and without exhaled humidity during NIV. **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. A temperature of 37° C was held constant. To stimulate exhaled humidity (active exhalation), the collecting filter was connected to a cascade humidifier (37C and 100% relative humidity) simulating BTPS exhaled humidity at the bronchi. NIV was administered via full face mask (PerformaTrack Mask, Respironics) with PIP/PEEP of 20/5 cmH2O. Nebulizers were placed between the leak and the mask. Albuterol sulfate (2.5 mg/3 ml) was nebulized with the JN (Mistymax, Carefusion), and MN (Aeroneb Solo, Aerogen). Filters were eluted with 0.1 HCl and analyzed by spectrophotometer at 276 nm. Descriptive statistics, independent t-test were used for data analysis ($p<0.05$). **RESULTS**: Table below shows the percent of dose delivered (mean ±SD) distal to the bronchi. Aerosol delivery with JN was significantly lower than MN during NIV with and without exhaled humidity ($p=0.0001$ and $p=0.0001$, respectively). Simulating exhaled humidity in this lung model during NIV reduced aerosol delivery with JN ($p=0.042$) and MN ($p=0.001$). **CONCLUSION**: The type of nebulizer used during NIV affects aerosol delivery in this simulated adult lung model. The JN is less efficient than MN. Further studies are needed to determine whether greater deposition in a dry model is an artifact of the model that does not simulate exhaled humidity.

Sponsored Research - None

	Unheated NIV Circuit		
	Without Exhaled Humidity	With Exhaled Humidity	p values
Jet Nebulizer (JN)	10.09 ± 0.49	8.19 ± 1.09	0.042
Mesh Nebulizer (MN)	25.63 ± 0.44	21.20 ± 0.62	0.001
p values	0.0001	0.0001	

2302103

PLACEMENT OF AERONEB SOLO BY RESPIRATORY THERAPISTS IN THE ICU.

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

INTRODUCTION: The Aeroneb Solo is a newer nebulizer used in line with the ventilator circuit. According to the manufacturer, the nebulizer should be placed at the wye of the ventilator circuit. Based on a research study, higher aerosol outputs were achieved when the nebulizer was placed directly on the heater. The purpose of this study was to evaluate which method of placment was used by the respiratory therapists (RTs) in the ICU. METHODS: IRB approval was received prior to the study. The survey asked the RTs to indicate (1) where they place the Aeroneb Solo; (2) the reason why they choose such location. Identical hard copy and online surveys [Survey Monkey (TM)] were done to maximize the sample size. The surveys were sent to RTs who work in the ICU and hold an CRT or RRT credential. One hundred surveys were sent to eligible RTs at 4 hospitals in Alabama where Aeroneb Solo was used in the ICUs. The RTs were asked to complete and return the surveys within two weeks. RESULTS: Thirty six (36%) surveys were received. Twenty-three (64%) respondents reported that they placed the Aeroneb Solo on the heater and 13 (36%) respondents reported that they place the Aeroneb Solo at the wye of the ventilator circuit. Table 1 shows the result details. DISCUSSIONS: A majority (23/36 or 64%) of the respondents placed the Aeroneb on the heater which is the best practice based on research findings. However, 18 of these 23 respondents were mistaken that this location was based on manufacturer's instructions. A minority (13/36 or 36%) of the respondents placed the Aeroneb Solo at the wye of the ventilator circuit, which is not the best practice but is based on the manufacturer's instructions. CONCLUSIONS: There are inconsistencies among RTs in the placement of Aeroneb Solo. The RT departments should evaluate the placement of the Aeroneb Solo and provide a consistent policy for RTs. The decision should be scientifically sound and based on best practice, rather than based on manufacturer's instructions.

Sponsored Research - None

Table 1 Placement of Aeroneb Solo and reason for placement

Placement of Aeroneb Solo	Number of response	Reason
Connected to the heater	23 (64%)	18/23 Manufacturer instructions
		5/23 Department policy
Connected to the wye	13 (36%)	6/13 Manufacturer instructions
		7/13 Department policy

2302162

ACCURACY OF OBSERVATION OF CHEST RISE AND MOVEMENT OF THE VALVE HOLDING CHAMBER'S EXHALATION VALVE TO COORDINATE PRESSURIZED METERED DOSE INHALER ACTUATION AND INHALATION.

Ariel Berlinski[1], Dirk Von Hollen[2], Ross H. Hatley[3]; [1]Pediatrics, University of Arkansas for Medical Sciences, Little Rock, AR; [2]Philips Respironics, Somerset, NJ; [3]Respironics Respiratory Drug Delivery (UK) Ltd, a business of Philips Electronics UK Limited, Chichester, United Kingdom

Background Asthma is highly prevalent in the pediatric population. Many patients are treated with pressurized metered-dose inhalers (pMDI) with valved holding chambers (VHC). Caregivers are instructed to actuate the pMDI at the beginning of the inhalation. We hypothesize that visualization of chest rise and movement of the expiratory valve of the VHC will allow an accurate coordination of pMDI actuation and the inhalation maneuver. **Methods** Data were extracted from a clinical trial that evaluated the effect of coordinated and uncoordinated maneuvers on ex-vivo fluticasone deposition in 32 asthmatic children aged 5-8 years old who used a small volume VHC made of non-electrostatic material (Optichamber Diamond, Philips) with mouthpiece (NCT01714063). The plastic actuator was modified to allow recording of breathing parameters and pMDI's shaking and actuation. Subjects were studied in sitting position during tidal volume breathing while connected through a mouthpiece. The investigator actuated the pMDI when chest began rising and/or the expiratory valve stopped moving. Tests were done in triplicate. The subjects and the investigator were blinded to the data that were being recorded. Eighty-four maneuvers of 31 subjects with valid data were reviewed. The occurrence of the actuation of the pMDI and the beginning of inhalation were recorded and the interval (ms) was calculated. The study was approved by the local IRB. **Results:** The events of the start of actuating of the pMDI and inhaling of 1st breath occurred within 24ms (median) (95% CI 10-38ms). Conclusion Coordination of actuation and inhalation of a pMDI with VHC could be accurately achieved by monitoring chest rise and cessation of movement of the VHC's exhalation valve. **Disclosures:** Dr. Berlinski served as Principal Investigator in clinical trials sponsored by Vertex, AbbVie, Aptalis Pharma, Genetech, Janssen Research and Development, Gilead, Teva, Philips, Novartis, and Therapeutic Development Network. D. Von Hollen is an employee of Philips Respironics. R.H.M. Hatley is an employee of Respironics Respiratory Drug Delivery (UK) Ltd, a business of Philips Electronics UK Limited.

Sponsored Research - The study was supported in part by Philips Respironics.

2302341

TRANSITIONING TO A BREATH-ACTUATED PNEUMATIC NEBULIZER IN THE ED AND IN-PATIENT SETTINGS; EXPERIENCED GAINED FROM STAKE-HOLDERS INVOLVED WITH THE PROCESS.

Dolly N. Saunders; Respiratory Care, Chesapeake Regional Medical Center, Chesapeake, VA

Background: We report experience gained in a transition from a conventional nebulizer to a breath-actuated nebulizer (BAN) for the rapid treatment and rescue of patients in the ED and In-Patient settings of a 310 inpatient bed community hospital with an additional 60 bed ED. We are located in southeast Virginia in the City of Chesapeake. **Methods**: Our Respiratory Department transitioned from a continuously operating jet nebulizer to the routine use of the disposable ***AeroEclipse-II®*** BAN (Monaghan Medical Corp., Plattsburgh, NY) in the ED during October of 2011, and on the inpatient side in January of 2012. Following a 2 year period of use, we surveyed the various stakeholders involved with the transition. **Results**: The following observations were obtained: (a) Efficacy – we observed that treatment-to-effect was completed in one-third of the time with the BAN nebulizer (b) ED to inpatient admissions in 2012 for COPD decreased from 65.94% to 36.7%. Likewise admissions for Asthma decreased from 5.71% to 1.6%. The following years have shown the same trend. ED inpatient admissions for COPD and Asthma in 2013 were 34.5% and 1.4% respectively, and in 2014 were 33.2% and 1.2% respectively (c) Therapy frequency – majority of treatments were switched from Q4 to Q6 saving 1, 8 hr/day RT position with a net of benefits saving estimated at $73k (d) Quality of Care – HFAP and JCAHO standards were met by completing all treatments one/one with the patient, which could not be achieved with the previous nebulizer because of time constraints of the nebulizer and average pt.load (e) Patient Acceptance – Customer satisfaction improved, the patients felt like they were receiving a better delivery of medication in a shorter time with the BAN, infact we had to start our hospital wide trial early due to request from patients that received the BAN in the beginning ED trial (f) Continuum-of-Care – We asked two of our homecare providers to stock the reusable ***AeroEclipse®-II*** BAN intended for 6 months of home use, so that patients will continue to receive the benefits in terms of efficacy, with the ultimate aim of decreasing their readmissions rate **Conclusions:** The adoption of the BAN as our primary device for delivery inhaled therapy to patients with severely obstructed airways has resulted in significant quality, clinical, financial, and patient satisfaction benefits. We intend to follow up this study by measuring if reduced hospital readmission rates can be correlated with this approach.

Sponsored Research - None

2302472

COMPARISON OF AEROSOL EMITTED DOSES USING AIR AND OXYGEN AS CARRIER GASES.

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BACKGROUND: Aerosol therapy is a common RT procedure when delivery of bland or medicated aerosol is indicated. When aerosol therapy is not administered inline with the ventilator circuit, oxygen and air are typically used as carrier gases. Use of oxygen or air as carrier gas is often determined by the patient condition or availability of gas source. This study was done to determine if the emitted aerosol doses were different between oxygen and air when they were used as carrier gases. METHODOLOGY: IRB approval was not required for this study. An electrically powered lung simulator (Vent Aid TTL, Michigan Instruments, Inc.) was used to mimic normal breathing pattern. The compliance and resistance were set at 40 mL/cm H2O and 5 cm H2O/L/sec, respectively. The aerosol setup was done using conventional methods. A microscopic filter was placed proximal to the test lung to collect the emitted dose for each trial. The pre- and post-treatment weights of each filter were measured and used to calculate the emitted dose. A total of 10 trials were done using air as carrier gas at flow rates of 8 L/min (5 trials) and 10 L/min (5 trials). The duration of carrier gas flow for all trails was 5 minutes. Another 10 trials were done using similar procedure with oxygen as carrier gas. Data analysis was done by t-tests. RESULTS: Table 1 shows the weights of emitted doses with air and oxygen at flowrates of 8 L/min and 10 L/min. In comparing the emitted doses between air and oxygen as carrier gases, the t-test values are 0.084 and 0.096 for 8 L/min and 10 L/min, respectively (Table t value d.f. 8 at 0.05 = 2.306). CONCLUSIONS: There are no significant differences on the emitted doses using air and oxygen as carrir gases at both flowrates. The selection and use of air or oxygen as carrier gas for aerosol therapy should be determined by patient conditions (e.g., signs of hypoxia, adverse sensitivity to high FIO2) or availability of gas source. Limitation of this study is the small sample size.

Sponsored Research - None

Table 1 Emitted aerosol doses using air and oxygen as carrier gases

Trial	Weight in g (Air)	Weight in g (Oxygen)
1	0.325 (8 L/min)	0.162 (8 L/min)
2	0.314 (8 L/min)	0.277 (8 L/min)
3	0.311 (8 L/min)	0.500 (8 L/min)
4	0.242 (8 L/min)	0.308 (8 L/min)
5	0.200 (8 L/min)	0.115 (8 L/min)
6	0.192 (10 L/min)	0.178 (10 L/min)
7	0.470 (10 L/min)	0.300 (10 L/min)
8	0.350 (10 L/min)	0.511 (10 L/min)
9	0.077 (10 L/min)	0.171 (10 L/min)
10	0.401 (10 L/min)	0.376 (10 L/min)

2302600

INVESTIGATION OF MEDICATION DELIVERY FROM SMALL VOLUME NEBULIZERS (SVN) AND A BREATH-ACTUATED NEBULIZER (BAN) USING *IN-VIVO* GENERATED BREATHING PROFILES.

Judy Schloss[1], Dominic P. Coppolo[2], Jason A. Suggett[3], Vivian Wang[3], Cathy Doyle[3], Mark W. Nagel[3]; [1]UMMC, Minneapolis, MN; [2]Monaghan Medical, Syracuse, NY; [3]Trudell Medical International, London, ON, Canada

Background: Conventional SVNs deliver aerosol constantly during their operation, however, the medication delivered is primarily a function of the patient's breathing pattern. BANs only deliver medication during inhalation. The aim of this study was to develop a methodology that could be used to capture multiple *in vivo* breathing patterns taken from patients having defined disease conditions, and then simulate such waveforms in-vitro, measuring medication delivery **Methods:** Two separate patient waveforms were recorded over the entirety of the neb treatment using a RSS 100 Research Pneumotach Instrumentation system. Pattern 1: 32 y/o female, acute exacerbation of CF likely from a bacterial pneumonia with severe obstructive lung disease. Pattern 2: 62 y/o male post-op liver transplant for cirrhosis. Experiencing dyspnea with productive mucus cough. Each pattern was then replicated using the ASL 5000 breathing simulator. A filter was placed at the mouthpiece of the device on test to determine total inhaled mass (TM). Filters were replaced at 1 minute intervals until the nebulizer began to sputter and each filter assayed for albuterol using HPLC. Benchmark measurements (n=5 replicates) were made under each of the 2 inhalation waveforms patterns with conventional SVNs (Nebutech® HDN®, Circulaire® II Hybrid) and a BAN (AeroEclipse® II). Each device was filled with 3-mL of albuterol (2.5mg/3mL). In a parallel experiment the fine droplet fraction < 4.7μm diameter (FDF) was measured for each nebulizer by laser diffractometry (Spraytec). Fine droplet mass (FDM) was determined as the product of TM and FDF. **Results:** Mean FDF was 84.9%, 53.6% and 59.2% for the BAN, Nebutech and Circulaire respectively. The variation of FDM (μg ± S.D) with change in breathing waveform is given in the table. The FDM was consistent between the two patients for the BAN. **Discussion & Conclusion:** Patients have diverse breathing profiles and even for an individual patient their breathing profile is not consistent within a single treatment. The mass of inhaled medication can also vary significantly when using conventional nebulizers. The BAN delivered a consistent amount of FDM, providing assurance of dosing both intra- and inter- patient. Based on this clinically relevant study, clinicians need to be aware of the implications of using conventional SVNs . **Disclosures:** J Schloss participates in Monaghan Medical's Speaker Bureau. Remaining authors are affilitated with Trudell Medical International.

Sponsored Research - None

Patient pattern	BAN	Nebutech	Circulaire
1	830 ± 37	445 ± 19	374 ± 25
2	819 ± 29	219 ± 16	182 ± 15

2302913

VIBRATING MESH NEBULIZER COMPARED TO METERED DOSE INHALER IN MECHANICALLY VENTILATED PATIENTS: A RETROSPECTIVE STUDY ON OUTCOMES.

Meagan N. Dubosky, Mary Henriksen, David L. Vines; Respiratory, Rush University, Chicago, IL

Background: The impact of aerosol delivery devices on patient outcomes during mechanical ventilation is unknown. Clinicians can choose from metered-dose inhalers (MDIs) and various nebulizers to deliver medications in-line through the ventilator circuit with each device having its own positive and negative attributes. The aim of this study was to determine if there was a difference in patient outcomes between the vibrating mesh nebulizer (VMN) (AeroNeb® Solo, Aerogen, Galway, Ireland) and the MDI. **Methods:** This retrospective study reviewed medical records for all mechanically ventilated, adult patients (≥ 18 years) with a physician order for aerosol treatment from August 2011 to August 2013. The hospital converted from MDI to VMN in August 2012, therefore data was gathered for one year pre/post conversion. Excluded were patients with a tracheostomy, those mechanically ventilated less than 24 hours, patients who received a combination of nebulizer and MDI treatments or those extubated and re-intubated at a later date. **Results:** Two hundred twenty-eight subjects were included. Forty-eight (21%) subjects received treatment with an MDI and 180 (79%) subjects were treated with the VMN. Demographic data (Table 1) didn't significantly differ for age or APACHE II scores between the groups but did for gender (p=0.0274). Difference in median days on mechanical ventilator for the MDI 5(IQR 3.00-8.50) and the VMN 6(IQR 4.00-10.00) were not found to be statistically significant. There was no correlation found between use of either device and the primary outcomes of VAP and in hospital mortality. In multivariable logistic regression analysis, the number of days on mechanical ventilator increased the odds of VAP (OR 1.3, 95% CI 1.14-1.49, p<0.001) and mortality (OR 1.12, CI 1.04-1.21, p= 0.002). Higher APACHE II scores increased the odds of mortality (OR 1.05, CI 1.001-1.092, p= 0.04). **Conclusion** Our results suggest that there is no association between an MDI or VMN and mortality or VAP in mechanically ventilated patients. Those receiving mechanical ventilation longer may be at a higher risk for VAP and in-hospital mortality. Patients with higher APACHE II scores may also be at a higher risk for in-hospital mortality.

Sponsored Research - Aerogen, Galway, Ireland.

2302990

EFFECT OF NEBULIZER POSITION ON AEROSOLIZED EPOPROSTENOL DELIVERY IN AN ADULT LUNG MODEL.

Allison C. Anderson[1], Meagan N. Dubosky[1], Kelly A. Bianchi[1], Vanessa Lopez[1], Carl A. Kaplan[2], David L. Vines[1]; [1]Cardiopulmonary Sciences, Rush University Medical Center, Chicago, IL; [2]Pulmonary and Critical Care Medicine, Rush University Medical Center, Chicago, IL

Background: Aerosolized epoprostenol may be used as a substitute for inhaled nitric oxide (iNO) in the management of patients with severe hypoxemia and pulmonary arterial hypertension. The objective of this study was to determine differences in drug deposition related to nebulizer positioning at the humidifier inlet (dry side), the humidifier outlet (wet side), between the endotracheal tube (ETT) and patient wye, and within the inspiratory limb of the circuit using a vibrating mesh nebulizer. **Methods:** A lung model was designed using an 8.0 endotracheal tube (ETT) connected to a training test lung (TTL) (Michigan Instruments, Grand Rapids, Michigan) set at a compliance of 30 mL/cm H_2O with a collecting filter (Carefusion, San Diego, CA) placed at the ETT-test lung junction. A PB840 (Covidien, Mansfield, MA), heated wire circuit (Carefusion, San Diego, CA), and pass-over humidifier (Fisher & Paykel, New Zealand) were utilized. A syringe pump (ALARIS Medical Systems, San Diego, CA) was used to continuously instill a 15,000 ng/mL epoprostenol solution at 30, 50, and 70 ng/kg/min into the nebulizer (Aeroneb® Solo, Aerogen, Galway, Ireland). Tidal volumes (V_T) were set at 4, 6, and 8 mL/kg for a 70 kg patient with respiratory rates of 25, 16, and 12 breaths/min, respectively, to maintain minute volume (V_E) at 100 mL/kg/min. Epoprostenol was eluted from the filters with 10 mL of sterile water. Samples (n=180) were analyzed under ultraviolet-visible spectrophotometry at 205 nm. **Results:** Mean epoprostenol deposition increased significantly ($p < 0.001$) as the dosage was increased from 30 ng/kg/min (4539 ± 2497 ng) to 50 ng/kg/min (8276 ± 5593 ng) and 70 ng/kg/min (11067 ± 5922 ng). With changes in ventilator settings, a significant difference ($p = 0.021$) in drug deposition was observed between V_T of 280 (6828 ± 4834 ng) and 560 mL (9556 ± 6587 ng). The other V_T comparisons were not significantly different. Although no significant difference in deposition exists between the humidifier inlet (11814 ± 4417 ng) and outlet (11778 ± 5925 ng), these positions resulted in significantly ($p < 0.009$) higher mean epoprostenol deposition compared to the inspiratory limb (2781 ± 1561 ng) and between the ETT and wye (5471 ± 2378 ng). See Figure 1. **Conclusion:** Increasing the delivered dose resulted in an increase in mean epoprostenol deposition as expected. The greatest amount of mean epoprostenol deposition resulted with the nebulizer placed at the humidifier inlet or outlet.

Sponsored Research - None

2303242

NEBULIZER LOCATION AND AIR TRAPPING EFFECTS ON AEROSOL DELIVERY DURING AIRWAY PRESSURE RELEASE VENTILATION (APRV) IN ADULT LUNG MODEL.

Muhanad Bensaleem, Meagan Dubosky, Allison Anderson, David L. Vines, James Fink; Rush University, Chicago, IL

BACKGROUND: Optimal positioning of aerosol delivery devices during mechanical ventilation is dependent on multiple factors including mode of ventilation. The aim of this study is to determine the effect of aerosol device positioning and air trapping on albuterol deposition while using APRV. **METHODS**: An adult lung model was ventilated through an 8.0 endotracheal tube (ETT) and collecting filter to a passive test lung (TTL; Michigan Instruments,) with compliance of 30 mL/cm H_2O. A Dräger Evita® XL (Draeger Medical Inc., Telford, PA) set to APRV. T_{high} was set on 4.6 and 4.7 sec and T_{low} were set on 0.35 and 0.25 sec, resulting in air trapping of approximately 50% and 75% of peak expiratory flow rate (PEFR) respectively. P_{high} and $_{Plow}$ were set at 28 and 0 cm H_2O cm at 50% of PERF and 28 and 7 cm H_2O cm at 75% of PERF. Ventilation was monitored (Novametrix,). Albuterol sulfate (2.5 mg/3mL) was administered with a vibrating mesh nebulizer (Solo, Aerogen Ltd.,) placed at dry inlet of humidifier, between Y-piece and inspiratory limb, and between Y-piece and ETT. Drug was eluted from the filter using 0.01% NaOH and analyzed via spectrophotometry (276 nm) Each experiment repeated (n=10) One way analysis of variance and mean drug deposition related to air trapping were compared with independent t-test to determine if significant differences ($p < 0.05$). **RESULTS**: Table shows albuterol delivered distal to ETT (mean ± SD) albuterol. Drug delivery was higher at 75% of PEFR vs 50% of PEFR ($p = 0.02$) with no difference between nebulizer poitions during APRV. **CONCLUSION**: When using a mesh nebulizer to deliver albuterol during APRV, mean drug deposition was higher with air trapping at 75% PEFR compared to 50% PEFR. Drug delivery may be similar with all three positions during APRV.

Sponsored Research - None

MEAN ALBUTEROL DEPOSITION (μg ± SD).

Nebulizer Location	50% PEFR	75% PERF
Heater Dry-side	284.3 ± 31.2	303.3 ± 22.2
Inspiratory limb	262.4 ± 65.2	303.2 ± 58.6
ETT & Wye	210.9 ± 40	274.7 ± 124

2303263

WHICH HME BYPASS DEVICE RESULTS IN THE HIGHEST EMITTED DOSE OF AEROSOL TO THE ARTIFICIAL AIRWAY?

Tim Op't Holt, Mohammed Hazazi; University of South Alabama, Mobile, AL

Background: Aerosolized medication delivered directly to the airways is important in the management of respiratory disease during mechanical ventilation. The heat and moisture exchange humidifier (HME) is an efficient humidifier. If an aerosol is delivered while an HME is in place, the aerosol will be trapped by the HME and not be delivered to the patient. HME bypass devices (HME-AD) that allow aerosol delivery to bypass the HME during an aerosol treatment are available. This experiment sought to evaluate which commercially available HME-AD (Gibeck HME-AD and the Airlife HME-AD in the bypass position) results in greater aerosol deposition on a filter in-vitro, compared to a nebulizer with heated humidifier on, or nebulizer with the heated humidifier turned-off. **Method:** A ventilator with an adult circuit was connected to an adult test lung (TTL). The ventilator settings were: mode VC-CMV, V_T 500mL, RR 18/min, flow 50 L/min, PEEP 5cmH_2O. Nebulizer flow from the ventilator was 7 L/min during inspiration and 3 mL of saline was placed in the nebulizer, positioned 15 cm proximal to the wye. The HME-ADs were connected between the circuit wye and a collecting filter which was connected to the test lung. Aerosol deposition through the HME-ADs was compared to aerosol deposition with no HME-AD in the circuit in two configurations: nebulizer with heated humidifier on, and nebulizer with the heated humidifier turned-off. The weight of aerosol deposited on the filter was determined as the weight of the filter after the nebulizer run minus the weight of the filter before the nebulizer run, using an analytical balance. Each configuration was tested four times. Each run lasted until sputter, approximately 7 minutes. Aerosol deposition on the filters among the four configurations was compared using ANOVA and Tukey's HSD, α=.05. **Results:** There was a significant difference in emitted dose among the four configurations (p=.02). The nebulizer alone produced the highest emitted dose to the collecting filter with a mean weight change of 0.1767± 0.02g. The second highest emitted dose resulted from Airlife bypass HME (0.135 ± 0.001g), then by nebulizer with humidifier (0.1211 ± 0.01g). The Gibeck HME-AD allowed the least emitted dose (0.0638 ± 0.0638g). **Conclusion:** The nebulizer alone provided the highest emitted dose among the four configurations, but between the two bypass devices, the Airlife HME-AD provided a higher emitted dose.

Disclosures: none

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2303263

WHICH HME BYPASS DEVICE RESULTS IN THE HIGHEST EMITTED DOSE OF AEROSOL TO THE ARTIFICIAL AIRWAY?

Tim Op't Holt, Mohammed Hazazi; University of South Alabama, Mobile, AL

Background: Aerosolized medication delivered directly to the airways is important in the management of respiratory disease during mechanical ventilation. The heat and moisture exchange humidifier (HME) is an efficient humidifier. If an aerosol is delivered while an HME is in place, the aerosol will be trapped by the HME and not be delivered to the patient. HME bypass devices (HME-AD) that allow aerosol delivery to bypass the HME during an aerosol treatment are available. This experiment sought to evaluate which commercially available HME-AD (Gibeck HME-AD and the Airlife HME-AD in the bypass position) results in greater aerosol deposition on a filter in-vitro, compared to a nebulizer with heated humidifier on, or nebulizer with the heated humidifier turned-off. **Method:** A ventilator with an adult circuit was connected to an adult test lung (TTL). The ventilator settings were: mode VC-CMV, V_T 500mL, RR 18/min, flow 50 L/min, PEEP 5cmH_2O. Nebulizer flow from the ventilator was 7 L/min during inspiration and 3 mL of saline was placed in the nebulizer, positioned 15 cm proximal to the wye. The HME-ADs were connected between the circuit wye and a collecting filter which was connected to the test lung. Aerosol deposition through the HME-ADs was compared to aerosol deposition with no HME-AD in the circuit in two configurations: nebulizer with heated humidifier on, and nebulizer with the heated humidifier turned-off. The weight of aerosol deposited on the filter was determined as the weight of the filter after the nebulizer run minus the weight of the filter before the nebulizer run, using an analytical balance. Each configuration was tested four times. Each run lasted until sputter, approximately 7 minutes. Aerosol deposition on the filters among the four configurations was compared using ANOVA and Tukey's HSD, α=.05. **Results:** There was a significant difference in emitted dose among the four configurations (p=.02). The nebulizer alone produced the highest emitted dose to the collecting filter with a mean weight change of 0.1767$\pm$ 0.02g. The second highest emitted dose resulted from Airlife bypass HME (0.135 $\pm$ 0.001g), then by nebulizer with humidifier (0.1211 $\pm$ 0.01g). The Gibeck HME-AD allowed the least emitted dose (0.0638 $\pm$ 0.0638g). **Conclusion:** The nebulizer alone provided the highest emitted dose among the four configurations, but between the two bypass devices, the Airlife HME-AD provided a higher emitted dose. **Disclosures:** none

Sponsored Research - None

2245742

RECOVERY UNIT CULTURE TRANSFORMATION IMPROVED OUTCOMES IN CARDIOTHORACIC SURGERY PATIENTS.

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Background: Spectrum Health Fred and Lena Meijer Heart Center, performs the highest volume of isolated coronary artery bypass grafting (CABG) procedures in the state of Michigan. In an effort to decrease prolonged mechanical ventilation (defined as greater than 24 hours) for CABG patients when compared to Society of Thoracic Surgeons (STS) benchmark, we developed a multidisciplinary team to review our protocols and standardize our approach to all patients treated in our Cardiovascular Recovery Unit (CVRU). **Method:** We took a stepwise approach implementing small, discipline specific changes over the past 29 months in order to create standardization of workflow and routine surveillance. Changes include increased frequency of post-operative rounding by respiratory therapists (RT) to every 30 minutes, modification of the Rapid Extubation Protocol, standardization of analgesic practices by cardiac anesthesiologists, and aggressive weaning of anesthetic and improved analgesia through narcotic titration by the bedside registered nurse (RN). Cardiac anesthesiologists have increased rounding in the CVRU and implemented earlier post-operative pulmonary critical care consults. We developed tracking forms which are maintained by the RN and RT while the patient is in the CVRU. The team has met routinely to review how these changes have impacted patient care through data analysis from our tracking forms. Multidisciplinary collaboration has been crucial in promoting the culture change for working with patients in the CVRU. **Results:** From October 2012 through February 2015 we have demonstrated a decrease in prolonged mechanical ventilation from 10% of isolated CABG Cases to 4.6%; and a decrease in median ventilation times from 6.21 hours to 3.85 hours. These changes have positioned us as noted leader in the nation as well as the state with sustainable rates of prolonged mechanical ventilation and median ventilation times for isolated CABG patients lower that the STS benchmark. **Conclusion:** Through transformation of the care model in the CVRU and creation of standard work for all disciplines we have reduced prolonged mechanical ventilation and improved our time to extubation, creating a proactive model for addressing patient safety needs and improving quality of care.

Sponsored Research - None

2263438

MEASURING FUNCTIONAL RESIDUAL CAPACITY DURING AIRWAY PRESSURE RELEASE VENTILATION IN TRAUMA PATIENTS.

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BACKGROUND: Airway Pressure Release Ventilation (APRV) is an open-lung ventilation strategy utilizing continuous positive airway pressure (CPAP) to improve alveolar ventilation, and theoretically, increase functional residual capacity (FRC). FRC is the resting lung volume at end-expiration available for gas exchange and has been suggested as a method to guide ventilator management. Prior to recent technologic advances, FRC has been difficult to measure at the bedside, thus preventing routine measurements. The aim of this study was to observe the effect of APRV ventilation on FRC. We hypothesized that transitioning to APRV would increase FRC towards predicted values, resulting in improved oxygenation (PaO_2/FiO_2). **METHODS:** A prospective observational study of trauma patients was performed at an ACS verified level 1 trauma center from June 2014 – November 2014. Patients ≥ 18 years old who were intubated for longer than 2 days and were transitioned to APRV were included in this study. FRC measurements were done with an automated nitrogen washout/washin method without disconnection from the ventilator. Changes in ventilator management were not influenced by FRC values. Data collected included patient demographics, FRC (pre-and post APRV), PaO_2/FiO_2, mean airway pressure (P_{AW}), plateau pressure (P_{Plat}), dynamic compliance (C_{Dyn}), and expired tidal volume (Vt_{Exp}). Additionally, FRC measurements were compared to the predicted supine FRC values. Statistical analysis was performed using paired t-tests and significance was attributed to a p-value < 0.05. **RESULTS:** During the study period, 39 patients met inclusion criteria, but 24 were excluded due to the inability to obtain FRC measurements. In the remaining 15 patients, FRC increased by 28% (p=0.049) following the change to APRV, restoring FRC values to 92% of predicted. Increases in P_{AW}, P_{Plat}, and PaO_2/FiO_2 were also observed. **CONCLUSION:** Patients receiving APRV experienced a significant increase in functional residual capacity and PaO_2/FiO_2. This improvement in oxygenation may have been due to the restoration of FRC. Because technical constraints no longer limit FRC measurements at the bedside, further investigation is needed to determine the use of routine FRC measurements to guide ventilator management.

Sponsored Research - None

Comparison of pulmonary mechanics before and after transition to APRV

	Pre-APRV	Post-APRV	P value
FRC (L)	1.8 ± 0.6	2.3 ± 0.8	0.049
P_{AW} (cmH_2O)	12.1 ± 2.7	23.3 ± 1.9	<0.001
P_{Plat} (cmH_2O)	18.6 ± 3.2	24.6 ± 3.5	0.025
PaO_2/FiO_2 (mmHg)	240.3 ± 56.7	272.7 ± 86.5	0.044
C_{Dyn} (mL/cmH_2O)	35.3 ± 8.1	39.9 ± 20.2	0.40
Vt_{Exp} (mL/kg)	7.7 ± 1.0	7.6 ± 1.7	0.76

2277006

PROVIDER PRESENCE AT TERMINAL EXTUBATION.

Kenneth Miller, Daniel Ray, Craig Durie, Cheryl Heffner, Elke Rockwell, Hope Kincaid; Respiratory Care, Lehigh Valley Health Network, Bath, PA

The majority of deaths in ICU (intensive care units) involve withdrawal of aggressive interventions, including mechanical ventilation, referred to as terminal extubation (TE). TE can be a difficult experience for patients, families and clinicians, with a high risk of patient physical distress. The presence of a provider at the bedside can be reassuring and allow for rapid assessment and intervention of symptoms. The literature reports sporadic provider presence at TE and differing perceptions as to the importance. Using survey methodology, the goal was to identify clinical providers' experience, attitudes, and knowledge related to TE. To account for institutional processes and uniqueness of respondent groups, modifications were made to an existing survey.[1] Three distinct respondent groups were identified: respiratory therapists (RRT's), critical care nurses, and ICU physicians and advance practice clinicians (providers). The survey assesses perceptions of the need for provider presence at TE, sufficiency of order sets and desirability of a TE protocol, as well as clinicians' level of education and experience, attitudes surrounding patient and family discussions. It was distributed to 125 RRT's, 549 critical care nurses and 269 providers during a 4 month time period. The return rate was 38.4% RRT's, 31.1% nurses and 11.9% providers (Table 1). Few of the respondents received formal education on the TE process, and the majority felt it important to educate clinicians on end of life procedures and patient care during and following TE. Additionally, the need for a protocol or standardized order sets for the procedure was identified by all respondent groups. Prior to the survey period, it was documented that a provider was present at the time of TE in 27% of patients, yet the perception that a provider was present varied among respondent groups. At the same time, the majority of respondents felt the patient's provider should be present. When asked if RRT's should be included in the interdisciplinary family meeting, only 87.5%RRT's felt they should be present while 88.2% of nurses and 71.9% of providers felt it important. A work group has been convened with representatives from the three respondent groups to focus on the development of a standardized protocol and an education component on care at TE. 1. David C. Willms and Jodette A. Brewer. *Survey of respiratory therapists' attitudes and concerns regarding terminal extubation.* Respir. Care, 2005, 50(8):1046-49 .

Sponsored Research - None

SURVEY RESULTS

	RRT n=59	RN n=171	Provider n=32
Providers throught to be present at TE	10%	25%	50%
Received prior education on TE process	27.1%	18.2%	9.4%
Presence of provider should be required at TE	65%	64.9%	59.4%
Enhanced education on the TE process	90%	90%	90%

2277780

THE UTILIZATION OF A NON-INVASIVE VENTILATOR TO COMPENSATE FOR CHEST TUBE LEAK DURING EXTRACORPOREAL MEMBRANE OXYGENATION.

Kenneth Miller, Kimberely Smith, Dave Marth, Dorothea Waston, Rita Pechulis, Susan Carven; Respiratory Care, Lehigh Valley Health Network, Bath, PA

Maintaining lung inflation via mechanical ventilation during Extracorporeal Membrane Oxygenation (ECMO) is an integral part of clinical management. The goal of ECMO is to minimize ventilator induced injury, however despite minimizing airway pressures lung trauma can occur. If lung trauma progresses to large chest tube leak ventilatory strategies can be limited. A fifty year old male was admitted with cavitating Pneumonia with refractory hypoxemia. Despite aggressive conventional ventilatory management gas exchange failed to be optimized resulting in the need for V-V ECMO cannulation. Despite the utilization of lung protective ventilation the patient developed pneumothoraces of the right lung resulting in several chest tubes needing to be placed. Gas exchange and secretion removal remained problematic and required additional clinical interventions. Prolonged paralytic administration, daily bronchscopies, and placement on High Frequency Percussive Ventilation were required to maintained stable gas exchange despite maximizing ECMO parameters. Attempts to remove paralytic administration and transition from HFPV resulted in gas exchange deterioration and increase in chest tube air leak. On ventilator day 38 attempts were made to place back on conventional ventilation to reduce the administration of the paralytic. The transition to conventional ventilation failed to provide ventilation secondary to the large chest tube leak, which caused ventilator malfunction. Leak compensation via conventional ventilation failed secondary to chest tube leaks greater than 25 liters. The decision was to trial a non-invasive ventilator with leak compensation to maintain ventilation and minimize chest tube leak induced by conventional ventilation. Decision was made to use the V-60 (Respronics) to maintain lung inflation, reduce paralytic administration and minimize chest tube leak. The Chest tube leak was reduced from 25 liters to approximately 3-5 liters with no deterioration in gas exchange. (Table 1) Additional benefit was that the patient was able to generate triggered spontaneous breaths for the first time since being ventilated. Unfortunately, the patient succumbed on ventilator day sixty seven. In the presence of a large chest tube leak conventional ventilators may fail to ventilated adequately or triggering patient spontaneous efforts. In this case scenario the V-60 allowed for stable ventilation in the presence of a large chest tube leak.

Sponsored Research - None

Table 1

	Chest Tube Leak	ABG	%Spontanoues Breaths	ECMO Parameters
Conventional Ventilator	>25 liters	7.42-41-66	0%	100%/ 8 lpm
V-60	3-5 liters	7.41-40-69	50%	100%/ 7 lpm

2288220

USING A QUALITY IMPROVEMENT PROCESS AND INNOVATION TO ENHANCE OUTCOMES FOR CHILDREN REQUIRING CHRONIC VENTILATION.

Joyce Baker, Jodi Thrasher; The Children's Hospital of Colorado, Aurora, CO

Background: Pediatric patients with chronic respiratory failure (CRF) have increased medical costs, length of stay (LOS), and readmission rates. The primary focus of population health management is to assess and manage patient needs across the continuum of care. Our interdisciplinary Ventilator Care Program (VCP) was established to provide quality inpatient-to-outpatient care for children with CRF. Starting the end of 2012 the VCP participated in a quality improvement project to focus on reducing LOC, cost, and readmissions. During the initial assessment the following was identified: inconsistencies in family education, unclear roles of the interdisciplinary care team, and variation of patient care plans. **Method:** A process map was utilized to plot out every patient/caregiver contact point with the VCP and the plan-do-study-act (PDSA) cycle was utilized to assist in assessing the steps where change was implemented. The team partnered with quality improvement, clinical application services, the high-fidelity simulation laboratory, clinical informatics, and marketing for optimization of the program. The electronic medical record was leveraged to create a discharge readiness report for tracking the progress of family education and required steps for discharge. The report helped to streamline care coordinator during weekly VCP rounds. A "road map" was created to guide patient caregivers on the progress for discharge. Educational handouts and educational videos were modified to have emphasis on outcome-based education. A tracheostomy-based CPR class was provided to primary caregivers and innovative high-fidelity simulation scenarios were used to assess the educational design and prepare caregivers for emergencies in the home setting. **Results:** Patient admissions for tracheostomy and initiation of home ventilation were analyzed before and after the changes in processes. Mean LOS decreased from 250 days (n-18) to 144 days (n=12), p=0.003. Time from ICU transfer to discharge decreased from 111 days to 63 days, p=0.006. This resulted in a significant cost reduction to the hospital. **Conclusion:** In this evolving health care landscape, there is a stronger emphasis on decreasing cost, improving outcomes and patient experience. Through our quality improvement process and innovative efforts we have identified high potential to decrease costs while improving patient outcomes.

Sponsored Research - None

2288398

LIBERAL MANIPULATION OF VENTILATOR SETTINGS AND ITS IMPACT ON TRACHEOSTOMY RATE AND VENTILATOR-FREE DAYS.

Lela Broughton, Lori Killian, Ariel Modrykamien; Baylor University Medical Center, Dallas, TX

Introduction: The utilization of checklists, bundles and protocols attempts to provide standardization in the delivery of patient care. Despite important progress obtained in the prevention of hospital-acquired infections, the daily management of mechanical ventilation is still prone to heterogeneity, depending on the number of providers manipulating the ventilator. Whether the number of changes made on ventilator parameters impact on clinical outcomes remains unknown. **Methods:** A quality improvement (QI) project was designed to assess whether liberal manipulations of ventilator settings affect the rate of tracheostomy and 28-day ventilator- free days. Over the course of 7 days, respiratory therapists recorded all ventilator changes in newly ventilated patients. Ventilator changes were considered as major changes, if manipulations included changes in the mode of ventilation. Minor changes included manipulations of settings within the same mode of ventilation. We evaluated whether the number of total and major changes affected clinical outcomes. Logistic regression was used for multivariate analysis. **Results:** One-hundred and seventeen ventilator manipulations were recorded among 54 patients. Out of those 117 ventilator changes, 35% were major manipulations. For every major ventilator manipulation, the odds of requiring tracheostomy increase 4.95 times. Furthermore, for every major ventilator change, there is an 18.6% decrease in 28-day ventilator-free days. These associations were found after adjustments by APACHE 2 score, BMI, and type of ICU. Total number of changes was not associated with either primary outcome measure. **Conclusion:** The number of major ventilator manipulations is associated with rate of tracheostomy and length of stay on the ventilator.

Sponsored Research - None

2289058

VENTILATOR SETTINGS ASSOCIATED WITH TRIGGERING VENTILATOR ASSOCIATED EVENTS.

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BACKGROUND: In 2013 the Centers for Disease Control and Prevention implemented the construct of ventilator associated event (VAE) as a surveillance quality metric to replace ventilator associated pneumonia (VAP). The first tier of VAE is a ventilator associated condition (VAC), defined as 2 days of stable PEEP and FiO2 followed by a sustained increase in PEEP by ≥3 cm H2O or FiO2 of ≥0.20 for 2 days. Although suggested to be caused by new onset of ARDS, pneumonia, atelectasis and pulmonary edema, little is reported about the details of the PEEP/FiO2 settings that trigger VAE. METHODS: We conducted a chart review of all 224 patients identified as developing VAE by our infection prevention group during 2013. The goal was to determine the ventilator settings that triggered the VAC in each of our 7 adult ICUs. We collected the lowest PEEP and FiO2 for the 2 days prior to the VAC, day of and 2 days after the VAC. If PEEP was the trigger, the reason for increasing PEEP was determined. The project was approved as a QA/QI project by our IRB. RESULTS: The setting most responsible for triggering a VAC was PEEP in 88.7% of all cases (range 82-95% for the various ICUs), FiO2 in 3.6% (1-17%) and both in 7.7% (0-11%). The reason for PEEP increase was poor oxygenation in 71% (40-84%), atelectasis in 5.6% (0-12%), combination of oxygenation/atelectasis in 6.6% (1-10%), MD request in 7.5% (4-20%), auto-PEEP in 2.8 % (0-20%), and unknown in 2.8% (0-20%). Mean FiO2 pre-VAC was 0.46 (ICU range of 0.37-0.50); post-VAC was 0.49 (0.43-0.53). Mean PEEP pre-VAC was 5.7 cm H2O (ICU range of 4.2-6.5); post-VAC was 9.8 (7.3-10.8). Pre vs post-VAC FiO2 reduced by >0.10 in 5% of the cases, by 0.05 in 10%, no change in 38%, and increased by 0.5 in 9.4%, by 0.10 in 15% and >0.10 in 17%. Pre vs post-VAC PEEP was reduced in <1% of cases, no change in 4%, increase by 3 cm H2O in 43%, by 4 in 6%, by 5 in 34%, and by >5 in 12%. CONCLUSIONS: An increase in PEEP, generally by 3-5 cm H2O, triggered >90% of VACs, a rate higher than Boyer (58%) but similar to Klouwenberg (94%). As expected low oxygenation or atelectasis was the major reason for increasing PEEP but certain ICUs had an important incidence of 'per physician decision'. We plan to examine our management strategies to determine whether we might be reducing PEEP too quickly and/or keeping it elevated longer than necessary.

Sponsored Research - None

2294370

WORK OF BREATHING USING NIOV IN A LOW COMPLIANCE HIGH MINUTE VENTILATION LUNG MODEL.

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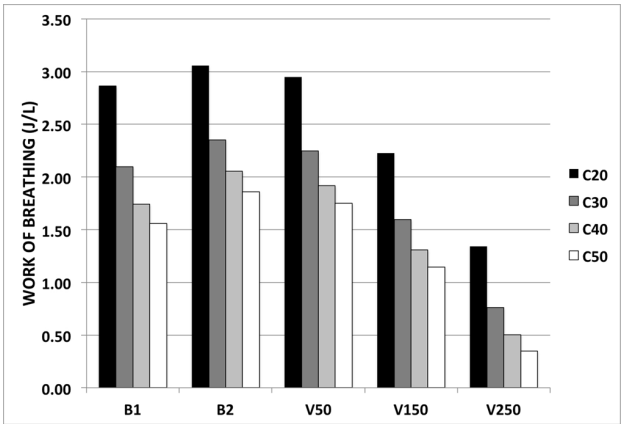
Background: The Non-Invasive Open Ventilation system (NIOV, Breathe Technologies) is a ventilation assist device that utilizes a nasal pillow interface. We measured work of breathing (WOB) changes during breathing simulation in a low compliance high minute ventilation lung model using the NIOV system. **Method:** The ASL 5000 breathing simulator was attached to model noses and set to a frequency of 30/min with the constant tidal volume closed loop control of Pmus, set point Vt 500 mL, rise time 20%, inspiratory hold 0%, release time 20%, resistance 10 cm H2O/L/sec, and compliance settings 20, 30, 40, and 50 mL/cm H2O (C20, C30, C40, C50). The NIOV device was set to an inspiratory time of 30%, trigger sensitivity 3, and low, medium, and high volume settings of 50, 150, and 250 mL (V50, V150, V250). ASL 5000 measurements were used to calculate total patient WOB in Joules/Liter (J/L) at each test condition. Baseline WOB measurements without NIOV were recorded with a nose model alone (B1) and with a nose model with the NIOV nasal pillows permanently attached (B2). All measurements were recorded during each test condition after the ASL 5000 closed loop control of Pmus stabilized at the set point Vt of 500 mL. **Results:** Patient WOB increases with the application of the NIOV nasal pillow interface (B2-B1) by an average of 0.26 J/L (range 0.19 - 0.31 J/L). NIOV settings of V50, V150 and V250 decreased WOB from baseline B2 by an average of 5% (range 4 - 7%), 33% (range 28 -38%), and 70% (range 56 -81%). The average peak inspiratory pressure (cmH2O) with NIOV was 0.2 (range 0.0 – 0.7), 5.5 (range 4.7 – 6.5), and 13.3 (range 13.0 – 14.1) at the V50, V150, and V250 settings respectively. **Conclusion:** These results suggest that NIOV may be useful as a ventilation assist device to reduce WOB in patients with low lung compliance and high minute ventilation requirements.

Sponsored Research - NIOV device used for the study was provided by Breathe Technologies



2299420

HIDDEN AMBIGUITY IN PEEP/FIO2 TABLES.

Sherry Babic, Robert L. Chatburn; Respiratory Institute, Cleveland Clinic, Cleveland, OH

As a result of the ARDSnet trials, many clinicians use one of the ARDSnet PEEP/FiO_2 tables for the ventilator management of ARDS patients. The PEEP/FiO_2 tables from the ARDSnet study initially suggested that oxygen concentrations should only be adjusted in increments of 10%. However, it appears there may be several alternative methods of interpreting the same PEEP/ FiO_2 tables when adjusting FiO_2 in increments less than 10%. The purpose of this study was to evaluate the ability of respiratory therapists to interpret the ARDSnet PEEP/ FiO_2 table using FiO_2 increments of 10% or 1%. **METHODS** An anonymous electronic survey was created (and approved by the IRB) with questions consisting of two groups of PEEP and FiO_2 combinations and the task was to determine if the combination was allowable according to the ARDSnet low PEEP-FiO_2 table. An undisclosed number of surveys were sent to respiratory therapists through the AARC Connect and the Ohio Society for Respiratory Care. Group A questions tested the ability of respondents to identify allowable combinations as only those appearing on the table. Group B questions tested whether respondents consider interpolated values of FiO_2 (increments of 0.01) and PEEP (increments of 1 cm H2O) to be allowable. **RESULTS** We received 152 completed surveys. The mean (SD) score for group A was 98% (9%). The scores for group B showed that 94% of respondents considered values of FiO_2 and PEEP, adjusted in increments smaller than indicated on the table, to be allowable. **CONCLUSIONS** The vast majority of respondents were capable of accurately interpreting the original ARDSnet low PEEP-FiO_2 table. Of interest, most respondents also recognize alternative interpretations of the table and that may allow for more precise control of oxygenation. These alternative interpretations must be considered when designing any metric of quality in terms of table adherence.

Sponsored Research - None

2299436

OPTIMUM VENTILATION FOR PASSIVE PATIENTS WITH ARDS – A SIMULATION STUDY.

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For ARDS patients, neuromuscular blockade has improved outcomes [Critical Care 2013,17:R43]. Ventilation of passive patients allows alternative ventilator management schemes aimed at lung protection without major concerns for asynchrony. The purpose of this study was to simulate a ARDS with a mechanical model and compare the potential lung protective value of two different strategies: volume control with ARDSnet protocol, VC-AP, [N Engl J Med. 20004;342(18):1301-8], and pressure control with minimum tidal volume, PC-MTV. We hypothesized that these strategies lead to different values for tidal volume and lung strain. **METHODS** A passive patient was modeled (ALS 5000 lung simulator ImgMar Medical) using published parameters for an ARDS patient: weight = 60 kg, R = 11 cm H_2O/L/s, C = 29 mL/cm H_2O, V_D/V_T = 0.6. Targets: minute alveolar ventilation (MV_A) = 4 L/min, total PEEP = 9 cm H_2O. Ventilator settings for VC-AP (using volume control continuous mandatory ventilation) were taken from published studies. For PC-MTV (using pressure control continuous mandatory ventilation), the minimum V_T was determined by increasing the frequency and adjusting set PEEP and inspiratory pressure to maintain the targets until the set PEEP reached 0 or no further tidal volume reduction was observed. End expiratory volumes and tidal volumes (V_{EE}, V_T) corrected to BTPS were averaged over 10 breaths from waveforms recorded by the simulator. Strain = V_T/V_{EE}. Mean values for V_T and strain were compared with t-tests ($P < 0.05$ considered significant). **RESULTS** Summary data are shown in the figure below. PC with minimum V_T yielded the lowest tidal volume (5 mL/kg vs 7 mL/kg) and strain ($P < 0.001$) at a frequency of 80 breaths/min. **CONCLUSION** This model study confirms that a strategy of minimizing tidal volume offers an alternative strategy for lung protection in paralyzed patients. Furthermore, it appears that the minimum tidal volume with a conventional ventilator in this patient model (eg, V_D/V_T = 0.6) is 5 mL/kg. **DISCLOSURES** Chatburn consults for IngMar.

Sponsored Research - None

	VC-CMV	PC-CMV	Change	P
f (b/min)	29	80		
V_T (mL)	415	324	-22%	< 0.001
V_T (mL/kg)	7	5		
I:E	1:4.18	1:1		
MV (L/min)	12	26		
MV_A (L/min)	4.2	4.3		
IPset	NA	24		
Pmean	14	13		
Pplt	22	19		
set PEEP	9	0		
total PEEP	9	8		
V_{EE} (mL)	299	268		
Strain	1.4	1.2	-14%	< 0.001

2300321

TIDAL VOLUME ADJUSTMENTS TO THE IMPACT EAGLE 754 VENTILATOR UNDER HYPERBARIC CONDITIONS.

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Background**:** Modern ventilators are designed with pneumotachs, transducers, pressure sensitive controllers that require precise performance characteristics and may be affected by deviations from normal atmospheric pressures. In hyperbaric medicine, the Impact Eagle 754 ventilator is widely used to ventilate patients between 1-3 ATA of pressure (but up to 6 ATA). After preliminary measures indicated that the Eagle 754 was affected by hyperbaric conditions, we measured tidal volumes as pressure was increased from 1 to 2.8 atmospheres (0-60 fsw - feet salt water). Method**:** A circuit was assembled that included the Eagle 754 and 3 volume measuring methods: TTL Michigan test lung, Ohio 5420 volume monitor and a Wright repirometer. Ventilator settings were initiated and maintained constant throughout the study at VT = 1000 ml, I:E of 1:2, frequency of 8/min, F_IO_2 = 1.0, PEEP = 0 cmH_2O and Assist Control mode. The ventilator and respirometers were placed in a Fink TL20-171 Multiplace Hyperbaric Chamber. During descent, tidal volume data were collected from each volume measuring device at surface pressure, 10 fsw, 20 fsw, 30 fsw, 40 fsw, 50 fsw, 60 fsw. Results**:** The tidal volume setting was maintained on the Eagle 754 at 1000 ml, yet delivered tidal volume decreased progressively during the descent to 60 fsw. The TTL test lung, a volume displacement spirometer considered the gold standard, produced tidal volume changes from +5% to -19%. The Wright respirometer, a rotating vane spirometer, varied from the set VT by +9% to -14%. The Ohmeda respirometer employing a turbine vane transducer had the greatest deviation from TTL measured volumes - from 0% to -13.9% during descent. Conclusions**:** The Eagle 754 ventilator is a dependable portable ventilator used in hyperbaric chambers. However, tidal volume delivery decreases during pressurization from surface to standard therapeutic hyperbaric pressures (60 fsw). Typical dives are 90 minutes in duration, therefore, tidal volume adjustments are required to maintain surface minute ventilation. We recommend increasing set tidal volume by 15% prior to diving to maintain the approximate minute ventilation of normobaric pressures when diving to 60 fsw (2.8atm). Deeper dives would require greater adjustments Tidal volume shoud be returned to baseline setting just prior to ascent to normobaric status.The Wright respirometer is preferred for tracking the fidelity of tidal ventilation delivery. Disclosures**:** No disclosures

Sponsored Research - None

2300342

EXTRACORPOREAL MEMBRANE OXYGENATION FOR ACUTE RESPIRATORY FAILURE: A SINGAPORE EXPERIENCE.

Ivan G. Lee[1], Anthony Yii[1], Qiao Li Tan[1], Duu Wen Sewa[1], Chong Hee Lim[2], Su Ying Low[1]; [1]Respiratory and Critical Care Medicine, Singapore General Hospital, Singapore, Singapore; [2]Cardiothoracic Surgery, National Heart Centre Singapore, Singapore, Singapore

Background: Extracorporeal membrane oxygenation (ECMO) can be used as salvage therapy when conventional treatments for respiratory failure are unsuccessful. We aimed to characterize patient demographics, clinical parameters, and outcomes of patients with severe acute respiratory distress syndrome (ARDS) requiring mechanical ventilation coupled with ECMO support in the Medical Intensive Care Unit (MICU) of Singapore General Hospital, a tertiary care university-affiliated teaching hospital. **Methods**: Single-center, retrospective case records review of all adult patients with severe ARDS requiring ECMO support from 2008 to 2013 inclusive. **Results**: A total of 41 patients received ECMO support, of whom 36 were on veno-venous ECMO and the remaining 5 on veno-arterial ECMO. Mean age was 40 (SD, 14.9) years, PaO2/FiO2 of 57 (SD, 12) mmHg, and 23(56%) were males. All patients presented with severe community acquired pneumonia as the cause of respiratory failure, of which 28 (68.2%) were of viral etiology. The median duration on ECMO support was 7 (4-11) days. Overall survival to hospital discharge was 63.4%. PaO2/FiO2 ratios, arterial pH and PaCO2 did not differ significantly between survivors and non-survivors. Complications observed included pneumothorax, hemorrhage, hemolysis, cardiac tamponade and thrombosis, but complication rates did not differ significantly between survivors and non-survivors (P=0.57). Patients with ARDS due to viral etiology had a better outcome compared to bacterial etiology **(P=0.024)**. The development of shock while on ECMO support was associated with mortality **(P=<0.001)**. **Conclusions**: Our study demonstrates that ECMO support for patients with severe ARDS who have failed conventional therapies in Singapore General Hospital has an overall hospital mortality of 36.6%, comparable to that reported by the Extracorporeal Life Support (ELS) Registry (hospital mortality 44%) and other regions (ICU mortality 29%). Bacterial etiology and the development of shock whilst on ECMO portend a poor outcome.

Sponsored Research - None

2300706

A CASE STUDY: A NOVEL APPROACH USING FLEXIBLE BRONCHOSCOPY TO DEFINE OPTIMAL PEEP IN A COPD PATIENT WITH DYNAMIC AIRWAY COLLAPSE.

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Introduction: This case study describes the use of flexible bronchoscopy as a tool in confirming optimal PEEP in a COPD patient with dynamic airway collapse. Benefits of optimal PEEP may include: Abortion of dynamic airway collapse, elimination of auto-PEEP, and improved pulmonary mechanics. The implications of low tidal volume strategy will also be discussed. **Case Summary:** A 60-year old male with COPD exacerbation was admitted to ICU and intubated for respiratory insufficiency. Initial vent settings PCV 26/PEEP10/RR14. VT 477, RR 21, VE 10, TPEEP 22, Ph 7.13, CO_2 77. Patient was noted to have prolonged exhalations, accessory muscle use, labored breathing, and wheezing unresponsive to bronchodilator. Patient was placed on a Cisatracurium drip in an attempt to decrease auto-PEEP. Patient continued to have TPEEP 22. PEEP was increased in increments of two until a decrease in VT and improved flow-volume loops were observed. Optimal PEEP was estimated to be 18cmH_2O. When PEEP was adjusted from 10cmH_2O to 18cmH_2O the VT increased from 477ml to 900ml, RR 14, VE 12.6. Due to an increase in VT and VE, driving pressure was decreased to 22. Patient was later transitioned to PRVC 400/RR20/PEEP12. Cst 27.33, VE 9.6, PIP 33, MAP 16, Ph 7.38, CO_2 63, TPEEP 24. Vent settings changed to PRVC 550/RR12/PEEP18. VE 8.4, PIP 30, MAP 21, Ph 7.39, CO_2 59. After changes, Cst increased to 62.77 and improved flow-volume loops were observed. Patient was prepared for flexible bronchoscopy. During procedure, PEEP was decreased to 5cmH_2O. A significant amount of dynamic airway collapse was observed despite positive pressure ventilation. Dynamic airway collapse improved when PEEP was increased to 10cmH_2O and 14cmH_2O consecutively. When PEEP was increased to 18cmH_2O, complete abortion of dynamic airway collapse was visualized. Discussion: Patients with COPD exacerbation have varying degrees of dynamic airway collapse. In this Case, PCV mode, flow-volume loops, and TPEEP were used to estimate optimal PEEP. Flexible Bronchoscopy was used to confirm optimal PEEP by visually observing abortion of dynamic airway collapse. As a result, the patient was ventilated at a lower driving pressure, a lower VE, and improved Cst. In the PRVC mode the patient was changed from low tidal volume strategy and ventilated at a higher VT, MAP, and PEEP, with a lower PIP, VE, and RR. Indicating that low tidal volume strategy may not provide optimal ventilation in COPD patients with dynamic airway collapse.

Sponsored Research - None

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ITEM # SW0028

AARC Uniform Reporting Manual for Respiratory Care, 5th Edition

This updated edition can analyze productivity, track trends in the utilization of services, establish FTE requirements, and measure demand and intensity of services. This URM provides current standards for clinical activities and includes: Echo/Non-invasive Cardiology Labs; Blood Gas Labs; Pulmonary Diagnostic Labs; Sleep Disorders Labs; Hyperbaric Medicine; and Pulmonary Rehabilitation Services. Worksheets are included for each productivity system. Copyright 2012 AARC.

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2nd Edition

ITEM # SW0027

Orientation and Competency Assurance Documentation Manual for Respiratory Care

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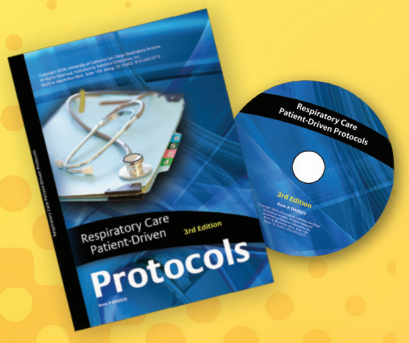

ITEM # SW0025

Respiratory Care Patient-Driven Protocols, 3rd Edition

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MEMBER PRICE	**$ 90.00**
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2228148

A LEAN SIX SIGMA HANDOFF PROCESS BETWEEN OPERATING ROOM AND PEDIATRIC INTENSIVE CARE UNIT: IMPROVEMENT IN SAFETY, EFFICIENCY AND EFFECTIVENESS.

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Background: This Six Sigma project was initiated to improve the transfer of care of patients from the OR to the PICU. Medical errors, especially miscommunication, are responsible for increased health care spending. Here, surgical patients with scheduled admissions to the PICU are first recovered in the PACU. With this process, unstructured handoffs occur in parallel between providers, which leads to communication errors, content variability, and inefficiency. **Method:** A multidisciplinary Q.I. project was initiated including ICU, anesthesia and surgical representatives. Via a series of PDSA cycles, the current process via value stream mapping was evaluated and a new process of direct transfer of the patient to the ICU was initiated. A single, structured, bedside report between all care providers was introduced, including a standardized handoff tool. We used process times, wait times and information content as process measures and handoff errors as outcome measures. A 10-point satisfaction score was also measured. **Results:** With the new transfer process, the wait time decreased by 58 minutes, process time decreased by 9 minutes, and lead time decreased by 66.5 minutes. The handoff error rate decreased by 1.3 errors/patient and first time quality rate increased by 67%. Staff satisfaction improved from 48% to 73%. By elimination of the PACU care, the costs involved in admission to the PACU were deferred. **Conclusions:** A single, multidisciplinary bedside handoff process between the OR and ICU leads to cost and time savings. By elimination of non-value added processes, there were fewer errors, improved quality, and staff satisfaction. **Disclosures:** None

Sponsored Research - None

Table 1.

Category	Standard OR-PACU-PICU	Direct OR-PICU	Change
Wait Time	90 mins	32 mins	Improved (-58 mins)
Process Time	25.5 mins	16.5 mins	Improved (-9 mins)
Lead Time	115.5 mins	49 mins	Improved (-66.5 mins)
Value Added Ratio	22%	31%	Improved (+9%)
Error Rate	1.6 errors/patient	0.3 errors/patient	Improved (-1.3 errors)
First Time Quality	0%	67%	Improved (+67%)
Staff Satisfaction	48%	73%	Improved (+25%)

2268587

OUTCOMES OF A PRE/POST- IMPLEMENTATION OF A CORPORATE RESPIRATORY CARE SERVICE (RCS) LINE EDUCATION TASK FORCE - 22 HOSPITALS INCLUDED.

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Background: Intermountain Healthcare (IM) owns & operates 22 acute care hospitals across the intermountain west. During a 2013 Corporate Demographic Survey, gaps in the existence of corporate Respiratory Care Services (RCS) policies, procedures & guidelines (PPGs) with associated education references were identified. **Method:** An RCS Education Task Force was created/lead by an RCS Educator. Content Experts (CE), Content Approvers (CA), RCS QA/Compliance Manager & the RCS Executive Director with support from Corporate Education (CEd) & Document Management Services. Policies were defined as regulatory-based, procedures were defined as regulatory based to support policies & guidelines. Categories included General RCS, Arterial Blood Gas (ABG) based on the College of American Pathology standards & Pulmonary Function Testing (PFT) based on American Thoracic Society standards. Evidenced based standards, literature & current practice were used to develop documents. CE's reviewed the documents. Literature reviews were completed by the document developers, CEs & current RT students. Reference bibliographies were created. CAs were comprised of system RCS directors/managers. An electronic system was used which encouraged participation with rapid turnaround of content. After creation & uploading into the electronic system, documents proceeded for review from CEs, CAs, CEd (format review) to QA/Compliance Manager review & finally to RCS Executive Director for final approval. At each review participants were able to make suggestions for change or revision based on evidence. Once finally approved, documents are housed in the document management database & linked from the RCS webpage in order to be readily accessible. **Results:** Baseline 2013 survey results and 2014 end of year PPGs with system educational resources (Skills Pass-offs/Instructor Reference) are reported in Table One. Additional outcomes include the creation of a corporate RCS new employee orientation resource. **Conclusion:** Corporate RCS education initiatives & the time required to complete these were submitted in an RCS Status Report during quarter one of 2015. The submitted status report included a proposal to add a corporate RCS Educator. Future considerations include additional resources in the form of guidelines, education support documents, a standardized orientation & residency program. A validation survey to verify education completion for PPGs implemented across the system is planned for 2015.

Sponsored Research - None

Table One: 2013 & 2014 Pre- & Post-RCS Corporate Education Task Force

Year	Policies # (%)	Procedures # (%)	Guidelines # (%)	Skill Pass-Offs/Instructor References # (%)
2013	1(1)	19 (11)	0	0
2014	3 (2)	26 (16) - ABG 17 (10) - PFT 43 (26) total	15 (9)	43 (26)

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2286196

VOLUME EXPANSION PROTOCOL WITH INTENTION TO REDUCE RESPIRATORY COMPLICATIONS IN TRAUMA PATIENTS.

Bethany A. Nyland, Meghan W. Halub, Julie A. Jackson, Keith D. Lamb, Trevor W. Oetting, Sheryl M. Sahr, Sarah K. Spilman; UnityPoint Health, Des Moines, IA

Background: Little evidence exists in the literature on prophylactic respiratory therapy to prevent adverse respiratory outcomes, particularly in the trauma literature. This study assessed the effectiveness of a volume expansion protocol (VEP) in adult trauma patients. The ultimate goal was early identification of patients at risk for pulmonary complications, administration of appropriate respiratory therapies, and prevention of deterioration requiring a transfer to the ICU. **Methods:** Patients admitted to a general inpatient floor at a Level 1 trauma center received a respiratory therapy consult. If patients met criteria, they received prophylactic respiratory treatments at the discretion of the respiratory therapy service, primarily MetaNeb® therapy, vest therapy, or EzPAP. Primary outcomes included hospital length of stay (LOS), floor LOS, ICU LOS, and unplanned admission to the ICU for respiratory reasons. The protocol group (n=139) was compared to a pre-protocol group (n=142) from the year prior to protocol initiation. Differences were assessed with ANOVA, and statistical tests were two-tailed based on 0.05 significance level. Approval of the study was granted by the hospital IRB. **Results:** In the protocol phase, VEP was ordered for 139 of 256 patients (62% compliance), and 101 (72.7%) patients were assessed and met criteria. Patients in the pre-protocol phase had significantly higher injury severity scores (ISS) than patients in the protocol phase (14 v 10, p=.005). After controlling for ISS, there were significant declines between the groups in hospital LOS (6 vs 5, p<.001), ICU days (1 vs 0, p<.001), and floor days (5 vs 4, p<.001). Additionally, there were fewer returns to the ICU for respiratory reasons (4.2% vs 3.6%, p=.005) and fewer medical emergency team (MET) calls (3.2% vs. 2.9%, p=0.002). Bronchodilator use decreased in the protocol group (22.5 vs. 13.7%, p<0.001). **Conclusions:** This study showed trends towards decreased hospital days, unplanned transfers to the ICU for respiratory reasons, medical emergency team (MET) calls, and use of bronchodilators in the trauma population. However, protocol compliance was low, with 38% of the eligible population failing to receive a VEP order. Phase 2 is currently underway to increase compliance and narrow inclusion criteria; preliminary results suggest effectiveness of the protocol in preventing unplanned admissions to the ICU for respiratory reasons. Full results will be available by the conference.

Sponsored Research - None

Table 1. Volume Expansion Protocol (VEP) Study: Outcome Variables in Pre-Protocol and Phase 1, Controlling for Injury Severity Score (Wilks' Lamba=12.04, p<.001)

	Pre-Protocol (n=142)	Phase 1 (n=139)	P-value
Hospital Days, median (IQR)	6 (4, 12)	5 (3, 7)	<.001
ICU Days, median (IQR)	1 (0, 3)	0 (0, 2)	<.001
Floor Days, median (IQR)	5 (3, 8)	4 (2, 6)	<.001
Discharged from ED to Floor, n (%)	55 (38.7%)	79 (56.8%)	<.001
Received bronchodilator during hospitalization, n (%)	32 (22.5%)	19 (13.7%)	<.001
Return to ICU (respiratory)	6 (4.2%)	5 (3.6%)	.005
MET call	5 (3.5%)	4 (2.9%)	.002

Volume Expansion Protocol (VEP) Study: Outcome Variables in Pre-Protocol and Phase 1, Controlling for Injury Severity Score (Wilks' Lamba=12.04, p<.001)

2299336

EFFECTS ON RESPIRATORY CARE DEPARTMENT'S PERCENTILE RANKING WHEN CONVERTING TO A DIFFERENT PROPRIETARY COMPANY'S BENCHMARKING SYSTEM.

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Introduction AHRQ comments on benchmarking: process to compare performance with external standards, motivating tool to engage in improvement, help one understand where performance falls compared to others. Some consulting groups have gone beyond this traditional benchmarking process using comparative data for productivity & staffing targets. **Methods** Comparison was made of 2 proprietary Benchmarking companies' percentile ranking of hospital. The benchmarking for "Company A" involved compare group hospitals entering statistics in a data base that multiplied the number of units by a RVU measure from 2007-2010. The benchmarking standard was "staff worked hours/time of procedures". The benchmarking for "B" involved hospitals entering staff worked hours/number of CPT coded procedures from 2010-2014. Both A & B determined the percentile ranking within their national database. During the entire time, Department's Worked Hours/Stat was a control & internal benchmark of productivity. **Results** -In A's data: Department started at 40%ile & improved to 10%ile (75% change) -In B's data: Department started at 100%ile & improved to 40%ile (60% change) -Improvement rate was gradual in A's program; was more significant in B's -While simultaneously in both programs: Department was in best quartile for A & worst for B -Department's internal control of worked hours/stat improved from 0.3-0.2 (33% change) **Discussion** Overall Department productivity improved slightly within the internal control while improving dramatically in both company's program. These improvements resulted from "adjustments" made by the Department. For A, measures were established to better collect input data for all procedures. For B, there were: Adjustments to the peer group, exclusions of worked hours for employees in special programs, & inclusion of additional procedures. Summary - There is a marked degree of difference within the two company's percentile ranking & dramatic rate of change for the Department within a short period of time suggesting a high degree of variability. **Conclusions** Study has identified: Need-QA Standards for comparative data provided by proprietary companies Need-Benchmarking programs should use external peer review process to assure validity & reliability of data Need-Department should assure profile matches favorably with peer group Concern-Should benchmarking data be used for productivity determination & staffing decisions **Disclosures** Authors have no conflicts of interest

Sponsored Research - None

2299809

INTERDISCIPLINARY FRONTLINE STAFF ENGAGEMENT IN QUALITY IMPROVEMENT.

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Background: Medical errors contribute to billions of dollars in health care expenses and attribute to over a hundred thousand deaths annually. Many of these medical errors are a result of preventable system or process failures. There is significant value in having front line staff engage in identifying operational barriers (OB). Over the past several years few studies have involved front line registered nurses (RN) and respiratory therapists (RT) in evaluating and identifying OBs. In many patient care units RNs and RTs work closely to care for patients, and there is value in looking at the perceptions around OBs from both disciplines to determine commonalities. **Methods:** Nurses within our institution participated in a national collaborative in 2012 with 14 other hospitals through the Improvement Science Research Network (ISRN), to report the type and frequency of OBs using the STAR-2 Pocket Card©. Front line RTs throughout our institution participated in a quality improvement initiative using an index card to self-report type, frequency, and time to address OBs. Information was tallied for each discipline and statistics were used to analyze and compare the self-reported OBs. **Results:** A total of 344 pocket cards were collected from 57 RNs. A total of 2,133 OBs were recorded across 3 medical/surgical units over a 20 day period. OBs occurred at a rate of 4.4 per hour, and on average of 6.2 barriers per shift. A total of 159 cards were collected from RTs over a 21 day period. Of those cards 34% percent were returned reporting of no OBs, 37.1% of the cards reported one OB, and 29% report 2-4 OBs per shift. The average time RTs spent overcoming one OB was 30.26 min. The combined mean time for all reported obstacles in the 3-week collection period was 5395 min (89.9 hours), which extrapolated over a year's time to a 0.83 full time employee. The OBs most frequently reported for both disciplines was related to equipment/supplies/technology (nursing 44.59%, respiratory 54.5%). **Conclusions:** Detecting barriers provides practice-based data about operations that can drive change. Each individual department can develop specific interventions to address the failures. Decreasing OBs equates to decreased money spent on preventable errors, improved quality and patient safety, improved efficiencies, and improved work environment. This work is ongoing and beneficial to frontline staff engaging in quality improvement affecting their everyday practice.

Sponsored Research- None

Sponsored Research - None

2300544

LUNG PARTNERS - PRIMARY RESPIRATORY CARE: STAFFING MODEL.

Russell A. Acevedo[1], Julia Wright[1], Frederick F. Easton[2], Gary LaPoint[2], Wendy Fascia[1], Jennifer Pedley[1]; [1]Respiratory Care, Crouse Hospital, Syracuse, NY; [2]Whitman School of Management, Syracuse University, Syracuse, NY

Background: In a primary care model, the Respiratory Therapist (RT) will likely have patients throughout the hospital. The standard deployment for RTs is via individual assignments, which makes attending their primary patients inefficient. Additionally, with our staffing levels, our late treatment rate was 23%. Our goal was to support the primary care model and minimize late and missed treatments. The staffing matrix protocol for the respiratory therapy department utilizes multiple factors that when deployed determines the number of full-time staff members required to meet existing treatment volume. **Method:** The Syracuse University Whitman School of Management performed time studies on our RTs and created computer simulations for different scheduling models to determine the most efficient way to deploy our RTs. Computer modeling determined that 5 additional FTE's were needed to deploy the team therapy delivery model. An additional 4.5 FTE's was added year end 2014 as a result of year end budget matrix outcome. The previous year's volume was used to estimate treatment load. **Results:** The best model has the RTs administering floor therapy as a team, moving from one unit to the next. Scheduled treatment times traditionally have been hospital-wide and treatments were scheduled in a small time window (e.g. all morning treatments scheduled at 0800 hrs). In this model the treatment times changed with each unit to match the RT Team workflow (e.g. 7 Memorial at 0730 hrs, 6 South at 0800 hrs, etc.). The RT Team will see all their patients as part of their routine workflow. The pre-intervention period (1-10/2014) was compared with the new schedule (11/2014-3/2015). Overall RT Medication Errors decreased from 1.60% to 0.97% ($p < 0.0001$). Late treatments decreased from 23.3% to 4.7% ($p < 0.0001$). From January – March, 2015 we experienced an increase in total volume from 32,349 to 51,800 from the same 3 months in 2014. As a result of implementing the team rounds model, when we experienced our recent volume surge we were able to maintain our improved medication error rate. **Conclusions:** Deploying RTs in a team model in combination with variable treatment times can reduce late treatments and support a primary RT model. The team rounds model had a larger impact on reducing medication error rate than increasing manpower hours. We believe this type of scheduling for RT departments in acute care is unique. **Disclosures:** Acevedo: Sonovion Advisory Panel

Sponsored Research - None

2301463

RESPIRATORY CARE STAFFING FOR THE FUTURE.

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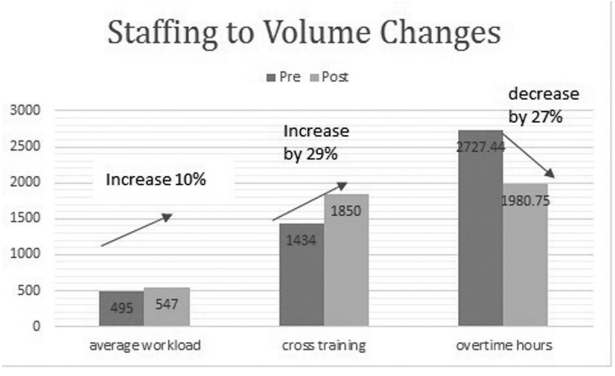
Background: With healthcare reform, hospitals are evaluating ways to cut overall budget without eliminating positions or effecting overall quality of care. Respiratory Care departments are forced to make changes to better meet the demands around healthcare reform. **Methods**: Senior Leadership requested to reduce overtime while maintaining appropriate staffing and excellent satisfaction scores. To fill this request, research began by looking at other evidence based productivity models like the AARC Uniform Reporting Manual and how other departments within the healthcare system developed their staffing models. After looking more closely at our Premier, Inc operations advisor report, the current staffing tool was analyzed to see where improvements in staffing and budget could be made. Staffing tool was revised to get a better idea of what the productivity looked like at the beginning of each shift. It was important to gain a clear picture of what time treatments were due instead of just frequency of treatments. It was also important to create a fair assignment for all therapist by understanding what each therapist workload was for the entire shift. Collaboration occurred with the Directors from Central Division of Respiratory Care at Carolinas HealthCare System, to see if we could work together on a future staffing plan. Realizing that all three departments had different needs, we came up with a cross training plan to better help day to day staffing, from inpatient to outpatient services. **Results**: After educating all the charge therapists with the new staffing tool, we began to see a better correlation in our staffing to volume trend from Premier, Inc report. Daily conversation were initiated between the three departments for any staffing needs or issues to help make better decision of overall staffing. With the help of the Directors, we created a plan to rollout cross training for all interested staff members across Central Division. **Conclusions**: Using an evidence based productivity tool can help departments meet budget of decreasing overtime and maintain a consistent staffing to volume trend. With the changes that were made, we observed a decrease in overtime by 27%, increase in cross training/orientation by 29% with an increase workload by 10%. Our staffing to volume correlation went from 0.29 to 0.90 over the same time frame.

Sponsored Research - None



2301693

RETROSPECTIVE ANALYSIS OF SVN ADMINISTRATION USING THERAPIST-DRIVEN PROTOCOLS.

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Background: Currently, there is limited data around the adoption rates of therapist-driven protocols related to SVN usage. Given the recent advancements in EMR capabilities at CRH, we are now able to pull data to evaluate the number of svn's delivered on patients with protocol orders. Objective: To evaluate the current adoption rates among the different units within the hospital and identify opportunities for improvement. **Method:** From the EMR we pulled any patient that had received an SVN during their stay. Every admission for 2014 was reviewed. Subsequently, for all of those patients receiving SVN's data was pulled to see how many of those patients had received the order for 'RT Protocol'. **Results:** The hospital units were grouped into the following categories; Cardiac Stepdown, Med Surg, ED, Critical Care, Inpatient Rehab, and Other. Data was then analyzed two different ways; percentage adoption by unit and each unit was then tested for statistical significance when looking at the overall adoption rate in the facility. A 2-proportions test was used to analyze for statistical significance. Detailed outcomes are reported in Table One. **Conclusion:** The adoption rate of the 'RT Protocol' for patients receiving svn's was statistically significantly higher when compared against the hospital as a whole. The reasons for the embrace of the protocol are likely tied to the hospitalist program that is in place in the med surg areas and the cardiology group that sees most of the patients in the cardiac stepdown unit. The ED has been slow to embrace the protocol format and this will be investigated, with a likely cause being the protocol adopted by the ED was a modified version of what has been implemented on the inpatient units. With the complexities of demonstrating a direct cost savings from having therapist-driven protocols in place, the adoption rate is important to be aware of and hopefully at some point a national benchmark will exist.

Sponsored Research - None

Table One

	Cardiac Stepdown	Med Surg	ED	Critical Care	Inpatient Rehab	Other	All
Yes (Protocol)	271	1343	135	154	56	4	1873
No(no Protocol)	43	150	421	57	18	78	767
Total	314	1503	456	211	74	82	2640
Percent	86.3%	90.0%	8.3%	72.9%	75.6%	4.8%	70.9%
Pvalue	0.000	0.000	0.000	0.581	0.436	0.000	

2302744

OUT OF OPERATING ROOM ADVANCED AIRWAY MANAGEMENT – WE CAN DO THIS!

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Introduction: VA Healthcare Directive 2012-032 states: "Urgent and emergent airway management is often required outside of an operating room. It is critical that appropriate individuals who respond to the airway management needs of the patient are trained and qualified to perform airway management. Competence in airway management must be demonstrated and cannot be assumed based solely on job title, which includes physicians". Comparative success rates of Out of Operating Room Airway Management (OOORAM) by EMS personnel have been studied and shown as safe and efficient, decreasing morbidity and improving outcome of critically ill patients, especially those with cardiac/respiratory arrest, multiple injuries, or severe head trauma [(1)]. Respiratory Therapists are readily available practitioners, already responsible for basic airway management, but also having advanced airway management skills within their scope of practice[(2-3).] This study reports ongoing data from a successful multi-center OOORAM training program[(4)]. **Method**: Retrospective review of ongoing Quality Improvement data. **Results**: Of 191 documented emergent intubations since inception of our OOORAM training program, 114 (60%) have been performed by a Respiratory Therapist. There is a 95% success rate overall, with 93% of those being performed on the first pass. The remaining 77 have been placed by MD's, with a 93% success rate overall, 94% of those were first pass (Fig 1). **Discussion**: This program utilizes the elements of didactic, high fidelity simulation, and Operating Room certification/recertification on an annual basis. The primary instructors are RT's. Our findings continue to show RT performance equal to MD's and significantly better than non-MD personnel. The program is now utilized to instruct non-Anesthesia MD staff. **Conclusions**: Properly trained RT's are more than capable leading OOORAM training and performing endotracheal intubation in even the most trying circumstances. Our data supports previously published findings. We feel that a successful OOORAM training program must include these elements to maintain the highest quality outcomes and success rates. [1] Pepe P et al. Ann Emerg Med. 1985 Nov;14(11):1085-92. [2] Noblett K et al. Respir Care. 1995 Oct;40(10):1063-7. [3] Zyla E et al. Respir Care 1994; 39: 30-33. [4] Graham, R et.al "Implementation of an Advanced Airway Management Training Program Within a Multi – Center Health Care System" (Poster/Abstract), December 2009, AARC/San Antonio.

Sponsored Research - None

2302930

2015 UTAH SOCIETY FOR RESPIRATORY CARE (USRC) MEMBERSHIP SURVEY—TWO YEARS IN REVIEW.

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Background: The 2015 membership survey is a follow up to compare knowledge, attitudes & feedback gained from the 2014 USRC Membership Survey and to determine if URSC Board of Director (BOD) actions to increase knowledge and participation were successful. **Method:** An 18 question survey was created using Survey Monkey® and was distributed to Respiratory Therapists (RT) via the AARC to current members. It was also sent to directors/managers specifically to reach ***non***-AARC/USRC members & was reviewed at the 2015 USRC annual conference. The Utah Division of Professional Licensing (DOPL), denied our request in 2014 to distribute the survey to all Utah licensed RTs; therefore, we did not request access this year. We are still unable to determine the number of RTs that received a survey invitation. Currently there are 1421 Licensed Respiratory Care Practitioners in Utah as compared to 1316 in 2014 with USRC memberships rates listed at 24.3% and 24.5% respectively. Demographic information was added this year. **Results:** We received 146 responses as compared to 95 in 2014 (54% increase). Of the respondents, 26 (19%) joined for the first time last year (students & practitioners) & 29 (22%) practitioners joined after a lapse in membership. When asked if the USRC has addressed community concerns, 82 (56.5%) agreed or strongly agreed. According to those surveyed, salary ranks as the number one concern. Refer to Table One for a comparison of the 2014 & 2015 survey results. **Conclusion:** Following the 2014 survey, the USRC BOD & committee chairs continued to visit hospital sites to discuss USRC Board legislative initiatives, the *AARC 2015 & Beyond* reports and to distribute fliers & posters regarding membership benefits. The site visits allow increased face-time with Board /committee members as well as opportunities for open discussions. It is our impression that the increase in surveys returned as well as the increase in desired participation in the USRC & its committees directly correlate with the increase in knowledge gained with the face-to-face visits, new USRC webpage, outreach to gain USRC Committee Chairs/Co-chairs, the implementation of a community education program (*Breathe-zy*) & information fliers that have been distributed. A new USRC plan includes a mission and core strategies with specific activities to engage new, existing & prospective members in moving the profession forward.

Sponsored Research - None

Table One: 2014 & 2015 USRC Membership Survey Results

Question	2014* # (%)	2015* # (%)
Are you a member of the AARC/USRC?	57 (60)	132 (91)
Were you aware your USRC membership is included in AARC dues?	60 (63)	122 (85)
Were you aware monthly USRC meetings were open to all?	47 (50)	109 (76)
Are you interested in attending the monthly USRC meetings? (Definitely or Probably would attend)	40 (42)	72 (50)
How interested would you be in joining a USRC committee? (regularly, occasionally, or somewhat interested)	46 (48)	76 (53)
Total # (%) surveys returned	95 (100)	146 (100)

*All Yes responses

2303003

SURVEY OF CURRENT PRACTICE PATTERNS FOR MECHANICAL VENTILATOR INITIATION AND MANAGEMENT IN THE EMERGENCY DEPARTMENT.

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Background The availability of respiratory care practitioners (RCP) in emergency departments (ED) is believed to be highly variable across the United States and may be attributed to resource allocation. Mechanical ventilation (MV) is often initiated in the emergency room setting. Not having RCPs available to assist places increased burden on ED staff to understand and troubleshoot mechanical ventilators. Utilizing the responses of RCPs from across the country, a cross-sectional sampling of common practices for MV management and personnel allocation was assessed. **Methods** Qualtrics ® survey software, a web- based survey was utilized to sample the responses of current practices in the management of mechanically ventilated patients in the emergency department (ED). The survey was created by the authors and was evaluated for accuracy and significance by practicing respiratory therapists and intensivist /emergency physicians. A pilot test of the survey was performed by 1-pulmonologist, 1-respiratory therapist, and 1- emergency physician. Descriptive statistics were used to describe respondents and results are presented as mean ± sd of value (%). **Results** There were 384 total respondents. 49.2% were respiratory care managers and 46.5% were clinical respiratory therapists. Years of experience were 26.8 ± 11.22 years. The educational background of respondents was 139 (36.5%) with an associates degree, 147 (38.6%) a bachelors degree, 90 (23.6%) a master's degree and 5 (1.3%) possessing a doctoral degree. Regarding hospital size, 16.56% of hospitals had between 200-300 beds. In terms of critical care beds, 18.60% of respondents worked in a hospital with 90 to 100 or more ICU beds. The average number of ED beds 37.89 ± 26.33. Two hundred and seven (68.54%) respondents reported their hospital had 24/7 availability of an intensivist. Fifty- six percent of the respondents reported their hospital provides 24 hr RCP staffing in the emergency department. The majority of respondents note that the average mechanically ventilated patient spends approximately 2-4 hours in the ED. **Conclusions** Initiation of mechanical ventilation is common in the emergency department. However, there is significant variability of RCP availability in the ED. This is a cross-sectional study and further studies are needed to compare whether an association exists between lack of RCP availability and outcomes in mechanically ventilated patients.

Sponsored Research - None

2303164

MULTIDISCIPLINARY TRACHEOSTOMY TEAMS – A SIMPLE SOLUTION TO AN AGE OLD PROBLEM!

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Background: Hospital care and disposition of the patient with a tracheostomy can be daunting; discharge home can be downright terrifying to the patient and family. Discharge is frequently delayed due to the complexity of orchestrating equipment, supplies, and training. Patients who lack sufficient caregivers or cannot provide for their own care often find themselves discharged to settings other than home, which increases both risk of harm and cost to the patient. Implementation of an interdisciplinary tracheostomy team has been shown to be a simple and cost-effective solution that can lead to improved patient outcomes and reduced health care costs [(1)]. **Method**: Ongoing retrospective comparative review of departmental database prior to and post implementation. Primary team members consist of Respiratory Therapists and Speech Language Pathologists. A physician champion is available as necessary. Patients are tracked through their stay on a white board, noting date placed, subsequent downsizes, days to decannulation, and days to discharge (Fig 1). The same successive time period for three consecutive years (the first year pre-trach team) is reviewed. **Results**: Percentage of decannulations prior to discharge increased by 4.3% after implementation ("n"=29/154). During the most recent review period, Decannulations increased by an additional 5.5 %("n"=65/225), which represents a total of 10% since team inception. Additionally, days to decannulation has decreased 16% from 37 to 31 days. **Discussion/Conclusions**: The statistical significance of these numbers is difficult to determine, but indicate improvement in care by currently accepted methods. The simple solution of tracking a specific group of patients on a white board and meeting as an interdisciplinary team has impacted quality and cost of patient care. A structured process of downsizing towards decannulation, speech/swallow assessment, and institution of best practices has profoundly affected quality of life for the population of patients served. Further study is indicated. Our data collection is ongoing, and we look forward presenting it at future meetings. [(1)]Cameron T et al, Crit Care Resusc 2009, Mar; 11 (1):14-19.

Sponsored Research - None

2303304

EVALUATION OF THE STAFFING PATTERNS OF RESPIRATORY THERAPISTS IN CRITICAL CARE UNITS OF CANADIAN TEACHING HOSPITALS.

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BACKGROUND: The optimal level of respiratory therapy (RT) care in Canadian ICUs has not been described in the literature. An examination of practice patterns is essential to develop an understanding of the contribution of Respiratory Therapists (RTs) to both short- and long-term patient outcomes in this context. The purpose of this study was to identify the ratio of mechanical ventilator to RT (Vent/RT ratio) in the ICUs of Canadian teaching hospitals and the factors that influence it. **METHODS:** This observational study investigated all adult ICUs (n=38) of the primary teaching hospital associated with each Canadian medical school. The electronic survey was repeated at three intervals over a period of three months to control for seasonal variation. Data was collected on the hours worked by all respiratory therapists, the number of mechanically ventilated patients, ICU characteristics, and the practice patterns of the RTs. Data was used to calculate the Vent/RT ratio, and repeated measures analysis of variance (ANOVA) examined for variation between findings of each of the data collection points. Correlation analyses between key variables was performed and identified associations were further explored by t-test. Approval for the study was granted by the University of Manitoba Research Ethics Board. **RESULTS:** A mean Vent/RT ratio of 5.1 (SD=2.818) was identified. Repeated measures ANOVA demonstrated no significant differences between findings of the three data collection points, F(1.7,30.5)=0.695, P=0.49. Several variables were associated with a significant difference in the Vent/RT ratio including ICUs where RTs insert arterial monitoring lines [4.05 (SD=2.89) vs. 6.97 (SD=2.85), t(17.6)=-2.64, p=0.02], Neurologic ICUs [4.04 (SD=2.76) vs. 6.40 (SD=3.35), t(30)=-2.09, p=0.04], and Coronary Care Units [5.72 (SD=2.80) vs. 3.10 (SD=1.88),t(35)=2.72, p=0.01]. Significant differences were also identified in the mean number of RT hours worked in ICUs where RTs intubated [31.40 (SD=9.71) vs. 60.54 (SD 47.20), t(13)=-2.17, p=0.04] and procured arterial blood gases [41.68 (SD=30.85) vs. 77.33 (SD=46.22), t(35)=-2.79, p=0.01]. **CONCULSIONS:** This study is the first to present the Vent/RT ratio and RT practice patterns in Canadian ICUs. The results will serve as a baseline for comparison of staffing norms and will enlighten future research on the impact of RT staffing and practice patterns on patient outcomes.
DISCLOSURES: The authors have no conflicts to disclose.
Sponsored Research - None

2303339

EFFECTS ON ABG RESPONSE AND THERAPIST ENGAGEMENT AFTER IMPLEMENTATION OF EVIDENCE-DRIVEN POLICIES.

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Over the last few years, literature has changed the way that ventilation has been used in neurologically injured patients, with more attention to maintaining tight control of pCO2. At the same time, it's fairly common for large hospitals to have respiratory departments where, due to frequent, random rotations, the therapists are not overly aware of unit-specific quirks and are simultaneously not fully engaged with the unit staff or decision-making processes. With our Neuro Critical Care Unit's recent increased emphasis on evidence-based medicine, a previously validated ventilator protocol was implemented and a core therapist team was formed in order to address those problems simultaneously from different angles. This study was intended to examine what effects, if any, the new policies resulted in. The data sets were gathered retrospectively during two randomly chosen 60 day periods prior to and then immediately after implementation of both policies. Patient records were examined if they were admitted into the unit and required mechanical ventilation during the periods of interest. As this was examining the effects of previously-approved policy changes, and therefore a retrospective quality study, approval from the Chief Medical Quality Officer was sought and received. Unequal variance t-tests were performed on the data after undergoing variance stabilizing transformations. The primary measure, time from out-of-range ABG to a ventilator change, showed immediate significant improvement $t(334)=1.97$, $p=0.02$, indicating greater engagement and parameter confidence from unit therapists. Secondary measures, hours with pCO2 and pH out-of-range, were not significant but appeared to be trending downward $t(117)=1.98$, $p=0.18$ and $t(129)=1.98$, $p=0.46$. Additionally, a one-sample t-test between percentages showed that the proportion of ventilator changes made by therapists increased significantly $t(623)=1.8$, $p=0.04$. Overall, the immediate direct effects of the new policies were significant and in the intended direction. As this is an ongoing project, it is expected that in the future even more measures will become significant once all therapists and staff members have become fully comfortable and familiar with the changes. This will have an increasingly positive impact on the quality of patient care as response times and decision-making skills continue to improve. The author has nothing to disclose.
Sponsored Research - None

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2254966

COMPARISON OF RESPIRATORY ACUITY SCORES IN NEONATAL PATIENTS AT THE INITIATION OF HIGH FREQUENCY OSCILLATORY VENTILATION AND/OR HIGH FREQUENCY JET VENTILATION.

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Background: High-frequency oscillatory ventilation (HFOV) and high-frequency jet ventilation (HFJV) are both methods of ventilation that have been used to prevent and treat neonates who have developed air leaks during mechanical ventilation. Limited data exists that examines respiratory acuity scores (RAS) at the initiation of HFOV or HFJV in children who present with and without air leaks. At our institution we utilize HFOV for early rescue therapy and HFJV for treatment for acute air leaks and respiratory failure. The purpose of this study is to evaluate the differences in initial RAS in neonates treated with HFOV and/or HFJV at our institution. **Methods:** Single center, IRB approved, retrospective chart review and radiology review of chest x-rays of infants who were admitted to the Neonatal Intensive Care Unit and received HFOV and/or HFJV between January 2011 through December 2013. RAS were determined by data collected on the Acute Care of at Risk Newborns (ACoRN) Respiratory Scores, Respiratory Severity Score (Mean Airway Pressure x FiO_2), and SpO_2/FiO_2 ratio at the initiation of HFOV and HFJV. Data analyses were performed using a paired t-test. A Pediatric Radiologist, who had no prior knowledge of initial radiographic interpretation, reviewed the chest radiography to determine if any air leaks were present. Infants were classified into three specific gestational age (GA) groups, < 30 weeks, 30 – 34 weeks, and > 34 weeks, based on ACoRN scoring criteria. **Results:** One hundred and fifty four infants were included in this study with 237 incidences of HFOV (n = 146) and/or HFJV (n = 91). There were no differences in the instances of air leaks when comparing HFOV and HFJV groups for GA < 30 weeks (p = 0.53), GA 30 – 34 weeks (p = 0.29), and GA > 34 weeks (p = 0.89). No statistical differences were seen in RAS with infiants when initiated on HFOV or HFJV who present with and without air leaks (Table 1). **Conclusions:** Though retrospective in nature, no differences was found when comparing RAS at the initiation of HFOV or HFJV in children who presented with and without air leaks at our institution. Both HFOV and HFJV are useful in treating air leaks, and may be beneficial in preventing lung injury, but physiological considerations of lung disease should be made when electing to use HFOV or HFJV. Further investigation may be useful in examining if changes in RAS during ventilation can serve as a clinical guide for the type of high frequency ventilation usage.

Sponsored Research - None

2262334

ARE WE GETTING IT RIGHT: BENEFITS OF IMPROVED PARTNERING OF RESPIRATORY THERAPIST AND REGISTERED NURSES FOR SKIN ASSESSMENTS IN THE NEONATAL INTENSIVE CARE UNITS.

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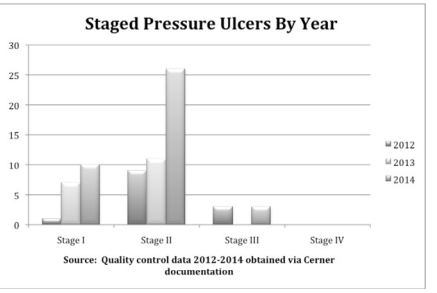
Introduction: Awareness and prevention of hospital acquired pressure ulcers (HAPUs) is now recognized as a hospital acquired condition and thus organizations have an increased focus for improvement. Our facility's NICU remains below the national benchmark for HAPUs; however, through data analysis we found that most respiratory related PUs were diagnosed at Stage II and greater. Nursing quality coaches were implemented in 2013 and RTs were added to the quality coach role in 2014 to aid in the identification and prevention of RT device related PUs in the ICUs. The coaches have an annual education session followed by mentoring with other quality coaches within their units. Once a month they perform head–to-toe skin assessment on all patients. As part of the initiative, every shift the bedside staff started performing RN/RT assessments as a team approach. A retrospective study was then performed to evaluate the difference in identifying PUs after these interventions. **Method:** We performed a retrospective data analysis to evaluate the impact of our new program on the early diagnosis and treatment of PUs. The data analysis was completed from January 2012 to December 2014 for all NICU patients with documented PUs related to non-invasive respiratory devices and equipment. The data was compiled and categorized by stage and location of PU. The 2012 - 2013 data served as control and 2014 was the intervention year. **Results:** Data showed very few stage I and II PUs for the control years of 2012 and 2013. In 2014 the total number of PUs diagnosed increased dramatically from 13 and 18 to 40. This was a 122% increase in documented PUs from the previous year. There was no change in stage III or IV PUs. It was found that Stage I PUs went from 1 and 7 up to 10 in 2014, which represents a 42% increase. Stage II PUs had the largest spike with 9 and 11 up to 26 in 2014. This was a 136% increase from baseline. **Discussion:** Being able to identify PUs that previously were thought to be "sore spots to keep an eye on" is invaluable. Having an increased awareness, proper education, improved team assessments, and implementing RT quality coaches was our rationale for seeing such an increase 2014. Data will continue to be monitored to evaluate the effectiveness of various disciplines partnering together to aid in early diagnosis and prevention. The goal is a reduced total number of PUs at our facility. Sponsored Research- None

Sponsored Research - None



2266793

SURVEY OF RESPIRATORY THERAPISTS ON MISPLACED METERED DOSE INHALERS.

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Background: Metered Dose Inhalers (MDIs) are a primary method of delivering inhaled medications. We discovered a large number of MDIs were removed from the medication Pyxis prior to depletion of the contents of the original MDI (defined as 90% of the contents utilized). This resulted in crediting the duplicate charge and a subsequent loss of revenue. A survey was developed and sent to Respiratory Therapists (RTs) for causes and possible solutions. **Methods:** This study was not deemed human subject testing by the UAMS IRB. Data were collected from 3/2014-12/2014 to determine the number of MDIs credited during this time period. Additionally, a 6 question survey was sent to RTs who directly administer MDI therapy to solicit their observations and potential solutions. The survey was available for 2 weeks after initial staff notification. The survey consisted of 2 yes/no/sometimes and 4 open ended questions. **Results:** A total of 51 duplicate MDI charges were credited during the review period out of 3,985 (1.3%) dispensed. This equated to an estimated annualized revenue loss of ~$25,000. The survey response rate was 41% (39/96). Several practices were discovered that may have resulted in lost MDIs. For example, 49% (19/39) stated that they pulled an MDI from the medication Pyxis and 84% of those (16/19) primed the MDI even if the scheduled treatment was not due for several hours. Most respondents (74% [29/39]) indicated that MDIs were lost either by not returning it to its appropriately designated location or lack of a consistent location for storage. Although patient transfer was thought to be one of the most common reasons for lost MDIs, only 24% (12/51) could be traced to this activity. Suggestions for process changes that could be trialed to decrease the number of lost MDIs included "lock boxes in patient rooms" (21% [7/33]), "standardized location of MDIs" (18% [6/33]), and "pull MDIs only when administering the medication" (12% [4/33]). **Conclusion:** Although the number of MDIs credited back to the patient was small, it still represented a significant loss of revenue. An additional consideration included the time spent by RTs trying to locate missing MDIs. Based on the survey results, a task force was formed to implement a small-scale test of change to purchase and utilize lock boxes in standardized locations in patient rooms. The cost of the lock boxes would be justified by savings realized in lost MDIs and RT time spent searching for lost MDIs.

Sponsored Research - None

2270661

CUFF PRESSURE AND TIDAL VOLUME STABILITY WITH CUFFED NEONATAL ENDOTRACHEAL TUBE.

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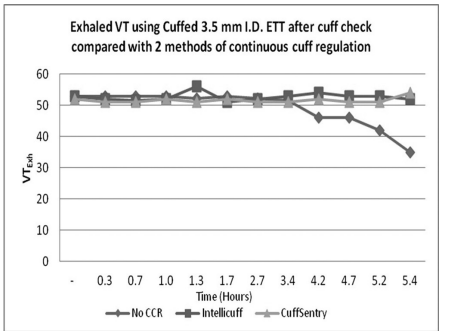
The past decade has seen an increase in the use of cuffed neonatal and pediatric ETTs. CP below 20 cmH_2O in neonates is a reasonable target to avoid tracheal damage, provide stable VT, and protect against micro-aspiration. We wanted to know the stability of CP and VT in a cuffed neonatal ETT after inflation to baseline and compare this to automated continuous CP regulation. **METHODS:** A section of 10 mm I.D. ribbed aerosol tubing representing an artificial trachea was intubated with a cuffed 3.5 mm I.D. ETT, (Smiths Medical ASD, Keene, NH). The ETT was connected to a Hamilton G5 ventilator, (Hamilton Medical, Reno, NV), using a Fisher & Paykel RT-235 patient circuit, (Fisher & Paykel Healthcare, Inc, Irvine, CA). The artificial trachea was attached to an ASL-5000 breathing simulator, (IngMar Medical, Ltd, Pittsburgh, PA), using a neonatal profile. CL = 2 ml/cmH2O; Raw = 15 cmH2O/L/sec. Ventilator settings: Pawp = 25 cmH_2O, PEEP = 4 cmH_2O, $Time_{Insp}$ = 0.4 seconds, RR = 30 BPM. Two 3-way stopcocks connected the inflation syringe and ETT pilot balloon to a certified TSI-4080 FA-Plus pressure analyzer, (TSI, Inc. Shoreview, MN). The cuff was inflated to baseline CP = 15 cm H_2O. The elapsed time (ET) until CP readings fell by 2 cm H_2O or VT decreased 5 mL below baseline was recorded. The test was repeated using continuous cuff regulation (CCR). CuffSentry (CS) flowrate = 100 mL/min, (OutcomeSolutions, Mocksville, NC), and Hamilton G5 Intellicuff were separately adjusted for CP = 15 cmH_2O. CP, VT, and the ET were recorded and compared to the 1st phase of this test. ANOVA and paired t-tests were performed ($p \leq 0.05$). **RESULTS:** Using a standard inflation practice CP decreased ≥ 2 cmH_2O below baseline within 1 hour and the ET before VT decreased ≥ 5 mL below baseline was approximately 4 hours. CP and VT using CCR did not decrease below baseline ($p > 0.05$) through 24-hours ET. Comparing standard inflation to CCR the MD (± SD) in CP with CuffSentry was 2.02 mL (± 2.6 mL), ($p < 0.05$) and Intellicuff 2.7 mL (± 2.4 mL), ($p < 0.05$). VT MD (± SD) with CuffSentry = 2.4 mL (± 6.4 mL), ($p < 0.05$); Intellicuff = 3.6 mL (± 6.0 mL), ($p < 0.05$). **DISCUSSION:** CP is variable, changing with positioning and passive deflation of the cuff. CP stability requires multiple interventions between routine cuff checks. CP and VT thresholds will likely be violated before scheduled routine checks. CCR may be a significant tool to prevent this problem.

Sponsored Research - None



2272776

IMPLEMENTATION OF A BETA-AGONIST/AIRWAY CLEARANCE PROTOCOL IN A PEDIATRIC INTENSIVE CARE UNIT - A SECOND REVIEW.

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Background: The Beta Agonist/Airway Clearance Protocol (BA/ACP) was implemented in our Pediatric Intensive Care Unit (PICU) in August 2013. Initial review of procedures showed a slight increase in treatment modalities with therapist driven BA/ACP (Oct-Dec 2013) compared to physician driven orders (Oct-Dec 2012).[1] A follow-up study was conducted for Jan-Mar 2014 (therapist driven BA/ACP) compared to Jan-Mar 2013 (physician driven orders) to review treatment modalities, acuities, and length of stay (LOS). **Methods:** This study was not deemed human subject testing by the UAMS IRB. Respiratory care charges for PICU subjects with acute respiratory failure (ICD-9 codes 518.81, 518.51, 518.84 and 518.53) were obtained for Jan-Mar 2013 and Jan-Mar 2014. There were 78 subjects in 2013 and 96 subjects in 2014 which met the inclusion criteria. Records were only reviewed if the entire PICU stay was inclusive of the Jan-Mar time periods. Data were analyzed using independent samples t-tests with significance set at $p<0.05$. **Results:** There were no significant differences in mean age (67.5m [2013] vs. 55.7m [2014], p=0.31); mean Daily Acuities (3.32 [2013] vs. 3.24 [2014]; p=0.18), or mean weighted Daily Acuities (4.00 [2013] vs. 3.70 [2014]; p=0.08). There was a 23.6% decrease in BA interventions (1984 [2013] vs. 1516 [2014]; p=0.016); and an 18.1% reduction in AC interventions (2908 [2013] vs. 2382 [2014]; p=0.012). A 22.2% decrease in ventilator days (639 [2013] vs. 497 [2014]; p=0.003) was also noted. There was a significant reduction in LOS (9.6 days [2013] vs. 7.2 days [2014]; P=0.01) during this time frame. PIM 2 scores showed no significant difference (-3.86 [2013] vs. -4.14 [2014]; p=0.18); however, PIM 2 Rate of Mortality, PRISM 3, and PRISM Probability of Death showed significant differences (6.74 [2013] vs. 2.52 [2014], p=0.035; 6.82 [2013] vs. 4.30 [2014], p=0.027; and 7.86 [2013] vs. 2.66 [2014]; p=0.45, respectively). **Conclusion:** This data suggests that the BA/ACP reduced the number of interventions (BA and AC), ventilator days, and LOS while subject acuities were comparable between the two time periods. However, PIM 2 and PRISM 3 scores showed that subjects were more acutely ill in 2013 and may confound the findings. While other factors may be responsible for the reduction in interventions, ventilator days, and LOS, the implementation of the BA/ACP must be entertained as a plausible explanation for the observed results.

Sponsored Research - None

2280050

IMPACT OF A PROTOCOL DRIVEN LIMITED STAY UNIT ON HOSPITAL LENGTH OF STAY FOR PEDIATRIC BRONCHIOLITIS PATIENTS.

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Background: Bronchiolitis is a common illness of the respiratory tract caused by an infection that most often affects children under the age of two.[1] Bronchiolitis is the leading cause of hospitalization for infants under one year of age. The national benchmark for the mean hospital length of stay (HLOS) for acute pediatric bronchiolitis (APB) is 3.3 days or 79.2 hours. [2] We hypothesize that APB patients who are managed on a protocol driven limited stay unit (LSU) will have a decreased HLOS when compared to standard pediatric MedSurg units and the national benchmark. **Method:** The LSU was designed to house patients for 8-72 hours. The unit has the capability to admit and discharge patients 24 hours and 7 days a week. A protocol was developed for APB patients (see Table 1 for details). Clinical staffing was maintained to provide optimal care: RN to patient ratio was 1:5, RT to patient was 1:12, one attending physician with 4-5 residents, and an APN. Patients with chronic medical conditions were excluded from the protocol and this study. IRB approval was obtained and data was collected for 114 days (from 11/9/2014-3/3/2015). **Results:** A total of 376 patients were treated and included in this study. Median patient age was 7 months. 66% of patients required high flow nasal cannula therapy (Vapotherm) with an average flow of 5.51 LPM and FiO2 of 30.86%. APB patients admitted to the LSU had a mean HLOS of 40.66 hours. APB patients admitted to the general MedSurg units during the same time frame had a mean HLOS of 57.4 hours (n=103). APB patients on the LSU had LOS reduced by 38.54 hours when compared to the national average. The rate of readmission within 30 days was statically insignificant. **Conclusion:** Protocol driven care of select uncomplicated acute bronchiolitis patients reduced HLOS without effect on readmission rate. Although widespread implementation has the potential for dramatic improvement in the above mentioned parameters, more studies assessing overall outcomes are needed. **References:** 1. www.kidshealth.org. Bronchiolitis. Reviewed by Mary L. Gavin, MD. Date reviewed: January 2014 2.Corneli, H. (2012). Bronchiolitis: Clinical Characteristics associated with Hospitalization and Length of Stay. *Pediatric Emergency Care, 28*(2), 99-103.

Sponsored Research - None

Bronchiolitic Protocol Contents:

Supplemental oxygen for saturations <90% or severe respiratory distress
IV placement and/or fluid for respiratory distress, dehydration, poor oral intake, vomiting or oral medication intolerance
Consider rapid Flu/RSV
Consider Hypertonic saline nebulizers q4
Albuterol q4 for patients with a h/o RAD or wheezing
Suctioning q4 WA, qHS and prn

2286345

A COMPARISON OF TEMPERATURE AND HUMIDITY DIFFERENCES AMONG NEONATAL VENTILATOR HEATING SYSTEMS.

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BACKGROUND: Gas conditioning minimizes complications associated with invasive ventilation of neonates. Poorly conditioned gas contributes to humidity deficit, facilitates condensate pooling in the ventilator circuit and contributes to safety events. The purpose of this research is to compare the ChonchaTherm Neptune and the Fisher and Paykel 850 heater systems to determine the effect the temperature drop across the unheated portion of a neonatal circuit has on temperature and the consequences of circuit condensate. We hypothesize that the ChonchaTherm Neptune heater would deliver a measured temperature closer to set temperature and less tidal volume (V_T) variation than the Fisher and Paykel 850 heater. **METHODS:** Dry weights for the ventilator circuits and filters were obtained, circuits were assembled according to manufacturer recommendations and a ventilator operational verification procedure performed prior to data collection. A neonatal test lung was connected to each Servo-I ventilator with the following settings; pressure control IMV mode, inspiratory pressure: 14 cm H_2O to achieve an exhaled V_T of 7.0 mL, PEEP: 5 cm H_2O, PS: 5 cm H_2O, F_IO_2 0.21, Set frequency 40/minute, and T_I: 0.4 seconds. The Fisher and Paykel 850 and ChonchaTherm Neptune heaters were set to deliver a temperature of 40 °C. To evaluate both systems under similar conditions, the ChonchaTherm Neptune heater humidity control was set to midline. The heaters were turned on simultaneously and given 1 hour to equilibrate. Hourly readings for room temperature, airway temperature at the patient wye, airways resistance, exhaled tidal volume, relative humidity (RH) and observation of circuit condensation and/or pooling were recorded for a 24 hour period. Data were entered into Excel for analysis. Airway temperature and V_T, were compared by ANOVA. T-test compared airways resistance and RH. Descriptive statistics reported water consumption and circuit weight change. Statistical significance was established at $p < 0.05$. **RESULTS:** Evaluation of outcome variables is found in the table below. **CONCLUSION:** Circuit condensate reduced tidal volume delivery and increased airway resistance for the Fisher and Paykel system. The temperature at the wye was significantly lower than the temperature monitored by the system, 12 inches distally, which can negatively impacts gas conditioning.

Sponsored Research - None

2292085

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

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BACKGROUND: A plethora of data is available supporting protocol use in adult acute care, but little information is available for pediatrics. The purpose of this study is to quantify the use of protocols, describe the implementation barriers experienced by children's hospitals and determine if a toolkit providing protocols, and resources directed at addressing barriers was used. **METHODS:** Two electronic surveys were distributed to respiratory care department directors from 40 children's hospitals participating in the Children's Hospital Association. Survey's were confidential and consent implied. The survey's contained 21 closed questions and one open-ended question gathering organizational and departmental demographic information, protocol prevalence, type(s) used and implementation barriers. Survey results were used to develop a toolkit addressing team building techniques, appraising evidence in the literature, data collection, outcomes reporting and create a protocol repository. Toolkits, information on use and how to access protocols were provided at two face to face meetings and a webinar. A post-survey was administered to evaluate resource use, and report its effect on protocol use. Data were entered into Excel for analysis. Chi square determined differences in pre-post response proportions. Descriptive statistics summarized ordinal data. Statistical significance was established at $p < 0.05$. **RESULTS: O**rganizational and departmental demographics are found in the Table. Most participants reported current protocol use (71%), and 78.6% had multiple protocols in place. Bronchodilator use (91.7%), ventilator and oxygen management (50%), and bronchial hygiene (25%) were most commonly implemented. Protocols were only routinely ordered by 42.9% of the medical staff, due to a perceived loss of control in the treatment provided to their patients and lack of awareness regarding the clinical and economic benefits of implementing protocols. Protocol use was supported by nursing, administration and respiratory care managers. Only 38.9% of participants accessed protocol resources posted on the Children's Hospital Association website. Less than one quarter (22.2%) attended the informational seminar detailing the resources available addressing protocol implementation and overcoming barriers for use. **CONCLUSIONS:** A variety of protocols are used in pediatric hospitals. Although a majority of hospitals reported protocol use, physician ordering practices limited their use.

Sponsored Research - None

2299188

REDUCING UNPLANNED EXTUBATIONS USING LEAN METHODOLOGY.

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BACKGROUND: Unplanned extubations can lead to iatrogenic injury and have the potential to contribute to serious safety events. We adopted lean methodology to reduce the unplanned extubation rate in a Level 3b NICU. We hypothesized that the use of rapid cycle strategy through a plan, do, study, act (PDSA) initiative would reduce the unplanned extubation rate. METHODS: Baseline unplanned extubation data were collected from November 1, 2012-June 6, 2014. A voice of the customer survey ascertained staff perceptions regarding unplanned extubation causes and impact on care. The anonymous and confidential survey contained 2 open ended and 4 closed ended questions and was distributed to a random sample of nurses and respiratory therapists (RT). A fishbone diagram was used to identify opportunities. Seven improvements were identified and rolled out in 2 phases over a 2 month period using didactic and kinesthetic techniques. The first phase standardized the process for turning intubated infants, assessing endotracheal tube (ETT) placement with growth, and direct caregiver communication regarding tube positon. Phase two addressed respiratory plans of care, use of an RT driven weaning protocol, correcting ETT migration, ETT re-securement methods, and standardizing head position during radiologic studies. Fisher Exact was used to determine differences in the number of unplanned extubations rate per 100 intubated days. Descriptive statistics were used to report survey results. Statistical significance was established at P <0.05. RESULTS: A 68% (17/25) survey response rate was realized and results shown in the table below. Baseline data revealed 3.8 unplanned extubations per 100 intubated days. 2.7 unplanned extubations per 100 intubated days occurred in the post improvement phase, p = 0.014. A statistically significant decrease in the number of intubated days between the pre and post groups, p < 0.000 was noted. CONCLUSIONS: Staff underestimated the prevalence of unplanned extubations, but recognized the need for improvement. Personal accountability enhanced engagement with the improvement process. Rapid cycle PDSA improved patient safety by significantly reducing the unplanned extubation rate in the NICU. The concomitant decrease in the number of intubated days may have be a byproduct of the post phase improvements which encouraged practice changes.

Sponsored Research - None

Table

Question	Yes (n)	No (n)	Sometimes (n)
Do you feel that unplanned extubations are happening to frequently?	6	10	0
Do you feel that some of the unplanned extubations could be prevented?	15	2	0
Do you feel personally responsible when an unplanned extubation occurs on your patient?	6	6	5
Do you feel responsible when an unplanned extubation occurs even when you have taken every measure possible to prevent it?	4	9	3

2299954

USE OF HFJV TO DECREASE OXYGEN INDEX (OI) AND INOTROPIC EQUIVALENT (IE) IN A TERM NEWBORN WITH SEVERE RESPIRATORY FAILURE SECONDARY TO PERSISTANT PULMONARY HYPERTENSION OF THE NEWBORN (PPHN).

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Introduction: Ventilation/Oxygenation can prove to be very challenging in patients with PPHN. The use of HFJV may be beneficial in decreasing oxygen indices by reducing mean airway pressure and adverse hemodynamic side effects. Case Summary: Neonate born at 40 5/7 weeks was intubated at two hours of age due to worsening respiratory distress, presumed meconium aspiration syndrome (MAS), and hypoxemia. Surfactant therapy was given. Initial CXR revealed streaky perihilar opacities, not consistent with MAS. Pre/post-ductal SpO2 were 95% and 82% suggesting significant PPHN. Several fluid boluses were administered and dopamine was initiated due to poor perfusion. The patient was placed on HFOV Hz 10, MAP 20, AMP 44, 100% FIO2, and 20ppm NO. ABG revealed 7.11/76/72/24/-5 and a calculated OI of 27. Dobutamine was added due to continued hypotension. The IE, an index of inotropic support required to maintain adequate cardiac output and BP, was 40. Throughout the next 4.5 hours the HFOV settings were escalated to Hz 6, MAP 26, AMP 54, 100% FIO2 and 20ppm NO. A corresponding ABG of 7.13/66/35/22/-7 and OI of 74 were reported. The IE reached 75 with the addition of epinephrine and milrinone drips. Transport was requested at 7 hours of age for consideration of ECMO. Central BP and HR were 45/34 and 212 respectively. Following transfer, the patient was placed on HFJV rate 420, PIP 38, PEEP 12, background rate of 10, PIP 22, 100% FIO2, and 20ppm NO. Resulting MAP was 17.1. HR and BP improved to 174 and 54/37 respectively. ABG revealed 7.17/58/54/21/-7 and a decrease in calculated OI to 31. Echocardiogram was performed and revealed a structurally normal heart with evidence of severe pulmonary hypertension, hyper dynamic cardiac function, PDA with bidirectional shunting, right ventricular enlargement and flattened interventricular septum. Dobutamine was discontinued decreasing the IE to 55. Over the next 20 hours, HFJV settings were weaned to a rate of 360, PIP 39, PEEP 11, background rate of 10, PIP 22, FIO2 45% and 20ppm NO. Resulting MAP was 16.8. Dopamine and milrinone drips were decreased and epinephrine was discontinued. This achieved a reduction in OI to 8 and IE to 25.5. ECMO was no longer indicated. Patient was transitioned to conventional ventilation at 36 hours of age and subsequently extubated on the 3rd day of life. Discussion: HFJV enabled the use of lower MAP while maintaining adequate ventilation/oxygenation and reducing adverse hemodynamic side effects.

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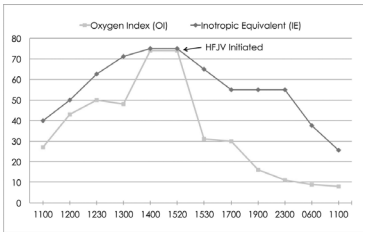

2300465

THE USE OF NIV-NAVA AS A TREATMENT STRATEGY FOR APNEA OF PREMATURITY.

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Introduction: Apnea of prematurity (AOP) is a common occurrence and significant concern in neonatal intensive care nurseries. Those children born at a preterm gestational age (<36 weeks) are at risk for apnea of prematurity and the associated symptoms make them difficult to manage clinically. Neurally Adjusted Ventilatory Assist (NAVA) is a new way to trigger a ventilator. Patients on NAVA ventilation trigger ventilator breaths through recognition of the electrical activity sent to the diaphragm (Edi) to begin inhalation. This Edi, measured by a specialty gastric catheter, sends a signal to the ventilator, and then simultaneously delivers synchronous ventilation to the patient. This technology uses the natural signal from the brain to the diaphragm to trigger the ventilator, not the effort or capacity of the patient to create flow or negative pressure. A study of this kind will identify if NIV-NAVA can deliver mechanical breaths to a patient with AOP using the neural impulse to the diaphragm along with back up ventilation. **Methods**:The identified problem's in the neonatal intensive care unit were treatment options and intubation rates in neonates diagnosed with apnea of prematurity. A NIV-NAVA treatment protocol was created, and recommended clinical guidelines were established by the NICU team. Approval was granted by the IRB at CHS. This study was a retrospective chart review for the historical control group and a prospective observation of the applied new technology. The method used for data collection is direct observance and physician ordered NIV-NAVA. The data will be collected and recorded from the patients electronic record. Patients were excluded if re-intubated for reasons other than AOP.**Results:** The key metric used was intubation rates.Historical data collected included 22 patients meeting criteria. 16 patients failed historical non-invasive treatment and were intubated and mechanically ventilated.Intubation rate of the historical control population was 73%.Of the 18 patients treated with NIV-NAVA 7 patients were intubated. Intubation rate of the NIV-NAVA group was 39%.The chi-squared test gives a p-value=.0313. **Conclusion:** NIV-NAVA is a promising new way to manage patients failing non-invasive treatment strategies for apnea of prematurity. This study proves to be clinically and statistically significant. The authors suggest further studies to determine required NAVA levels specific to patients needs.

Sponsored Research - None

2301473

A COMPARISON: INTRAPULMONARY PERCUSSIVE VENTILATION WITH A PEEP VALVE WITH CONVENTIONAL AIRWAY CLEARANCE MODALITIES FOR THE TREATMENT OF ATELECTASIS IN INTUBATED PEDIATRIC PATIENTS.

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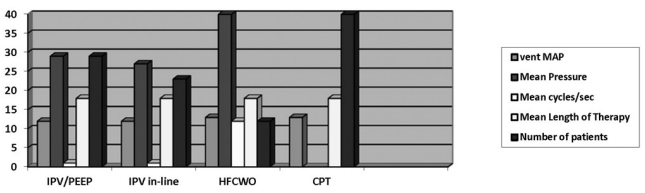
Background: Atelectasis is a common complication of intubated patients. A literature review was conducted using the following PICO question: In pediatric intubated patients in the Pediatric Intensive Care Unit (PICU) with atelectasis refractory to recruitment maneuvers does IPV with a PEEP valve (IPV/PEEP) versus standard airway clearance result in improvement in atelectasis, compliance, ventilator days, and patient comfort? The literature suggested IPV was the treatment of choice for atelectasis, regardless of cause. **Methods:** An IRB approved evidence-based project was conducted in the PICU utilizing a pre and post design. A convenience sample of 114 intubated patients with atelectasis (score 1-6) not responsive to recruitment maneuvers and a PEEP ≤10 torr had data collected over 10 month period in IPV with PEEP (IPV/PEEP), IPV in-line with a ventilator (IPV in-line), chest physiotherapy (CPT), or high frequency chest wall oscillation (HFCWO) groups. Ages range from 0.04 to 33 years; median 3.5. Gender: 53 male and 158 female. Two validated tools, the COMFORT score and atelectasis scoring, were used. Baseline and next 2 day radiographs were read by a radiologist blinded to treatment. The data was analyzed using paired T-test, Kruskal Wallis, Mann Whitney U, and Poisson generalized linear tests. Statistical significance was defined as p <0.05 with a CI of 95%. Results: There were 3 statistically significant improvements: decreased atelectasis in patients receiving treatments versus no treatment (p=<.001), reduction in ventilator days (p=<.001), and improved compliance (p=.008). There were 2 non-significant improvements: reduction in atelectasis score among treatments (p=.676) and patient comfort (p=0.771). **Conclusions:** This evidence-based project showed clinical improvements in atelectasis when any airway clearance modalities were used. Additionally, ventilator days decreased and compliance was significantly improved when IPV/PEEP was used. The data shows a high probability that IPV/PEEP is more effective than other therapies in improvement of atelectasis scoring and had clinical significance. IPV/PEEP is a safe and efficacious therapy for pediatric intubated patients.

Sponsored Research - None



2301819

CORRELATION OF TRANSCUTANEOUS CARBON DIOXIDE MONITORING AND BLOOD GAS ANALYSIS IN SICK NEONATES.

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BACKGROUND: Transcutaneous Carbon Dioxide Monitoring ($tcPCO_2$) has traditionally been used for monitoring trends in gas exchange during invasive and non-invasive ventilation in the neonatal critical care population. We wanted to test the correlation between $tcPCO_2$ using available equipment and PCO_2 via blood gas analysis in sick infant subjects. **METHODS:** After obtaining IRB approval, we retrospectively examined 53 subjects from the Neonatal Intensive Care Unit (NICU) at Blank Children's Hospital located adjacent to Iowa Methodist Medical Center, and part of UnityPoint Health Des Moines, Des Moines, Iowa. Subjects admitted to the NICU from November 2014 through February 2015 were identified via chart review. Subjects were identified that had $tcPCO_2$ monitoring at some point during their ICU stay. Each chart was reviewed and data was collected beginning immediately after the fourth hour of admission. The first four available blood gas analyses (BGA) were evaluated for each subject and PCO_2 data was noted. Subsequently, the $tcPCO_2$ data that was documented nearest in time to the BGA was documented as well. If there was no corresponding $tcPCO_2$ documented then the BGA data was discarded and not used in our analysis. Other demographic and outcomes data were noted and included in our analysis. Pearson Correlation Coefficient analysis was performed on each of the four groups of data. Statistical analysis was performed with Analyse-it Software (Leeds, United Kingdom). $tcPCO_2$ data was supplied by Sentec Digital Monitoring Systems (Therwil, Switzerland) **RESULTS:** 53 subjects were studied. A total of 172 groups of data were compared as long as they had corresponding $PaCO_2$ and $tcPCO_2$ values documented. Data points with no corresponding data were excluded (zeros). **CONCLUSIONS:** Our subjects were primarily comprised of sick pre-mature RDS/Septic infants (94%). Our $tcPCO_2$ monitoring appeared to correlate well with blood gas analysis, irrespective of the type of blood gas sample (arterial, venous, capillary). Moreover there was better achievement of correlation the further out from initiation of ventilator support. It is our belief that $tcPCO_2$ monitoring while using the equipment that our group tested, can be safely used as a surrogate for PCO_2 in the studied subject population. This may be truer after the initial few hours of resuscitation efforts. **DISCLOSURES** Mr. Lamb has consulted for GE, Masimo and Sunovian. The remaining authors have nothing to disclose.

Sponsored Research - None

2302797

CONTROL ID:

TITLE: CAN NONINVASIVE MONITORING OF THE PERFUSION INDEX PREDICT PATENT DUCTUS ARTERIOSUS IN PRETERM NEONATES?

Christopher Joyce[1], Firas Saker[2], Robert Chatburn[3], Jack Silver[1], John Dickson[1], Susan Brant[1], Daniel Sutton[1]; [1]Cardiopulmonary, Cleveland Clinic Hillcrest Hospital, Painesville, OH; [2]Neonatology, Hillcrest Hospital, Mayfield Hts, OH; [3]Research, Cleveland Clinic, Cleveland, OH

BACKGROUND The Perfusion Index (PI) is an indirect measurement of cardiac output and the oxygen supply to the body. Normal values for the PI have not been well established for neonates of various weights. The birth weights are classified as: ELBW is < 1 kg; Very Low Birth Weight (VLBW) neonates < 1.5 kg and > 1 kg; Low Birth Weight (LBW) < 2.5 kg and > 1.5 kg. The purpose of this study was to determine the PI range for each of these neonate categories. The specific hypothesis was that Extremely Low Birth Weight neonates display a lower Perfusion Index than both Very Low Birth Weight and Low Birth Weight neonates within the first week of life. **METHODS** The study was granted exempt status by the Cleveland Clinic Institutional Review Board. Patients were selected based on day of life, gestational age and birth weight. Inclusion criteria: neonates between 22 and 35 week gestation and hemodynamically stable. Exclusion criteria: neonates with sepsis, CHD, on inotrope support and those with a gestational age < 22 weeks and > 35 weeks. Using the Masimo® Radical-7™ monitor, the neonates' oxygen saturation, PI and heart rate was collected every two seconds over four days. Neonates were separated into three groups and a one-way analysis of variance (ANOVA) was used to determine if there were any significant differences among the mean PI values of each group: Group 1 (ELBW), Group 2 (VLBW), and Group 3 (LBW). **RESULTS** Comparisons were made among three groups. For ELBW, PI = 1.1 ± 0.787, for VLBW, PI = 1.2 ± 0.601, for LBW, PI = 2.0 ± 1.053 ($P < 0.001$). Comparisons of PI between ELBW and LBW neonates showed a difference in means of 0.883. Comparisons of PI between ELBW and VLBW neonates showed a difference of 0.0913. **CONCLUSIONS** ELBW and VLBW neonates displayed a statistically significant difference in PI, but it was not considered to be clinically important. Comparisons between ELBW neonates and LBW neonates displayed a PI difference that was statistically significant and clinically important. Testing with a larger sample population and manipulation of variables would be suggested to provide a more definitive answer.

Sponsored Research - None

2302847

VDR PATIENT INTERFACE PERFORMANCE VARIATIONS.

Charles J. Hoydu, Kevin Crezee, Chris Benitez, Brent Welch; Respiratory Care Services, Primary Children's Medical Center, Salt Lake City, UT

Background: The Percussionaire VDR ventilator (Sagle, ID) has gone through several generations of Phasitrons. These Phasitron changes have resulted in different circuit configurations. The Phasitron is the functional patient interface to the ventilator. Phasitron performance differences between each generation have not been previously published. This study looks at functional differences between phasitron variations and the impact to VDR ventilator. **Method:** This study measured pressure performance for the different circuit configurations produced by the various Phasitron generations. Circuits tested include the VDR Universal disposable/Fisher Paykel (Auckland NZ) RT 240 circuit, discontinued TurboHub/ Fisher Paykel RT 235 circuit, and original Phasitron. Nebulizer flow was tested in both on and off position. An MR850 was used per manufacturer recommendation. The patient interface was connected to a 3.5 ETT. This ETT tube was then connected to a Smart Lung Infant (IMT Medical Switzerland) test lung. Test lung settings were R 5 and C 2 ml/mbar. Pressures were measured in two locations. At the patient interface pre ETT tube and post ETT using a TSI Certifier FA Plus (Shoreview MN). VDR settings were maintained at PIP 35 cmH2O, PEEP 10 cmH2O, Rate 20 bpm, I-time 1 sec., and Percussive Rate 600bpm. **Results:** For all circuit configurations except for the TurboHub with added nebulizer flow, a decrease in PIP, Peep, and Mean between pre and post ETT were observed. Average pressure decreases were 5.7 cmH2O for PIP, 1.6 cmH2O for PEEP, and 0.1 cmH2O for MAP. The pressure variance showed a range of 1.8 cmH2O for PIP, 3 cmH2O for PEEP, and 3.2 cmH2O for MAP. The largest outlier was the TurboHub with nebulizer flow activated on the ventilator. With this configuration, PIP decreased 1.8 cmH2O, but PEEP increased by 11.9 cmH2O and MAP by 10.5 cmH2O. **Conclusion:** The patient configurations except for the TurboHub with nebulizer flow activated performed similarly comparing PIP, PEEP, and MAP. The TurboHub with nebulizer flow activated showed a significant increase in Peep and MAP pressures post ETT tube. Elevations in PEEP and MAP may result in a significant decrease in delta P and increase the likelihood of physiologic air trapping post ETT when applied to a patient.

Sponsored Research - None

2302931

DIFFERENCE IN SET VS ACHIEVED PRESSURES WITH NEOTECH RAM CANNULA ON A CRITICAL CARE VENTILATOR: AN BENCH EXPERIMENT.

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Background: The RAM cannula has become widely used as an interface for delivery of CPAP & NIV in the NICU. Most experiments demonstrate the effectiveness of this interface with CPAP using a delivery system with a set liter flow. When using the RAM cannula with a ventilator that does not allow for set flow rate for CPAP delivery & compensates for the needed leak around the interface, it is possible we may achieve different results. We sought to investigate the inspiratory flow utilized by a ventilator to achieve a set pressure as compared to how much pressure is delivered to the patient. We were also interested in if there was a change in achieved pressures if the RAM cannula was attached to the circuit during the circuit calibration. **Method:** Study design included an ASL 5000 configured as an actively breathing infant (3kg/f 30/Rrs 40/Crs 8/Pmax 10) connected to a model nose for which the infant RAM cannula had a 70% occlusive fit. The RAM cannula was connected to a Draeger V500 ventilator. A Bicore cuvette was put into the inspiratory limb of the circuit to measure inspiratory flows. Measurements were done for ten levels of CPAP ranging from 5-25 cmH2O. The lung model was run for 150 breaths at each CPAP level & data from the last 5 breaths were averaged for final analysis. Tracheal pressure was measured on the airway waveforms from the ASL. Measurements were repeated with circuit calibration done with the RAM cannula attached to determine if there is a difference in pressures achieved with that type of calibration. **Results:** Tracheal pressure was 4.7 cmH2O when the ventilator was set at a CPAP of 5 cmH2O with a linear increase of 0.16 cmH2O in tracheal pressure per cmH2O increase in CPAP (R^2=0.99). Inspiratory flow increased from 6-28.2 lpm over the range of CPAP. Comparing data from the 2 circuit calibrations, there was not a clinically significant difference in the achieved pressures for each CPAP setting. However, there was a statistically smaller slope (p=0.002) when calibration was done with the RAM in place (0.13 cmH2O increase in tracheal pressure per cm H2O increase in CPAP, R^2=0.98). **Conclusion:** Use of the RAM cannula as an interface for CPAP with a 30% leak on a critical care ventilator should be done with caution above 5 cmH2O of prescribed CPAP as with increasing CPAP pressure there is a negligible increase in pressure delivered to the trachea. Calibration of the circuit with the RAM attached results in a lower achieved tracheal pressure.

Sponsored Research - None

2303066

CARBON DIOXIDE ELIMINATION VARIABILITY IN MECHANICALLY VENTILATED CHILDREN.

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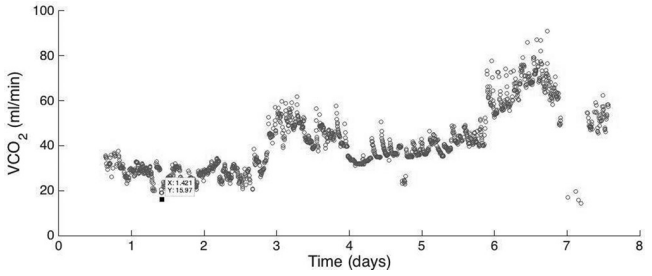
BACKGROUND: The continuous measurement of carbon dioxide elimination (VCO_2) is useful for assessing response to ventilatory changes and estimation of energy expenditure. We have previously described VCO_2 values observed for mechanically ventilated children. However, the degree to which VCO_2 fluctuates over time has not been adequately described. Therefore, we sought to quantify the degree of VCO_2 variation observed in mechanically ventilated children in the pediatric intensive care unit. *METHODS*: Mechanically ventilated pediatric subjects who were ventilated for >24 hours were eligible for the study. Carbon dioxide elimination was measured continuously. For each subject, data were filtered and computation of a steady state period for VCO_2 was done according to established methods. VCO_2 variability was quantified by calculating the coefficient of variation. *RESULTS*: Thirty-seven subjects were enrolled in the study. The median (IQR) age, weight, duration of ventilation and VCO_2 were 0.80 (0.15 to 1.10) years, 7.0 (4.9 to 10.0) kg and 12.1 (5.0 to 17.2) days and 5.3 (4.6 to 6.6) ml/min/kg respectively. Steady state was observed 25% of the time on the ventilator for the cohort. The coefficient of variation was 19.5% (13.8 to 35.2%). The figure depicts a single subject and demonstrates the high day-to-day as well as intra-day variability for VCO_2; on day 2, the subject had a steady state VCO_2 that was as high as 33 and as low as 16 ml/min. *CONCLUSIONS*: We observed a high degree of both patient to patient variability as well as intra-patient variability for VCO_2 in mechanically ventilated children. Although work will need to be done to provide clinical correlates for day-to-day changes in gas exchange, these data suggest that measuring gas exchange for short periods, even if steady state is computed, could lead to over- or underestimation.

Sponsored Research - None



2303138

CHANGES IN ON-TIME AND HOW IT EFFECTS MEAN AIRWAY PRESSUREDURING HFJV.

Kevin Crezee, Jeffrey Wright, Rick Carter; Respiratory Care, Primary Childrens Hospital, Salt Lake City, UT

Introduction: Current strategies increase On-Time(OT) to obtain a larger pulse and/or to increase gas exchange time. In clinical practice increased OT results in higher monitored HFJV Mean Airway Pressures(JMAP). We investigated increases in MAP due to OT changes to determine factors that contribute to increased JMAP. **Method:** The HFJV (Bunnell Salt Lake City, Utah) was set up with 3.5 LifePort(LP) adapter. A Drager Evita XL(XL) (Telford, PA) and a infant circuit were attached to the LP. The LP was connected to a 3.0 and 3.5 ETT. The ETT was connected to the TSI 4100 Certifier FA Plus(TSI) and an IMT Infant Smart Lung(ISL) (Switzerland). The ISL was set at a compliance of 1ml/Mbar and a Resistance of 5. The TSI measures PIP(TPIP), MAP(TMAP), PEEP(TPEEP), and flow post ETT. The XL provided PEEP at 8cmH_2O. The HFJV rates tested at 420, 360, and 300. The OT tested at 0.02, 0.03, and 0.34. The HFJV PIP(JPIP) tested at 20 and 30cmH_2O. Measurements were recorded in cmH_2O. **Results:** Overall JPIP was unchanged. The JMAP increased 0.2 to 2.1 and HFJV PEEP(JPEEP) ranged -0.4 to 0. The TPIP increased 3.2-6.2, TMAP increased 0.8-2.5 and TPEEP ranged -0.3-0. In the PIP 20 group the JMAP increased an average of 0.9 and 1.8 in the 30 group. The JMAP increased an average of 1.3 for both groups. In the PIP 20 group JPEEP increased an average of 0.1 and 0.2 in 30 group. The JPEEP averaged 0.1 higher for both groups. In the PIP 20 group the TPIP increased an average of 2.7 and 4.6 in the 30 group. The TPIP increased an average of 3.6 for both groups. In the PIP 20 group the TMAP increased an average of 1.2 and 2.1 in the 30 group. The TMAP increased an average of 1.6 for both groups. In the PIP 20 group the TPEEP increased an average of 0.4 and 0.7 in the 30 group. The JPEEP increased an average of 0.5 for both groups. The measured TSI I:E ratios post ETT where longer than calculated values. The 420 rate group E ratio was 1.1-1.3 longer averaging 1.2. The 360 rate group E ratio was 1.3-1.5 longer averaging 1.4. The 300 rate group E ratio was 1.6-1.8 longer averaging 1.7. Conclusion: The MAP increased with changes in PIP and OT. PEEP showed minimal change. Measured I:E ratios post ETT are longer than calculated values, potentially reduce the risk of air trapping. Increased MAP may be directly attributed to increases in PIP delivery with longer OT. As OT is increased the PIP post ETT increased. Increases in OT improved PIP delivery and reduce set vs. delivered PIP differences.

Sponsored Research - None

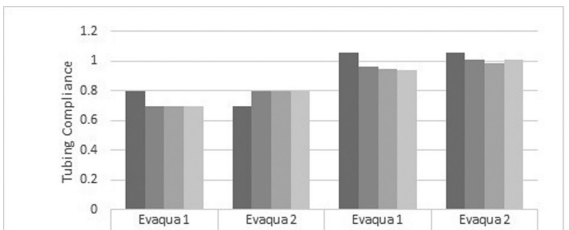
2303247

BENCH MODEL COMPARING TUBING COMPLIANCE OF TWO INFANT VENTILATOR CIRCUITS ON DIFFERENT VENTILATORS.

Ryan M. Sharkey, Daniel D. Rowley; Pulmonary Diagnostics and Respiratory Therapy, University of Virginia Health System, Charlottesville, VA

BACKGROUND: Previous research has shown ventilator circuit tubing compliance differs when heated/humidified from a dry/room air state. Tubing compliance is often calculated on a dry/unheated circuit during a pre-use check. Tidal volume is compensated from the tubing compliance of the ventilator circuit. Changes to this compliance can affect the tidal volume delivered. We hypothesized that there would be no difference in ventilator circuit tubing compliance between a dry circuit and a heated/humidified circuit. METHODS: We tested the Fisher and Paykel RT 236 (Evaqua) and RT 266 (Evaqua 2(Auckland, New Zealand)) each on the Servo-i (Maquet, Solna, Sweden) and VN500 Babylog (Dräger, Lubeck, Germany) mechanical ventilators. The tubing compliance for each circuit was tested at room temperature with no water in the humidification chamber, once the circuit reached 37°C, 30 minutes, and at 60 minutes. Tubing compliance was calculated using the circuit check on the ventilator. The test was then repeated on the subsequent ventilator. Circuits underwent ventilation in between calculations with RR: 30, PIP: 20 cmH_2O, PEEP: 5 cmH_2O, and F_{IO2}: 40%. RESULTS: See Table 1. It should be noted the Servo-i and VN500 Babylog calculated different tubing compliance for the same circuits at the same time points. Data was analyzed using SPSS v.22 (IBM, Chicago, IL) using a Friedman's 2-way ANOVA (P= .39). Alpha was set at .05. We fail to reject the null hypothesis. CONCLUSION: There is no statistically significant difference in ventilator circuit tubing compliance when comparing dry and heated/humidified ventilator circuits. There appears to be no clinical significance, either. This conflicts with other research that has been reported previously on the subject, suggesting that there is a difference. The Servo-i and VN500 Babylog calculated different tubing compliances for similar circuits, which is most likely due to internal mechanisms. Tubing compliance calculated should be correct for each ventilator and compensated appropriately. There is no indication of clinical significance of tubing compliance between the dry circuit and when it is heated/humidified.

Sponsored Research - None



	Dräger VN500		Maquet Servo-i	
	Evaqua 1	Evaqua 2	Evaqua 1	Evaqua 2
Room Temp	0.8	0.7	1.06	1.06
37°C	0.7	0.8	0.96	1.01
30 minutes	0.7	0.8	0.95	0.99
60 minutes	0.7	0.8	0.94	1.01

2303310

ANALYSIS OF A CLINICAL GUIDELINE FOR PEDIATRIC USE OF HIGH FLOW NASAL CANNULA OUTSIDE THE ICU.

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Background: High flow Nasal Cannula (HFNC) is often utilized to decrease work of breathing in pediatric patients with acute primary pulmonary pathology such as bronchiolitis. Often there are patient safety concerns with the use of high flows on general pediatric floors, with the use standard nasal cannula causing a sense of false reassurance with the potential to mask hypoventilation. On the other hand, HFNC is often better tolerated than non-invasive or invasive ventilation. Our institution developed guidelines for use of HFNC in non-ICU areas, in order to reduce the need for emergency responses to these patients outside our ICUs. The guidelines specified upper limits of HFNC flow and FiO2, based on empiric modeling relating flow rate to FiO2. (Respiratory Care 56(10), 1653), stratifying limits based on age ranges of <3 m, 3-6m, 6m-3y, 3y-6y, >6y, with the rationale that these groups would have similar minute ventilations. They were implemented in December of 2011 on the general pediatric floors. Although these empiric practice guidelines have been successful in reducing the incidence of code events amongst patients using HFNC outside the ICU, there has been a sense that they be too restrictive with younger patients, so we decided to do systematic review of their performance. **Methods:** A retrospective chart review was completed from December 2011 through December 2014 on all patients who used HFNC on the general care areas. Data collected included age, diagnosis, flow, FiO2, rapid response team activation, code events, ICU admissions and subsequent therapeutic interventions including continued use of HFNC, need for non-invasive Ventilation (NIV) and intubation while in the ICU. **Results:** 248 patients were reviewed for data analysis. 55% (137/248) patients remained on the general care floor with median flow ranges 3LPM-6LPM depending on the age grouping. At least one response team activation was made in 60% (147/248), 1% (3/248) had a code event, 51% (127/248) had a diagnosis of RSV/Bronchiolitis. 45% (111/248) were transferred to the ICU; the chart below describes therapeutic interventions for each age group after ICU admit. **Conclusion:** Using empiric clinical guidelines, our institution was able to use HFNC safely and successfully on general pediatric floors, with a reduction of emergency responses required for HFNC patients. This practice has allowed us to divert ICU volume during times of high capacity and acuity.

Sponsored Research - None

Intensive Care Unit (n=111)

	HFNC / Median Flow	NIV	Intubation
<3m	66% / 4 LPM	33% (4/12)	0% (0/12)
3-6m	54% / 6 LPM	63% (12/19)	16% (3/19)
6m-3y	47% / 7 LPM	48% (28/58)	21% (12/58)
3y-6y	76% / 8 LPM	21% (3/14)	7% (1/14)
> 6y	38% / 8 LPM	63% (5/8)	25% (2/8)

Poster Discussions #4: Neonatal/Pediatrics

2260831

MODIFIED IDSA/ATS MINOR CRITERIA FOR SEVERE COMMUNITY-ACQUIRED PNEUMONIA BEST PREDICTED MORTALITY.

Qi Guo[1], Wei-dong Song[2], Hai-yan Li[3], Yi-ping Zhou[1], Ming Li[1], Xiao-ke Chen[1], Hui Liu[1], Hong-lin Peng[1], Hai-qiong Yu[1], Xia Chen[1], Nian Liu[1], Zhong-dong Lü[2], Li-hua Liang[4], Qing-zhou Zhao[4], Mei Jiang[5]; [1]Department of Respiratory Medicine, Affiliated Futian Hospital, Guangdong Medical College, Shenzhen, China; [2]Department of Respiratory Medicine, Affiliated Shenzhen Hospital, Peking University, Shenzhen, China; [3]Department of Primary Care, Affiliated Futian Hospital, Guangdong Medical College, Shenzhen, China; [4]Department of Radiology, Affiliated Futian Hospital, Guangdong Medical College, Shenzhen, China; [5]Guangzhou Institute of Respiratory Diseases (State Key Laboratory of Respiratory Diseases), Guangzhou, China

Background It is not clear whether the IDSA/ATS minor criteria for severe community-acquired pneumonia (CAP) could be simplified or even be modified to orchestrate improvements in predicting mortality. **Methods** A retrospective cohort study of 1230 CAP patients was performed to simplify and to modify the scoring system by excluding four noncontributory or infrequent variables (leukopenia, hypothermia, hypotension and thrombocytopenia) and by excluding these variables and then adding age ≥ 65 yrs, respectively. The simplification and modification were tested against a prospective two-centre validation cohort of 1409 adults with CAP. **Results** The increasing numbers of IDSA/ATS, simplified, and modified minor criteria present in the retrospective cohort were positively associated with the mortality, showing significant increased odds ratios for mortality of 2.711, 4.095, and 3.755, respectively. The validation cohort confirmed a similar pattern. The sensitivity, specificity, positive predictive value, and Youden's index of modified minor criteria for mortality prediction were the best pattern in the retrospective cohort. High values of corresponding indices were confirmed in the validation cohort. The highest accuracy of the modified version for predicting mortality in the retrospective cohort was illustrated by the highest area under the receiver operating characteristic curve of 0.925 (descending order: modified, simplified, and IDSA/ATS minor criteria). The validation cohort confirmed a similar paradigm. **Conclusions** The IDSA/ATS minor criteria could be simplified to five variables and then be modified to orchestrate improvements in predicting mortality in CAP patients. The modified version best predicted mortality.

Sponsored Research - The study was funded by the medical science and technology foundation of Guangdong province in 2010 (No. A2010553), the planned science and technology project of Shenzhen municipality in 2011 (No. 201102078), and the non-profit scientific research project of Futian district in 2011 (No. FTWS201120).

2260854

CUR-65 SCORE FOR COMMUNITY-ACQUIRED PNEUMONIA PREDICTED MORTALITY BETTER THAN CURB-65 SCORE IN LOW-MORTALITY-RATE SETTINGS: RETROSPECTIVE AND PROSPECTIVE COHORT STUDIES.

Hai-yan Li[2], Qi Guo[1], Wei-dong Song[3], Yi-ping Zhou[1], Ming Li[1], Xiao-ke Chen[1], Hui Liu[1], Hong-lin Peng[1], Hai-qiong Yu[1], Xia Chen[1], Nian Liu[1], Zhong-dong Lü[3], Li-hua Liang[4], Qing-zhou Zhao[4], Mei Jiang[5]; [1]Department of Respiratory Medicine, Affiliated Futian Hospital, Guangdong Medical College, Shenzhen, China; [2]Department of Primary Care, Affiliated Futian Hospital, Guangdong Medical College, Shenzhen, China; [3]Department of Respiratory Medicine, Affiliated Shenzhen Hospital, Peking University, Shenzhen, China; [4]Department of Radiology, Affiliated Futian Hospital, Guangdong Medical College, Shenzhen, China; [5]Guangzhou Institute of Respiratory Diseases (State Key Laboratory of Respiratory Diseases), Guangzhou, China

Background It is not clear whether low blood pressure criterion could be removed from CURB-65 score to orchestrate an improvement in identifying patients with community-acquired pneumonia (CAP) in low-mortality-rate settings. **Methods** A retrospective cohort study of 1230 CAP patients was performed to simplify the CURB-65 scoring system by excluding low blood pressure variable. The simplification was validated in a prospective two centre cohort of 1409 adults with CAP. **Results** The hospital mortalities were 1.3% and 3.8% in the retrospective and prospective cohorts, respectively. The mortality rates in the two cohorts increased directly with the increasing scores, showing significant increased odds ratios for mortality. The pattern of sensitivity, specificity, PPV, and Youden's index of a CUR-65 score of ≥ 2 for prediction of mortality was better than that of a CURB-65 score of ≥ 3 in the retrospective cohort. Higher values of corresponding indices were confirmed in the validation cohort. The higher accuracy of CUR-65 score for predicting mortality was illustrated by the area under the receiver operating characteristic curve of 0.937, compared with 0.915 for CURB-65 score in the retrospective cohort (p = 0.0073). The validation cohort confirmed a similar paradigm (0.953 vs 0.907, p = 0.0002). **Conclusions** CURB-65 score could be simplified by removing low blood pressure to orchestrate an improvement in predicting mortality in CAP patients who have a low risk of death. A CUR-65 score of ≥ 2 might be a more valuable cut-off value for severe CAP.

Sponsored Research - The study was funded by the medical science and technology foundation of Guangdong province in 2010 (No. A2010553), the planned science and technology project of Shenzhen municipality in 2011 (No. 201102078), and the non-profit scientific research project of Futian district in 2011 (No. FTWS201120).

2260883

MORTALITIES AMONG SEVERE COMMUNITY-ACQUIRED PNEUMONIA PATIENTS DEPEND ON COMBINATIONS OF 2007 IDSA/ATS MINOR CRITERIA.

Hai-yan Li[2], Qi Guo[1], Wei-dong Song[3], Yi-ping Zhou[1], Ming Li[1], Xiao-ke Chen[1], Hui Liu[1], Hong-lin Peng[1], Hai-qiong Yu[1], Xia Chen[1], Nian Liu[1], Zhong-dong Lü[3], Li-hua Liang[4], Qing-zhou Zhao[4], Mei Jiang[5]; [1]Department of Respiratory Medicine, Affiliated Futian Hospital, Guangdong Medical College, Shenzhen, China; [2]Department of Primary Care, Affiliated Futian Hospital, Guangdong Medical College, Shenzhen, China; [3]Department of Respiratory Medicine, Affiliated Shenzhen Hospital, Peking University, Shenzhen, China; [4]Department of Radiology, Affiliated Futian Hospital, Guangdong Medical College, Shenzhen, China; [5]Guangzhou Institute of Respiratory Diseases (State Key Laboratory of Respiratory Diseases), Guangzhou, China

Background The individual 2007 Infectious Disease Society of America (IDSA)/American Thoracic Society (ATS) minor criteria for severe community-acquired pneumonia (CAP) are of unequal weight. It is not clear whether patients with different combinations of the predictive values might have diverse severities or different mortalities. **Methods** A prospective two centre cohort study was performed of 385 severe CAP patients fulfilling three or more IDSA/ATS minor criteria amongst 1430 patients. **Results** Hospital mortality rose sharply from 5.7%, 9.9%, and 16.5%, respectively, for patients with none of the three strongest values [arterial oxygen pressure/fraction inspired oxygen (PaO_2/FiO_2) ≤ 250 mm Hg, confusion and uremia], one of those, and two of those to 38.6% for patients with all those (p < 0.001). The number of strongest values present had a significant increased odds ratio for mortality of 2.796 (95% confidence interval, 1.993-3.922; p < 0.001), and was positively related to sequential organ failure assessment scores at 72 hours, incurring significantly longer hospital stay and higher costs. **Conclusions** Severe CAP patients fulfilling different combinations of 2007 IDSA/ATS minor criteria had diverse severities and different mortalities. The combination of PaO_2/FiO_2 ≤ 250 mm Hg, confusion and uremia predicted more severity and higher mortality compared with others.

Sponsored Research - The study was funded by the medical science and technology foundation of Guangdong province in 2010 (No. A2010553), the planned science and technology project of Shenzhen municipality in 2011 (No. 201102078), and the non-profit scientific research project of Futian district in 2011 (No. FTWS201120).

Hospital mortality according to the combinations of minor criteria (n = 385)

Group	NO. (%) patients	NO. (%) deaths
Presence of three strongest values	44(11.4)	17 (38.6)
Presence of two strongest values	79 (20.5)	13 (16.5)
Presence of one strongest value	121(31.4)	12 (9.9)
Absence of three strongest values	141(36.6)	8 (5.7)
Total	385 (100.0)	50(13.0)

2266742

A BASELINE REVIEW OF ASTHMA FREQUENT FLIERS AT 22 HOSPITALS WITH FOUR YEARS IN REVIEW —- ADULT & PEDIATRIC PATIENT NON-COMPLIANCE ISSUES.

Kimberly J. Bennion[1], Steve Abplanalp[1], Jeff Craghead[2]; [1]Corporate Respiratory Care, Intermountain Healthcare, Salt Lake City, UT; [2]Finance, Intermountain Healthcare, Salt Lake City, UT

Background: Intermountain Healthcare (IM) owns & operates 22 acute care hospitals across the intermountain west. We sought to identify what if any issues contribute to asthma hospital "frequent flier" visits. **Method:** Pts were initially identified by members of the corporation's financial team & verfied by the quality manager. Data included any pt with an Emergency Room (ER) &/or hospital admission & asthma diagnosis during 2011 & 2012. A total of 138 pediatric & adult pts were initially identified as having > 4 visits/year at any IM hospital ER or inpatient admission. Of these, 72 (52%) were pediatric pts (< 18 years of age) & 66 (48%) were adults. Detailed chart reviews were performed by Respiratory Therapy students. **Results**: Fifteen variables were included. Pt non-compliance issues are reported in Table One. **Conclusion**: Non-compliance issues should be reported & addressed if inclusive care plans are to be created, understood & followed. Pediatric leaders have targeted second-hand smoke exposure education in pediatric pts. This process is being considered for adult care as no mention of second hand smoke exposure in adult medical records was noted. Tobacco cessation education has been revamped to occur earlier & be more interactive. Overall outcomes for pediatric asthma pts appear better in our corporation when compared to adults. We are now considering an adult version of the pediatric on-line tool used by patients/caregivers to report weekly compliance of care plans to primary care physicians. It should be noted 31 (33%) of the 94 patients with at least 1 non-compliance issue were non-compliant with medications. Better access to medications is being addressed as many pts reported ED visits for medications only. We are coordinating with community resources. The corporation has applied for Joint Commission clinical accreditation. A plan to place RTs in the homecare setting of asthma & COPD frequent flier is planned.It is our impression that early intervention iwith Respiratory Therapists as care managers in a non-hospital setting may decrease hospital frequent flier visits. [1]Special thanks to the Respiratory Therapy program students of Weber State University and Stevens Henager College for the detailed medical record extraction.

Sponsored Research - None

Table One: 2011-2014 Adult & Pediatric Asthma "Frequent Flier" Non-Compliance Issues

Age Grouping	Tobacco Use* # (%)	Second-Hand Smoke Exposure # (%)	Medication # (%)	Clinic Visits # (%)	Unspecified** # (%)	Pets In Home # (%)
Adult Total n=66	24 (36)	Not Reported	24 (36)	3 (5)	3 (5)	Not Reported
Pediatric Total n=72	3 (4)	11 (15)	7 (10)	1 (1)	1 (1)	4 (6)
# (%) Adult Patients With at Least 1 Issue of Non-compliance: 64 (97)						
# (%) Pediatric Patients With at Least 1 Issue of Non-compliance: 30 (42)						

*Defined as current or former user of tobacco or marijuana for adults; current smokers for pediatrics
**Noted in physician documentation but non-compliance issue(s) not specified

2266835

A BASELINE REVIEW OF ASTHMA FREQUENT FLIERS AT 22 HOSPITALS WITH FOUR YEARS IN REVIEW —- ADULT & PEDIATRIC PATIENT PULMONARY FUNCTION TESTING (PFT) & PULMONARY CONSULT OUTCOMES.

Kimberly J. Bennion[1], Steve Abplanalp[1], Jeff Craghead[2]; [1]Corporate Respiratory Care, Intermountain Healthcare, Salt Lake City, UT; [2]Finance, Intermountain Healthcare, Salt Lake City, UT

Background: Intermountain Healthcare (IM) owns & operates 22 acute care hospitals across the intermountain west. We sought to identify what if any issues contribute to asthma hospital "frequent flier" visits. **Method**: Pts were initially extracted by members of the corporation's financial team & verified by the quality manager. Data included pts with an Emergency Room (ER) &/or hospital admission assigned an asthma diagnosis during 2011 & 2012. A total of 138 pediatric & adult pts were initially identified as having > 4 visits/year at any IM hospital ER or inpatient admission. Of these, 72 (52%) were pediatric pts (< 18 years of age) & 66 (48%) were adults. Detailed chart reviews were performed by RT students[1]. **Results**: Fifteen variables were included. Pt PFT & pulmonary consult outcomes are reported in Table One. **Conclusion**: It is our impression that while many primary care physicians can manage basic asthma patients using the National Heart, Lung Blood Institute asthma guideline, pulmonary consults &/or PFTs should be considered in asthma patients with frequent hospital visits. This may assist with more comprehensive care plans & identification of other underlying issues. We did not expected the higher pediatric PFT & pulmonary consults found; however, pediatric leaders made a concerted effort to include PFT & pulmonary consults as a part of comprehensive care plans. Overall outcomes for pediatric asthma pts appear better than adults. We are discussing an adult version of the pediatric on-line tool used by patients/caregivers to report weekly compliance to primary care physicians. We have implemented as adult asthma protocol which utilizes more timely PFT & Pulmonary consult referrals. The corporation has applied for Joint Commission for clinical accreditation to place RTs in the homecare setting of asthma & COPD frequent fliers. It is our impression that early RT intervention ias care managers in a non-hospital setting may decrease hospital frequent flier visits. [1]Special thanks to the Respiratory Therapy program students of Weber State University and Stevens Henager College for the detailed medical record extraction.

Sponsored Research - None

Table One: 2011-2014 Adult & Pediatric Asthma "Frequent Flier" PFT & Pulmonary Consult Outcomes

Age Grouping	Patient with PFT Results in Medical Record # (%)	Pulmonology Consult Documented in Medical Record* # (%)
Adult	23 (35)	14 (21)**
Pediatric	13 (39)≠	32 (77)
Total n	Adult n=66 Pediatric n=33≠	Adult n=66 Pediatric n=72

π Pediatric Pts > 5 Yrs of Age
*Noted at any time not necessarily associated with current encounter/visit
**Of those adults with noted Pulmonary consult, 13 (93%) had at least one reported non-compliance issue.

2266922

A BASELINE REVIEW OF ASTHMA FREQUENT FLIERS AT 22 HOSPITALS WITH FOUR YEARS IN REVIEW —- ADULT PATIENT DEMOGRAPHICS, COMORBIDITIES & ACCESS TO HEALTHCARE.

Kimberly J. Bennion[1], Steve Abplanalp[1], Jeff Craghead[2]; [1]Corporate Respiratory Care, Intermountain Healthcare, Salt Lake City, UT; [2]Finance, Intermountain Healthcare, Salt Lake City, UT

Background: Intermountain Healthcare (IM) owns & operates 22 acute care hospitals across the intermountain west. We sought to identify what if any issues contribute to asthma hospital "frequent flier" visits. **Method**: Pts were initially extracted by members of the corporation's financial team and verified by the quality manager. Data included any pt with an Emergency Room (ER) &/or hospital admission with an asthma diagnosis during 2011 & 2012. A total of 138 pediatric & adult pts were initially identified as having > 4 visits/year at any IM hospital ER or inpatient admission. Of these, 72 (52%) were pediatric pts (< 18 years of age) & 66 (48%) were adults. Detailed chart reviews were performed by RT students[1]. **Results**: Fifteen variables were included. Pt. demographics, comorbid conditions & access to healthcare are included in this abstract & are reported in Table One. **Conclusion:** While we did expect a higher incidence of anxiety or depression, we did not expect to identify chronic pain or Behavioral Health issues as frequently. This information was communicated to the corporation's Pain, Behavioral Health & Pediatric Clinical Program services. Identification & treatment for co-morbid conditions (e.g., antacids for GERD) may help alleviate asthma symptoms. Outcomes for pediatric pt outcomes appear better in our corporation. We are changing key processes in the way pts are cared for in lieu of the 40 (61%) of the total 66 pts who were either on Medicaid or self-pay and may have limited access to healthcare. Changes include improved access to medications, earlier, enhanced face-to-face patient education & pulmonary consults. We are seeking Joint Commission clinical accreditation with plans to place RTs in home care. It is our impression that doing so may allow for expert care management prior to hospital visits. [1]Special thanks to the Respiratory Therapy program students of Weber State University and Stevens Henager College for the detailed medical record extraction.

Sponsored Research - None

2268584

CASE STUDY: COPD/BRONCHIECTASIS PATIENT OUTCOMES OF BASELINE VS THREE AIRWAY CLEARANCE TECHNIQUES (ACT).

Kimberly J. Bennion; Corporate Respiratory Care, Intermountain Healthcare, Salt Lake City, UT

Background: Vest® therapy (VT) effectiveness in bronchiectasis patients has been reported in previous studies.The goal of this case study was to determine what, if any, ACT might be more effective in a pt diagnosed with severe COPD/bronchiectasis. **Method**: The pt is an 87 YO female with a 20 yr, 2 pk/day smoking history who quit smoking at 40 yrs. She was diagnosed with COPD/bronchiectasis in 1982. Pts daily prescribed regimen was: 1) 2.5 mg inhaled albuterol/nebulizer BID, 2) VT or Aerobika® BID, 3) 2 L continuous O2/NC, & 4) 2 puffs MDI albuterol PRN. The pt was placed into each 2-wk phase in her home. Phases included: Phase 1-Pt's preferred regimen (PR). Phase 2-BID albuterol/nebulizer, Aerobika BID x 10 breaths x 3 cycles. Phase 3-PR . Phase 4-BID albuterol/nebulizer followed by 10 min VT. Phase 5-PR. Phase 6-BID albuterol/Metaneb x 15 min. A RRT visited the pt daily to verify compliance. **Results:** Baseline & post-phase outcomes are reported in Table One. **Conclusion:** It appears the ***trial*** may have worsened the pts overall pulmonary status; however, the study was begun at a time when the pt was in a rapid decline. With this single case study, no conclusions are assumed to be definitive; however, several outcomes are noteworthy. The VT appears most effective in secretion removal. It appears the Aerobika is no better than her PR in terms of secretion removal. While the pt's least preferred regimen was the Metaneb, it was due to her marked pulmonary decline & inability to control respiratory efforts. Her decline is obvious over the course of the 14 wk study when noting decreasing BMI, increasing baseline O2 need & increase in her dyspnea score. The author's impression is earlier intervention with the Metaneb in COPD pts, especially pts with an element of bronchiectasis, may prevent insipidus secretions & the airway obliteration that accompanies it. It may aid in lung recruitment & aerosol delivery & may lend to better VQ matching. A prospective, randomized control trial is being planned. Despite repeated hospital admissions, the pt has never asked about compliance to her prescribed ACT regimen. Questions regarding adherence to care plans should be used to determine compliance and to tailor regimens.

Sponsored Research - None

Table One: Outcome Variables for Baseline & Post Each Two Week Study Phase

Variable	Baseline PR	Aerobika	PR	Vest	PR	Metaneb	PR
BORG Dyspnea Score Post 6-min Walk	4**	4**	4**	5≠	5≠	5≠	7±
Body Mass Indexα	19.4	19.0	18.9	18.7	18.6	18.4	18.2
Pre-walk % SpO2*	95	94	94	95	94	95	95
Post-walk % Spo2*	83	82	83	84	83	84	83
Mucous Production by Weight (gms)	124	126	125	180	134	142	126
O2 (LPM)	2	2	2	2	4	4	4

*Oxygen at 3 LPM
** Somewhat severe
π Severe
±Very Severe
αWeight in pounds: 119.6, 118.3, 117.2, 116.1, 115.3, 114.1 & 113.3

2287932

EVALUATION OF RESPIRATORY THERAPIST INVOLVEMENT IN ASTHMA MANAGEMENT IN THE EMERGENCY DEPARTMENT.

Rhonda D. Reed[3], Leah Rosler[4], Timothy Lee[2], Teresa A. Volsko[1]; [1]Nursing Administration, Akron Children's Hospital, Akron, OH; [2]Emergency Medicine Administration, Akron Children's Hospital, Akron, OH; [3]Respiratory Care, Akron Children's Hospital, Akron, OH; [4]University of Akron, Akron, OH

Background: Evidence based asthma care and patient/family education improve adherence to asthma home management plans, and reduce emergency department (ED) visits. We assessed the effect a dedicated respiratory therapist (RT) had on asthma pathway management in the ED. We hypothesized an RT managed asthma pathway would reduce 24 hour and 7 day asthma revisitation rate, maintain targeted ED length of stay (LOS)**,** and increase protocol adherence and completion of asthma education. **Methods:** Data from patients treated for asthma, status asthmaticus, and reactive airways disease between the ages of 2 and 18 years in the emergency department were retrospectively reviewed. Pre- (non-dedicated RT in the ED) and post- (dedicated RT in the ED pilot) data collection periods were conducted 1 year apart, February - March, using the same asthma pathway. Asthma pathway management was shared by nurses and RT's in the pre-phase and only RT managed in the post phase. Descriptive statistics reported patient demographics. T-tests determined differences in ED LOS. Chi square evaluated differences in the proportion of direct care staff (nurses and RT's in the pre-phase and RT's in the Post phase) adhering to the asthma score driven decision making, asthma education provided and ED recidivism. Statistical significance was established at $p < 0.05$. **Results:** Records of 90 patients were evaluated (pre- phase =39, post- phase = 51). Most were male (57%), and declared a primary care physician where they received regular care (97%). The patients in the pre-phase were more culturally diverse and had government subsidized healthcare insurance. There were no differences in ED LOS targets ($p = 0.9$) or revisitation rates ($p = 0.162$).Statistically significant increases in the number of patients/families receiving asthma education ($p = 0.005$) and asthma score driven decision making adherence ($p = 0.001$) was noted in the post-phase. **Conclusions:** RT managed asthma pathway improved educational and pathway adherence outcomes without adversely affecting LOS targets. The small sample size limited the detection of potential differences.

Sponsored Research - None

2301167

WHOLE LUNG LAVAGE FOR PULMONARY ALVEOLAR PROTEINOSIS.

Mohamed O. Yusuf[1], Gage W. Stroope[1], Norman Torres[2], Onur Demirci[2]; [1]Respiratory Care Program, University of Minnesota Rochester and Mayo School of Health Sciences, Rochester, MN; [2]Department of Anesthesiology, Mayo Clinic Rochester, Rochester, MN

Introduction: Pulmonary alveolar proteinosis (PAP) is a rare lung disease of unknown etiology resulting in the filling of the alveoli with a coarse, proteinaceous substance that impedes normal gas exchange. Whole lung lavage performed under general endotracheal anesthesia is the one of the few effective treatments of PAP. Here, we present a case of a young female who was diagnosed with idiopathic PAP and was successfully treated with whole lung lavage. **Case summary:** A thirty-four year old female was referred to our hospital for severe hypoxemia believed to be due to asthma exacerbation with superimposed pneumonia. Her past medical history was significant for a remote pulmonary embolus and recent 15-pack-year smoking. She had developed chronic cough with shortness of breath over the past two years and had acute worsening of her symptoms recently. Given the lack of clinical improvement with traditional asthma and pneumonia treatments as well as supplemental oxygen, a CT scan of her chest was ordered. This revealed bilateral ground-glass infiltrates and an "erratic paving" pattern of the lung parenchyma. A bronchoscopy with bronchoalveolar lavage was performed which showed murky, wax-like secretions, and positive staining with periodic acid-Schiff. Based on these findings, the diagnosis of PAP was made. Due to worsening hypoxemia, the decision to perform a whole-lung lavage was made. Using a double-lumen endotracheal tube, total of 8 liters warm sterile saline in one liter increments was instilled into the right lung and subsequently evacuated until clear return was obtained. Same procedure was repeated on the left side. Following a short stay in the hospital, she was discharged home on 2 L/min nasal cannula oxygen. **Discussion:** PAP is most often diagnosed in tertiary care centers with expertise in uncommon lung diseases. The proteinaceous material accumulation in the alveoli can cause a variable clinical course ranging from respiratory failure to spontaneous resolution. Due to its idiopathic nature and low incidence, significant research has not been conducted on improved treatment modalities. Life expectancy of patients with PAP often depends on how well the symptoms are treated. Treatment plans may include hypertonic saline nebulizer as well as vibratory therapy. Whole lung lavage is the gold standard for treatment and is recommended when the patient's symptoms progress into acute worsening of chronic dyspnea or hypoxia. **Disclosures:** Authors have nothing to disclose.
Sponsored Research - None

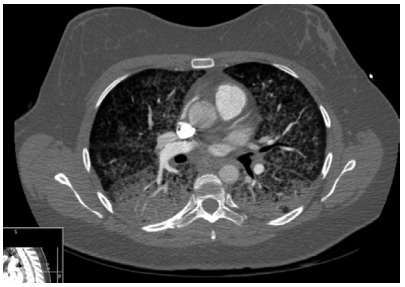

Figure #1: Chest CT showing the "Erratic Paving" pattern that is characteristic for PAP

2301848

TEST YOUR FENO WITH NIOX MINO: AN EXTENSION OF THE URBAN SURGE PROJECT.

Krystal F. Polanco[1], Joshua Casey[1], Michael McCarroll[2], Sofia Ray[3], Marina Bornacorsi[1], David Huggar[4], Sarah Stone[5], De De Gardner[1], Joseph Diaz[6], Brianne Murphy[6]; [1]Respiratory Care, UTHSCSA, San Antonio, TX; [2]Medicine, UTHSCSA, San Antonio, TX; [3]Nursing, UTHSCSA, San Antonio, TX; [4]Pharmacy, UTHSCSA, San Antonio, TX; [5]Physician Assistant, UTHSCSA, San Antonio, TX; [6]Urban Surge Free Asthma Clinic, San Antonio, TX

Background: Asthma is a chronic disease that can be deadly if not managed correctly. More than 3 thousand people, nationally, died prematurely due to uncontrolled asthma in 2011. Three million people live in Public Health Service Region 8 (PHSR8), which incorporates San Antonio. There are almost 2.6 million people in the PHSR8 with asthma and more than 63 thousand of them are children. Many asthmatics are without insurance or have insurance but are unable to afford their copayments. In order for these patients to best manage their asthma, they must have access to medications and be taught how to use them correctly. These statistics, along with many others, emphasize the need for asthma clinics such as the Urban Surge Free Asthma Clinic, which is the location of our project. **Methods:** Asthma knowledge and asthma control surveys will be utilized to gage the patients' disease understanding and medication adherence. Nursing and medical students perform a physical assessment on each patient including vital sign measurements. RT students assess the patients' FENO by using the NIOX MINO and the patient performs basic spirometry measuring: Peak Expiratory Flow Rate (PEFR), Forced Vital Capacity (FVC) and Forced Exhaled Volume in 1 second (FEV1). Combined these results provide an overview of airway inflammation and obstruction. The physician, medical or PA student review results, assess the patient and prescribe medications for asthma control and quick relief medication. The pharmacy or RT student provide asthma medication education using the teach-back method while utilizing verbal and visual aids. R**esults:** More than 50% (18/33) of patients were Hispanic, females. 45% (15/33) of those had an education level of a high school diploma or less and did not have insurance. 57% (19/33) of patients had an annual income less than $30,000, only 12% (4/33) of those were utilizing an assistance program. More than 70% (52/73) of patients believed their asthma was not well controlled. **Conclusion:** The Urban Surge Asthma Clinic fits a niche of patients with asthma in the "gap" of no insurance or with insurance but an inability to pay copayments. A vast majority of patients were very knowledgeable of their disease but had difficulty identifying their own symptom severity. Asthma is a controllable disease; this project demonstrates the importance of personalized asthma education in order to prevent unnecessary repeat emergent hospital visits.
Sponsored Research - In-kind contribution of a NIOX MINO by an Aerocrine representative.

Patient preforming a FENO measurement.

2302558

RESPIRATORY THERAPIST KNOWLEDGE OF LUNG CANCER IMPACT AND SCREENING.

Sarah M. Varekojis, Shane Brunner, Surya Dulal, Lindsey Eickel, Erin Hohlbein, Jessica Lumbard; The Ohio State University, Columbus, OH

Background: Licensed respiratory therapist (RT) knowledge of lung cancer has rarely been explored although RTs have an active role in the care of patients at risk for lung cancer. The objective of this study was to determine RT knowledge of the impacts of and screening guidelines for lung cancer. **Methods:** Institutional IRB approval was obtained. Objectives were accomplished by emailing a survey to the population of active licensed RTs in Ohio. RTs that were currently primarily working in neonatal/pediatrics or not working as an RT did not qualify for the survey. The participant was asked to selected true statements about lung cancer impacts and screening. The number correct determined the level of knowledge of the therapist. **Results:** Data was analyzed with descriptive statistics. Results indicated that only 5.7% of respondents had adequate knowledge of lung cancer impacts and 15.4% correctly identified criteria for lung cancer screening. There was no significant difference between RT's self-reported level of knowledge vs actual knowledge (P=.202). There was no significant difference between the level of knowledge and hospital size, number of years working, and hospital settings. 95% of licensed RTs believe it is their responsibility to promote lung cancer screening. **Conclusions:** The majority of RTs have less than adequate knowledge of the impacts and screening of lung cancer. If we can improve RTs knowledge of lung cancer, they will have a better understanding of what to recommend when they come in contact with a patient at risk for lung cancer. This can be achieved by providing enhancements to existing educational programs. **Disclosures:** No authors have any disclosures to report.
Sponsored Research - None

2302798

LUNG CLEARANCE INDEX AND NOCTURNAL OXYGEN SATURATION IN SUBJECTS WITH CYSTIC FIBROSIS.

Riccardo Guarise[1], Simone Gambazza[1], Anna Brivio[1], Palmiro Mileto[2], Carla Colombo[1,2]; [1]Cystic Fibrosis Center, Fondazione IRCCS Cà Granda Ospedale Maggiore Policlinico di Milano, Milan, Italy; [2]Faculty of Medicine, University of Milan, Milan, Italy

BACKGROUND Nocturnal hypoxemia is frequent in CF subjects and it is related to the increased vulnerability to cardiopulmonary changes induced by sleep. Reductions in minute ventilation and lung volumes, increased upper airway resistance, and positional V/Q mismatching potentially provide an increased ventilation inhomogeneity (VI). Given that lung clearance index (LCI) is an index specifically developed to detect heterogeneities in ventilation, we aimed to determine the correlation between LCI and nocturnal oxygen saturation (%SpO2). METHODS Clinically stable subjects with CF with a nocturnal monitoring of %SpO2 were recruited from January 2015 to April 2015. N2MBW was performed in triplicate using Exhalyzer®D (Eco Medics AG) according to the European CF Society operating procedure. LCI, indices of VI arising in the conductive (Scond) and acinar (Sacin) zones and first-to-zeroth moment ratio (M1/M0) were calculated. Descriptive analysis was conducted according to normality of data, tested through Shapiro-Wilk. Omoschedatistic non parametric analysis of variance was performed to detect differences among disease-severity groups. Spearman correlation was calculated between %SpO2 and FEV1(% of pred.), LCI, Scond and Sacin. Statistical significance was accepted at $P<0.05$. Data are presented as mean(sd). Institutional review committee approval was obtained for this study. RESULTS 25 subjects (13F) aged 17.5(12.5)yrs with a FEV1 %pred. of 79.6(30.2)% and a %SpO2 of 95.1(1.5)% were recruited. Difference among groups stratified by lung disease severity was found significant for LCI (P=0.004) and M1/M0 (P=0.002). Post-hoc test for LCI revealed significant differences between subjects with severe versus mild/normal pulmonary function (P=0.007) and between subjects with moderate versus mild/normal pulmonary function (P=0.003). Significant difference was found in mean M1/M0 between subjects with severe versus mild/normal pulmonary function (P=0.003) as well as between subject with moderate versus mild/normal pulmonary function (P=0.003). A significant negative correlation was detected between %SpO2 and LCI (rho -0.4876, P=0.013), Sacin (rho -0.4060, P=0.044) and M1/M0 (rho -0.4533, P=0.022). CONCLUSION LCI and M1/M0 provide an additional overview over FEV1 alone in assessing lung disease severity in CF. Correlation between %SpO2, Sacin and M1/M0 can provide new challenging insights in monitoring nocturnal SpO2, along with a deeper knowledge of early lung damage in CF.
Sponsored Research - None

2302806

WHEEZE AWAY ASTHMA EDUCATION: PEDIATRIC PULMONARY NAVIGATOR.

Jamie Lemmon, Holly Harron; Respiratory, Carolina's Healthcare System - Levine Children's Hospital, Indian Trail, NC

BACKGROUND: The most common chronic pediatric disease is asthma, effecting nearly 5 million children under the age of 18. The current estimated cost for asthma care exceeds 12 billion dollars, and is expected to rise to 20 Billion by 2020. JACHO established the first Pediatric Core Measure called Children's Asthma Care (CAC) in 2007. The measure for CAC is the Home Management Plan of Care (HMPC). This form is scored on an "all or nothing approach." Levine Children's Hospital (LCH) reached disease specific certification for CAC in 2012. As our system grows larger, there is a need to unify the care we provide. In 2014 we added a Pulmonary Navigator position. Our goal is to increase our compliance rate with the HMPC, decrease pediatric asthma admissions, and provide the same education throughout Carolina's Healthcare System. METHOD: The Pulmonary navigator at LCH is a Registered Respiratory Therapist. The Navigator provides individualized one on one asthma education, self-management skills, and medication management with delivery devices to hospitalized pediatric patients and their families at the main location. The navigator works closely with clinical case management, RRT, RN, and MD to help families better understand their child's disease. Every patient that is hospitalized for Asthma at LCH participates in asthma education. During education, families receive their HMPC, 2 spacers, a peak flow if applicable, and age appropriate asthma materials. Families are also scheduled a follow up visit with their primary care Physician, within 7 days of discharge. RESULTS: In 2012 our completion rate was 94%. With improvements to our program our HMPC compliance rate is now at 98%, 10% higher than the national average. CONCLUSION: We are now in the first stages of a pilot program for asthma education via telehealth. Through telehealth families at the pilot site will be able to interact with our Pulmonary Navigator by computer. A RRT at the pilot facility will take each family that needs education a computer. When the class is complete, the RRT at the pilot facility will finalize the families HMPC, provide the 2 spacers, and peak flow. Once the pilot facility is successful we will then expand the program to 3 other facilities. We believe that telehealth is the future of healthcare and a program like this will have a huge impact on our system and the community.

Sponsored Research - None

2303322

HARNESSING THE EMR TO IMPROVE DISCHARGE INSTRUCTIONS PROVIDED TO PATIENTS AND REDUCE TIME TO DISCHARGE.

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BACKGROUND: The NAEPP standard of care requires that patients discharged from the hospital with the diagnosis of asthma are to receive a comprehensive plan of care for home management. In studying the discharge process, it was noted that patients at Cincinnati Children's Hospital Medical Center received two documents upon discharge: an Asthma Action Plan (AAP) and an After Visit Summary (AVS), both delineating correct dosages 32% of the time. Working with a multidisciplinary team, a key driver diagram was developed to review the current process, identify system failures, test PDSA cycles and implement systems. The team developed a SMART aim to increase the percent of consistent discharge medication instructions on both discharge documents, the AAP and the AVS from 32% to 80%. **METHOD:** Those patients admitted under the asthma protocol were tracked to identify discrepancies between the two discharge documents. Compliance with the measure was plotted on a control chart. Interventions were trialed with several key measures adopted into practice. As the most prevalent issue identified was lack of communication between the bedside caregivers and physicians, a reminder text to reconcile medications was sent by the Respiratory Therapist (RT) four hours prior to discharge, The data demonstrated that this intervention was effective in improving discrepancies between discharge documents. **RESULTS:** Mapping the process identified the medication reconciliation as the source of information for the AAP and AVS. The key PDSA, the RT paging the physician four hours before discharge to reconcile the medications increased the percentage of correct AAP and AVS as well as decreased discharge from the expected by almost 20%. See attached control chart. Percentage of correct AAP and AVS increased from 32% to a median of 82%. **CONCLUSIONS:** Sustainable outcomes were achieved by employing a quality improvement system. Standardizing the process to reconcile medications had two significant outcomes; providing patients with consistent discharge instructions and reducing time from predicted discharge. Sustainability is being implemented with an automatic reminder generated by the EMR system that signals the RT to notify the MD four hours prior to discharge.

Sponsored Research - None

2303173

EARLY EXPERIENCE WITH THE COPD CARE COORDINATION PROGRAM AT THE RESPIRATORY INSTITUTE OF THE CLEVELAND CLINIC.

Richard Rice[1], Howard Christie[1], Pat Curtis-McCarthy[1], Scott Marlow[1], Xiaofeng Wang[2], Umur Hatipoglu[1]; [1]Respiratory Institute, Cleveland Clinic, Cleveland, OH; [2]Quantitative Health Sciences, Cleveland Clinic, Cleveland, OH

Background: Centers for Medicare and Medicaid Services has reduced payments to hospitals with excess readmissions within 30 days of hospital discharge. Chronic obstructive pulmonary disease (COPD) is one of the conditions included in the program. A multicomponent COPD care Coordination program was put into place to improve the care of the COPD patient after severe exacerbation and to decrease readmissions at the Cleveland Clinic. ***Methods:*** In April 2014, COPD exacerbation clinic was established to provide multidisciplinary outpatient followup for patients within 1 week of discharge from the Cleveland Clinic Main Campus. During the one hour visit, the patient is seen by a mid-level provider, a physician and an educator. In July 2014, the program was expanded to include visiting the patient while in-house and making weekly phone calls after discharge for a structured interview to assess health status and needs. Due to different onset of the program components and presence of patients who attended the clinic visit only, an opportunity presented itself to evaluate different components of the care coordination program. Pearson's Chi-squared test and pairwise comparison of proportions were used to determine differences in readmission rates between the patient groups exposed to various components ***Results:*** Of the 158 patients scheduled in the clinic, 95 attended the visit. Of these 95 patients, 13 were readmitted to the hospital. 45 were enrolled in phone follow up and accounted for 9 (20%) readmissions. Four of the 50 who did not receive phone follow up had 4 readmissions (8%). Conversely, of the 63 patients who did not attend the clinic, 29 (46%) were readmitted to the hospital. 25 were enrolled in phone follow up only and accounted for 14 of the readmissions (56%). 15 of the 38 not enrolled in any component (39%) accounted for the rest. Attending the COPD clinic was associated with significant reduction in readmissions when compared to telephone follow-up only or not participating in the program (p= 0.0001 and 0.005 respectively). There was no significant reduction in readmissions when phone follow-up was added to the COPD clinic visit (p= 0.32). ***Conclusions:*** Early post discharge follow-up in a specialty clinic was associated with reduced 30 day readmission rate. Incorporation of phone followup to the program was not associated with further reduction in readmissions. Limitations of this analysis include small sample size and lack of risk adjustment.

Sponsored Research - None

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2280665

CUFFED ARTIFICIAL AIRWAY STABILITY: DOES PRESSURE EASY, CUFF-SENTRY, OR INTELLICUFF REQUIRE HUMAN INTERVENTION COMPARED WITH TRADITIONAL PRACTICE?

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

BACKGROUND: It has been reported that 12 interventions/day are necessary to maintain artificial airway cuff pressure (CP) in the recommended range between 20 – 30 cm H_2O.[1] Continuous cuff regulation (CCR) is designed to maintain a selected CP but we wanted to know the impact on interventions (IVR). **METHODS:** A 24 mm I.D. artificial trachea (ribbed aerosol tubing) was intubated with a water-soluble lubricated 8.0 mm I.D. cuffed ETT; Hudson-RCI-Sheridan, (Teleflex Medical, Research Park, NC). The trachea was connected to an ASL-5000 breathing simulator, (IngMar Medical, Ltd, Pittsburgh, PA), compliance = 30 ml/cm H_2O, resistance = 20 cm H_2O/L/sec and ventilated with a Hamilton G5 ventilator, (Hamilton Medical, Reno, NV), in volume-controlled mode, VT=350 mL, RR=20 BPM, PEEP=17 cmH_2O, I:E = 1:3. CP and VT stability was evaluated separately with 2 pneumatic devices: CuffSentry (CS), (OutcomeSolutions, Mocksville, NC), and Pressure Easy, (PE), (Smiths Medical, Keene, NH), and 1 electronic device: Intellicuff, (IC), (Hamilton Medical, Reno, NV). PE was evaluated with and without an optional pressure feedback line (PFL) and inflated according to manufacturer's instructions. With the 2 remaining devices CP was adjusted to 25 cm H_2O BL. The number of IVR to maintain baseline CP and/or maintain VTexh within 50 mL of VTinsp was measured over 24 hours. ANOVA and paired t-tests were performed ($p \leq 0.05$). **RESULTS:** PE with and without the optional PFL required 5 and 10 IVR respectively in 24 hours to maintain CP ≥ 20 cm H_2O and VTexh within 50 mL of VTinsp ($p < 0.01$). CS and IC did not require IVR in the 24 hour period to maintain CP and VT within targeted baselines ($p > 0.05$). **DISCUSSION:** The BL CP applied to the artificial trachea was sufficient to effectively create a zero-leak condition. This was illustrated by equal measure of VTinsp compared to VTexh. Unlike frequent manual adjustments reported necessary with traditional surveillance and routine cuff check practices, CCR did not require intervention with 2 of 3 the devices evaluated. [1] Sole M, et al. Evaluation of an intervention to maintain endotracheal tube cuff pressure within therapeutic range. Am J Crit Care. 2011, March; 20(2): 109–118.

Sponsored Research - None

2290183

ARTIFICIAL AIRWAY VT AND CUFF PRESSURE STABILITY: ELIMINATING THE NEED FOR HUMAN INTERVENTION WITH PORTABLE INTELLICUFF?

William R. Howard, Paul Nuccio; Respiratory Care, Brigham and Women, Boston, MA

BACKGROUND: Cuffed artificial airways require multiple interventions (IVRs) to retain recommended cuff pressure (CP). Traditional practice is to react to cuff leaks by adding air to the cuff and provide once-per-shift cuff checks. With our use of continuous cuff regulation (CCR) we had concerns for patients managed on ventilators not having this feature. We also wanted a continuum of care for patients on lengthy transports where the cuff may deflate below 20 cmH_2O. We evaluated a portable (pre-FDA-510K approved) CCR for CP and VT stability and the frequency of IVRs. **METHODS:** A LifeForm adult airway trainer, (Model LF03699U, Nasco, Fort Atkinson, WI) was intubated with an 8.0 mm I.D. Microcuff ETT, (HalyardHealth Alpharetta, GA).The trachea was connected to an ASL-5000 breathing simulator, (IngMar Medical, Ltd, Pittsburgh, PA), compliance = 30 ml/cmH_2O, resistance = 10 cmH_2O/L/sec and ventilated with a Hamilton G5 ventilator, (Hamilton Medical, Reno, NV), in volume-controlled mode, VT= 500 mL, RR=14, PEEP=10 cmH_2O, I:E = 1:3. CP from an Intellicuff portable CCR, (Hamilton Medical, Reno, NV), was set to 25 cmH_2O.The airway trainer was turned every 2 hours to 1 of 5 positions; semi-fowlers, prone, supine, left and right lateral recumbent for a period of 120 minutes each. The following were continuously measured and recorded with a certified TSI-4080 FA-Plus analyzer, (Shoreview, MN): CP, inspired VT, and VTexh. The number of IVRs to maintain baseline CP and or maintain VT within 50 mL of baseline (BL) was measured over the 10 hours. Statistical analysis was performed by analysis of variance with a significant level of $p < 0.05$. **RESULTS:** During the 10 hour evaluation 36,000 measurements of VT and CP were recorded. The MD (± SD) of VTexh compared to inspired VT was -1.2 mL (± 5.4), ($p > 0.05$). CP MD (± SD) compared to set BL was -0.94 cmH_2O (± 1.6).There were no manual IVRs after initiation with the evaluated device. **DISCUSSION:** BL CP was sufficient to effectively create a zero-leak condition. This was illustrated by equal measure of inspired or set VT compared to VTexh. CP temporarily increased 2-7 cmH2O with each 'patient' turn. Within 4-10 minutes CP returned to BL without requiring IVRs. CP and VTexh were maintained at targeted baselines during this 10-hour evaluation. Unlike frequent manual adjustments necessary with traditional surveillance and routine cuff check practices CCR with the evaluated device did not require intervention after initiation.

Sponsored Research - None

2301399

HIGH CUFF PRESSURE OCCURS DURING MECHANICAL VENTILATION: CAN IT BE AVOIDED?

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

BACKGROUND: Cuff pressure, (CP), in excess of 30 cm H_2O is a risk factor for acquiring tracheal ischemia and subsequent complications. We wanted to identify whether CP using a standard cuff inflation technique, (SCI), exceeded baseline (BL) during mechanical ventilation, (MV). We also wanted to know if there was protection from excessive CP exposure using continuous cuff regulation devices. **METHODS:** A LifeForm adult airway trainer model LF03699U, (Nasco, Fort Atkinson, WI), was intubated with an 8.0 mm I.D. MicroCuff, (Halyard Health, Alpharetta, GA). CP was adjusted by syringe inflation to 25 cm H_2O BL. The airway trainer was connected to an ASL-5000 breathing simulator, (IngMar Medical, Ltd, Pittsburgh, PA), compliance = 30 mL/cm H_2O and resistance = 20 cm H_2O/L/sec. MV was provided by a Hamilton G5 ventilator, (Hamilton Medical, Reno, NV). Settings were: decelerating ramp waveform, VT = 350-500mL, RR = 14-25 BPM, PEEP = 5-10 cm H_2O, I:E = 1:2 to 2:1. Inspired VT, expired VT, and CP during inflation and deflation were recorded for 20 breaths in each test. In separate interventions the test was repeated using PressureEasy with pressure feedback line, (Smiths Medical, Dublin, OH), CuffSentry, (CS), (OutcomeSolutions, Mocksville, NC), and Intellicuff (IC), (Hamilton Medical, Reno, NV). BL CP with CS and IC was set to 25 cm H_2O. All measurements were recorded with a TSI-4080 FA-Plus pressure analyzer, (TSI Inc., Shoreview, MN). Statistical analysis was performed by analysis of variance with a significant level of $p < 0.05$. **RESULTS:** Measurements were taken every second for a total of 1,031 recordings in each test. There was no significant difference between inspired and exhaled VT ($p > 0.05$) with any method. Comparisons of SCI CP MD (±SD) with PE, IC, and CS are illustrated in the Table below. During inspiration SCI resulted in 42.4% of CP measurements in excess of 30 cm H2O. This compared to CP using PE, IC, and CS in excess of 30 cm H_2O at a rate of 86.6%, 15%, and 0.0% respectively during this evaluation. **DISCUSSION**: CP above normal perfusion pressure may contribute to tracheal ischemia. Traditional cuff inflation practice did not consistently limit CP to an acceptable maximum threshold during MV. Products designed to provide protective CP varied in performance.

Sponsored Research - None

	CP MD compared to SCI (±SD)	p	High CP % >30 cmH2O	Inspired vs. Expired VT MD (mL) (±SD)
SCI			42.4	3.9 (±16.6) (p >0.05)
PE	4.7 (± 4.5)	< 0.01	86.6	4.4 (± 14.6) (p >0.05)
IC	1.6 (± 5.3)	< 0.01	15.1	8.2 (± 12.9) (p >0.05)
CS	3.3 (± 3.4)	< 0.01	0.0	17.2 (± 23.4) (p >0.05)

2286999

EVALUATION OF PERFROMANCE CHARACTERISTICS OF 4 OSCILLATORY POSITIVE PRESSURE DEVICES IN A SIMULATED CYSTIC FIBROSIS MODEL.

Hillary Vanfleet[2], Diane K. Dunn[3], Teresa A. Volsko[1]; [1]Nursing Administration, Akron Children's Hospital, Akron, OH; [2]Respiratory Care, Rush Univeristy, Chicago, IL; [3]Respiratory Care, Akron Children's Hospital, Akron, OH

Background: Oscillatory Positive Expiratory Pressure (OPEP) therapy is an airway clearance therapy designed to deliver positive pressure and airflow oscillations during exhalation to decrease the mucus viscosity and propel secretions cephalad. ***Objective:*** To describe differences in performance characteristics of four commercially available OPEP devices during a simulated active exhalation. We hypothesized that statistically and clinically significant differences would occur in the mean PEP, oscillatory pressure amplitude, and frequency produced by the Acapella, Flutter, Cornet and the Aerobika. ***Methods:*** The Ingmar Medical ASL 5000 lung model simulated the pulmonary mechanics of a pediatric cystic fibrosis patient with moderate and severe lung disease. Resistance was standardized at 17.1 cmH_2O/L/s and compliance at 42.1 ml/cm H_2O. Breathing with active exhalation was simulated by setting the breath rate to 22 breaths/minute, and adjusting the muscle pressure (Pmus) to produce a tidal volume (V_T) of 409 ml. The Acapella, Coronet, Flutter and Aerobika OPEP devices were tested. Each device was set to create varying levels (low, medium and high) of expiratory pressure. The Flutter angle was achieved by positioning the device in a silicone adapter and verified with and electronic level and protractor. The Green Acapella, Blue Acapella, Aerobika and Cornet were adjusted to give low, medium, and high mean expiratory pressure using a dial on the device. Values for oscillatory frequency, peak pressure, positive expiratory pressure (PEP) and pressure amplitude were recorded over a 1 minute period, and graphically displayed. Oscillatory frequency counted over a 1 second period from the graphical display. Data were analyzed by 2-way repeated measures analysis of variance, and differences were considered significant when p was < 0.05. ***Results:*** Device performance varied with the pressure setting used during active exhalation, Table 1. The PEP and pressure amplitude were the lowest for the Flutter, Coronet and Acapella Blue across all pressure settings. The Coronet provided the most consistent peak pressures across all resistance levels. ***Conclusions:*** Although statistically significant, there were no clinically relevant differences in PEP, peak pressure and pressure amplitude between the Green Acapella, Blue Acapella, Aerobika and Cornet. The performance variations the Flutter produced, may impact clinical efficacy.

Sponsored Research - None

2300800

PREDICTORS OF TRACHEAL LENGTH FROM THE THORACIC INLET TO THE CARINA IN PEDIATRIC PATIENTS.

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BACKGROUND: Detecting and correcting tracheal tube (TT) malposition is essential to the care of intubated infants and children. However, in intubated patients in whom Pediatric Advanced Life Support (PALS) and Neonatal Resuscitation Programs (NRP) criteria are used to determine TT insertion depth, as many as 35% are malpositioned. This study evaluated adherence to PALS and NRP depth criteria and investigated relationships between chest X-ray (CXR) findings to predict tracheal length. **METHODS:** Of a total of 2000 intubated pediatric ICU patients (01/01/09 to 05/05/12), we used a randomization table to select a sample of initial AP supine CXRs that were retrospectively reviewed to confirm TT position, excluding patients with skeletal dysplasia, spinal deformities, or poor quality films. We measured distances (mm) from the superior margin of the clavicular heads to the tip of the TT, superior endplate of T1 to inferior endplate of T12, superior margin of the clavicular heads to lower endplate of T12, and superior endplate of T1 to carina. We recorded age, height, weight, gender, TT internal diameter, and cm marking at which the TT was secured to the lip. We compared the cm marking at which the TT was secured to the TT depth estimated using NRP and PALS criteria. Estimates were considered acceptable, based on TT size, if estimated and actual were ±0.25 cm for 2.5 - 4.0 mm TTs, ±0.50 for 4.5 – 6.0 mm TTs and ±1.0 cm for TTs ≥ 6.5 mm. We used descriptive statistics to report demographic data and TT depth guideline adherence. Spearman's Correlation evaluated the association among the distance markers, with $p<0.05$ considered significant. **RESULTS:** 507 CXRs were reviewed. 57% of patients were male; mean age (SD) was 46.44 (62.87) months. 15% of TT adhered to NRP and PALS depth guides within a conservative tolerance range. Table 1 provides the correlation across radiographic markers. **CONCLUSIONS:** Adherence to PALS and NRP depth criteria was poor. The radiologic markers with the greatest predictive values for tracheal length were the superior endplate of T1 to the inferior endplate of T12, and superior margin of the clavicular heads to the lower endplate of T12. The superior margin of the clavicular heads, an external landmark, merits further study to guide TT positioning.

Sponsored Research - University of Texas Medical Branch provided a restricted grant to the Department of Respiratory Care to sponsor a research scholar. Funding, in terms of salary support, was provided for the 1st author (a novice investigator) to participate in group discussions regarding study design, participate in data collection training and data collection

2301820

COMPARISON BETWEEN THE AARC CPG RECOMMENDED SUCTION PRESSURE AND MAXIMUM SUCTION PRESSURE ON VOLUME REMOVAL FROM TEST LUNG.

Justin Rodenbaugh, David Chang; University of South Alabama, Mobile, AL

BACKGROUND: Endotracheal (ET) suctioning is a common procedure performed in the ICU on mechanically ventilated patients. Complications of ET suctioning include removal of gases from the lungs, atelectasis, hypoxia, and arrhythmias. The AARC Clinical Practice Guideline (CPG) recommends that adults be suctioned with a maximum of 150 mmHg of suction pressure. The recommendation may not be followed by health care providers due to individual preferences or patient conditions. This study was done to evaluate the volume removal from the test lung at 150 mm Hg suction pressure and maximum pressure (>200 mm Hg). **METHODS:** Closed suction catheters of French sizes 12 and 14 were used to measure the volume removal at suction pressures of 150 mm Hg (AARC CPG maximum), and maximum pressure >200 mm Hg (vacuum regulator by Precision Medical TM). A modified test lung with a volume of >2 L was used in conjunction with a Carefusion Vmax Encore (TM) PFT system to measure the mid-inspiratory flow rate that was generated during the suctioning procedure. The average flow was converted to volume using flow (L/sec) x time (sec). Ten trials were done with both suction catheters at 150 mm Hg and maximum suction pressure (>200 mm Hg). The unpaired t test was used to compare the volume measurements. **RESULTS:** For the 12 French suction catheter, the mean volume difference was 0.06 L and the calculated t was 5.51 (table t = 2.11 at 0.05 level). For the 14 French suction catheter, the mean volume difference was 0.13 L and the calculated t was 11.14 (table t = 2.11 at 0.05 level). **CONCLUSIONS:** At a suction pressure of >200 mm Hg, the volume removal was significantly higher than the suction pressure as recommended by the AARC CPG. The health care providers must be vigilant when performing ET suctioning. Since excessive suction pressure could lead to atelectasis, ciliary removal, mucosal damage and adverse patient outcomes, the suction pressure should be kept at the lowest level possible. The patient's vital signs, cardiac rhythm and SpO2 should be monitored before, during and after the ET suctioning procedure.

Sponsored Research - None

2302463

THE RATIO OF UNPLANNED EXTUBATION TO REINTUBATION - IS THERE A RELATIONSHIP?

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Background: Recent data indicates that in spite of the advent of Spontaneous Breathing Trials, sedation "holidays", and aggressive ventilator liberation policies, greater than 10% of patients will extubate themselves(1). Previous data (2) has also indicated that approximately 10% of patients with spontaneous respiratory effort will require re-intubation. Data has also shown that purposeful Spontaneous Breathing Trials (SBT) shorten the duration of mechanical ventilation. In spite of this data, aggressive liberation from mechanical ventilation remains variable and is not always based on objective criteria. We previously presented our findings on Unplanned Extubation within our ICU's (3). We have continued to collect and monitor this data while looking for practical applications to practice change. **Method**: Retrospective departmental Quality Assurance data, approved for reporting by our IRB. **Results**: We have seen a further reduction in the ratio of UE/Intubations, with most recent data decreased to 0.019 (which represents a 24% decrease in UE events from our previous mark). Less than 3% of our UE events require reintubation (whether immediate or delayed). In addition to tracking the UE/Intubation ratio, we have incorporated the ratio of Reintubations < 24 hours/Total Extubations (including UE). The cumulative average for the past 10 months is 4.5% in all ICU's (n=147/3259 respectively). A single month's recent data is shown in Fig 1. **Discussion**: Tracking reintubations < 24 hours vs. total number of extubations presents an intriguing concept, at least in theory. Previously published data suggests a fairly low reintubation rate in spontaneously breathing patients (2), which is supported by our findings. This raises the question of whether or not more aggressive ventilator liberation practices will keep this ratio higher. It would be possible to compare this ratio across the spectrum to determine validity. **Conclusions**: Further study is warranted to determine if this ratio has significant impact on Ventilator Days. Secondary safety outcomes should be reviewed as well to ensure that ventilator liberation practices minimize safety risk while at the same time maximizing outcomes. [1]J Emerg Trauma Shock. 2013 Oct-Dec; 6(4): 241–245 [2] Brochard L et al, Am J Respir Crit Care Med, 2013 Jun 15; 187(12):1294-302 [3] "Unplanned Extubation in the Intensive Care Unit: One Hospital's Ongoing Experience" (Poster), December 2011, AARC International Congress, Tampa, FL

Sponsored Research - None

2303107

IN VITRO EVALUATION OF ENDOTRACHEAL CUFF PRESSURES FILLED WITH AN ALKALINIZED LIDOCAINE INTRACUFF MIXTURE.

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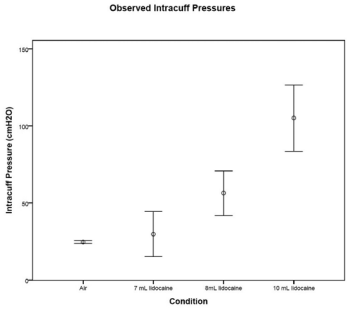
Introduction: The use of an alkalinized lidocaine mixture instilled into endotracheal cuff instead of air has been used in the operative setting for the reduction of emergence tube irritation. Although the use of this approach has been limited to 4 – 6 hours in the operative setting, some have proposed this approach in the intensive care setting. High intra-cuff pressures are a known cause of tracheal damage in patients who receive mechanical ventilation and current guidelines recommend maintaining cuff pressures at 25 cmH2O. No information exists about the level of pressure within the endotracheal tube cuff or what pressure is transmitted to the trachea when the endotracheal tube (ETT) is filled with an alkalinized lidocaine mixture. We conducted a bench model to quantify the intracuff pressure and the pressure transmitted to the trachea when the endotracheal tube is filled with a bicarbonate-lidocaine mixture. **Methods:** A biorealistic trach model was connected to an ASL 5000 test lung. The test lung was set to a compliance 50 mL/cmH2O and airway resistance to 5 cmH2O/L/sec. The trach model was intubated with a 7.0 ETT. We tested two brands of ETT (Mallinckrodt, Hudson RCI), 3 ETT for each brand. An Avea ventilator was connected to the endotracheal tube on A/C, VT 500, f 20, PEEP 5, FiO2 1.0. An esophageal balloon was connected to the Avea and inserted into the trach model so that balloon was adjacent to the endotracheal cuff to measure transmitted pressures. A 10 mL syringe was prepared with the following mixture: 1mL 4% lidocaine, 1 mL 8.4% sodium bicarbonate, and 8 mL saline. We tested 4 conditions: (1) filled with air to 25 cmH2O, (2) 7 mL, (3) 8 mL, and (4) 10 mL. Each condition was ventilated for 10 breaths. ETT pressures were measured using a Compass lumbar puncture transducer. ETT intracuff pressure and peak esophageal balloon pressure were measured at the end of the 10 breath run. Data is represented as mean ± sd. Results: Mean intra-cuff pressure for air = 25.67 ± .8, 7 mL = 29.8 ± 14.0, 8 mL = 56.5 ± 13.8, and 10 mL = 105.17 ± 20.5. Peak esophageal balloon pressures were as follows: air = 12.8 ± 5.6, 7 mL = 13.6 ± 5.6, 8 mL = 15.8 ± 4.9, and 10 mL = 18.8 ± 5.8. **Conclusion:** In this bench model instilling more than 7 mL of an sodium bicarbonate mixture may lead to excessive intracuff pressures. Further research is needed to evaulate the long term safety in using an alkalinized bicarbonate instilled into an endotracheal tube cuff.

Sponsored Research - None



2303148

AN IN-VITRO COMPARISON OF FLUID LEAKAGE PAST THE KIMVENT MICROCUFF® SUBGLOTTIC SUCTION ENDOTRACHEAL TUBE AND TAPER-GUARD EVAC® SUBGLOTTIC SUCTION TUBE IN AN ANIMAL TRACHEA.

Tim Op't Holt, Mohammed Rajhi; University of South Alabama, Mobile, AL

Background: Nosocomial pneumonia due to fluid leakage past the endotracheal tube cuff is a potentially fatal complication in mechanically ventilated patients. Oral hygiene and suctioning above the ETT cuff are used to reduce the incidence of nosocomial pneumonia. Continuous aspiration of subglottic secretion (CASS) tubes are used to remove secretions that may accumulate above the cuff in mechanically ventilated patients. The Kimvent Microcuff tube has a cylindrical cuff, while the Taperguard tube has a tapered/conical cuff. We hypothesized that fluid leakage past the cuff of the KimVent Microcuff CASS tube would be no different than that past the TaperGuard Evac CASS tube. **Method:** A 20 mm I.D. lamb trachea obtained from a slaughterhouse was intubated with the two styles of CASS ETTs to provide a model for measuring fluid leakage past the ETT cuff. The trachea was suspended at a 30-degree angle using a laboratory clamp. A graduated cylinder was used to measure the leakage of fluid (mineral oil) past the tube cuffs. Mineral oil (50 mL/hr) was dripped on top of the tube cuffs through an IV set. The oil was used to simulate oral secretions. Two new seven mm tubes of each of the two styles of tube were used in two experimental trials. In each trial, cuff pressures were decreased from 40 to 15 cm H_2O in decrements of 5 cm H_2O and fluid leakage was measured for five minutes at each pressure. Vacuum pressure to the CASS lumen was maintained at -20 mm Hg using a suction regulator, according to manufacturer's specifications and the CDC guidelines. One-way analysis of variance and Tukey's HSD were used to analyze the data with $\alpha = .05$. **Results:** There was no leakage of mineral oil past the ETT cuff at any cuff pressure in both cuff styles. **Conclusion:** This study determined the effectiveness of two models of CASS endotracheal tubes (ETTs) to prevent leakage of fluid past the cuffs. Results revealed that neither model of tube allowed leakage of fluid at the tested cuff pressures. **Disclosures:** none

Sponsored Research - None

2303293

ENDOTRACHEAL INTUBATION TRAINING AND SKILL MAINTENANCE FOR RESPIRATORY THERAPISTS.

Andrew G. Miller; Duke University Medical Center, Durham, NC

Background: Although respiratory therapists (RTs) performing endotracheal intubation (ETI) is a well-established practice, the optimum approach to train and maintain skills is unknown. The purpose of this study was to describe training methods for RTs who perform ETI, to explore how their skills are maintained and evaluated, and to identify barriers to RT performing intubation. **Methods:** A survey instrument was developed by the author and declared exempt by our institution's IRB. Following approval from the AARC Board of Directors, the survey was posted on the Management Section of the AARConnect online media platform in March of 2015 after being declared exempt from institutional review board review and. Respondents from institutions where RTs intubate answered questions about RT training and skill maintenance, while the other respondents answered questions about barriers to RTs performing ETI. **Results:** There were 74 respondents who completed the survey. 50% of the respondents were from institutions where RTs performed ETI. Institutions where RTs perform ETI were larger (mean 431 ± 397 vs. 257 ± 206 beds, p=0.02) and had more adult ICU beds (mean 58 ± 69 vs. 26 ± 28 beds, p=0.01). There were trends towards more RTs on staff (61 ± 59 vs. 40 ± 40, p=0.08), more neonatal intensive care beds (35 ± 26 vs. 25 ± 19, p=0.06), and for their facility to be a level 1 trauma center (16% vs. 3%, p=0.11). Other demographic data were similar. Results for training methods, re-certification methods, and staff selection are summarized in table 1. Classroom education lasted a mean of 4.3 hours with a range of 1 to 16 hours. The majority (62%) required 1 to 5 supervised ETIs, 29% required 6-10, and 9% required > 10. Recertification was automatic if a minimum number of ETIs were performed annually in 78% of centers, 59% required observed competency in the clinical setting, 24% required observed competency in the operating room, and 11% required a written test or classroom training annually. The most commonly cited barriers to RTs performing ETI were: 'Lack of need for RTs to intubate' (59%), 'RTs have not traditionally intubated at our institution' (53%), and 'resistance from providers' (41%). **Conclusion:** A variety of training methods were utilized, most commonly simulation training and supervised intubations. ETI recertification also varied, with most RTs being recertified if completing a minimum number of ETIs annually.

Sponsored Research - None

Table 1

Training Methods	Percent	Staff Selection	Percent
Supervised intubations	86%	Demonstrated competence in basic airway management	83%
Simulation training	84%	NRP - if intubating neonatal patients	83%
Classroom education	65%	PALS - if intubating pediatric patients	77%
Written materials	54%	ACLS	70%
Online learning modules or videos	38%	RRTs only	51%
Re-certification Methods		All staff are eligible for ETI training	26%
Automatic if a minimum number of ETIs were performed annually	78%	Years of experience prior to ETI training	
Observed competency in a clinical setting	59%	None	60%
Observed competency in the operating room	24%	> 1 year	24%
Written test	11%	> 2 years	16%
Annual classroom education	11%		

Table legend: ETI = endotracheal intubation, NRP = neonatal resuscitation program, ACLS = advanced cardiac life support, PALS = pediatric advanced life support, ACCS= adult critical care specialist, NRP = neonatal pediatric specialist

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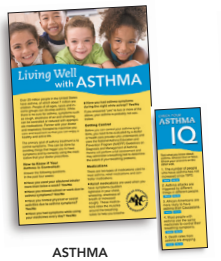

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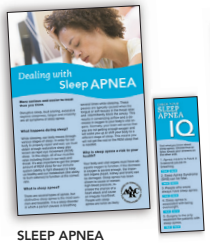

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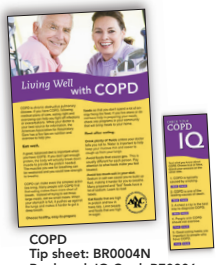

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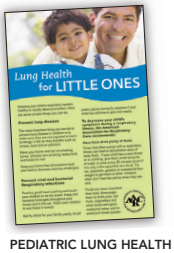

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2263390

USING A TEST BLUEPRINT TO ASSESS THE COGNITIVE LEVEL OF QUESTIONS IN A RESPIRATORY CARE PROGRAM.

Thomas D. Baxter; Allied Health, Northern Kentucky University, Highland Heights, KY

Introduction: The focus of this study was to use a test blueprint to evaluate the cognitive level of test questions. The research question of the study was; can a test blueprint be a useful tool for determining if test questions administered on Respiratory Care program examinations is equivalent to the NBRC's cognitive levels? **Methods**: The faculty of the Northern Kentucky University's Respiratory Care program provided twenty examinations from didactic classes for evaluation. A simple percentage was calculated and compared to the percentages of these three categories for both the NBRC's Therapist Multiple Choice (TMC) exam at the Certified Respiratory Therapist and Advanced Level. **Results**: The aggregate results showed an average cognitive level for each of the categories as follows: 58.25% recall, 23% application and 16.5% analysis. These results were compared to the NBRC's published values for each category: 25% recall, 53% application, and 22% analysis for the CRT level and 22% recall, 44% application, and 34% analysis for the Advanced level of the TMC. **Conclusions**: A test blueprint may be one tool that can be used by a Respiratory Care programs to assess the cognitive level of examination questions. The NBRC has established standards, for the cognitive levels of their CRT and Advanced levels, by which Respiratory Care program faculty can evaluate the examination questions administered within the faculties' programs. The faculty can then modify, if necessary, the cognitive level of the questions, administered in programmatic examinations, to better prepare these students for the NBRC exams.

Sponsored Research - None

2288838

EFFECTS OF SENSITIVITY TRAINING ON COLLEGE STUDENTS WHO PERFORMED HEALTH SCREENINGS AT AN URBAN FOOD PANTRY.

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BACKGROUND: In the United States, more than 45 million people are living at or below the poverty line, and healthcare providers are treating more individuals from underserved populations than ever before. Clinicians are often unaware of the difficulties these individuals face on a daily basis and may be unprepared to interact appropriately with them. The purpose of this study was to evaluate the impact of sensitivity training on students from The Ohio State University School of Health and Rehabilitation Sciences who performed health screenings on food insecure individuals at an urban food pantry as part of the School's CARE Connect grant. METHODS: Students from the following programs participated in the study: Respiratory Therapy, Physical Therapy, Occupational Therapy, and Medical Dietetics. IRB approval was obtained prior to the sensitivity training. Before conducting health screenings, students participated in sensitivity training that consisted of six hours of lecture, discussion, small group activities, and videos, and a three-hour visit to the food pantry. Twenty-six participants completed the Toronto Empathy Questionnaire (TEQ) and responded to two open-ended questions about their perceptions of food pantry clients, before training and three weeks after the screenings ended. TEQ scores were compared using two-tailed Students' paired t-tests with $p \leq 0.05$ considered to be statistically significant. Open-ended questions were coded for themes by three independent researchers in order to ensure inter-rater reliability. RESULTS: There was no statistically significant difference between pre and post TEQ scores. ($p=0.08$) Post project responses were significantly more personal and less stereotypical when students were asked to describe the population. When asked about resources necessary to improve the circumstances of the food insecure population, students were much more likely, post project, to suggest resources that were client-centered versus materialistic in nature. CONCLUSION: Our findings suggest that students working with underserved urban populations may benefit from sensitivity training prior to their involvement. Better understanding of underserved populations may ultimately lead to improved rapport and better health outcomes.

Sponsored Research - None

2289007

EPINEPHRINE PEN TRAINING AT GRADES K-12 SCHOOLS.

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Background: The purpose of this study was to investigate whether or not faculty in a k-12 school environment were properly trained in Epinephrine (Epi) Pen administration. The presence of trained staff, previous training with or without certification, and thoughts toward reacting to various situations were all explored. One hypothesis was tested: Faculty in grades kindergarten through grade twelve (k-12) are not properly trained to administer epinephrine (epi) pen treatment while in the work environment. **Methods:** A local school district was utilized to investigate the understanding of Epinephrine Pen (Epi) usage. The school district has a total of four schools on the school districts premises. A grade K-2, 3-5, 6-8 and a 9-12 school were surveyed. Within these four schools focus was on the faculty, staff, cafeteria staff and transportation departments skill set and knowledge base on the Epinephrine (Epi) Pen. The faculty was given a survey to complete that had a total of twenty questions and one open ended question for questions or comments. The survey was sent out through the director of instruction in an email blast. The surveys included basic questions focusing on their beliefs on the benefits of obtaining Epi Pen training and First Aid certification for themselves and their school, comfort of their skill level, seeing how many individuals in the elementary school faculty are actually certified without need of their job title, and how many faculty would be willing to become trained or certified. **Results:** A total of 144 participants (44%) of participants completed the survey. The results show that although 64% of those who responded have had Epinephrine (Epi) Pen training, 80% said they are not First Aid certified, and 97% have never utilized an Epinephrine (Epi) Pen on a student or colleague. Another major response showed that it was split between yes and no responses when asked if they could name 5 signs of an allergic reaction and if they were able to tell an Epinephrine (Epi) Pen had expired. **Conclusions:** Although many of those asked said they had training of Epinephrine (Epi) Pen administration it was split down the middle in regards to whether or not they knew what allergic reaction appeared as and how to tell if an Epinephrine (Epi) Pen was expired. Furthermore in depth questioning of staff may need to be utilized as well as small group training for proper administration of Epinephrine (Epi) Pen in life threatening situations.

Sponsored Research - None

2292012

ARE RESPIRATORY THERAPIST EDUCATED ON THE EMOTIONAL ASPECT OF TERMINAL EXTUBATION?

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BACKGROUND: Limited data are available regarding the availability of education targeting end of life issues for respiratory therapists. The purpose of the study is to examine if respiratory therapists (RTs) are educated on the emotional aspect of terminal extubation within the intensive care units in a pediatric hospital. **METHODS**: The descriptive study used a non-experimental research design and survey methodology. This study was approved by the Institutional Review Board. A convenience sample of respiratory therapist were recruited who have experience in the pediatric and neonatal intensive care units during their employment at Akron Children's Hospital. A survey was used to elicit responses on the type and frequency with which the subjects participated in end of life care. The electronic survey contained 18 closed ended questions gathering tenure information, type of terminal degree obtained and the type and length of education and training the participant recieved on end of life decisions and care. Informed consent was implied and participants had 2 weeks to complete their survey. Two reminder e-mails were used to improve the survey response rate. A thank-you was e-mailed to participants upon survey completion. The survey was constructed in an manner that prevented participants from subitting more than one survey. Descriptive statistics were used to summarize results. **RESULTS:** A 46% (19/41) survey response rate was realized. All of the respondents earned the RRT credential. Only 9% were baccalaurate prepared and 9% earned a graduate degree. Tenure varied from ***1.5*** to ***28*** years. Nearly all of the RT's participating (99%) of RT'S removed ventilator support during terminal extubation. A majority (88%) of RT's felt upset or needed support after performing terminal extubation. Most RTs (69%) did not receive education on end of life or terminal extubation during orientation and training and 88% did not receive continuing education during their career as a respiratory therapist. Nearly all (94%) felt RT's should routinely engage in end of life discussions with the multidisciplary team. **CONCLUSION:** Participating in terminal extubation causes emotional stress. RTs receive very little education and training to help them deal with this aspect of their career. The survey highlights educational gaps and provides validation of the need to enhance knowledge to minimize stress felt during end of life care.

Sponsored Research - None

2299143

WHY ARE COLLEGE STUDENTS SAYING NO TO ORGAN DONATION?

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Background: The purpose to this study was to investigate whether or not college students are misinformed on organ donation, have beliefs that prohibit donation, or are an organ donor. One hypothesis was tested: Misconceptions in regards to organ donation cause college students to say no when asked to donate their organs in fear of not being given proper care in emergency situations. **Methods:** A college student population was given a survey that had a total of 11 questions and one open ended question to address any questions or concerns. The survey was sent through a blast email system to the entire student population. The survey included basic questions focusing on whether college students are misinformed on organ donation, have beliefs that prohibit donation, or are a current organ donor. Informed consent was obtained. **Results:** Out of 54 participants, 66% were organ donors. Twenty seven percent (27%) of those surveyed have been persuaded not to donate at some point in time. Participants indicated beliefs that proper care would not be given if they were an organ donor (40%), had a fear that their organs would be taken before all measures were utilized to save their life (50%), and they have had a bad experience with organ donation (20%.) When those surveyed were asked if they would donate their loved ones organs if the situation arose, 35.19% were very likely, 33.33% were somewhat likely, 20.37% were not very likely, and 11.11% were not at all likely. **Conclusions:** people would say they would definitely take an organ for a dying loved one. They would be grateful for the family of the donor, but when it came down to it, would they have done the same when thinking about organ donation, many thing? This is a major issue with organ donation today. More education is needed about donation and the process, so people understand that the misconceptions are not true.

Sponsored Research - None

2299357

THE RELATIONSHIP OF A STANDARDIZED PRE-ADMISSION EXAMINATION AND SUCCESS ON THE RESPIRATORY THERAPIST CREDENTIALING EXAMINATIONS.

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BACKGROUND: Directors of Respiratory Therapy Programs are challenged to admit students with the ability to academically prosper and eventually be successful on national credentialing examinations. Similarly schools of medicine, law, and pharmacy utilize standardized pre-admission examinations as part of program matriculation criteria. This study is designed to assess the correlational relationship of scores attained on a specific standardized pre-admission examination with scores attained on the national respiratory therapy credentialing examinations. METHODS: Upon IRB approval, 61 students from two consecutive baccalaureate–level Respiratory Therapy Program cohorts voluntarily participated and were administered the Health Occupations Basic Entrance Test (HOBET V). Seven (7) students were lost to follow-up. Among the remaining students, participation varied among the three credentialing exams: Certified Respiratory Therapist (CRT) N = 54; Written Registry Exam (WRE) N = 48; Clinical Simulation Exam (CSE) N = 46. The Pearson product-moment correlation coefficient r was used to evaluate the strength of the relationship between the overall HOBET V Score (HVS) and the score of each exam. Significance was accepted at $P < 0.05$. RESULTS: The relationships found were: (1) HVS (M 54.51, SD ± 12.40, 95% CI 51.29-57.66) and CRT (M 82.02, SD ± 5.98, 95% CI 80.26-83.59), ($r = 0.554$, $P < 0.001$, 95% CI .315-.724); (2) the HVS (M 55.42, SD ± 11.52, 95% CI 52.06-58.56) and WRE (M 75.08, SD ± 8.75, 95% CI 72.60-77.46), ($r = 0.365$, $P = 0.011$, 95% CI .138-.568); and (3) the HVS (M 55.65, SD ± 11.67, 95%CI 51.98-58.50) and CSE Pass/Fail ($r = 0.314$, $P = 0.034$, 95% CI .003-.539). Using the coefficient of determination R2, the HOBET V accounted for 30.6% of the variability in performance of the CRT exam, 13.3% for the WRE exam, and 9.8% for the CSE Exam. Therefore for each exam respectively 69.4%, 86.7%, and 90.2% of the variability may be accounted for by variables not identified in this study. CONCLUSION: The authors conclude some program directors may find the HOBET V a useful adjunct to existing matriculation criteria in assessing potential performance of a new RT student on the CRT exam. Data supporting similar conclusions for the WRE and CSE exam are less compelling. DISCLOSURES: The authors have no conflict of interest with the content of this paper. It is noted that Assessment Technologies Institute (ATI), HOBET V owner, made the examinations available at no charge.

Sponsored Research - None

2301216

WHY DO EXPERIENCED CRTS ATTEMPT TO BECOME RRTS? A SURVEY OF CRTS PREPARING FOR THE RRT EXAMS.

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38% of Registry program graduates do not become RRTs. The question is "Why?" What are the barriers once they pass the CRT to becoming RRTs? And why do some CRTs later become motivated to seek their RRT credential? A survey of credentialed therapists who attended NBRC exam prep seminars was conducted in 2014 & 2015 to evaluate the barriers they had to become RRTs upon graduation and the reason they go back later in life to become RRTs. The majority of those surveyed were CRTs with 13.6 years experience. Becoming a RRT was a personal goal for the majority of CRTs. The primary barrier for motivation in becoming a RRT was the RT hiring manager who did not require RRTs to work in their facility. Over 2/3rds of those surveyed had failed one or both of the RRT exams. Only a third said that cost of taking exams was a barrier. Over half identified "Life got in the Way" as a reason they didn't pursue the RRT credential, such as marriage, babies, ill family, new job, etc. Three quarters said they waited too long after graduation to take the RRT exams. . Job security was an issue for a third of those surveyed, including they needed RRT or would lose their jobs and were less likely to get laid off as a RRT compared to CRT. Nearly 2/3rds said they couldn't find jobs as CRTs because managers are hiring only RRTs in their location. Only 6% said they couldn't get a RT license in their state unless they were RRT. 2/3rds of respondents said they would earn more money as a RRT, on average almost $9000 more per year. The significant barrier to becoming a RRT was that RT managers didn't require RRT for employment, thus allowing entry level practitioners to provide patient care. Waiting too long after graduation to take the boards was also a major issue as was failing a board exam and loosing motivation to retake the boards. Affording the exams was not a significant barrier but life events was a barrier. In conclusion, there are too many newly graduated CRTs in the workforce and RT managers are the biggest barrier to motivating CRTs to become RRTs. However, current market forces are starting to motivate a small number of CRTs to become RRTs. Financial rewards for the higher credentials doesn't seem to have a significant impact on motivation of CRTs. External motivating forces are needed to move the large number of CRTs to become the advanced Registered Respiratory Therapists.

Sponsored Research - None

2302053

PERCEPTIONS OF RT STUDENTS ON THE USEFULNESS OF METI CLINICAL SIMULATIONS PRIOR TO CLINICAL EXPERIENCE.

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INTRODUCTION: Clinical simulations have been used to supplement classroom, laboratory, and clinical learning. They are intended to improve a student's clinical knowledge and skills prior to clinical experience. This research study was done to evaluate the perceptions of RT students on the usefulness of clinical simulations prior to their clinical experience. METHODS: Fourteen METI (TM) clinical simulations were used to offer the pre-clinical instructions to RT students. These simulations were held at the Simulation Lab using standard protocols (i.e., pre-sim instruction, simulation, post-sim debriefing, discussion, & evaluation). The survey asked the opinions of 19 junior and 23 senior RT students on the usefulness of the simulations prior to their clinical experience. The simulation titles were: 1. Clinical assessment, 2 ECG, 3 O2 therapy, 4 Patient transport on mechanical ventilation, 5 CPR, 6 Patient falling, 7 RSV, 8 Arrhythmia recognition, 9. Neonatal distress, 10 Blocked airway, 11 Smoking cessation, 12 High risk neonatal assessment, 13 ET suctioning, 14 Speaking valve. For each simulation, the survey provided six options for respondents, as follows: Did not attend simulation, Did not experience in clinical, Not helpful at all, Somewhat helpful, Very helpful, and Extremely helpful. Respondents were asked to write in comments at the end of the survey. Survey results were analyzed by using frequency count. Written responses were noted for comments and suggestions for improvement. RESULTS: A total of 42 surveys (100%) were received. A vast majority (90%+) of the students responded that the 14 clinical simulations were useful (Very helpful and Extremely helpful) prior to their clinical experience. Written comments indicated that clinical simulations in the future should include (1) more interaction with other health care providers, (2) opportunities to repeat the simulations, (3) more time to practice the skills, (4) more simulations on different topics, and (5) more hands-on experience using the required equipment and supplies. CONCLUSIONS: METI clinical simulations are helpful to RT students who responded to the survey. Future simulations should include more opportunities to repeat the simulations, to work with other health care professionals, and to offer more hands-on experience with simulation equipment and supplies. More clinical simulations were also suggested by the RT students.

Sponsored Research - None

2302386

PERCEPTIONS OF RT MANAGERS AND PROGRAM FACULTY ON THE CHARACTERISTICS OF EFFECTIVE CLINICAL INSTRUCTORS.

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BACKGROUND: Clinical instructors are one major component of RT education. According to the published literature, there are many professional and personal characteristics that are essential to clinical instructors. The purpose of this study was to evaluate the perceptions of RT managers and program faculty on the characteristics of effective clinical instructors. METHODS: IRB approval was obtained prior to the study. Literature review was done to compile a list of important characteristics that were essential to clinical instructors. The 19 characteristics were grouped into four areas (Table 1): (1) Professional competence, (2) Interpersonal relationships, (3) Teaching ability, and (4) Evaluation skill. A survey was developed using these 19 characteristics. For each characteristic, the respondents were asked to select one of five options: Most important, Important, Neutral, Less important, Unimportant. Identical paper and electronic [(Monkey Survey (tm)] surveys were used to maximize the available sample size. Paper surveys were sent to 20 clinical managers at the local hospitals and electronic surveys were sent to 72 program faculty in five southeastern states. Both groups were asked to complete and return the survey within 30 days. Survey results were analyzed using frequency count and a descriptive method. RESULTS: Twenty (100%) paper surveys and 52 (72%) electronic surveys were received. A vast majority (90% to 100%) of respondents felt that each of 19 characteristics were "most important" or "important" for effective clinical instructors. A minority (0% to 10%) of respondents selected "neutral" on some of the 19 characteristics. No respondent selected "less important" or "unimportant" in the entire survey. CONCLUSIONS: RT managers and program faculty who participated in the survey have a general agreement on the published characteristics of effective clinical instructors. RT program directors and faculty should incorporate the concepts of these characteristics in the training program for clinical instructors and preceptors.

Sponsored Research - None

Table 1 Characteristics of effective clinical instructors based on literature review

Area	Characteristic
I. Professional competence	1. Facilitate student awareness of professional responsibility 2. Provide high-quality patient care 3. Demonstrate knowledge and clinical skill in clinical situations 4. Display and promote professionalism
II. Interpersonal relationship	5. Respect student as an individual 6. Be honest and direct with student 7. Demonstrate self-control, flexibility and patience 8. Is approachable, accessible and available to student during clinical hours 9. Provide support and encouragement to help build student
III. Teaching ability	10. Explain concepts and decisions clearly by emphasizing what is essential in clinical practice 11. Help students develop critical thinking skills 12. Able to collaborate with other professions 13. Demonstrate enthusiasm for teaching 14. Encourage students to ask questions 15. Help students achieve clinical competence
IV. Evaluation skill	16. Provide suggestions for improvement 17. Provide honest and constructive feedback 18. Avoid criticizing students in front of others 19. Evaluate student objectively and fairly

2302391

OUTCOMES OF THE UTAH SOCIETY FOR RESPIRATORY CARE'S (USRC) BREATHE-ZY COMMUNITY EDUCATION PROGRAM.

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Background: A member of the USRC Board of Director's (BOD) created & implemented a community education program since 1995 to raise lung health awareness among school-aged students. Key elements include: overview of chest anatomy, basic gas exchange, asthma attack physiology, interactive exercises & bovine/porcine lung dissection. The USRC was awarded a $5000 grant by Intermountain Healthcare as community partners to fund the program. Two Super User Training sessions were conducted to train Super Users prior to implementation by the USRC*. A RT student was assigned to lead the project as the USRC Student Committee's Chair. Seven sessions were completed between February 17 - April 20, 2015. A total of 89 elementary students completed the course. **Method:** Pre- & post-program assessment exams were given to students. **Results:** Pre- & post-program assessment exam outcomes are reported in Table One. **Conclusions**: Through the *Breathe-zy* program, we have appreciated an ***increased:*** 1) youth & adult awareness of the impact of tobacco on lung health, 2) awareness of the profession of RT, 3) RT value as key members of the healthcare team/community partners, & 4) University student engagement in the profession & AARC/USRC initiatives. Students & professionals better understand the impact of RTs as community partners. The program has provided RT & other university student disciplines to be mentored as leaders since they were responsible to schedule & teach courses, coordinate volunteers, input, analyze & report outcomes & create an abstract for publication. At the time of this survey, a $2500 grant was awarded to the USRC from SelectHealth with an additional $3000 donated from the Uinta Basin Medical Center to continue the program. The BOD has approved the purchase of an additional set of materials & supplies to meet the demands of the program across the state. It is our impression that for the profession to fully appreciate reaching the AARC's 2015-2020 initiatives, the forming of strong community partnerships will prove imperative. * Special thanks to Intermountain Healthcare, SelectHealth, Uintah Basin Medical Center & Super Users (Utah RT professionals, Weber State University & Stevens Henager RT students & University of Utah pre-medical students).

Sponsored Research - None

Table One: 2015 Breathe-zy Program Pre- & Post-Assessment Exam Outcomes

School Type	Student Participants # (%)	Pre-Program Exam Accuracy n=11 # (%)	Post-Program Exam Accuracy n=11 # (%)	Total Exam Questions # (%)
Elementary	89 (100)	6 (55)	10 (91)	11 (100)

2302442

COMPARISON OF SENIOR RESPIRATORY CARE STUDENT UTILIZATION OF SELF-INFLATING AND FLOW-INFLATING RESUSCITATION BAGS.

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Background: There are many variables in delivering adequate minute volumes during manual ventilation, including, which resuscitation bag to use. The purpose of this research project is to investigate the accuracy in which senior Respiratory Care (RC) students provide manual ventilation with the self-inflating and flow-inflating resuscitation bags. The null hypothesis states there is no significant difference in tidal volume (Vt), respiratory rate (RR) and minute ventilation (MV) when providing manual ventilation with self-inflating resuscitation and flow-inflating resuscitation bags. **Methods:** This study received IRB approval from the Texas State University IRB. Senior Texas State University RC students were recruited for participation by email. Participants were assigned two seperate dates and times to participate in the study as a way to prevent fatigue. Subjects signed an informed consent and were instructed to provide manual ventilation to an intubated RespiTrainer Advance manikin and test lung for five minutes with a set rate of 10 breaths per minute and a tidal volume of 500ml using a self-inflating resuscitation bag connected to oxygen on the first day of participation and again during the second day of participation using a flow-inflating resuscitation bag. Prior to providing manual ventilation to the manikin head, the test lung was calibrated using manufacturer recommendations and the test lung was set to a compliance of 50mL/cmH2O and a resistance of 5cmH2O/L/sec. Participants were blind to the parameters of their own resuscitation skills and data was recorded using the RespiTrainer Advance device. Data was analyzed using the paired t-test at an alpha level of 0.05. **Results:** Table 1 displays the means and standard deviations for RR, Vt and MV when using self-inflating and flow-inflating resuscitation bags. The paired t-test demonstrated significant differences between Vt ($p < 0.01$) and MV ($p < 0.01$) when comparing self-inflating and flow-inflating resuscitation bags. The paired t-test did not demonstrate a significant difference between the RR when using self-inflating and flow-inflating resuscitation bags ($p = 0.45$) Conclusion: The null hypothesis was rejected. Senior RC students provide accurate manual ventilation when using a self-inflating resuscitation bag; however additional practical training should be provided to RC students with the use of flow-inflating resuscitation bags when preparing them for a career in Respiratory Therapy.

Sponsored Research - None

Table 1. The mean standard deviations (SD) for Tidal Volume (Vt), Respiratory Rate (RR), and Minute Ventilation (MV) obtained for senior Respiratory Care Students providing manual ventilations with self-inflating and flow-inflating resuscitation bags.

Resuscitation Bag	Mean Vt ± SD (mL)	Mean RR ± SD (breaths/min)	Mean MV ± SD (L)
Self-Inflating	505.43 ± 75.46	10.10 ± 2.91	5.00 ± 1.25
Flow-Inflating	443.20 ± 98.56	9.61 ± 3.14	4.12 ± 1.25

2302811

COMPARISON OF HIGH-FIDELITY VERSUS LOW-FIDELITY SIMULATION WHEN PERFORMING BAG MASK VENTILATION.

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Background: Bag-mask ventilation (BMV) is a crucial step in the resuscitation process of an unresponsive patient to maintain life. It is important for clinicians to have the knowledge and skill to properly bag mask ventilate to increase the likelihood of a positive outcome. One method of teaching proper BMV technique is the use of simulation-based modalities. This study compared high-fidelity simulation training versus low-fidelity simulation procedural training on proper administration of bag-mask ventilation. **Methods**: Respiratory therapy students in an entry-level bachelor's and master's degree program and licensed respiratory therapists employed at an academic medical center (n=24) were randomly divided into two groups: the experimental group and the control group. The experimental group received BMV training with a high-fidelity simulator. The control group received BMV training using a low-fidelity simulator. Cognitive pre- and post-tests and pre- and post- affective surveys were used to determined study participant's change in knowledge and level of confidence. Both affective BMV surveys had anchors of 1 "very low" and 5 "very high" on a Likert scale. Psychomotor checklists were used to evaluate hands-on performance after the educational intervention. These tools were used to determine if there is a difference between low-fidelity and high-fidelity simulation when teaching proper bag-mask ventilation. **Results:** The overall group pre-cognitive test score was 67% with a post-cognitive test score of 77% with a p-value < .05. The control group had a pre-test score of 69% with a post-test score of 77% and a p-value < .001. The experimental group had a pre-test score of 64% with a post-test score of 76% with a p-value < .05. All of these scores were statistically significant. The psychomotor control group had a score of 85% and the experimental group had a score of 82%. This gave a p-value of .50; therefore this was not statistically significant. The average confidence score for the combination of the control (low fidelity) and experimental (high fidelity) group was 3.82 with a post training confidence score of 4.32. This is statistically significant with a p value of .00046. **Conclusion:** Overall, both high-fidelity and low-fidelity simulation improved knowledge and confidence regarding bag-valve mask ventilation. There was no difference in psychomotor skills between the control and experimental groups.

Sponsored Research - None

2302849

BASIC LIFE SUPPORT TRAINING FOR SPEECH AND HEARING IMPAIRED: A PILOT STUDY.

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Introduction The existing guidelines proposed by the American Heart Association (AHA) allow all individuals to be trained in Basic life support (BLS). That being stated, there is limited evidence on how to train individuals with disabilities, particularly speech and hearing difficulties. We wanted to assess the feasibility and identify the various techniques or modifications necessary for training speech and hearing impaired young adults in BLS using the current AHA guidelines. Method A pilot study was conducted among adults in the age group of 18 to 30 years. A total communication (TC) expert was identified and trained in the adult BLS program. Speech and hearing impaired individuals were trained by the BLS instructor with the help of the trained TC expert. The participants were trained according to the 2010 AHA adult BLS guidelines. The study received ethical clearance from the Institutional Ethics Committee. Participant's ability to understand the program, quality of chest compressions, ability to operate the automated external defibrillator (AED) was observed. Results and discussion A total of six individuals (2 males) having speech and hearing disability range as 80-90%, were trained. Of the two individuals who used hearing aids, one used a single hearing aid and the other used a pair of hearing aid. The subjects were able to perform high quality chest compressions but they found it difficult to perform bag mask ventilation and required repeated training. They could operate the AED but could not hear the instructions given by the device. The barriers to training are activating emergency response system, determining the depth of compression during practice, use of AED. The barriers during teaching include communication and clearing of doubts by the student, how to call for help, language of communication by the instructor, explaining the timing and critical concepts is difficult, concept needs to be known by the communication expert. Conclusion After the conducting the program we urge the resuscitation organizations to incorporate the following modifications to improve the training program for speech and hearing impaired. A facility to send message to the emergency medical response team, to incorporate a mannequin that has a visual feedback for chest compressions, modify the AED device to make it user friendly for speech and hearing impaired individuals, utilize a total communication expert for training speech and hearing impaired individuals.

Sponsored Research - None

2302996

USING SIMULATION TO ENHANCE TRANSITION TO A SINGLE PATIENT ROOM NEONATAL INTENSIVE CARE UNIT.

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Background: Simulation learning can promote the opportunity to develop and refine processes and skills using a multidisciplinary approach without putting patients at risk. The Neonatal Intensive Care Unit (NICU) at Akron Children's Hospital planned a transition from a 59 bed, open bay unit to a 75 bed, single room unit. We hypothesized that although an intense design and build project with meticulous planning had preceded the event; numerous process gaps could still be revealed that would enhance patient safety and improve perceived staff satisfaction with the transition. **Method:** A simulation program was designed to include a maximum of two eight hour sessions for nursing, respiratory care, advanced practice nurses, and physicians. A multidisciplinary team approach, led by respiratory therapists was used to design the program to meet the objectives of low and high acuity patient platforms. Evaluation forms were provided to reflect and summarize the staff's engagement, professional satisfaction before and after the simulation program, along with their recommendations for process improvements. Debriefing themes after each simulation were shared with leadership staff so that process enhancements could be changed quickly and re-evaluated for the next scheduled simulation. Daily frequently asked questions (FAQ's) and answers were shared via staff huddle and email. **Results:** A total of 274 staff members attended the simulation programs over a thirty day period. Participants identified over 40 discrete latent safety threats that included the theme of communication, organization, accommodations, ergonomic and technical safety threats that were resolved by workflow modification or practice change. Overall staff satisfaction improved with perceived comfort level for the anticipated transition after each session. **Conclusion**: Simulation can identify process gaps prior to a major institutional change. Increased staff satisfaction and improved process planning were recognized. Continued enhancement to processes and auditing will be needed to show sustained employee satisfaction and patient safety measurements.

Sponsored Research - None

2303187

CHANGING FROM INTRA-SHIFT INSERVICING TO PRE/POST SHIFT INSERVICING IMPROVES ATTENDANCE.

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Background: Respiratory therapy requires a lot of on-going education which requires frequent inservicing. The major barrier to attending an inservice is the fact that the therapists are busy caring for their patients. This conundrum often leads to therapists not being able to attend the inservice. The plethora of problems created by not receiving proper education could be discussed ad naseaum. **Method:** We issued a survey to ask the therapists as to why they could not attend the inservices that were being offered. The most common reason the therapist could not attend was that the therapists were busy taking care of their patients. We then shifted from intra-shift inservicing to pre/post shift inservicing. This is a retrospective review of inservice attendance. **Results:** During intra-shift inservicing we reported an average attendance of 74.8% and during pre/post shift inservicing we averaged an attendance of 90.75%. This is an increase in attendance by 16%. Intra-shift inservicing - 74.8% Dec, 2013, 99/164, 60%: February, 2014, 136/164, 83%: March, 2014, 127/164, 77%, May, 2014, 126/164 77%, July, 2014 127/164, 77% Pre/Post shift inservicing - 90.75% Dec, 2014, 155/164, 95%: Jan, 2015, 141/164, 86%: March 2015, 156/164, 95%: April, 2015, 142/164, 87% **Conclusion:** This novel approach to inservice scheduling, significantly improved the attendance rates. This research suggests that other departments can employ a similar strategy to improve their attendance rates. The authors agree that this research should be repeated by other centers to see if they get similar results. **Disclosure:** The authors have no conflicts of interest to disclose.

Sponsored Research - None

2303269

COMPARING PERCEPTION OF NICOTINE DEPENDENCE TO ACTUAL DEPENDENCE IN COLLEGE STUDENTS.

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Background: Nicotine is a highly addictive substance and people may not realize the severity of their dependence. The purpose of this study was to determine the association between the perception of nicotine dependence and actual nicotine dependence amongst college students. The null hypothesis states there is no relationship between student perception of their nicotine dependence and their measured nicotine dependence using the Fagerstrom Test for Nicotine Dependence (FTND). **Method:** This study received exemption from full IRB review by the Texas State University IRB. A questionnaire was provided to current students on the Texas State University campus who were greater than 18 years of age and identified themselves as tobacco consumers. Specific ethnicities were not excluded from the study. The 17-question survey consisted of items from the FTND questionnaire and additional questions regarding student perception of their own nicotine dependence measured on a 5-point Likert scale and their tobacco habits. The relationship of student perception of nicotine dependence to the level of nicotine dependence identified by the FTND questionnaire was obtained using the Spearman Correlation at an alpha level of 0.05. **Results:** Table 1 displays the demographic data and raw data collected from the questionnaire. The mean FTND score was 3.15 ± 2.25 standard deviation and the mean student self-dependency score was 2.93 ± 1.32 standard deviation. A rho of 0.59 and a p-value of < 0.01 was obtained using the Spearman Correlation when comparing student perception of nicotine dependence and nicotine dependence obtained from the FTND questionnaire. **Conclusion:** A moderate positive relationship was found when comparing student perception of nicotine dependence and actual nicotine dependence measured by the FTND questionnaire. Due to this the null hypothesis was rejected. When comparing student perception of nicotine dependence on the weighted 5-point Likert scale to their level of nicotine dependence on the weighted 10-point FTND scale, student perception of nicotine dependence exceeded their level of nicotine dependence determined by the FTND questionnaire. Disclosures: The authors have no conflicts of interest with this non-funded research.

Sponsored Research - None

2303288

EVALUATING THE HEALTH LITERACY AND EFFECTIVENESS OF WRITTEN DRY POWDER INHALER INSTRUCTIONS IN PATIENTS DIAGNOSED WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE.

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Background: Improper inhaler use results in decreased drug deposition in the lungs. The impact of health literacy and poor vision on the patient's ability to learn inhaler technique by reading instructions has not been confirmed. This study evaluated the role of health literacy and visual acuity on learning inhaler technique for patients diagnosed with chronic obstructive pulmonary disease (COPD) who used a dry powder inhaler (DPI). **Methods:** This pilot study recruited patients diagnosed with COPD from an outpatient pulmonary clinic. Institutional review board approval was obtained. Health literacy was measured by the S-TOFHLA and visual acuity by a Snellen chart. A trained assessor scored patients' inhaler technique based upon a checklist developed from the American College of Chest Physicians (ACCP) handouts. After reading the appropriate ACCP handout, inhaler technique was re-assessed and total correct steps computed. Peak inspiratory flow rates (PIFRs) were measured using an InCheck DialTM. Associations between health literacy and visual acuity with changes in patients' inhaler technique scores were assessed by a Spearman's rho. Inhaler technique change scores were assessed by the Wilcoxon signed rank test at $P = 0.05$. **Results:** Of the 24 patients enrolled, 63% were female, mean age was 65.6 years, and 83% were GOLD grades 2 or 3. The median health literacy and vision scores were 31 (IQR = 20 to 36) and 20/20 (IQR = 20/20 to 20/30), respectively. There were no associations detected between health literacy and the handout intervention for Diskus®, $rs = 0.052$, $P = 0.84$, nor Handihaler®, $rs = -.038$, $P = 0.88$. Similarly, no associations were detected between vision and handout intervention for Diskus®, $rs = 0.369$, $P = 0.16$, nor Handihaler®, $rs = -0.013$, $P = 0.96$. Wilcoxon scores were significant for improved total scores for both the Diskus® and Handihaler® with $z = 1.983$, $P < 0.047$ and $z = 3.169$, $P < 0.002$, respectively. The minimum required PIFR was achieved by 93.8% of the Diskus® and 94.4% of the Handihaler® groups. **Conclusion:** Neither vision nor health literacy were associated with the inability to learn inhaler technique from the ACCP handouts. The ACCP handouts for DPIs helped patients already using a DPI to improve their inhaler technique. Stable patients diagnosed with COPD are able to generate appropriate PIFRs to properly use DPIs. Disclosures: No disclosures to report.

Sponsored Research - None

2303344

USING HIGH-FIDELITY SIMULATION TO INCREASE NONINVASIVE VENTILATION PROFICIENCY IN RESPIRATORY THERAPY STUDENTS.

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Using High-Fidelity Simulation to increase Noninvasive Ventilation proficiency in Respiratory Therapist Students Background: Respiratory Therapists must be well-versed and proficient in all aspects pertaining to noninvasive ventilation. High-fidelity simulation presents as a great adjunct tool to augment RT students' proficiency in NIV, by exposing students to real-life scenarios in a controlled environment without exposing patients to harm. We hypothesized that high-fidelity simulation will significantly affect respiratory therapy students' proficiency level. **Methods:** IRB approval waiver was received. Thirty senior students of an Associate Degree Respiratory Therapy (ASRT) program participated in a prospective randomized controlled study with repeated measures of practice and test-simulations. Students underwent a practice simulation (practice group) followed by a test-simulation of a clinical scenario (test-simulation group) that evaluated the students' performance as it pertains to the assessment and treatment of either a CHF or COPD patient using NIV. Demonstration of increased proficiency was assessed by comparing practice group and test-simulation group scores. Data was analyzed by the paired-samples Student's t-test. The alpha value was set at .05. The Human Patient Simulator by METI with MUSE software and the V60-ventilator by Philips-Respironics were utilized to conduct the simulations. **Results:** There was significant difference in the scores for practice simulation group ($M=34.8$, SD 9.3), and test-simulation group ($M=42.0$, SD 10.3) conditions; $t(29) = -4.14$, $p = .000$. Figure 1. Practice simulation and test simulation scores. **Conclusion:** We found significant difference between the practice group and test-simulation group scores which indicates that high-fidelity simulation can serve as tool to augment RT students' proficiency in NIV. **DISCLOSURES:** No conflict of interests to disclose.

Sponsored Research - None

2300898

REDUCING LENGTH OF STAY WITH TRANSFER OF STABLE LONG TERM VENTILATOR PATIENTS TO MEDICAL SURGICAL FLOORS.

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Background: Patients requiring long-term ventilation (LTV) have lengthy stays in intensive/critical care settings. The average ICU length of stay (LOS) prior to moving to our step down Progressive Care Unit (PCU) is 15.5 days. The baseline average for LOS for PCU is 20 days. The hospital executive team challenged the medical service line to create an alternative location for providing appropriate, cost effective care interventions for these long-term ventilator patients. A multidisciplinary approach was used to create an action plan which included respiratory therapy (RT), nursing and pulmonary critical care (PCC). The goal was to reduce PCU LOS from 20 to 15 days by June 30th 2015. **Method:** Criteria to define which patients would transfer were developed jointly by RT and nursing and approved by PCC. Stable home ventilator patients were chosen as the first group to be evaluated; all education to bedside nursing staff was scheduled with a dedicated RT to the unit and a nurse educator. Competencies were established and verified. **Results:** The data obtained on each of the 10 ventilator patients thus far that have transferred from PCU to the med/surg floor demonstrate that 80% of them had a LOS<20days in PCU. The average LOS of patients transferred to the med/surg floor is 10.25; this is close to a 50% reduction from the baseline LOS for the overall ventilator population in PCU. Labor and supply cost savings, alone, over the 12 weeks were > $9000.00. **Conclusion:** Improving patient flow, decreasing cost and improving clinical outcomes by using a multi-disciplinary team to manage the LTV population is demonstrating positive results. The next phase will include taking stable long-term ventilator patients directly from critical care and from the emergency department.

Sponsorship: None
Sponsored Research - None

2301040

MULTIMODAL STRATEGIES IMPROVE COMPLIANCE WITH LUNG-PROTECTIVE VENTILATION GUIDELINES.

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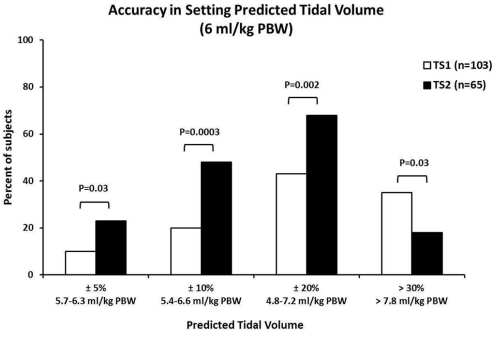
Introduction: In a previous study we identified low compliance in setting tidal volume (V_T) according to a lung protective strategy of 6 mL/kg predicted body weight (PBW) as per our institutional guidelines. Only 20% of subjects received lung protective ventilation (LPV) within ± 10% of their predicted V_T (PV_T). We found that lack of adherence to our institutional guideline for LPV was not due to inaccurate height measurement and calculated PBW but rather suspected that it may be related to the previous teaching strategy (TS1). **Hypothesis:** Compliance would be increased using an improved multimodal teaching strategy (TS2) that includes both classroom and bedside components specifically directed at LPV. **Methods:** Residents at the beginning of their monthly rotation received a classroom lecture redesigned to emphasize the LPV protocol, ARDSnet V_T charts were placed in each ICU room, and LPV settings were reviewed during daily rounds in our trauma/surgical critical care unit. Data were collected on 65 consecutive subjects who were receiving conventional volume ventilation. Height was determined by measuring ulnar length (Ulnar Ht) using an established, validated method and then compared to the height entered into the hospital's electronic medical records (Epic Ht). Predicted body weight was determined using the ARDSnet V_T tables. Set V_T (SV_T) was then compared to PV_T and reported as percentage PV_T. IRB approval was obtained prior to collecting these data. Student's t-test was used to compare continuous variables while Fisher's exact test was used to compare dichotomous variables. **Results:** There was no significant difference between Ulnar Ht and Epic Ht (P>0.2). The accuracy in setting PV_T for each teaching strategy is shown in the Figure. Compared to TS1, TS2 resulted in significantly higher percentages of subjects receiving LPV within 5%, 10%, and 20% of PV_T. Only 18% of the TS2 group had SV_T > 30% of PV_T compared to 35% of the TS1 group. Forty-eight percent of TS2 subjects received LPV within 10% PV_T (range 5.4-6.6 ml/kg PBW), as compared to only 20% of TS1 subjects. **Conclusion:** A multimodal teaching strategy significantly improved compliance with our LPV guidelines. Further studies are required to determine the contribution of each component of the teaching strategies in order to optimize compliance.

Sponsored Research - None



2301190

TO EXPLORE THE CLINICAL FACTORS OF VENTILATOR WEANING.

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Background:Due to the advancement of medical technology, the average age of human has been prolonged, which results in the coming of aging society. Increasing of the patients with chronic diseases lead to the increasing of patients with ventilator-dependent. Patient use ventilators for a long time can cause a lot of complications, meanwhile it also increase the medical expenses. The weaning process is both manpower and material resources -consuming. This study aims to explore the relationship of the ventilators weaning and the characteristics of patients, including the weaning index and nutritional status.**Method** :The study collected data via chart review retrospectively. One hundred and fifty three intubated patients who use ventilators in medical intensive care unit(MICU) of one northern regional teaching hospital from January to December 2013 were collected. The basic characteristics (age, gender, primary diagnosis, Apach-II,on-ventilator days), nutritional status (albumin, BMI, calories), measurement data and clinical indicators of the patients were collected. Data that were obtained from this documentation then was hand-entered into an SPSS database. All analyses were done using SPSS software(SPSS17.0/WIN XP). Statistical analysis were performed using descriptive statistics, frequency distribution, Pearson's chi-squared test,T-test percentage, correlation analysis and etc.**Results**: This study showed that there were 89 patients successfully extubated and weaned from ventilators in 153 patients. Among those 89 patients who weaning successfully, there were 52 patients measured with weaning index (RSI) below 105(P<0.05). **Conclusion**:It was one of the important issues in how currently medical management helping the patients weaning from ventilator as soon as possible, in order to reduce the patient's anxiety and discomfort. From the results of this study, RSI value was the significant factor in predicting successful ventilator weaning. Through this study, we wish to provide the reference of clinical care and future prospective studies.

Keywords: ventilator weaning, RSI: Rapid shallow breathing Index
Sponsored Research - None

Table 1 : weaning index (RSI <105), RSI: Rapid shallow breathing index

MV Weaning	RSI	Number	Percentage	(Pearson) test
Failure	>105	64	41.8	-------
Success	<105	89	58.2	P<0.05
Total		153	100.0	

P <.05 as significant factor during the Patient weaning mechanical success .

2301384

DRG 3/4 VENTILATOR LENGTH OF STAY WITH A MULITIDISCIPLINARY APPROACH.

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Background: Approximately 250,000 traumatic brain injuries (TBI) and 12,000 spinal cord injuries occur in the U.S. every year. These patient populations are highly susceptible to prolonged mechanical ventilation (PMV>96hrs) and may require tracheostomy potentially increasing length of stay (LOS) and cost. Tracheostomy patients are coded as diagnosis related groups (DRG) 3, 4. Hypothesis was that using a multi-professional team to classify and treat these patients would reduce ventilator length of stay (VLOS), LOS, and subsequently reduce cost. **Method:** Daily Trauma rounds were used to identify and follow the DRG 3, 4 patient populations and track VLOS. There were 33 patients followed from December 1, 2014, thru February 8, 2015 (Group One). From this method it was thought that a multidisciplinary approach to these patients would be beneficial. A Lean Team was created and consisted of a Trauma MD,Trauma NP/PA, Trauma Navigator, Respiratory Therapist, PT, OT, Speech, Palliative care, bedside RN, Case management, and Financial counseling. This pilot program lasted 6 weeks, Monday - Friday from February 8, 2015 until April 2, 2015 (Group Two). The Lean Team identified 23 patients that met the following criteria; Severe TBI or GCS <8, intubated SCI, Expectation of mechanical ventilation >72 hrs. We compared VLOS from Group one vs. lean team Group two. Respiratory followed vent day,trach day,bronch day, vent settings, ventilator weaning, chest tubes/output and x-rays. **Results**: In a 6 week period we decreased VLOS by 26.5% between the two groups which averaged to a decrease of 3.34 ventilator days per patient. Total ventilator LOS prior to lean team averaged 12.6 days. Total VLOS with lean team averaged 9.26 days. This created 76.82 opportunity days. **Conclusions**: The multidisciplinary approach created a way to communicate effectively amongst all disciplines in real time and provided continuity of care throughout the hospital stay.There were no delays in patient care. Lean team RTs functioned in an untraditional manner, assigned only to lean team patients. RTs collected data for rounds and presented to the team, and worked closely with the bedside RTs to manage these patients. The multidisciplinary approach shows that you create hospital savings, decrease VLOS, increase patient satisfaction, and decrease overall hospital LOS. The RT was an integral part of the success of the lean team model and we will continue to seek ways to redefine our role and grow our profession.

Sponsored Research - None

2301454

TRANSITIONING CHRONICALLY VENTILATED PEDIATRIC SUBJECTS FROM THE SERVO *I* TO A HOME CARE VENTILATOR: A RETROSPECTIVE REVIEW.

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Background: An estimated 4,300 children in the US are managed at home on mechanical ventilation.[1] Transition to a home care ventilator (HCV) is required for hospital discharge. Failure to transition to a HCV leads to increased length of stay (LOS). Data were reviewed from ventilated pediatric subjects admitted to our long term ventilator unit to observe if patterns were noted in successful transitioning strategies. **Methods:** This study was not deemed human subject testing by the local IRB. Subjects' medical records were reviewed who transitioned from the Servo *i* to a HCV (LTV or Trilogy) from 2013-2015. All subjects required long term ventilation and were diagnosed as having chronic respiratory failure for a variety of diagnoses. Data collected included diagnosis, admission/discharge dates, LOS, and specific ventilator data including: Mode, Rate, PIP or $V_{T,}$ PEEP, Pressure Support (PS), MAP, Time Termination (TT), Flow Termination % (FT%), I-Time, and Inspiratory Rise Time (IRT) on the Servo *i* prior to transition and HCV after transition. Initial successful transition was defined as > 14 days. **Results:** Initially, 26 subjects were included in the study. Data were excluded from 9 subjects since they were readmitted for acute illness. Of the remaining 17 subjects, mean LOS was 14.5m (range 6.6m-27.4m). Successful transition attempts ranged from 1 to 10 per subject, with 60%transitioned to a HCV by the third attempt, while 40% required from 4-10 attempts. No differences between mean age or mean weight at initial transition and successful transition were found (12.5m vs 15.2m [p=0.33] and 9.0kg vs 9.7kg [p=0.46]; respectively). Settings between the Servo *i* and the HCV were matched for Mode, Rate, PIP or $V_{T,}$ PEEP, I-Time, and PS. Settings that could not be matched between the ventilators included IRT, FT%, and TT. Changes in IRT, FT%, and TT on the HCV were made infrequently during subsequent transition attempts and were only noted 35% of the time for IRT, 35% of the time for TT, and 29% of the time for FT%. **Conclusion:** Transitioning chronically ill children to HCV can be challenging. The data indicate there were no differences in ages or weights between initial and successful transition attempts. Changes in IRT, TT, and FT% were not altered following unsuccessful transition attempts which may have hindered successful transition. Protocol development addressing IRT, TT, and FT% may lead to earlier successful transitioning in chronically ventilated patients.

Sponsored Research - None

2301485

A COMPARISON OF LEAK COMPENSATION DURING NEONATAL NONINVASIVE VENTILATION DELIVERED BY THREE ICU VENTILATORS: A LUNG MODEL STUDY.

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Background: Nasal noninvasive ventilation (NIV) is the current approach for supporting neonates with respiratory distress. However, air leak causes triggering and cycling asynchrony. In this study, we evaluated leak compensation in 3 ICU during neonatal NIV. **Method:** Three ICU ventilators (Covidien PB840, Covidien PB980 and Maquet Servo-i) were compared using a lung simulator (ASL 5000, IngMar Medical) with leak. Four neonatal ventilation models with different lung mechanics based on body weight (0.5, 1, 2 and 5 ml/cmH_2O of compliance, 200, 150, 100 and 50 cmH_2O/L/s of resistance and -3, -4, -5 and -6 cmH_2O of inspiratory effort for 0.5, 1, 2 and 4 kg, respectively) were tested at four different leak levels (baseline [B]: 1.5 L/min for all; L1, L2 and L3: 3, 4.5 and 6 L/min for 0.5 and 1 kg; 6, 9 and 12 L/min for 2 and 4 kg). A neonatal mannequin head connected to the ASL 5000 was ventilated via 4 different sizes of the Neotech RAM cannula. All ventilators were set in NIV-pressure support (PS) mode with 5 cmH_2O of PEEP. Pressure support was set at the level to establish a tidal volume of 6-8 ml/kg. All combinations of increasing and decreasing leaks were sequentially added to the system. Two minutes of data was collected after each change in leak level and the asynchrony index (AI) was calculated as following: AI (%) = [auto-triggering (AT) + miss-triggering (MT) + premature cycling (PC) + delayed cycling (DC)] / (total simulated breaths + AT)] ×100. **Results:** At baseline settings, no triggering of the ventilator occurred in the 0.5 kg model with the PB840 and in the 0.5, 1 and 2 kg models with the Servo-i. The mean AI across all the ventilators was 84.6 %, and MT was the most common cause of asynchrony (AT: 1.7%, MT: 78.3%, PC: 5.9%, DC: 0.2%). The AI was significantly different between ventilators (PB840: 85.2%, PB980: 69.3%, Servo-i: 99.2%, $p < 0.001$). Among the PB840 and the PB980, trigger delay time of the PB840 was significantly longer than that of the PB980 (232 ± 52 ms vs. 192 ± 53 ms, $p<0.001$), the AI decreased as the body weight increased (0.5 kg: 99.3%, 1 kg: 76.3%, 2 kg: 70.8%, 4 kg: 48.0%, $p < 0.001$), and as leak decreased (B: 46.6%, L1: 65.8%, L2: 89.7%, L3: 92.8%, $p < 0.001$). The 4 kg model with the PB980 was the only condition that the AI was below 30% across all tested conditions (25.5%). **Conclusions:** In this lung model study, trigger delay and miss-triggering were frequently observed during PS in neonatal NIV delivered by ICU ventilators.

Sponsored Research - None

2302315

EXPIRATORY TIME CONSTANT AGREEMENT WITH ADULT MID-FREQUENCY VENTILATION.

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BACKGROUND: Mid-frequency ventilation (MFV) utilizes the application of pressure control ventilation to deliver low tidal volumes while preserving minute ventilation by providing higher than normal respiratory frequencies. However, frequency can be limited due to increased risk of auto-PEEP secondary to inadequate expiratory time. An important consideration for MFV is whether an agreement exists between the expiratory time requirement and the expiratory time allowed at these higher frequencies. **METHODS:** We tested the question of expiratory time requirements using mathematical agreements of higher-than-normal frequencies and expiratory time constants (3t and 4t) calculated using varied airway resistances and lung compliances. To determine adequate emptying of lung volume we used the concept of time constants as a guide (Fig 1). Expiratory time allowances were determined using frequencies of 50, 60 and 70bpm with an inspiratory time % (T_I%) of 40% and 45% (Table 1). Expiratory time required at each frequency was calculated by multiplying airway resistance (R_{aw}) by lung compliance (C_{rs}) to determine the corresponding expiratory time constants. These expiratory times were compared to determine if an agreement existed and assess the risk for auto-PEEP under the specified lung conditions and corresponding frequencies. **RESULTS:** As demonstrated by the required expiratory time at 3t and 4t in Table 2, the agreement of high respiratory frequencies during MFV and required expiratory time will be limited by R_{aw} and C_{rs}. Consideration of auto-PEEP is more likely in lung units with high resistance and high compliance- resulting in slow time constants. Figure 2 shows the agreement plots of the three respiratory frequencies given the two T_I% variables of 40% and 45%. These agreement plots can be used as a clinical practice guideline for the application of MFV in the presence of variable clinical conditions. **CONCLUSION:** The adoption of MFV has the potential to change clinical practice and mechanical ventilation management in patients with low lung compliance disease processes. To utilize MFV to its full potential, providers must determine an appropriate frequency that optimizes alveolar minute ventilation and limits formation of auto-PEEP. To safely introduce this unconventional mode, the practitioner is required to have a clear understanding of expiratory time constants and the effects of high frequencies on auto-PEEP and lung volume emptying.

Sponsored Research - None

Table 2. Expiratory time constants. Blue values indicate three expiratory time constants and green values indicate four expiratory time constants using specified compliance and resistance values.

	Expiratory Time (sec) at 3 and 4 Time Constants									
R_{aw} (cmH2O/L/sec)	20	0.9	1.2	1.2	1.6	1.5	2	1.8	2.4	2.1	2.8
	15	0.68	0.9	0.9	1.2	1.1	1.5	1.4	1.8	1.6	2.1
	12.5	0.56	0.75	0.75	1	0.94	1.3	1.1	1.5	1.3	1.8
	10	0.45	0.6	0.6	0.8	0.75	1	0.9	1.2	1.1	1.4
	7.5	0.34	0.45	0.45	0.6	0.56	0.75	0.68	0.9	0.79	1.1
	5	0.23	0.3	0.3	0.4	0.38	0.5	0.45	0.6	0.53	0.7
		0.015		0.02		0.025		0.03		0.035	
		C_{RS} (L/cmH2O)									

2302733

A BENCH STUDY COMPARISON OF NEGATIVE INSPIRATORY FORCE MEASUREMENTS USING THREE DIFFERENT MEASURING TECHNIQUES.

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Background: The accuracy of negative inspiratory force (NIF) measurements to assess patients' respiratory muscle strength prior to ETT extubation is technique dependent. Evidence based literature (EBL) indicates that in poorly cooperative patients with an acceptable drive to breathe, a manual NIF (MN) measuring technique utilizing an expiratory one way valve and inspiratory occlusion time of 20 – 25 sec. can serve as a surrogate for the patient's maximum NIF. Mechanical ventilators (MV) can also incorporate an electronic NIF measurement option. **Purpose:** The purpose of this study was to determine if the MV NIF option in two different ventilators can be used to accurately assess a simulated patient NIF measured via the MN technique described in the EBL. **Methods:** We created a bench model for generating a reproducible NIF using the ASL-5000 test lung (ASL), (Ingmar Medical). The ASL was configured to produce an inspiratory effort ranging from -5 cm H_2O to -60 cm H_20 in -5 cmH_2O decrements which served as the patient control. We measured the NIF at each ASL generated control value using (3) techniques: [A]Manual NIF (MN) using an expiratory one way valve and manometer, [B]Drager E-4 software (E4N), and [C]Drager VN-500 software (V5N). Three measurements were made with each of the three techniques at each inspiratory control setting. In a separate test, we evaluated the effect of occlusion time, phase of breathing during which the ventilator option was activated, and the measuring range of the MV on measurement accuracy. **Results:** The MN was significantly greater than both the E4N and V5N at each control setting, $p<0.05$. The MN and V5N were significantly greater than the E4N when control values decreased beyond 15 sec., $p<0.05$. The MN and E4N were significantly greater than the V5N when occlusion activation occurred at the peak of inspiration, $p<0.05$. The E4N and V5N values plateaued at control NIFs of -50 and -55 cm H_2O respectively. **Conclusion:** NIF measurements utilizing the MN technique validated in the EBL cannot be reproduced by either MV technique evaluated in this study. MV NIF occlusion time, phase of ventilation at activation, and device measurement range all contribute to the statistically significant differences between the manual NIF and MV NIF measurements.

Sponsored Research - None

Table 1:

ASL-5000 Control (cm H2O)	Manual NIF (±SD) (cm H2O)	E4 NIF (±SD) (cm H2O)	V500 NIF (±SD) (cm H2O)
-10	-10 (0)	-9 (0)*	-9 (0)*
-20	-20 (0)	-18 (0)*	-18 (0)*
-30	-29 (0)	-27 (0)*	-27 (0)*
-40	-39 (0)	-36 (0)*	-36 (0)*
-50	-49 (0)	-44 (0)*	-45 (0)*
-60	-49 (0)	-44 (0)*	-50 (0)*
ASL-5000 Control (cm H2O)	Manual NIF (±SD) MID "I" occlusion (cm H2O)	E4 NIF (±SD) MID "I" occlusion (cm H2O)	V500 NIF (±SD) MID "I" occlusion (cm H2O)
-60	-59 (0)	-44 (0)*	-24 (1.4) *

Table 1: Displays the effect of (3) different measurement techniques on the accuracy of the measured negative inspiratory force (NIF) in a simulated patient model using a standardized manual technique compared to the Drager E-4, and Drager V-500 NIF software along with a representative example of the effect of breathing phase at time of inspiratory occlusion on the measured NIF. All values reported in cm H2O ± (SD), *$p<0.05$.

2302932

COMPARISON OF VENTILATOR FLOW BIAS IN A LUNG MODEL OF COPD.

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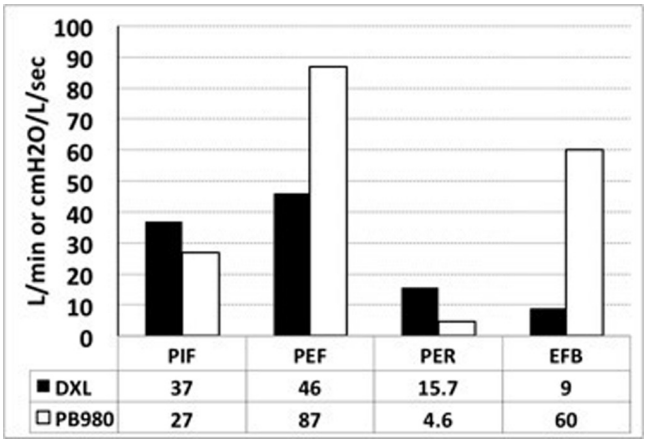
Background: During mechanical ventilation, the difference between peak inspiratory flow (PIF) and peak expiratory flow (PEF) can generate a flow bias that may result in mucus movement either away from the ventilator and deeper into the lungs or toward the ventilator promoting mucus clearance from the lungs. A flow bias threshold of 17 L/min difference between the PIF and PEF have been reported to affect mucus movement (Ntoumenopoulos, Respir Care, 56(12);2011). We compared differences in flow bias in a COPD lung model using the Drager XL (DXL) and the Puritan Bennett 980 (PB980) ventilators. **Method:** The ASL 5000 advanced breathing simulator was configured to a passive patient model. Both ventilators were set to the Pressure Regulated Volume Control mode (DXL-Auto Flow, PB980-VC+), Vt 500 mL, RR12, Ti 1.25 sec., I:E ratio of 1:3, and PEEP 5 cm H2O using identical ventilator circuits. Peak inspiratory pressure (PIP), peak inspiratory flow (PIF), peak expiratory flow (PEF), and the expiratory pressure (EP) at the point of PEF were recorded while ventilating the ASL 5000 with a set compliance of 60 mL/cmH2O, and airway resistance of 50 cmH2O/L/sec. Expiratory flow bias (EFB) and peak expiratory resistance (PER) were calculated using the following equations: EFB = PEF-PIF and PER = (PIP-EP)/(PEF/60) respectively. **Results:** The EFB on the DXL was 9 L/min and 60 L/min on the PB980. The DXL had a substantially lower PEF of 46 L/min in comparison to 87 L/min on the PB980. PER on the DXL was 15.7 cmH2O/L/sec compared to 4.6 cmH2O/L/sec on the PB980. **Conclusion:** This data suggests that due to the lower PER across the expiratory valve on the PB980, the ventilator has a higher PEF and EFB compared to the DXL. The higher EFB on the PB980 may promote mucus clearance from the lungs more than the DXL in patients with COPD.

Sponsored Research - None



	PIF	PEF	PER	EFB
■ DXL	37	46	15.7	9
□ PB980	27	87	4.6	60

2303011

SINGLE CENTER'S EXPERIENCE IN TRANSITIONING TO VENTILATOR-ASSOCIATED EVENTS SURVEILLANCE.

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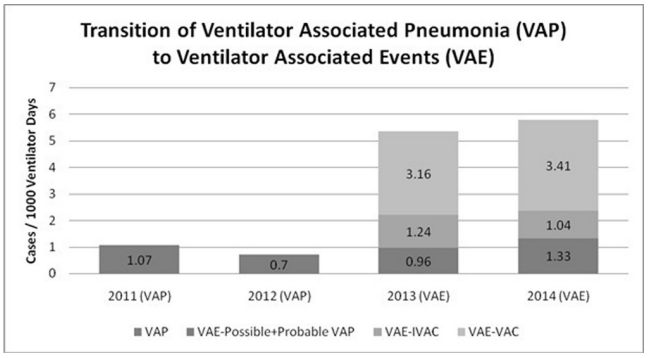
BACKGROUND - In January 2013, the CDC's National Healthcare Safety Network (NHSN) new ventilator- associated events (VAE) surveillance protocol for adults was implemented at our 500 bed private/community hospital with 68 ICU beds. Prior to 2013, the validity of ventilator-associated pneumonia (VAP) surveillance utilizing the NHSN VAP protocol was a concern both nationally and at our facility. The new NHSN VAE surveillance protocol provided an opportunity to evaluate the prior VAP surveillance process and identified other ventilator-related conditions to improve patient safety. **METHODS -** A multidisciplinary VAP team was re-established and educated on new VAE surveillance criteria. The two-year period served as an opportunity to study data and technology requirements and to resolve problems and processes to support implementation. The platform for successful VAE surveillance implementation included: the existing electronic medical record, expert providers, and hospital information technology resources. **RESULTS -** The VAP rate for 2011-2012 was 0.85 cases per 1,000 ventilator days (12 cases per 14,138 ventilator days) while the new VAE combined possible and probable VAP rate in 2013 -2014 was 1.14 cases per 1,000 ventilator days (16 cases per 14,040 ventilator days, with 15 possible and 1 probable VAP). This seemingly higher VAP rate was not significant (p=0. 447). The ventilator-associated condition (VAC) and infection-related ventilator-associated complication (IVAC) rates for 2013-2014 were 3.28 and 1.14 cases per 1,000 ventilator days, respectively. Most events identified were due to changes in PEEP versus change in FIO_2.These findings led to further discussion and investigation of prevention strategies and observations of current practice. These observations revealed deficiencies in VAP prevention bundle practices and increased awareness at the bedside of changes in ventilator settings. **CONCLUSION -** The new VAE surveillance program provided a new awareness of ventilator-associated conditions including VAP and improved opportunities in current practice with VAP Bundle compliance.

Sponsored Research - None



2303067

VALIDATION OF A NEW OXYGENATION INDEX *IN SILICO*.

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Background: The ratio of arterial oxygen partial pressure to fraction of inspired oxygen (PaO_2/FiO_2 ratio) is an FiO_2 dependent index, and has been used as one of the most common oxygenation indices. In order to calculate PaO_2/FiO_2 ratio an arterial blood gases (ABG) test is needed. This results in an over utilization of ABGs, compromises patient safety and increase the healthcare costs. Our objectives were First to compare variations in PaO_2/FiO_2 ratio and a new oxygenation index called mean predicted PaO_2 (MPP) at three levels of FiO_2 using Nottingham Physiology Simulator (NPS). Second to validate the consistency of MPP against changes in FiO_2. In order to calculate the new MPP index, we proposed a new method of calculation and compared results produced by this formula with PaO_2/FiO_2 ratio. **Method:** The NPS was used to create ninety virtual subjects. These subjects were configured to simulate common pathologies seen in intensive care units. Each subject had a unique lung defect that was generated from a combination of pulmonary shunt % and V/Q mismatch. Subjects were grouped according to the level of shunt% into four categories: 3-8%, 10-15%,18-20%, and 24-30%. PaO_2 (kPa) was evaluated at three points of FiO_2 0.21, 0.6, and 1.0. Consequently, PaO_2/FiO_2 ratio and MPP were calculated. Mean variation percentage ± SD % and paired t test were used to test significant differences between study groups. A *p*-value <0.05 was considered to be statistically significant. **Results:** The mean variation percentage for MPP and PaO_2/FiO_2 ratio are; 27% and 76 % respectively. The 95% confidence interval for both are (22%-31%) and (68%-38%). This clearly shows that PaO_2/FiO_2 ratio varies by 49 % higher than MPP variation. **Conclusions:** MPP index was assessed in different types of simulated pulmonary pathologies that are generally observed in intensive care unit. MPP index has proven to be robust index using Paired t-test ($P<0.0001$) when compared to PaO_2/FiO_2 ratio. The MPP index demonstrated a consistant stability against FiO_2 variation. **Disclosures:** None

Sponsored Research - None

2303120

WHEN UTILIZING NITRIC OXIDE IN TANDEM WITH HIGH FREQUENCY OSCILLATORY VENTILATION A ONE-WAY-VALVE DOES NOT AFFECT THE DELIVERY OF NITRIC OXIDE.

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Background: The user's manual for the Inovent-DSIR states, that a one-way-valve is needed when utilizing the Inovent with High Frequency Oscillatory Ventilation (HFOV). The theory behind the one-way-valve is highly questionable due to the fact that the HFOV is a closed system, and the flow is uni-directional where the injector module sits. The fear of not having the one-way-valve in line is that the delivered Nitric Oxide (NO) dose would increase significantly. We hypothesize that the one-way-valve is not necesary and the delivered dose would not change. **Method:** The bench tests were performed at the University of Maryland Medical Center (UMMC), in Baltimore, MD. Utilzing the Inovent DSIR and the 3100a HFOV, we compared the values of inhaled nitric oxide with and without the one-way-valve. The tests were repeated with different oscillator settings and different set values for the nitric oxide dose. The test lung utilized during this bench test was a dragger test lung. Test 1: Amp 30, HZ 12, MAP 12, Fi02 30%, Bias Flow 20 lpm, NO 20 PPM Test 2: Amp 37, HZ 10, MAP 14, Fi02 50%, Bias Flow 30 lpm, NO 40 PPM Test 3: Amp 46, HZ 8, MAP 18, Fi02 80%, Bias Flow 35 lpm, NO 60 PPM Test 4: Amp 46, HZ 8, MAP 22, Fi02 100%, Bias Flow 35 lpm, NO 70 PPM **Results:** There were no differences in the delivered values for nitric oxide with or without the one-way-valve. **Conclusion:** In conclusion, not having the one-way-valve delivered the same PPM as having the one-way-valve in line. By these results the authors conclude that the one-way-valve is not necessary. Eliminating the one-way-valve when setting up Nitric Oxide therapy with HFOV is a time saver, money saver and makes this process a little easier to do. The authors agree that further research is needed; however, this research should be instituted as practice change.

Sponsored Research - None

1st Set of Tests	With one-way-valve	Without one-way-valve
Test 1	18	19
Test 2	19	19
Test 3	19	19
Test 4	19	20
Test 5	20	19
2nd Set of Tests	With one-way valve	Without one-way-valve
Test 6	40	40
Test 7	40	40
Test 8	39	40
Test 9	40	41
Test 10	40	40
3rd Set of Tests	With one-way-valve	Without one-way-valve
Test 11	58	59
Test 12	60	61
Test 13	60	60
Test 14	60	60
Test 15	59	60
4th Set of Tests	With one-way-valve	Without one-way-valve
Test 16	69	69
Test 17	70	71
Test 18	70	70
Test 19	69	70
Test 20	70	69

2257031

COMPARATIVE STUDY OF 3 UPPER AIRWAY SUCTION DEVICES.

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Background: Hospitals routinely search for ways to reduce equipment and supply costs. When faced with a change in equipment, comparative tests should be performed to ensure the new product equals or exceeds the performance of the item currently used. A change in the multipurpose suction device (MSD) was pending and a comparative study was performed between 3 MSDs. **Methods:** This in-vitro study compared the Boogiebaby® (BB) MSD to the Little Sucker™ Preemie (LS-P) MSD and the Little Sucker™ Standard (LS-S) MSD. Five different MSD of each type were utilized for 3 runs for each MSD, resulting in 15 data points for BB, LS-P and LS-S. Suction pressure was set at -80 mmHg. Continuous suction was applied for 15 seconds for each run. Comparisons of amounts suctioned were initially performed with water. In order to model a mucus simulant, mixtures were prepared using a food thickening powder (Thicken Up®). The resulting mixtures had the consistency of nectar and honey to more closely model mucus. Mean values of 15 data points for BB, LS-P and LS-S were utilized for comparisons. Comparisons were made using ANOVA post hoc test Tukey HSD with significance set at $p<0.05$. **Results:** The amount of water suctioned was lowest in the LS-P (117.2g±9.9), followed by BB (127.5g±10), and LS-S (201.3g±6.9). The amount of nectar solution suctioned was lowest in the BB (31.6g±1.8), followed by LS-P (34.7g±2.3), and LS-S (38.1g±1.4). The amount of honey solution suctioned was lowest in the BB (18.1g±2.8), followed by LS-P (22.8g±1.6), and LS-S (31.5g±1.8). The difference between BB and LS-P for water was not significantly different ($p=0.167$), but was for BB and LS-S ($p<0.001$). For nectar, the difference between BB and LS-P and LS-S were significantly different ($p<0.001$). For honey, the difference between BB and LS-P and LS-S were significantly different ($p=0.003$ and $p<0.001$, respectively). **Conclusion:** The impetus for this study was the reduced cost associated with the BB MSD. However, in all scenarios with the exception of water, it did not evacuate the same amount of other solutions modeling mucus. Another significant consideration is the design of the devices since the BB is basically a shortened version of a suction catheter (~5cm long) compared to the tapered designs of LS-P and LS-S (~5 and 6.4 cm long). One concerning factor for all 3 devices was the lack of a side port which could result in airway trauma if the MSD lodged against the sensitive lining of the upper airway.

Sponsored Research - None

2300208

COMPARATIVE STUDY ON MEASURED COMPRESSIBLE VOLUMES FOR 3 MRI VENTILATOR CIRCUITS.

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Introduction: Commonly, intubated critically ill patients are transported from the ICU for an MRI. Although special MRI ventilator circuits are utilized, it is essential to maintain accurate tidal volume (V_T) during this process. We undertook this comparative study to examine compression volume and volume accuracy in 3 MRI circuits and determine differences in inspiratory and expiratory tidal volume (V_{TI} and V_{TE}) and measured peak inspiratory pressure (PIP). **Methods:** Three MRI ventilator circuits: Vital Signs Pediatric (VS-P), Vital Signs Adult (VS-A) and Medline Single Size (M-SS) were studied comparing compressible volume variances and the effect the different circuits had on V_{TI}, V_{TE}, and PIP. Three of each ventilator circuit type was used and expanded to its entire length (VS-P and VS-A = 274 cm; and M-SS = 302 cm). The Servo *i* (PRVC, rate-20, PEEP-8, circuit compliance-on, I-time-0.75, IRT-0.15, flow termination-30%, sensitivity-green) was used to ventilate a test lung (Rp 20 cmH_2O resistor; compliance set 15 mL/cmH_2O) with set V_T of 50mL, 100mL, 150mL, and 300mL. Airway flow and pressure waveforms were acquired utilizing a pneumotachograph (PNT) and a computerized digital recorder. MRI circuit types were compared using ANOVA with Post Hoc Test Tukey HSD with significance set at $p<0.05$. **Results:** The mean (±SD) compressible volumes for each circuit type were different: VS-P (1.73±0.02 mL/cmH_2O), VS-A (2.52±0.03 mL/cmH_2O), and M-SS (2.73±0.04 mL/cmH_2O); $p<0.001$. These compare to manufacturer's specifications of 0.73 mL/cmH_2O for VS-P, 1.38 mL/cmH_2O for VS-A, and 1.50 mL/cmH2O for M-SS. Overall, there were no differences in PIP, PNT measured V_T, ventilator displayed V_T, or percent error (displayed versus PNT measured) for V_{TI} or V_{TE}. Percent error was less than 10% for all circuits. A Bland Altman plot for V_{TE} shows an increased positive bias and less precision with the difference increasing as set V_T increased. A positive bias indicates that the ventilator displayed V_T was greater than PNT measured V_T. **Conclusion:** The compressible volumes for each circuit type were significantly different, and our measured values were higher than those cited by the manufacturer. By utilizing the circuit compensation mode on the ventilator, no differences were noted in V_{TI}, V_{TE}, and PIP. This reinforces the practice of utilizing the circuit compensation mode and translates to accurate volumes being delivered even with small V_T targeted in the pediatric population.

Sponsored Research - None

2262476

ACCURACY OF PEDIATRIC AND ADULT SIZED ESOPHAGEAL BALLOONS WHEN PLACED INSIDE A MODEL ESOPHAGUS DURING SIMULATED POSITIVE AND NEGATIVE PRESSURE.

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Background: Through recent clinical experience and research studies within our hospital we have begun to question the accuracy of measurements obtained from pediatric sized esophageal balloons in small children when the balloon is inflated. We sought to explore the accuracy of esophageal pressure measurements in relation to changes in pleural pressure using a simulated infant esophagus and pleural space as the balloon inflation amount is manipulated. **Method:** A 1 liter syringe was connected to an experimental chamber to create dynamic, positive and negative pressures from -40cmH20 to +40cmH20. Within the chamber, a 6Fr pediatric and 8Fr adult esophageal balloon (Carefusion, YorbaLinda, CA) were inserted into separate model infant esophagi constructed from a 6mm diameter Penrose drain. Each balloon was inflated to two levels, below recommended inflation values at 0.2ml, and to recommended inflation values (0.5ml for the 6Fr balloon, and 0.7ml for the 8Fr balloon). Esophageal balloon pressures at each condition were compared with the actual chamber pressure across the dynamic range of pressures, and the mean bias (mean chamber pressure - mean Pes) with 95% confidence intervals were reported and stratified by balloon condition. **Results:** During negative pressure, the 6Fr balloon mean bias in cmH20 was -10.04(-10.71, -9.37) when underinflated and -27.70(-28.69, -26.72) with recommended inflation; the 8Fr balloon mean bias was -2.06(-1.98, -2.14) when underinflated and -4.17(-4.33, -4.01) with recommended inflation. During positive pressure, the 6Fr balloon mean bias was 2.79(2.69, 2.90) when underinflated and -3.51(-3.83, -3.18) with recommended inflation; the 8Fr balloon mean bias was 1.06(1.02, 1.10) when underinflated and 0.32(0.30, 0.34) with recommended inflation. (See figure) **Conclusions:** There can be large differences between esophageal balloon pressure and simulated pleural pressure, particularly with the 6Fr pediatric balloon during negative pressure. Increasing balloon inflation amounts to manufacturer recommendations tends to diminish the ability of each balloon to measure negative pressure, whereas increasing the balloon inflation amount tends to improve the ability of the 8Fr balloon to measure positive pressure when the balloon is placed within a simulated esophagus. Disclosures: The authors have no conflicts of interest to disclose.

Sponsored Research - None

2265156

MOBILE PHONE CONTAMINATION - CARRYING SMART PHONES INTO PATIENT CARE AREAS MAY NOT BE VERY SMART.

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Background: Mobile phones devices (MPD) are an integral part of our daily lives. Most people carry MPD at all times, and aren't aware of how dirty they get with daily use. Several studies have documented the presence of pathogenic bacteria on MPD, specifically those carried by healthcare workers.[1,2] It has been shown that cleaning MPD is rarely done.[3] The aim of this project was to quantify Respiratory Therapists' (RTs) MPD contamination at our institution, and educate RTs on the importance of frequent cleaning their MPD. **Methods:** This study was not deemed human subject testing by the UAMS IRB. MPD were swabbed and analyzed with the 3M™ Clean Trace ATP Hygiene Monitoring System (CTS) to document the ATP load in a convenience sample of RTs working in all areas of the hospital. To quantify ATP load, a pre-packaged swab was used containing an ATP-free solution. The MPD was swabbed and put back in the original container. The contents were mixed and placed into the CTS which measured the sample and converted the reading into Relative Light Units (RLU) for quantification. RTs cleaned their MPD utilizing 70% isopropyl alcohol, and the measurement was repeated. RTs MPD were retested 24 hours later and monthly monitoring continued. Mean values of RLU were noted and comparisons were made using t-tests with significance set at $p<0.05$. **Results:** Pre-cleaning mean was 2019 RLU compared to post cleaning mean of 714 RLU ($p=0.001$). The next day the mean increased back to 1919 RLU ($p=0.87$). Over the next 4 months, ATP loads on MPD continued to decrease with means of 584 ($p=0.003$), 242 ($p<0.001$), 269 ($p<0.001$), and 115 ($p<0.001$) compared to the pre-cleaning mean. The type of phone case also impacted MPD ATP load. Mean pre-cleaning porous case ATP load was 2890 RLU compared to non-porous case mean of 1166 RLU ($p=0.022$) and no case mean of 760 RLU ($p=0.001$). Mean post cleaning porous case ATP load was 970 RLU compared to non-porous case mean of 413 RLU ($p=0.036$) and no case mean of 386 RLU ($p=0.046$). **Conclusion:** As a result of this project, RTs became more aware of the potential contamination their MPD harbored. Monthly random monitoring continued to reinforce routine MPD cleaning. Posters were placed in the department as visual reminders to clean their MPD. Monthly emails were sent communicating the latest results. The CTS does not identify bacterial species, but it does serve to quantify the cleanliness of MPD. This increased RTs awareness of potential MPD contamination.

Sponsored Research - None

2277774

STAFF SURVEY OF RESPIRATORY THERAPISTS' MOBILE PHONE PRACTICES DURING WORK HOURS AT A PEDIATRIC HOSPITAL.

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Background: Clinical evidence indicates mobile phone devices (MPD) harbor pathogenic organisms.[1,2] A process improvement project was implemented in the Respiratory Care Department to determine Respiratory Therapists (RTs) knowledge base and the cleaning practices they used for their personal MPD. During the initial phase of this project, a survey was developed and administered to RTs to elicit this information. This was antecedent to a secondary phase of this project where MPD were swabbed and analyzed with the 3M™ Clean Trace System ATP Hygiene Monitoring System. **Methods:** This study was not deemed human subject testing by the UAMS IRB. A survey tool containing 10 questions was developed, and administered to a convenience sample of RTs agreeing to participate. RTs responding to the survey represented all areas within hospital including intensive care units, medical/surgical units, and outpatient clinics. **Results:** RT response rate was 43% (39/91 potential participants), and 62% (24/39) were female. Responses to the question of length of current MPD ownership revealed 43% (17/39) were ≤ 1 year, 26% (10/39) were between 1 and 2 years, and 31% (12/39) were > 2 years. RTs carried their MPD into patient care areas 62% (24/39) of the time. Only 30% (12/39) cleaned their MPD on a routine basis, and 54% (21/39) recalled cleaning their MPD within the last week while 36% (14/39) stated they had never cleaned their MPD or couldn't remember the last time it was cleaned. A majority of RTs (97% [38/39]) were aware their MPD could harbor pathogenic organisms, and 69% (27/39) stated they would clean their MPD on a routine basis following this project. It was also noted that 54% (21/39) of the MPD had porous protective cases and the balance had non-porous cases. **Conclusion:** This survey revealed that although most RTs were aware that MPD could carry pathogenic organisms, only 30% proactively cleaned them. Carrying MPD into patient care areas could present potential risks to patients. Additionally, RTs could possibly expose their own family members to pathogenic organisms transferred to the device during patient care. The type of case may also impact the cleanliness of the MPD since organisms are more likely to remain on porous cases despite cleaning. This project increased RTs awareness of the importance of routine cleaning of their MPD, and potentially reduced the risk of inadvertent exposure of pathogenic organisms to patients and family members.

Sponsored Research - None

2286553

THE TEST RETEST RELIABILITY OF BREATHING PATTERN IN DIFFERENT BODY POSITION.

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The clinical importance and usefulness of some elements of breathing pattern (BP) is accepted. It is hypothesised that some elements of BP have the potential to be used to monitor respiratory health and used as an outcome measure for specific interventions designed to improve respiratory health. This study examines the test-retest reliability of various components of breathing pattern in both sitting and supine positions. An observational test-retest design was used. The study involved 51 individuals (46 healthy and 4 with self-reported asthma and 1 with diabetes) (males = 12; females = 39) aged between 19 and 52 years (Mean= 31.04, SD=6.79). The body mass index for these participants ranged from (16.5 to 44.1 BMI) with a mean 25.28 (SD = 0.5.22). Each participant attended 4 data collection sessions on 2 separate days (4 to 10 days apart, according to their availability). Each session lasted about 75 minutes in total. Breathing pattern (BP) data were collected using a Respiratory Inductive Plethysmography (RIP) device. For the first 15 minutes of BP recording the participants were in a sitting position; this was followed by another 15 minutes BP recording in the supine position. After this, participants were given a break of about 15 minutes to allow them to move around. Then they were asked to repeat the 2 recording periods as before in sitting and supine positions. Participants were then invited to return 4-10 days later according to the participants' availability. The second session followed the same procedure as the first. The ANOVA and ICC results showed that the breathing pattern components demonstrated good relative reliability, while the WSSD values were all low to moderate (according to the subjective assessment of the researcher), which indicates low levels of variability within individuals and thus, good levels of absolute reliability; thus, suggesting good test re-test reliability of the specific breathing pattern components under scrutiny. In addition, the 95% LA was generally narrow indicating acceptable agreement. A higher level of test re-test reliability was found for all components in the sitting position in comparison to the supine data. The data suggests that the breathing pattern components under examination in this study demonstrate good test re-test reliability in both sitting and supine positions.

Sponsored Research - Saudi Cultural Bureau- London

2287371

SAFE MONITORING AND TRANSPORT OF THE PATIENT ON INHALED NITRIC OXIDE.

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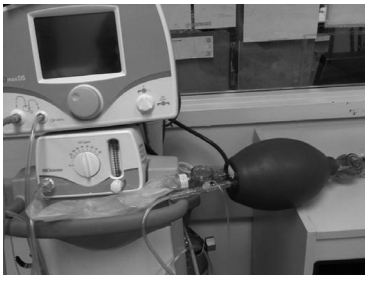
BACKGOUND: Transport of critically ill neonatal, pediatric, and adult patient's on the inhaled pulmonary vasodilator nitric oxide (NO) is associated with a certain degree of risk. Whether these transports are considered external from one facility to another or internal, risks need to be minimized through training and careful preparation prior to the transport, continuous monitoring throughout transport, and use of appropriate equipment and personnel. Once NO has been started, delivery should not be interrupted. Studies evaluating resuscitation bag performance in conjunction with INOmax DS® (Ikara, Clinton, NJ) (DS) monitoring / alarm system (MAS) performance during transport conditions are limited. The aim of this study is to validate MAS response during simulation transport. METHODS: An adult, pediatric and neonatal Mercury® (MB), (Clearwater, Florida) disposable manual resuscitator bag, with PEEP valve, was connected to a test NO gas cylinder containing 800 parts per million (ppm), one oxygen cylinder and attached to a test lung for simulation transport. Two methods for monitoring NO, nitrogen dioxide (NO_2) and FIO_2 were evaluated. The DS was set to deliver NO - 20 ppm via internal blender (IB) or injector module (IM) connected to MB. The DS and MAS were evaluated by disconnecting lines and turning off gas flow to test alarms response to alarm setting violations. The following schematic reflects experimental methods; each test 5 minutes: T1. IB and gas monitoring sample line (GMSL) via sample tee (Ikara, Clinton, NJ) on gas inlet of MB T2. IM connected to GMSL on sample tee to gas inlet on MB T3. IB and GMSL connected to pressure monitor port (PMP) on MB. T4. IM and GMSL connected to PMP on MB. RESULTS: ALL three MB in conjuction with the DS performed up to expectations with respect to set NO and monitored levels NO, NO_2, and FIO_2, The results of T1 to T4; INO-20 ppm, NO_2-0.3, FIO_2-0.99. CONCLUSION: During simulated NO transport, the MAS on the DS performed within manufactures specification. Between May 2008 and June 2014, >100 neonatal, pediatric and adult patients have been successfully transported both intra-hospital and externally. The GMSL connected to a sample tee on MB is the best for monitoring and detection of alarm situations, that was readily detected by the DS MAS during simulations and actual patient transport. This alerted transport staff of potential problems before patient decompensation and underscores the MAS importance.

Sponsored Research - None



2300511

STANDARDIZED DISPOSABLE SUPPLY STOCKING SYSTEM SAVES MONEY AND INCREASES OPERATIONAL EFFICIENCY.

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Background: Respiratory Care Services had numerous disposable supplies stored in satellite supply rooms throughout the hospital. Stocking practices were not consistent and supplies were not appropriately rotated resulting in some supplies exceeding their expiration date before use. Inconsistent stocking practices and a lack of organization hindered Respiratory Therapists (RTs) from locating the supplies they needed quickly, potentially impacting patient care. **Methods:** A pilot study in one of the satellite supply rooms was initiated utilizing a two-bin stocking system. A core team of RTs established par levels for each of the 59 respiratory supplies in this area. The par level of each supply was then divided into the two bins. The bins were organized on a shelf with similar items. One bin was placed in front of the other bin of the same supply. When the bin was emptied, the RT pulled it from the shelf and placed it in a designated location. The RT then pulled the second bin of that supply to the front of the shelf. Support staff rounded each shift and restocked the empty bins. Reductions in inventory and associated costs were recorded over a 3 week time period. **Results:** The initial inventory showed disposable supply costs of $2,626. Weekly reductions in par levels of inventory continued with stabilization occurring at week 3 (cost = $1,201) resulting in a savings of $1,425. Long-term monitoring showed that the dollar value of supplies in this satellite supply room was maintained at <5% variance. Upon completion of the pilot project, an additional 9 stocking areas were transitioned to the new system. By utilizing the same approach, par levels were established and adjusted in each area. One unit required an increase in stocked supplies to meet its needs resulting in an additional cost of $147, while the other 8 areas had decreases in stocked supplies with cost reductions ranging from $52 to $1,871. This resulted in a net total cost savings of approximately $7,200 in supply inventory. **Conclusion:** Setting and adjusting par levels in satellite supply rooms resulted in overall cost reductions of stocked disposable supplies, and supplies were rotated and used by their expiration date. Although the initial aim was identified as cost savings, the most important goal was to increase operational efficiency. Anecdotal evidence has shown that RTs could more easily find supplies, supply restocking was more efficient, and supplies were used before their expiration date.

Sponsored Research - None

2302939

EVALUATION OF CHARACTERISTICS OF FOUR OSCILLATORY PEP DEVICES FOR AIRWAY CLEARANCE.

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Introduction Oscillatory Positive Expiratory Pressure (OPEP) devices are used to mobilize secretions and promote cough and expectoration in patients with obstructive lung disease. Both pediatric and adult patients utilize the same OPEP devices despite differences in flow rates. The purpose of this study was to determine the effects of flow rate and resistance on, frequency, pressure and vibration for OPEP devices. **Methods** Four OPEP devices: Flutter (Aptalis Pharma, Birmingham, AL), Aerobika ®(Monaghan Medical, Plattsburgh, NY), Acapella Choice (Smith's Medical, Rockland, MA), and RC Cornet (Curaplex, Dublin OH) used by Cystic Fibrosis patients were evaluated for pressure amplitude, mean pressure and frequency measured at 6 different flow rates and three resistances. An automated mass flow controller system (range of 0-100 L/min, Aalborg, Orangeburg, NY) was used to apply constant incrementing flows of 5 to 30 L/min (5 L/min increments) to each device. Pressure and flow were recorded at a sample rate of 4 kHz (Power Lab). A 200Hz low pass filter was applied to the pressure waveform to remove background noise. Devices were placed in line with the circuit and flow equilibrated for 10 seconds at each flow rate followed by 100 cycles of pressure oscillations. Pressure was measured at a T-piece placed between the flow controller and the device. Values were analyzed with Lab Chart software (AD Instruments, Colorado Springs, CO). Overall comparison of OPEP device performance was performed via a two-way ANOVA with repeated measures followed by the Student Newman Keuls method for post hoc comparisons of manufacturers at individual flows. Pressure amplitude, mean pressure and frequency of vibration at the three resistances are displayed in the figure below. **Results** Comparisons of pressure amplitude, mean pressure and frequency at different flow rates and resistances are displayed for each device in the figure below. **Conclusion** Flutter generated the highest frequency oscillations with minimal effect of flow rate and resistance load. In contrast, pressure amplitude and mean pressure were flow dependent with RC Cornet generating the most consistent waveforms at pediatric low flow rates (5-10L/min) at both low and medium resistance. As resistance increased with adult flow rates, the Aerobika and RC Cornet contributed to the greatest pressure change.

Sponsored Research - None

2302977

EVALUATION OF DIFFERENT WATER VOLUMES IN THE HOLDING CHAMBER WITH HEATED WIRE T-PIECE FOR RESUSCITATION IN THE DELIVERY ROOM.

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BACKGROUND: Very low birthweight newborns have difficulty regulating their core body temperature immediately after birth. The Neonatal Resuscitation Program (AHA/AAP, 6th Ed.) suggests standard use of radiant warmers and other methods to prevent heat loss to the infant in the delivery room. T-piece resuscitators typically deliver unheated inspired gas (22°C) to the patient which may result in a decreased core temperature in these at-risk infants. The purpose of this study is to determine the feasibility reaching an optimal inspired gas temperature for use during immediate resuscitation using low, medium and high water volumes with a heated-wire t-piece resuscitator circuit. **METHODS:** A Heated-wire Humidified Resuscitation System 900RD110 (Fisher & Paykel, Auckland, NZ) was attached to the MR850 Humidifier and a NeoPuff Infant Resuscitator (Fisher & Paykel, Auckland, NZ). The MR850 was set in the invasive mode and the MR250 canister was filled with 20mL, 60mL and 100mL of sterile water respectively. Temperatures were measured at the probe proximal to the patient on the heated wire t-piece circuit as 10 L/min of air flowed through the system. The time required to reach a measured proximal temperature of 36°C was recorded at each fill volume. The test was repeated ten times at each fill volume and results were for each category were evaluated using the Student's t-test. Subsequently, values for time at low, medium, and high volumes were compared using the ANOVA test. **RESULTS:** Mean values and standard deviations for all three water volumes are displayed in the table above. There was a statistically significant difference in heating times between each volume used ($p<0.0001$). **CONCLUSION:** Equipment used for neonatal resuscitation requires prompt preparation. Smaller fill volumes reach optimal inspired gas temperatures (36°C) faster than higher volumes. A heated, humidified inspired gas available and ready for immediate resuscitation is reasonably achieved.

Sponsored Research - None

MR250 Volume	20 mL	60 mL	100 mL
Mean (seconds)	295.7	586.8	1009.4
SD (seconds)	19.6	51.4	93.3

2303015

AIRWAY TEMPERATURE CHANGE DURING INTRAPULMONARY PERCUSSIVE VENTILATION APPLIED DIRECTLY TO AN ARTIFICAL AIRWAY.

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Introduction: Intrapulmonary Percussion Ventilation (IPV) is an airway clearance modality that delivers high flow bursts of gas that promotes clearance of pulmonary secretions. There are two ways to deliver IPV to the patient: applied directly the airway (stand-alone) or in-line with a ventilator circuit. During the treatment, a dense aerosol is generated from a high pressure gas source. The supply gas source and aerosol generated are below room temperature. Theoretically, a change in state from a liquid to an aerosol may promote heat loss. While cool aerosolized particles typically reduce airway edema, hydration of secretions may blunted by drying effects of cold gas delivery. The purpose of this study is to determine if a significant temperature change occurs during routine IPV therapy when applied directly to an artificial airway. **Methods:** A 1L anesthesia bag (GE: Vital Signs; Totowa, New Jersey) was connected to the distal end of IPV 1C (Percussionaire; Sandpoint Idaho) breathing manifold attached with a Hudson RCI disposable thermometer adaptor and thermometer (Teleflex Medical Inc.; Morrisville, North Carolina) applied at the airway. Fifteen milliliters of normal saline at room temperature was added to the aerosol cup and baseline temperature data was obtained. The IPV unit was cycled on at 30 cm H_20 with the frequency dial in the 12:00 position. Values for temperature were recorded at 1 minute intervals until the treatment was terminated at 12 minutes. Mean temperatures and standard deviations for intervals were compared using a student's t test. **Results:** Temperature changes in two minute intervals are displayed in the table below. Mean baseline temperature 20.05° C (SD 0.22) decreased to an mean of 13.6° C (SD 0.60) over the treatment period A statistically significant difference in temperature change occurred (average-6.45 °C ;SD 0.60) over the duration of the treatment ($p<0.001$). **Conclusion:** Gas temperature decreases over the duration of an IPV treatment delivered directly to an artificial airway. Despite temperature changes that occur during stand-alone IPV therapy, potential clinical consequences have not been demonstrated, nor validated.

Sponsored Research - None

Temperature Change

	Minutes						
	0	2	4	6	8	10	12
Mean Temperature ˚ C	20.05	17.4	15.4	14.43	13.9	13.75	13.6
Standard Deviation	0.22	0.75	0.68	0.59	0.64	0.44	0.06

2303042

EVALUATION OF 3 NONINVASIVE CARBON-MONOXIDE MONITORING DEVICES.

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Background: Carbon Monoxide is one of the chief causes of poisoning morbidity and mortality in the United States. This can be attributed to the fact that carbon monoxide gas is very difficult to detect due to its invisible and odorless nature. Obtaining blood and analyzing gases has been a reliable way to attain accurate COHb. This method is invasive and can be relatively time consuming. Recently noninvasive methods and devices for obtaining COHb have been developed. We evaluated three different noninvasive COHb devices: Masimo Rad-57™ (RAD57) and Masimo Radical-7® (RAD7) multi-wave cooximeters and the Bedfont ToxCO™ (ToxCO) breath analyzer to assess their accuracy when compared to a standard invasive method. **Methods:** This IRB approved study began on June 30th 2014 and lasted for 3 days. The human subjects consist of patients scheduled for pulmonary function testing and healthy volunteers at a small community hospital in Lancaster County, PA. The study was performed in the PFT lab, where each test subject had blood drawn for ABG analysis. After the ABG sample was collected the RAD57 and RAD7 probes were applied to collect the COHb. Shortly following the application of the probes the patients were asked to exhale into the ToxCO to collect the last noninvasive COHb reading. The ABG results were analyzed via the Siemens© RAPIDPoint 500 System blood gas machine as the control within 15 minutes of the blood sample collection. After all forms of COHb analysis were collected, the results were recorded. The patients were also asked questions such as age, smoking history, and type of heating appliance used at home in order to identify any potential for a greater than normal exposure to CO. **Results:** A total of 20 adult human subjects participated in this study (10 male, 10 female, 6 of which had smoking history). The Anova test showed that the RAD7 and the RED57 had statically significantly different results than the control. The simple T-test showed that the ToxCO had the most precise COHb reading compared to the control. See table. **Conclusion:** All though invasive cooximetry is the most precise way to measure COHb levels, a non-invasive way is always more favored. It is safe to say that the ToxCO is a really precise device to measure COHb levels in a clinical setting. All though the Masimo Redical-7 and Red-57 were shown to be less precise in their COHb measurements, further studies should be done to see whether their precision gets better with higher COHb levels.

Sponsored Research - None

Study Results

Device	Mean COHb %	STDV	T-Value	P-Value
ToxCO	1.685	1.172	-0.295	0.385
RAD7	0.500	0.946	-4.06	0.001
RAD57	0.400	0.754	-4.83	0.000
Control	1.715	1.226		

This table depicts the results from the paired t-test for this study.

2303165

IMPROVING TIME TO OPTIMAL TEMPERATURE OF BREATHING GAS USING ACTIVE HUMIDIFICATION FOR INFANTS IN THE DELIVERY ROOM SETTING.

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BACKGROUND: The Neonatal Resuscitation Program (AAP/AHA, 2010) emphasizes prevention of heat loss to the infant in the delivery room as a critical step of resuscitation. Unless modified to add heat and humidification, manual resuscitators deliver unheated inspired gas (approximately 22°C) to the patient which may result in a decreased core temperature in newborns, especially ones born at very low birth weight. Because high-risk deliveries are often unplanned, swift preparation for a potential resuscitation is vital. A previous study found that the time required to reach optimal temperature (36°C) in a similar model was 420 seconds (Farley, 2013). The purpose of this study is to identify a method to reduce the time required in achieving an optimal inspired gas temperature for use during resuscitation. **METHODS:** A heated-wire Humidified Resuscitation System 900RD110 (Fisher & Paykel, Auckland, NZ) was attached to the MR850 Humidifier with the MR250 canister and a NeoPuff Infant Resuscitator (Fisher & Paykel, Auckland, NZ). The canister was filled with 30 mL of sterile water and the humidifier was enabled and set to the invasive mode for a target temperature of 36°C at the distal end of the circuit. A standard gas flow of 10 L/min was either started immediately with no delay(0 s) or was delayed for 60, 90, or 120 seconds (s) as the humidifier began heating. The time required (s) to reach 36°C in each category of delay was measured 15 times. Results for each delay category were evaluated using the Student's t-test. Subsequently, the respective categories of flow delay were compared using the ANOVA test. **RESULTS:** Mean values and standard deviations for all four time delays are displayed in the table. There was a significant difference in times between each flow delay category ($p<0.0001$). Thus, delaying the initiation of flow into the resuscitator for 120s was found to provide the fastest acquistion of optimal temperature at the distal end of the breathing circuit. Caution was used to limit the flow delays to 120s as to prevent overheating within the circuit. None of the delay times tested overheated the gas beyond normal body temperature. **CONCLUSION:** Delaying the initiation of gas flow into this humidified resuscitator model resulted in the achievement of optimal temperature in shorter times versus without a delay. This may translate into an improved method for manual ventilation in the delivery room when preparation time is limited.

Sponsored Research - None

Time to Reach Optimal Temperature as Flow of Gas is Delayed

Delay in Flow (s)	0	60	90	120
Average Time to Target Temp (s)	416.3	280.3	272.6	145.6
Standard Deviation	20.5	18.5	32.8	6.3

2303167

CAN DOPPLER IMPROVE THE AUDITORY LEGIBILITY OF HIGH FREQUENCY VENTILATION?

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Background: High frequency ventilation is in prominent use in Neonatal Intensive Care Units (NICU's). A major difficulty in assessing high frequency ventilation is the frequent need to disrupt ventilation to listen at the chest wall. This interruption can produce loss of functional residual capacity and preclude effective ventilation during the period of auscultation. On a patient who is paralyzed, auscultation is difficult as there is no spontaneous ventilation component. Doppler based ultrasound has been used to identify variation in tissue structure and fluidic flow but has not been used in the evaluation of bedside assessment of high frequency ventilation.If Doppler based techniques are applied to high frequency ventilation sound wave signals sampled at a chest wall interface, would analysis of the resulting waveform be an acceptable means of assessing ventilation? **Method:** A Sensormedics 3100-A (Becton, Dickinson**)** oscillatory ventilator was connected to a test lung of known compliance. An accelerometer (Karmelsonix) was used to sample *wav* files at the "chest wall" of the test lung for 5 seconds at 11 Hz. *Wav* files were imported into Adobe Audition 6.0 (Adobe) and subjected to a simulated Doppler phase shift using a starting distance of 15 meters, velocity 50 meters/second, 2 degree angle of approach, with a 0 meters frontal pass, and a -15 meter pass on the right. Using settings of mean airway pressure of 20 cm H_2O, frequency 10 Hz, and amplitude varying from 10-40 cm H_2O, a Fast Fourier transform of each amplitude setting was performed. **Results:** Discernable audible differences are clearly present in the sample files as noted in the graphic especially in the range of 40 to 100 Hz. **Conclusions:** Although the output is more focused and individual "breaths" can be isolated, this method requires clinical correlation. If these prove useful, "real" time techniques to slow down perceived breath propagation may make it possible to auscultate high frequency ventilation with a digital stethoscope in real time using short windows of interest {e.g., 5 seconds). Digital Doppler simulation produces an auditory signal that may prove acceptable for bedside auscultation.

Disclosures**:** There are no conflicts of interest identified.

Sponsored Research - None

2303303

REDESIGN OF AN OPEN SYSTEM OXYGEN FACEMASK WITH MAINSTREAM CAPNOMETER FOR CHILDREN.

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Background: End-tidal carbon dioxide monitoring in children is important to detect apnea or hypopnea early to intervene before hypoxemia. However, monitoring EtCO2 in children requiring oxygen therapy via facemasks is challenging. The accuracy of ETOC2 monitoring with facemasks is influenced by several factors including oxygen flow rate, tidal volume, mask fit, & the position of structures that guide expiratory gasses toward the EtCO2 sensor. To improve the EtCO2 measurement accuracy in a commercially available mask (CAP-One, Nihon-Kohden), we implemented design changes with deform-&-hold shaping technology & anterior-posterior adjustment of the expiratory gas flow direction cup allowing the mask to fit children of a variety of ethnic backgrounds. **Methods:** Two sizes of facemasks (small for 7-20kg, medium for 21kg-40kg) were evaluated. The prototype mask was initially tested for EtCO2 accuracy in bench setting using a lung simulator [Michigan Inc, MI] attached to manikin head [Resus Anne, Laerdal, NY]. IRB approved, clinical mask fit test study was conducted to evaluate physical & functional fit of the mask by anatomical gap measurement (gap between the mask and face) & evaluation of capnography tracing. Data described in mean±SD, & proportion in %. Fisher's exact test & t-test as appropriate. **Results:** Bench testing with a simulator revealed EtCO2 difference of -3.0± 3.6 between a measured EtCO2 & a set exhaled CO2 concentration, as compared to -17.0±8.2 mmHg in nasal cannula. For the clinical study, 35 children for small mask & 38 for medium mask were evaluated. The gap between nose & mask was 4.8±7.1mm for small & 11.2±5.9mm for medium masks, while the rest of gaps (cheek & chin to mask) were minimal. Capnography tracing was successfully obtained in 86% in small and 100% in medium mask ($p=0.022$). In children with small size masks, the mean gap were not statistically different among those with capnography tracing & without ($p=0.50$). **Conclusion:** The prototype mask was highly accurate in bench settings. Capnography tracing was successfully obtained in majority of children. A follow up study is necessary to evaluate the accuracy of EtCO2 with this mask against gold standard

Sponsored Research - Current study received a grant support from Nihon Kohden Inc., manufacturer or CAP-One Mask.

2303327

RESPIRATORY VOLUME MONITORING PROVIDES EARLY AND MORE SENSITIVE INDICATION OF CHANGES IN RESPIRATORY STATUS.

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BACKGROUND: Continuous respiratory monitoring of non-intubated patients is challenging. Capnography has a number of limitations. Pulse oximetry is the mainstay of respiratory monitoring. Increased monitoring often leads to false alarms & alarm fatigue. Using a respiratory volume monitor (RVM) that continuously measures minute ventilation (MV), tidal volume (TV) & respiratory rate (RR) in intubated and non-intubated patients we examined the relationship of SpO2 & EtCO2 to respiratory depression as defined by low MV. METHODS: Continuous RVM (ExSpiron, Respiratory Motion, Inc, Waltham MA) data were collected from 240 patients (130 females, age: 66.8 ±10.3 yrs, BMI: 29.6 ±5.7 kg/m2) undergoing surgery. In 114 patients EtCO2 data were collected from a ventilator (Drager Apollo, Andover MA) in the OR: 54 under general anesthesia collected from the ET tube & 60 under spinal anesthesia from a sampling nasal cannula (Smart CapnoLine Plus Oral/Nasal, Filterline, Covidien, Mansfield, MA). In the PACU, SpO2 data were recorded at 1 min intervals. SpO2 <90% constituted a "Low SpO2 alarm condition". "SpO2 false alarm" was defined as SpO2 < 90% for a single 1 min time point & "desaturation event" was defined as persistent SpO2 <90% for ≥2min. "Predicted" MV (MVPRED) based on BSA & "Percent Predicted" (MVMEASURED /MVPRED x100%) was calculated for each patient. Analyses included Deming regression, multifactor ANOVA & unpaired one-sided t-tests. RESULTS: In the OR, EtCO2 was negatively correlated with MV: as MV increased, EtCO2 decreased. In GA patients, EtCO2 was highly sensitive to changes in MV (slope of -83.5° ±9.7°, Fig1A). In SA patients the sensitivity was bimodal (one peak with high & one with low sensitivity, Fig 1B). In the PACU, 80 "low SpO2 alarm conditions" (<90%) were recorded, of them 62 (78%) were false alarms (<2min). The remaining 18 events (≥ 2min) occurred in 15 patients. The RVM showed that 11/18 desaturation events coincided with excessive motion and high MV & only 7 events (1 per patient) were "true desaturations," with "Unsafe MV" (Fig 1C). CONCLUSIONS: Here we show that EtCO2 can lack sensitivity to MV changes in non-intubated patients & confirm that SpO2 monitoring has a high false alarm rate & is a lagging indicator of respiratory depression. Monitoring MV rather than secondary indicators of respiratory depression (EtCO2 or SpO2) may reduce the false alarm rate & preemptively detect respiratory events that lead to desaturation.

Sponsored Research - None

2303767

CORRELATION BETWEEN THE INTEGRATED PULMONARY INDEX AND ARTERIAL BLOOD GASES IN A MEDICAL-SURGICAL ICU IN SAUDI ARABIA.

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BACKGROUND: Arterial blood gases are routinely obtained to monitor adequacy of oxygenation, ventilation, and acid-base status in patients undergoing mechanical ventilation. A novel respiratory index, the Integrated Pulmonary Index, (IPI), was developed to provide a simple and accurate tool to assess respiratory status and to assist in determining if an intervention is necessary. Through a mathematical algorithm that integrates respiratory rate (RR), end-tidal CO2 (etCO2), pulse rate (PR), and pulse oxygen saturation (SpO2), the IPI is continuously displayed as a number between 1 and 10, where 8 to 10 indicates a normal overall respiratory status, 5 to 7 indicates needs for assessment and possible intervention, and 1 to 4 calls for prompt intervention. Although IPI has been shown to correlate well with respiratory status in adults and children undergoing procedural sedation, it has not yet been correlated with arterial blood gas parameters obtained in the intensive care unit (ICU). This study evaluated the clinical correlation between the IPI and results from arterial blood gases routinely obtained in the ICU. **METHODS:** We prospectively recorded the value of the IPI (Capnostream 20, Oridion Capnography, Inc.) from 21 patients who were mechanically ventilated in a medical and surgical ICU at the National Guard Health Affairs in Riyadh, Saudi Arabia. The IPI was documented every two hours as part of the routine patient-ventilator "check". A total of 64 patient-ventilator "checks" (events) were selected for analysis as they were the only ones containing both the IPI and arterial blood gas values within the same clock hour. The RR, FiO2, PaO2/FiO2 ratio and SaO2/FiO2 ratios were also recorded and compared to the IPI. Descriptive statistics were obtained using SPSS 19.0 (Chicago, IL). **RESULTS:** The mean IPI for the 64 events analyzed was 8.1+/-1.8. The mean values for the respiratory rate and ABG values were within normal limits (RR: 21.2 + 4.3; PaCO2: 43.26 + 9.08 mm Hg; PaO2: 94.29 + 28.75 mm Hg; SaO2 97.28% + 1.57; FIO2: .38 + .11; PaO2/FiO2=260 + 77). Sponsored Research - None

IPI	FIO2	RR	pH	PaCO2	PaO2	SaO2	P/F ratio
Pearson Correlation	-.075	-.164	-0.44	-.079**	.163	.247*	.233
p value	.554	.194	.731	.000	.197	.049	.064

* correlation was significant at the 0.05 level (2-tailed)
** correlation was significant at the 0.01 level (2-tailed)

2303779

VALIDATION OF MEAN PREDICTED PAO2 (MPP) AS A RELIABLE OXYGENATION INDEX IN NINETY SIMULATED ICU CONDITIONS.

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Background: Assessment of pulmonary gas exchange impairment is essential in order to highlight the severity of particular defects, monitor changes over time, and help to continually improve clinical intervention. The PaO2/FiO2 ratio is probably one of the most popular oxygenation indeces. However, the reliability of PaO2/FIO2 ratio as an indicator of Qsp/Qt change is controversial. The mean predicted PaO2 (MPP) is a novel mathematical model that predicts PaO2 behavior in a variety of conditions.The purpose of this study was to assess the stability of the MPP and P/F ratio during FiO2 changes and different shunt values. **Methods:** The Nottingham physiology simulator (v NPS-110111) was used to simulate 90 subjects admitted to the ICU. All subjects were given similar demographic information (70kg; BMI 23.3; Temperature 37.2 Celsius; ETT 8.0 mm; VT 6ml/kg; PIP 18 cm H2O; f 12; PEEP 5 cm H2O; I:E 1:2; CO 9.5 L/min; respiratory exchange ratio 0.80). Nine shunt fractions (3% to 30%) were used for analysis. Once the state of each subject's lungs was configured, PaO2 (kPa) was evaluated at three FiO2 levels (0.21, 0.6, and 1.0). At each FIO2 point, once total body oxygen flux was less than 1 ml min–1, PaO2 was considered to have reached equilibrium, and PaO2 was recorded. Subsequently, PaO2/FIO2 and MPP were calculated. SPSS 22.0 was used to analyze the data. **Results:** The mean variation for MPP and PF ratio at different FiO2 levels were 27% (95% CI 22%-31%) and 76% (95% CI 68%-38%); mean difference 49%; p<0.0001. In only 2 out of the 90 simulated patients MPP was slightly inferior to P/F as an index of oxygenation. **Conclusions:** The results of this study demosntrated that the MPP is an accurate and consistent indicator of oxygenation, despite variations of FiO_2 at different shunt fraction levels. By contrast, the P/F ratio proved to be much less consistent and very sensitive to FiO_2 changes.
Sponsored Research - None

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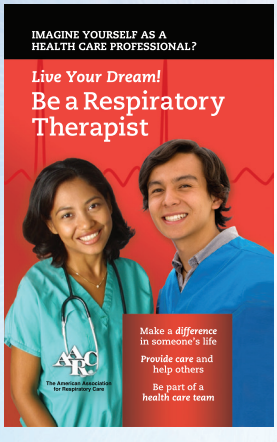

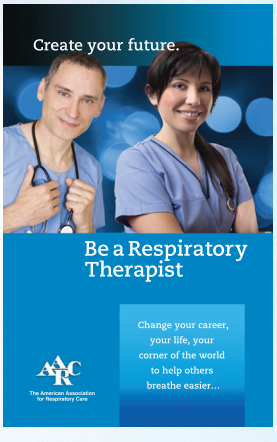

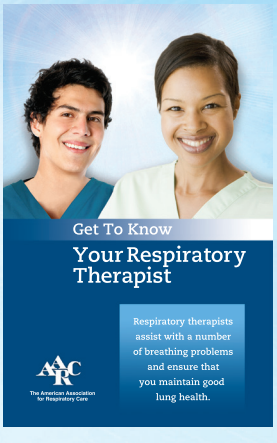

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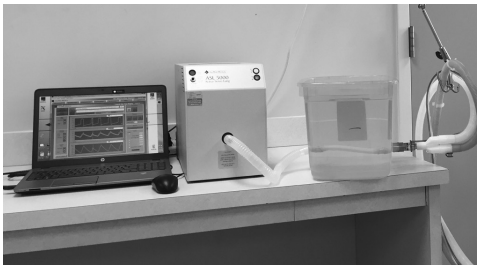
2303179

ACCURACY OF TOTAL PEEP MEASUREMENTS USING SIX DIFFERENT VENTILATORS.

Emily Lundstrom, Aaron Light, Doug Pursley, Christa Smith, Amanda Brown, Ethan Fenley, Andrew Lawson; Ozarks Technical Community College, Springfield, MO

BACKGROUND: The ability to accurately measure a patient's total PEEP (PEEPt) is important in ventilator management including determining Cstat, correcting ventilator dyssynchony, and monitoring clinical changes in the patient. We set out to determine if the Maquet Servo*i*, Draeger V500, Hamilton G5, GE Engstrom Carestation, Viasys Avea, and Puritan Bennett 840 could accurately report PEEPt. METHOD: Each ventilator was attached to an auto-peep model which utilized the Ingmar ASL 5000 breathing simulator set for a typical emphysema patient and known value of PEEPt. The auto-peep model is a 19-quart storage container with two holes drilled through the bottom sides and a Penrose drain tube connecting the holes. The bucket was then filled with water to collapse the drain tubing, simulating collapsible airways in an emphysema patient. Ventilators were set for VC mode with V_T of 500ml, set PEEP 5 cmH2O, and f of 20-32 to achieve a low (7-8 cmH2O), medium (12-13 cmH2O), and high (17-18 cmH2O) level of PEEPt. Total PEEP was measured using an expiratory hold with a scrolled review of the pressure-time scalar and by using the manufacturer's recommended procedure to obtain a digital PEEPt reading. Multiple measurements were made at each PEEP level. RESULTS: The pressure-time scalar method reported values within 10% of actual measurements on all ventilators except the Avea, which was 33%, 21%, and 17% lower on the low, medium, and high PEEP levels respectively. The PB 840 was not included in this group due to inability to freeze the screen in our model. When using the digital PEEPt reading supplied by the ventilator and with the simulator set for low PEEP, the Avea was >10% lower than the actual value. When set for medium PEEP, the Hamilton and Avea were >10% lower than the actual value and when set for high PEEP, the Draeger, GE, Avea, and Hamilton were >10% lower than the actual value. The Servo*i* and PB 840 digital PEEPt readings were within the 10% threshold on all PEEP levels. CONCLUSIONS: We found that there was a greater overall discrepancy between the control value and the PEEPt measured by the ventilator when using the digital PEEPt reading. Additionally, some ventilators list total PEEP as intrinsic PEEP, leading to potential confusion or possible incorrect documentation. In this study, an expiratory hold followed by a scrolled review of the pressure-time scalar proved to be a more accurate way to determine PEEPt in ventilators capable of freezing the screen.

Sponsored Research - None



Ingmar ASL 5000 breathing simulator with auto-peep model

2303184

HIGH PRIORITY VENTILATOR ALARM PROFILES IN INTENSIVE CARE UNITS.

Jefferson H. Mixell, John S. Emberger, Francis A. Gott; Respiratory Care, Christiana Care Health System, Newark, DE

BACKGROUND Data describing ventilator alarm management in intensive care units (ICUs) are limited. Effective alarm management is an important goal for The Joint Commission and for patient safety. One of the key elements of performance for effective alarm management is identifying necessary alarms versus alarms contributing to noise and alarm fatigue. We wanted to determine what the most frequent high-priority ventilator alarms in adult and neonatal ICUs and how long these alarms were active. **METHODS** We retrospectively gathered electronic ventilator alarm and event data without patient identifiers, for adults and neonates ventilated with a Drager Evita Infinity V500 ventilator in an ICU during April 2015. The data were analyzed for event, priority, date, time, and duration of alarm using Microsoft Access and Excel. The three most common ventilator alarms, comprising more than 80% of all high priority alarms, were compared. Alarm events are reported as a percentage of total alarms in each respective unit. **RESULTS** Forty eight ventilator logbooks were analyzed representing medical (n=17), surgical (n=10), neurological (n=10), and neonatal (n=11) ICUs and a total of approximately 200 days of mechanical ventilation. **CONCLUSIONS** Ventilator alarm profiles vary by patient population and probably reflect the use of different modes of ventilation in different units. The most common high priority alarms differed between adult ICU's and the Neonatal ICU. Respiratory rate high was the longest duration high priority alarm in the adult ICU. Low minute volume was the longest duration high priority alarm in the Neonatal ICU. Further studies are warranted to determine the informativeness of ventilator alarms to ensure that alarms are doing what they are intended to do: redirect attention from a lower priority situation to a higher priority situation.

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Most Common Ventilator Alarms

Most Common Adult Alarms	Airway Pressure High	MV Low	Respiratory Rate High
Medical, n (%)	4082 (55%)	954 (13%)	793 (11%)
Surgical, n (%)	629 (23%)	1071 (39%)	609 (22%)
Neurological, n (%)	750 (35%)	781 (37%)	170 (8%)
Most Common Neonatal Alarms	**MV Low**	**Disconnection?**	**Airway Obstructed?**
Neonatal, n (%)	606 (27%)	443 (19%)	250 (11%)
Average Duration of Adult Alarms	**Airway Pressure High**	**MV Low**	**Respiratory Rate High**
Medical, sec	3.2	24.3	34.7
Surgical, sec	4.7	20.1	36.5
Neurological, sec	4.9	21.2	19.6
Average Duration of Neonatal Alarms	**MV Low**	**Disconnection?**	**Airway Obstructed?**
Neonatal, sec	14.5	8.7	8.1

2303195

TIME UNTIL INTERVENTION FOR HIGH PRIORITY VENTILATOR ALARMS IN INTENSIVE CARE UNITS.

Jefferson H. Mixell, John S. Emberger, Francis A. Gott; Respiratory, Christiana Care Health System, Newark, DE

BACKGROUND Data describing ventilator alarm management in intensive care units (ICUs) are limited. Effective alarm management is an important goal for The Joint Commission and for patient safety. One of the key elements of performance for effective alarm management is identifying necessary alarms versus alarms contributing to noise and alarm fatigue. We wanted to determine how long the most common high priority alarms were active until there was an intervention made to the ventilator. **METHODS** We retrospectively gathered electronic ventilator alarm and event data without patient identifiers, for adults and neonates ventilated with a Drager Evita Infinity V500 ventilator in an ICU during April 2015. Interventions were separated into six categories (see Table) and defined as an intervention to an alarm if it occurred within 10 minutes of an alarm event. Data were analyzed for event, priority, date, time, and duration of alarm using Microsoft Access and Excel. Data is reported as average alarm time until intervention and count of each intervention per high priority alarm. **RESULTS** Forty eight ventilator logbooks were analyzed representing medical (n=17), surgical (n=10), neurological (n=10), and neonatal (n=11) ICUs and a total of approximately 200 days of mechanical ventilation. **CONCLUSIONS** Ventilator alarms are created and set to signify a change in a patient condition that requires the attention of the clinician. This study is the first data analyzing the length of time until an alarm is addressed, if it is going to be addressed in the first 10 minutes. All interventions to the most common high priority alarms occurred 3.3 to 5.0 minutes on average after the alarm. Factors influencing response time for an intervention could include staffing, workload and alarm fatigue.

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Types and Times Until Intervention For the Most Common High Priority Alarms

	Airway Pressure High	MV Low	Respiratory Rate High
Alarm Adjustment, avg minutes (n)	4.4 (1958)	4.1 (859)	4.3 (356)
Alarm Silence, avg minutes (n)	34. (5038	3.0 (1851)	3.7 (1582)
Mode Change, avg minutes (n)	4.3 (1194)	4.1 (588)	4.4 (275)
Reset, avg minutes (n)	3.7 (5497)	3.6 (2316)	3.9 (966)
Setting Adjustment, avg minutes (n)	5.0 (2202)	4.3 (895)	4.9 (466)
Suction, avg minutes (n)	3.8 (1147)	3.3 (379)	4.1 (338)

2303198

PATIENT-VENTILATOR ASYNCHRONY DURING EXERCISE USING ASSISTED MODES OF VENTILATION AND CPAP WITH PRESSURE SUPPORT VENTILATION.

Camille Stover[1,2], Ashley Blair[3,2], Hatsuyo Ebisu[2], Lonny Ashworth[2]; [1]Respiratory Care, University of Washington Medical Center, Seattle, WA; [2]Respiratory Care, Boise State University, Boise, ID; [3]Respiratory Care, Seattle Children's Hospital, Seattle, WA

Background: Current literature has shown the beneficial effects of early mobility in mechanically ventilated patients. However, despite these positive effects, there are no studies regarding which modes of ventilation are likely to be the most synchronous. This study evaluated patient-ventilator synchrony during assisted modes and CPAP at rest and during exercise with healthy individuals. **Methods**: After receiving IRB approval, informed consent was obtained from 16 subjects. Baseline values (HR, RR, and SpO_2) were recorded before beginning. Subjects were given a PFT mouthpiece connected to the Covidien PB 840 with a 7.5 mm ETT in-line. Four modes of ventilation were evaluated: Pressure AC (PC) at PIP of 5 cmH_2O, Volume AC (VC) at 8 ml/kg PBW, PRVC AC (VC+) at 8 ml/kg PBW, and CPAP with Pressure Support (CPAP) of 5 cmH_2O. All modes were selected randomly; assisted modes were set at a rate of 8 BPM and all modes had PEEP 0 cmH_2O. Subjects breathed on each mode for 2 minutes while seated and then in the same mode on a treadmill, set at 2.5 MPH with no incline. The ventilator screen was recorded during trial to capture displayed data and waveforms. Upon completion, subjects rated their work of breathing using the modified Borg Scale and returned to the chair for minimum of 3 minutes. The same procedure was followed for all 4 modes of ventilation. Asynchrony was identified when subjects had multiple-triggers, which resulted in the displayed PEEP level becoming negative as they continued to inspire after termination of the assisted breath. **Results:** While walking, CPAP had a significantly lower Borg Scale Rating than PC, VC, and VC+ (p=.005, p<.001 and p=.033, respectively). The mean PEEP level in CPAP minus the mean PEEP level in each mode was: PC 1.13 ± .18, p < .001; VC 7.51 ± .98, p < .001; VC+ 1.74 ± .26, p < .001. The mean PEEP level, during exercise, was significantly lower in VC than in PC, VC+ and CPAP (p<.001 in each mode), indicating significant asynchrony in VC compared to the other modes. Five out of 16 subjects were also unable to complete the exercise portion while in VC. **Conclusion:** Patient-ventilator asynchrony in assisted modes resulted in multiple triggering of breaths, and a decreased PEEP level. CPAP was the most comfortable and the most synchronous mode of ventilation for all subjects during rest and exercise. VC was the most uncomfortable and exhibited the most asynchrony during rest and exercise. **Disclosures:** none

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Borg Scale and PEEP Mean

	Borg Scale Rating		PEEP Mean	
Mode	Resting	Walking	Resting	Walking
PC	1.75	3.03	0.23	-0.81
VC	3.19	7.06	-1.87	-7.19
VC+	1.91	3.06	-0.07	-1.42
CPAP	0.69	1.50	0.60	0.32

2303239

DO RESPIRATORY THERAPISTS HAVE BETTER VENTILATOR GRAPHICS INTERPRETATIVE SKILLS THAN RESPIRATORY PHYSIOTHERAPISTS?

Edward Banguera[2], Diana Serrato[2], Angela Arevalo[2], Ruben Restrepo[1,2]; [1]UT Health Science Center, San Antonio, TX; [2]Respiratory Therapy, Universidad Santiago de Cali, Cali, Colombia

Respiratory care (RC) is practiced by professions other than RT in different countries. In Colombia, both RT and physiotherapists (PT) are licensed to practice RC in the ICU. Although RTs learn how to interprete ventilator graphics as part of their academic curriculum, most licensed PT learn on the job. To the best of our knowledge there is no report of how their training impacts their knowledge of ventilator graphics anywhere in the world. The purpose of this study was to compare the set of skills to interpret ventilator graphics between RT and PT in a large metropolitan city on Colombia. **Methods:** A faculty from the department of RC at the UT Health Science Center at San Antonio designed the evaluation tool and delivered a ventilator graphics course to a group of respiratory care professionals and RT students (RTS) in Cali, Colombia. The RTS had already covered mechanical ventilation in their curriculum. Prior to the course, participants were asked to complete a test (anonymous) to evaluate base knowledge on ventilator graphics interpretative skills. A 26-item questionnaire included short answers, drawings, few clinical scenarios, and recognition of common abnormalities on the waveforms. The first item of the evaluation asked to score their perceived knowledge of ventilator graphics (1:lowest to 10:highest) before the initiation of the course. **Results**: A total of 53 participants (RT=28; PT=17; RTS=8) completed the evaluation tool. RT reported a higher number of years working in the ICU than PT (RT=8.7±7.0, PT=6.2±4.2; p=0.14). There was a significant difference between the perceived knowledge of ventilator graphics between RTS and RT (RTS=2.38±1.60; RT= RT=3.93±1.90; p=0.02) but not between RTS and PT (PT= PT=3.18±2.03; p=0.11) and between RT and PT (RT=58.1%+/-19.9%; PT=57.2%+/-20.4%; p=0.43). Despite having the lowest perceived knowledge of ventilator graphics, the RTS had the highest baseline knowledge of ventilator graphics than RT and PT (RTS=65.5%±16.1%; RT=58.1%±19.9%; PT=52.9%±20.7%) but this difference did not reach statistical significance (RTS vs. RT, p=0.17; RTS vs. PT, p=0.16). **Conclusion:** RC practitioners in Cali, Colombia have similar skills regarding interpretation of ventilator graphics regardless of their profession and years in the ICU. Although RTS scored higher than RT and PT, the knowledge acquired during the practice of RC in these Colombian ICUs may prove to be more important than the curriculum covered in each academic program.

Sponsored Research - None

2303250

DIFFERENCES IN AEROSOL DELIVERY BY NEBULATIZON WHEN USING FLOW AND PRESSURE TRIGGERING DURING MECHANICAL VENTILATION.

Nicholas R. Henry, Brent A. Hoover, Benjamin C. Johnson, Kyle T. Francis, Oscar Contreras; Respiratory Care, Texas State University, Round Rock, TX

Background: The delivery of aerosolized medications to mechanically ventilated patients is affected by a variety of factors, including humidification, particle size, and nebulizer position. However, it has not been established as to whether pressure or flow trigger sensitivities have a significant impact on aerosol deposition. The null hypothesis states that there is no statistical difference in aerosol deposition between pressure trigger and flow trigger sensitivity. **Methods:** The study was performed utilizing a jet nebulizer containing 3ml of 0.9% sterile saline, which was delivered using 8L/min air in-line with a ventilator circuit. The nebulizer was placed proximal to the wye piece and proximal to the inspiratory limb of the ventilator circuit, subsequently. An ETT was placed distal to the circuit wye and connected to a test lung by advancing the ETT cuff into an adaptor and inflating the ETT cuff. The ventilator was set in volume-control assist-control mode with tidal volume 500mL, respiratory rate 12 breaths/minute, flow 65L/min, PEEP 5cmH2O, and FiO2 0.21. Each nebulizer position was tested at flow sensitivities of 2.5 to 5L/min in 0.5L/min increments and pressure sensitivities of -2 to -5cmH2O in 0.5cmH2O increments. An inspiratory filter placed between the ETT and test lung captured the nebulized aerosol. The inspiratory filter was weighed before and after aerosol administration using a scientific scale. An ANOVA and Tukey's HSD post-hoc statistical test with an alpha level of 0.05 was used to determine the statistical differences in saline deposition between the two trigger variables. **Results:** The ANOVA statistical method presented a p value of <0.01. Table 1 displays the descriptive statistics of the net changes in inspiratory filter weight, expressed in grams, as well as the p values obtained from the Tukey's post-hoc statistical test for each sensitivity variable and nebulizer placement. **Conclusion:** The ANOVA and Tukey statistical methods demonstrated significant differences. When placing the nebulizer proximal to the inspiratory ventilator circuit limb, a greater change in net filter weight was observed when utilizing pressure trigger compared to utilizing flow trigger. Due to this, the null hypothesis should be rejected. Aerosol delivery could be enhanced when placing the nebulizer proximal to the inspiratory ventilator circuit limb and utilizing pressure trigger sensitivity. Disclosures: The authors have no relationship to industry.

Sponsored Research - None

Table 1. Net change in inspiratory filter weight (g) with p-values obtained from Tukey's post hoc test.

Sensitivity Variable	Nebulizer Placement		
	Proximal to Wye Piece (mean ± SD)	Proximal to Inspiratory Limb (mean ± SD)	p-value
Flow Sensitivity	0.016 ± 0.032	0.020 ± 0.013	0.966
Pressure Sensitivity	0.003 ± 0.001	0.060 ± 0.013	< 0.01
p-value	0.614	0.002	

2303299

VENTILATOR GRAPHICS SKILLS OF RESPIRATORY THERAPISTS AND RESPIRATORY PHYSIOTHERAPISTS IN A LARGE METROPOLITAN CITY OF COLOMBIA.

Angela Arevalo[2], Diana Serrato[2], Edward Banguera[2], Ruben Restrepo[1,2]; [1]UT Health Science Center, San Antonio, TX; [2]Respiratory Therapy, Universidad Santiago de Cali, Cali, Colombia

Background: Colombia is one of the only 3 countries in Latin America that offers a BS degree in respiratory care (RC). However, respiratory therapists (RT) are not the only licensed professionals responsible for the management of ventilators in the ICU. Despite not receiving extensive academic training in mechanical ventilation, physiotherapists (PT) receive orientation in the ICU and can have similar responsibilities to those of the RT. The purpose of this study was to evaluate and compare the knowledge of ventilator graphics in a group of RC professionals with ICU experience in Cali, Colombia and to identify specific gaps in their interpretative skills. **Methods:** A previously validated assessment tool designed by faculty from the department of RC at the UT Health Science Center at San Antonio was distributed to a group of RC professionals and RT students (RTS) in Cali, Colombia. The tool was a 26-item questionnaire that included short answers, drawings, few clinical scenarios, and recognition of common abnormalities on the waveforms. Each item was specifically analyzed to determine the subjects overall competence. **Results**: Fifty-three participants (RT=28; PT=17; RTS=8) completed the evaluation. The overall score for the participants was 56.9% SD±20.8%). The RTS had a higher score than RT (RTS=65.5%±16.1%; RT=58.1%±19.9%; p=0.14) and PT (PT=52.9%±20.7%; p=0.38). Only 25% of participants knew the difference between scalars and loops. Most participants were able to list ventilator parameters (81.7%±1.4%) and abnormalities that can be identified with the graphics (88.7%±10.8%). Only 15.5% (SD±8.7%) of participants were able to draw loops after providing all the necessary ventilator parameters. The most commonly recognized abnormality was the presence of secretions (70.0%±4.6%), followed by decreased lung compliance (40.0%±4.9%). Only 18.3%+3.9% were able to recognize inadequate inspiratory flow. There was a significant difference between RT and PT regarding interpretation of loops (RT=17.0%, PT=5.9%; p=0.03). **Conclusion:** The overall knowledge of ventilator graphics by RC practitioners in these ICUs was suboptimal. Although these results are consistent with previous reports on evaluation of other professionals, including physicians and RT in the US, there is a critical need for continuing education on the interpretation of ventilator graphics in RC practitioners responsible for the management of the mechanical ventilator in the ICU.

Sponsored Research - None

2303305

ARE WE ROUTINELY USING A LUNG PROTECTIVE STRATEGY IN OUR MECHANICALLY VENTILATED PATIENTS WITHOUT ARDS ?

Kelli Hand, Richard Wettstein, Alyssa Gomez, David Guerrero, Kyran Manassya, Ruben Restrepo; UT Health Science Center, San Antonio, TX

BACKGROUND: Although determining tidal volume (VT) for patients requiring mechanical ventilation should be based on ideal body weight (IBW), this method is not routinely adopted. Instead, the VT is often set arbitrarily or calculated based on actual weight. A significant proportion of ventilated patients without lung injury can develop some form of respiratory complication if large VT are selected. The aims of this study were to evaluate the VT selection in a group of mechanically ventilated patients and to determine if a low VT strategy was used when patients receive high oxygen requirements. **METHODS:** Retrospective cohort study in a university affiliated medical ICU during a one-month period. We selected patients who received invasive mechanical ventilation for > or = 48 hours who did not fulfill the criteria for diagnosis of either ARDS on admission to the ICU. The ventilatory parameters measured included VT, RR, FiO_2, minute ventilation, PEEP, and IBW. The independent variable was a lung protective strategy defined as a V_T of 6-8 mL/kg based on ABW. The primary outcome was the "high oxygen need" defined as a FiO_2 >50% and a PEEP > 5 cmH_2O requirement. **RESULTS:** The VT selected for these patients based on IBW was 7.2 ±1.6 mL/kg with a range between 5.3 mL/kg and 9.8 mL/kg. A total of 8 patients (16%) received a tidal volume below 6 mL/kg (5.71±0.2) while13 patients (26%) received a tidal volume above 8 mL/kg (8.94+0.58). The mean V_T selected for these patients based on actual body weight was 5.6 mL (±1.86). The single most often selected V

2303334

VENTILATOR ALARM SELECTION IN LATIN AMERICAN COUNTRIES: RESULTS OF A MULTINATIONAL SURVEY.

Diana Serrato[2], Gustavo Olguin[4], Rodrigo Adasme[3], Ruben Restrepo[1,2]; [1]UT Health Science Center, San Antonio, TX; [2]Respiratory Therapy, Universidad Santiago de Cali, Cali, Colombia; [3]Universidad Catolica, Santiago de Chile, Chile; [4]Hospital Juan P. Garrahan, Buenos Aires, Argentina

Background: Ventilator alarms have been designed to improve safety in patients undergoing mechanical ventilation. Although typically selected by RTs in most ICUs around the US, a variety of licensed professionals that include nurses, physical therapists, and kinesiologists are responsible for the ventilator management in most Latin American countries. SOLACUR (Sociedad Latino Americana de Cuidado Respiratorio) has been trying to assess practices of respiratory care in Latin America. Only 3 of the 17 Latin American countries offer BS degrees in respiratory care. The specific objective of this study was to conduct a large-scale evaluation of who and how ventilator alarms are selected in Latin America. **Methods:** A 10-item questionnaire was created in Spanish using survey monkey and distributed by SOLACUR to Latin American respiratory care practitioners (RCP) of 17 countries. The survey was designed to identify who orders ventilator parameters, who selects the ventilator alarms, who makes changes to the parameters in the ventilator in ICU, how alarms are selected, and if alarms were perceived as disruptive of patient care. SPSS 22.0 (IBM, Chicago, 2013) was used to analyze the descriptive data. **Results:** A total of 512 RCP completed the survey. The country with the largest number of respondents was Chile (n=165), followed by Mexico (n=107), Argentina (n=101) and Colombia (n=55). The clinician most often responsible for selecting the ventilator parameters were intensivists (31%; n=142), while the RCP who sets the alarms was in most cases the RT (38%; n=172). Intensivists rarely (7%) select the alarm parameters. The most important factor in determining selection of specific alarms was according to the parameters set (53%), followed by policy and procedures (15.0%) and personal preference (14%). Half of the respondents considered alarms to be disruptive of patient care. **Conclusion:** This study revealed that the RT has an important role in selecting ventilator parameters and alarms in Latin American ICUs. The perception of alarms as nuisance by the majority of the respondents should be further investigated as it may determine how alarm parameters are selected.

Sponsored Research - None

2303336

ARE VENTILATOR ALARM PARAMETERS SELECTED DIFFERENTLY IN LATIN AMERICAN INTENSIVE CARE UNITS? RESULTS OF A MULTINATIONAL SURVEY.

Diana Serrato[2], Rodrigo Adasme[3], Richard Alcantar[3], Luis Campos[3], Ruben Restrepo[1,2]; [1]UT Health Science Center, San Antonio, TX; [2]Respiratory Therapy, Universidad Santiago de Cali, Cali, Colombia; [3]Universidad Catolica, Santiago de Chile, Chile

Background: The selection of ventilator alarms should be guided by individual patient respiratory parameters. A large percentage of false alarms and their associated "nuisance" have been reported as leading causes of alarm fatigue and that may lead to broadening of the alarm parameters. Previous reports on alarm selection have demonstrated that RTs in the US have a tendency to set alarm settings too far from the actual patient variable. SOLACUR (Sociedad Latino Americana de Cuidado Respiratorio) is trying to assess practices of respiratory care in Latin America. The goal of this study was to determine how ventilator alarms are selected in some Latin American ICUs. The specific aim was to determine the degree of discrepancy between ventilator alarm settings and some of the routinely monitored patient parameters in the ICU. Methods: A 10-item questionnaire was created in Spanish using survey monkey and distributed by SOLACUR to 512 healthcare providers responsible of patient care in ICU areas of 17 Latin American countries. The survey was designed to identify how alarms are selected after some patient parameters were provided. The alarm settings selected for analysis were high respiratory rate (HI RR), high peak inspiratory pressure (HI PIP), and high and low minute volume (HI MV, LO MV), as they represent the most frequently documented alarms in the ICU. SPSS 22.0 (IBM, Chicago, 2013) was used to analyze the descriptive data. **Results:** The ventilator alarm parameter that appeared to be selected farther from the patient parameter was the HI MV (60% higher), followed by HI PIP and and HI RR (both 50% higher). The tightest alarm selected was the LO MV at 20-40% lower than the patient's MV. **Conclusion:** Our data revealed that ventilator alarm selection in Latin American ICUs is very loose. Although responses to a survey may not reflect actual practice, these results are consistent with our report on alarm selection in the US. The impact of setting alarms closer to patient parameters on important clinical outcomes needs to be evaluated. However, the inability to capture patient deterioration soon enough is worth considering when selecting ventilator alarms.

Sponsored Research - None

2304267

DO LEVEL OF CONFIDENCE AND TRAINING TRANSLATE INTO ACTUAL KNOWLEDGE OF VENTILATOR GRAPHICS?

Himroz Sidhu, Brenda Falcon, Ruben Restrepo; UT Health Science Center, San Antonio, TX

healthcare providers in the US with most experience in the management of mechanical ventilation. Interpretation of ventilator graphics has become an essential tool in the recognition of patient-ventilator interaction. However, knowledge base of these interpretative skills is lacking. The purpose of this study was to evaluate and compare the base knowledge of ventilator graphics in a group of RT students of a BS degree program and MDs with experience in the ICU (fellow, attending) and to identify specific gaps in their interpretative skills. **Methods:** A faculty from the department of RC at the University of Texas Health Science Center at San Antonio designed and validated the evaluation tool. The RT students had already covered mechanical ventilation in their curriculum while most MDs learn by gaining experience in the ICU. Participants were asked to complete a test to evaluate base knowledge on ventilator graphics interpretative skills. A 26-item questionnaire included short answers, drawings, few clinical scenarios, and recognition of common abnormalities on the waveforms. Each item was specifically analyzed to determine the subjects overall competence. **Results**: Ninety-nine participants (RT=67; MD=28; other=3) completed the pre-course evaluation. The overall base knowledge score for the participants was 60.9% SD±20.0%). The RT students had higher baseline knowledge of ventilator graphics than the MD group (RT=64.8%±18.2%; MD=55.7%±20.5%; p=0.03) Only 1 out of 4 participants (24.7%±3.2%) knew the difference between scalars and loops. Most participants were able to list ventilator parameters (78.1%±2.6%) and abnormalities that can be identified with the graphics (88.1%±2.1%). Only 27.3% (SD±4.6%) of participants were able to draw loops after providing all the necessary ventilator parameters. The most commonly recognized abnormality was the presence of secretions (61.6%±4.8%), followed by air trapping (53.5%±50.1%) decreased lung compliance (47.5%±5.0%). Only 30.3%+4.6% were able to recognize inadequate inspiratory flow. **Conclusion:** This study demonstrates that the overall knowledge of ventilator graphics by RTs and MDs in this academic institution is suboptimal. These results are consistent with a previous report on a smaller sample of RTs and MDs in the US and other report in Latin America. The significant gaps regarding the ability to recognize abnormalities on the ventilator graphics call for a strong academic training for both RTs and MDs.

Sponsored Research - None

2304513

COMPARISTON OF THE NUMASK DEVICE AND TRADITIONAL FULL FACE MASK FOR NON-INVASIVE VENTILATION.

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BACKGROUND:CPAP and BiPAP ventilation are used in the hospital setting to ventilate patients non-invasively. The full mask is utilized as the interface for these modes of ventilation. This device is often said to be uncomfortable for the patient as well as difficult to maintain a seal, which could affect both patient compliance and adequate oxygenation and ventilation. The NuMask is an IntraOral Mask (IOM) that creates an airtight seal that fits under the lips but in front of the teeth. Along with the mouth piece is a Retention Shield which secures the IOM while occluding the nose. The hypothesis of this study was that participants will prefer the NuMask over a traditional full mask interface for CPAP and BiPAP; and that the NuMask will have a leak value less than the full mask. **METHODS:**The Institutional Review Board of Youngstown State University approved this study. Data was analyzed using SPSS Statistics software. Respiratory care student participants were asked to wear both interface devices on CPAP and on BiPAP for five minutes utilizing the Respironics V60. During the five minutes on each setting and mask, leak values were recorded at one minute intervals. After wearing both interfaces on both modes of ventilation, the participants were then asked to complete a survey that consisted of 10 multiple choice questions as well as 2 open-ended questions. **RESULTS:**Ten of the eleven participants completed the study. A two way repeated measures ANOVA to evaluate patient comfort on BIPAP and CPAP was statistically significant ($p<0.05$). A two way repeated measures ANOVA to evaluate the level of dryness with both BIPAP and CPAP modes of ventilation was statistically significant ($p < .05$). These results indicate the participants preferred the full mask for both comfort and level of dryness. Comments provided by ten respondents were reviewed. Dislikes of the NuMask were gum pressure as well as excessive salivation reported in 80% of responses. Dislikes of the full mask were related to equipment bulk (20%) and leaking of air into the eyes (30%). There was a documented leak with full mask on CPAP and BIPAP (mean leak of 45.3 L/min with CPAP; mean leak of 35.9L/min with BIPAP). There was no documented leak with the NuMask in either modes. The results indicate the NuMask maintained a more efficient seal for providing noninvasive ventilation then the full mask. However, the participants preferred the full mask for delivery of CPAP and BIPAP ventilation

Sponsored Research - None

2277584

25 YEARS OF RESPIRATORY CARE IN A PATIENT WITH OSTEOGENESIS IMPERFECTA.

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Introduction: Osteogenesis Imperfecta (OI) is a rare connective tissue disorder causing severe bone fragility, occurring in 1 per 20,000 live births. Rib fractures, thoracic cage deformities, and kyphoscoliosis can result in severe pulmonary insufficiency and early death. An aggressive respiratory management plan has helped to maintain pulmonary stability for 25 years in a patient classified with the most severe, non-lethal form of OI. **Case Summary:** A term, Caucasian female born by C-section. Multiple fractures and thoracic deformity were identified at birth. First respiratory failure event was at 5 months of age. Respiratory therapies prescribed for home upon hospital discharge included nebulized albuterol, vibratory chest physiotherapy (CPT) with a hand-held device, and supplemental oxygen. Over the next two years eight additional hospitalizations were required for respiratory failure with 14 necessary intubations. Tracheostomy was performed at age 2 and nocturnal ventilation was begun with an LP10 in SIMV/ volume control mode with pressure plateau. Inhaled gentamicin due to pseudomonas colonization of the airway and inhaled steroids were begun at age 4. At age 7 Mucomyst was trialed for thick secretions. Pulmozyme was begun daily 3 months later with intermittent use of Mucomyst for mucus plugging. Gentamicin was replaced by tobramycin at age 9. At age 11 a ventral hernia after GI surgery further compromised pulmonary function. She was changed to an LTV ventilator in pressure control/ assist control mode and pulmonary status improved. At 14 years of age an intrapulmonary percussive ventilation trial was not tolerated. Due to her hypopneic breathing pattern, hyperinflation technique was used for aerosol delivery. Ventilator support continued at night and during the day with acute illness. She was able to graduate from high school with plans for future online education. She enjoyed social activities. In 2012 Pulmozyme was replaced successfully by inhaled $NaHCO_3$ due to insurance restrictions. Current therapies include albuterol, $NaHCO_3$, CPT and Flovent with Mucomyst and Tobi as needed. Today, at 25 years of age, she is non-ambulatory and dependent upon the ventilator but still enjoys social activities. **Discussion:** Respiratory failure is the most common cause of early death in OI patients. This case demonstrates that an aggressive, creative respiratory care plan has contributed to an increase in survival and quality of life for this OI patient.

Sponsored Research - None

2283183

TITLE: DIAGNOSIS AND TREATMENT OF CONGENITAL LOBAR EMPHYSEMA.

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A two m/o term female developed acute respiratory failure secondary to severe airway compression of left distal main bronchus & right middle bronchus resulting in emphysematous parenchymal lesions transferred to our facility for a second opinion & treatment of CLD. Hx of tracheobonchomalacia, PDA & ASD. **Case Summary:** Admission ventilator settings: PC 48/PEEP14/PS10/f 35/45% O2/20 ppm iNO with 4.0 tracheostomy tube. A diagnostic bronchoscopy confirmed stenotic RM & LU bronchi. The RML severely over distended causing complete collapse of RUL & RLL. The LUL also over distended causing severe collapse of the LLL. CTA revealed suspicion of congenital lobar emphysema. A second therapeutic bronchoscopy performed to decompress the RML & LUL was unsuccessful. Dexamethasone course started to improve ventilation. iNO weaned off & Dexamethasone stopped for no improvement in clinical status. A PEEP grid showed PEEP level of 10 cmH20 for best ventilation & obstruction alleviation as seen on the flow volume curve. VQ scan revealed decreased perfusion & ventilation to bilateral upper lung fields. Heliox 80/20 initiated for laminar flow pattern to bypass obstructed bronchi & assist in ventilation & relieve collapse of the RU, RL and LL lobes**.** After 28 hrs Heliox stopped for no improvement on CXR. Fogarty catheters inserted in RM & LU lobes via bronchoscopy to determine if emphysematous areas were participating in gas exchange. After 12 hours, pCO2 decreased with an increase in Vt showing trial of the Fogarty catheters occlusion of LU & RM bronchi collapsed the overinflated lobes & assisted in expansion of the atelectasis in the LL, RL & RU lobes. A brief trial of HFJV in an attempt to reach collapsed lung segments was stopped due to hypercapnia. RML lobectomy performed. Postop ventilator support was weaned to CPAP+8/PSV+14. A bedside PDA ligation performed. Next day, ventilation was discontinued with HME days, t-piece at night. In two additional weeks, bronchoscopy was normal & tracheostomy downsizing began. Capping trials and tube downsizing continued with decannulation on DOA 105**. Summary:** Two m/o infant transferred for a second opinion of CLD & congenital lobar emphysema, Fogarty catheter placement was instrumental in demonstrating adequate ventilation could be maintained with exclusion of emphysematous lobes. Multiple modalities were used to maintain oxygenation & ventilation during treatment decisions while resection of RML improved infant outcome.

Sponsored Research - None

2303259

UNDERLYING DISEASE OF THE NEONATE AS AN OCCULT BARRIER TO ECMO DISCONTINUATION: NEONATAL ALVEOLAR CAPILLARY DYSPLASIA WITH MISALIGNED PULMONARY VEINS (ACD/MPV).

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Introduction: Significant resources and heroic measures are routinely used to care for the critically ill newborn. Infants with neonatal alveolar capillary dysplasia with misaligned pulmonary veins (ACD/MPV) rarely survive. This rare condition was isolated by lung biopsy in a patient with a rapidly evolving pulmonary decompensation. Case Summary: The infant is a term female born via spontaneous vaginal delivery at an outside hospital who initially began breast feeding with respiratory decompensation within the first hour of life requiring intubation and mechanical ventilation complicated by a pneumothorax. A left chest tube placed. The infant was transferred on hand ventilation with iNO and 100% oxygen to Children's Hospital of Philadelphia and immediately placed on VA ECMO due to respiratory insufficiency. The infant was on ECMO for 16 days with several low flow trials off ECMO (day 4,7,8,10). Each time desaturation and increased FiO_2 failures led team to suspect ACD. An open lung biopsy was performed while on ECMO and confirmed the fatal pulmonary condition. Early lung biopsy in the immediate neonatal period offered an advantage to decisions regarding invasive procedures. Discussion: ACD/MPV results from genetic etiology. The structural failure of the lungs communication with the circulating blood has grim prognostic outlook. Lack of radiologic cause for rapid decompensation with unexplained pulmonary hypertension that does not respond to inhaled nitric oxide in the presence of cardiac, genitourinary or gastrointestinal anomalies should prompt the team to consider this diagnosis. Risk benefit profile of early lung biopsy can guide decisions for costly, painful or risky treatments during the course of critical care of the neonate.

Sponsored Research - None

2302379

STUDY OF BUNDLE CARES WITH THE POSTOPERATIVE ADULT LUNG TRANSPLANT RECIPIENTS ON PSYCHOLOGICAL BEHAVIOR INTERVENTION.

Jiahui Ma; the First Hospital of Jilin University, Changchun, China

BACKGROUND: At present, all of the world the lung transplantation is recognized to be the only effective way to cure the patients with end-stage lung diseases,such as chronic obstructive pulmonary disease, pulmonary fibrosis, idiopathic interstitial pneumonia. While physiological function of the lung transplant recipients can be improved, due to the long duration of the primary disease itself, lung transplantation recipients need to wait for the donator a long time, and keeping protective isolation in ICU, common lung transplant recipients would appear postoperative delirium, anxiety, depression and other psychological problems,but mental state of recipients would directly affect the effect and prognosis of transplantation.To study of the effection of the bundle cares with the postoperative adult lung transplant of the psychological behavior intervention is important. METHOD: From April to December in the first hospital of Jilin university in 2014, five adult received double lung transplantation,and 4 cases selected in this study. Bundle cares includes six links,and to choose six special time nodes to assess mental status using Zung self rating anxiety scale (SAS), Zung depression self rating scale (SDS) and sleep quality: the Pittsburgh sleep quality index scale (PSQI), pain assessment using digital classification method (NRS). RESULTS: Among the six time nodes, SAS and SDS scores declined progressive. It showed time out of ICU, one week treatment in the isolation wards before treatment and discharged from hospital, SAS and SDS scores were lower than other three time nodes, including the day of admission, the day removing noninvasive ventilator, and after three days removing noninvasive ventilator, the difference was statistically significant ($P < 0.05$).Six time nodes NRS scores were no statistically significant differences($P > 0.05$).It's no correlation between NRS scores and SAS, SDS. CONCLUSION: According to the reasons of mental problems in lung transplant recipients,it's effective to carry out bundle cares dominated by psychological intervention.

Sponsored Research - None

2302917

HIGH FLOW NASAL CANNULA AND AEROSOLIZED EPOPROSTENOL AS A BRIDGE TO LUNG TRANSPLANTATION, CASE REVIEW.

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CASE STUDY: A 48 year old male with a history of pulmonary arterial hypertension (PAH), class IV group 3, as well as COPD, previous diagnosis of interstitial lung disease, prior tobacco / inhaled drug use, and a history of bilateral lobectomies. An echocardiogram showed evidence of severe right ventricular (RV) dysfunction, dilation and volume overload, severe PAH and cardiogenic shock. He was admitted for syncope episodes and poor pulmonary reserve, with a SvO2 of 39%. High Flow Nasal Cannula (HFNC) (Opti-Flow™ oxygen therapy adult nasal cannula medium, OPT544) for use with the RT202 adult breathing circuit heated with MR290 auto-feed chamber, Fisher & Paykel Healthcare LTD., Auckland, New Zealand) targeting an FIO2 of 0.60 at 40 L/min was ordered. After initiation of HFNC the SvO2 improved to 49%. Right heart catheterization (RHC) with thermo-dilution hemodynamic measurements demonstrated right atrial pressures (CVP) – 20 mm Hg, RV pressures – 58/10mm Hg (end diastolic pressure – 18), pulmonary artery (PA) pressure – 63/21 mm Hg, PA saturation 46% and right atrial saturation – 44%, pulmonary capillary wedge saturation - 99%, cardiac output – 2.23 L/min and cardiac index – 1.11. Interpretation, elevated right heart pressures with normal wedge pressures. Treatment plan; continuous intravenous (IV) infusion of Dobutamine 2.5 mcg/kg/min, Phenylephrine (Phenyl) 3.0 mcg/kg/min, Flolan 4ng/kg/min and continuous aerosolized epoprostenol (Flolan®, GlaxoSmithKline, NC). An Aerogen® (Danger, Galway Ireland) (ANB) nebulizer was connected to the dry side of the MR290. Aerosolize Flolan (AF) 20.000ng/mL was started at 8cc/hr via IV pump and tubing connected to ANB, in-line with HFNC. The intention were to increase vaso-activity, goals; improve SvO2, diuresis with Lasix to improve RV function. Prior to the start of IV Phenyl, Flolan, and AF, SvO2 was 49%, and CVP- 20 mm Hg. After initiation of Flolan SvO2 improved to > 60%, and CVP was maintained between 9 and 18 mm Hg with diuresis. Mixed venous oxygenation saturation continued to improve from 66 to 74%. He was maintained on HFNC, IV and AF for three weeks before receiving a bilateral sequential lung transplantation. CONCLUSION: Multi-disciplinary team collaboration is essential for safe administration of HFNC-AF during the peri-operative period. There were no reports of adverse events. More studies are needed to determine the best treatment strategy for use of HFNC-AF as a bridge to lung transplantation.

Sponsored Research - None

2303122

CASE REPORT: REVIEW OF A TRAUMA PATIENT WITH THORACIC COMPARTMENT SYNDROME ON AIRWAY RELEASE PRESSURE VENTILATION (APRV) AND EXTRACORPOREAL MEMBRANE OXYGENATION (ECMO).

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Introduction: A 20 year old male involved in a rollover motor vehicle crash presents to the emergency department with a Glasgow Coma score of 15 and aspiration. Patient's course included worsening respiratory status, adult respiratory distress syndrome (ARDS) and thoracic compartment syndrome. **Case Summary:** Patient developed aspiration pneumonitis which later became pneumonia. Serial bronchoscopies suctioned for a large amount of food from all lobes, and purulent secretions. Patient required 100% fractional inspired oxygen (FiO_2). The patient developed ARDS and required APRV mode of ventilation. Settings were P_{High} 26 cmH_2O, P_{Low} 0 cmH_2O, T_{high} 5 seconds, T_{Low} 0.6 seconds and FiO_2 of .50. Patient's status continued to decompensate and he required venovenous ECMO cannulation. Patient's chest x-ray (CXR) demonstrated bilateral pleural effusions. He developed a firm abdominal wall. A left chest tube was place for hydrothorax and ultimately hemorrhagic conversion, a right chest tube was placed for a hemothorax. CXR revealed opacification on right lung, compliance is extremely poor. Limited thoracic ultrasound reveals large pleural fluid collection with internal septations consistent with hemothorax. Patient hemodynamically labile, with poor urine output and high peak airway pressures. There were signs of venous congestion of the upper body. Patient taken to the operating room emergently for bilateral thoractoamies due to thoracic compartment syndrome. In the intensive care unit the patient's ventilator settings were decreased, hemodynamics and urine output improved. The ventilator settings were P_{High} 26 cmH_2O, P_{Low} 5 cmH_2O, T_{high} 13 seconds, T_{Low} 0.2 seconds and FiO_2 of 1.0. The patient had several chest washings to evacuate blood and clots. The patient was weaned off ECMO. **Discussion:** Patient developed severe case of ARDS and thoracic compartment syndrome requiring advanced therapies such as ECMO. Using APRV we were able to ventilated and oxygenated at pressures that did not impede ECMO circuit flows. After several days on APRV the patient's release tidal volumes were increasing. The typical ventilator rest settings for patients' receiving ECMO is PIP 10 cmH_2O, PEEP 10 cmH_2O, rate of 10 breaths per minute and FiO_2 of 30-60%. This patient required much higher pressures to maintain ventilation. Using APRV we were able to maintain adequate ventilation and minimize damage to the lungs by volutrauma and barotrauma.

Sponsored Research - None

2301503

NEW DIAGNOSTIC POSSIBILITIES IN THE DIAGNOSIS OF OBSTRUCTIVE DISEASES USING CAPNOVOLUMETRY.

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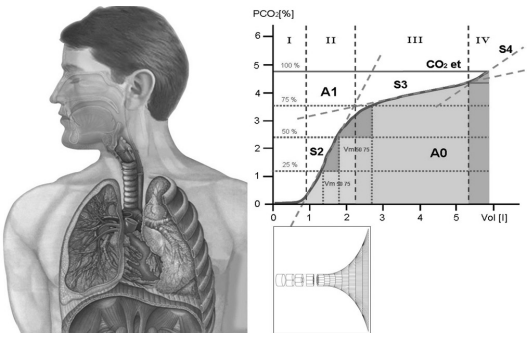
Background: Spirometry is the gold standard in diagnosing chronic obstructive pulmonary disease (COPD) and asthma. However, the result of a measurement is highly dependent on patient cooperation and the experience of the technician. It would be desirable to utilize an additional measurement at reasonable costs, which is completely independent from patient cooperation. Previous pilot studies revealed that the shape of the volumetric capnogram (capnovolumetry) is modified by airway obstruction and thus might allow to diagnose a present obstruction and might even allow to distinguish between COPD and asthma. **Methods:** 275 probands were analyzed, in a multi-center prospective study. 75 were diagnosed with COPD, 45 with asthma and in 155 no respiratory disease was diagnosed. An ultrasound based spirometer was used, which could also measure capnovolumetry. Numerous parameters of the volumetric capnogram were analyzed. With a ROC curve and calculation of the Youden-Index it was tried to determine reference values for specific parameters in order to determine sensitivity and specificity. Additionally, in 27 asthmatic patients the reaction on metacholine was analyzed. **Results:** The strongest significant difference between the different groups were found for the slope of the alveolar plateau (S 3), the angle Alpha of the ascending phase (S 2) and the alveolar plateau, and the anatomical deadspace. In order to distinguish between healthy probands and patients suffering from an obstructive disease, S3 as a parameter was used. A sensitivity of 89% and a specificity of 70% was calculated. This parameter also showed a strong general correlation to FEV1. The angle Alpha of asthmatic patients was significantly different compared to COPD patients ($p<0.05$). In the metacholine challenge testing group Alpha showed a stronger and earlier reaction after provocation than FEV1. **Conclusions:** In this study it has been shown that capnovolumetry is a quantitative method of analyzing the presence and the grade of an obstructive disease. Regarding the advantages of the effort independency and the measurement during tidal breathing, capnovolumetry opens new possibilities in the monitoring of respiratory diseases especially for children and for use at home.

Sponsored Research - None



2302097

EFFECTIVENESS OF UV RADIATION AND 70% ALCOHOL AS DISINFECTING AGENTS FOR STETHOSCOPES USED IN THE ICU.

Naser Abdulfatah, David Chang; University of South Alabama, Mobile, AL

INTRODUCTION: Nosocomial infections increase patient mortality, duration of hospital stay and health care costs. In the ICU, stethoscopes are often contaminated with pathogens. Health care providers typically use 70% alcohol wipe as disinfecting agent for stethoscopes before and after their use on patients. This study was done to evaluate the effectiveness of UV radiation and 70% alcohol as disinfecting agents for stethoscopes used in the ICU. METHODS: IRB approval was received prior to the study. Twenty new stethocopes [Welch Allyn (TM)] were used in this study. These stethoscopes were assigned to respiratory therpiasts (RTs) working in the ICU. Each RT used the assigned stethoscope for seven days. The RTs were allowed to disinfect the assigned stethoscope per their usual practice and department policy. At the end of the seventh day, the stethoscopes were sealed in separate bags and transported to the microbiogy lab for processing. Ten stethoscopes were cultured before and after exposing to UV light [PRO-511 Sterilizer (tm)] for 60 minutes. The other 10 were cultured before and after disinfecting with 70% alcohol wipe. All 40 samples were placed onto the blood and MacConkey agar plates and incubated at 37 degress C for 48 hours using standard laboratory protocols. Colony counts on each agar plate were recorded. Paired t-tests were used to compare the colony counts between the pre- and post-treatment samples. RESULTS: Table 1 shows the colony counts for the pre- and post-treatment samples. The calculated t values for the pre-UV/post-UV and pre-alcohol/post alcohol samples were 2.517 and 3.130, respectively. The table t value at 0.05 level (df 8) is 2.306. DISCUSSION: There were significant differences at the p 0.05 level between the pre- and post-treatment samples disinfected with UV and 70% alcohol. The UV may be used as a disinfecting agent for stethoscopes. Limitations of this study include small sample size, unkown exposure of the assigned stethoscopes, and unkown disinfecting practice performed by the RTs in the study.

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Table 1 Colony counts of pre- and post-UV and alcohol samples

Stethoscope #	(A) Pre-UV	(A) Post-UV	(B) Pre-alcohol	(B) Post-alcohol
1 (A) (B)	5	5	20	0
2 (A) (B)	6	0	15	2
3 (A) (B)	3	3	3	0
4 (A) (B)	6	4	15	7
5 (A) (B)	5	0	1	0
6 (A) (B)	2	1	4	2
7 (A) (B)	38	11	2	0
8 (A) (B)	30	2	3	1
9 (A) (B)	23	5	11	0
10 (A) (B)	2	1	3	0

2302501

EVALUATION OF TWO COMMON METHODS FOR CLASSIFYING ACID-BASE DISORDERS.

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BACKGROUND: Acid-base disorders are commonly classified using the "arrow method" or by employing an acid-base map. With the arrow method, there are up to 14 possible diagnoses based on whether the pH, PaCO2, and HCO3 are within, above, or below normal range. It is easy to learn but does not consider hydrolysis or more complicated disturbances. The acid-base map is used by plotting pH with PaCO2. Confidence bands for six acid-base disorders are shown. It can distinguish between simple and mixed disturbances but does not consider superimposed disorders. We sought to determine the accuracy of these methods by comparing them to a more holistic approach to interpreting acid-base balance. METHOD: To arrive at the most precise diagnosis possible, we conducted a bedside evaluation (including history and presentation) of 42 patients as they received a normally scheduled blood gas in a large tertiary care hospital. After IRB approval was obtained, acid-base values, electrolytes, and metabolites were then collected and analyzed. In acute respiratory conditions, hydrolysis was considered in order to reach a more accurate diagnosis. In chronic respiratory conditions, rules of renal compensation were used to determine if a mixed or acute-on-chronic diagnosis also existed. Winter's formula was utilized in metabolic acidosis and the "point seven plus twenty" rule in metabolic alkalosis to ascertain the degree of respiratory compensation. Anion and bicarbonate gaps were also calculated. RESULTS: Two blood gases were inconsistent with the H-H equation and were thrown out. Of the remaining forty, acid-base mapping predicted the correct interpretation in 82.5% (33/40) of patients owing only to a few superimposed or mixed acid-base disorders. The arrow method was less accurate at 52.5% (23/40). Not only did it miss superimposed and mixed disorders but because it does not factor in hydrolysis, it also misinterpreted the degree of compensation in several patients. CONCLUSIONS: Decisions about the care of a patient often hinge on the results of the arterial blood gas and its subsequent interpretation. Therefore, blood gases should be "interpreted" using the rules and assessments previously described as opposed to simply "classifying" a blood gas by systematically arranging the values according to established criteria. The arrow method should not be used to interpret acid-base disorders since, according to our study, it resulted in an incorrect interpretation in nearly 50% of cases.
Sponsored Research - None

2302716

DEVELOPMENT OF A NEW INDEX TO ASSESS PULMONARY OXYGENATION.

Taha Ismaeil[1,2], Adil Alotaibi[1,2], Abdulmohsen Alahmad[1], Usra Naeem[1], Declan Bates[3], Anup Das[3], Jonathan Hardman[1]; [1]School of Medicine, The University of Nottingham, Nottingham, United Kingdom; [2]King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia; [3]School of Engineering, University of Warwick, Coventry, United Kingdom

Background: The ratio of arterial oxygen partial pressure to fractional inspired oxygen (PaO_2/FiO_2 ratio) is widely used index in critical care settings because of the simplicity of it's calculation. However, the external physiological factors (EPFs) such as haemoglobin (Hb), and inspired oxygenation fraction (FiO_2) can effect PaO_2/FiO_2 ratio. The aim of this study was to generate a new oxygenation index that control the effect of EPFs, therefore represent the condition of the lung accurately. **Method:** We configured fifteen simulated subjects using a validated computational model of human pulmonary physiology entitled Nottingham Physiology Simulator. Each simulated subjects had a unique pulmonary configuration with varying degree of pulmonary shunt fraction and ventilation perfusion mismatch but had identical level of FiO_2 0.3, Hb 145 g/l and mechanical ventilator settings. The EPFs were varied each in isolation, the new corrected PaO_2 index ($CrPaO_2$) and PaO_2/FiO_2 ratio were calculated and their variability were compared using a coefficient of variation (CV%). The new $CrPaO_2$ index was derived from multiple trials incorporating both EPF and PaO_2 values using the polynomial equation to optimize an index of oxygenation, with the aim to produce unaffected value by EPFs variation. Subsequently, by using the 5th order polynomial equation we corrected for both the FIO_2 ($CrFiO_2$) and Hb (CrHb) to reduce the induced variation in PaO_2, and then multiplying them together creates the corrected factor (CF).Finally, by dividing PaO_2 by the CF provides the equation below $CrPaO_2=PaO_2/CF$ $CF=CrFiO_2X$ CrHB $CrFiO_2=((FiO_2^5\times0.0000000067)+(FiO_2^4\times-0.000002238)+(FiO_2^3\times0.000281)+(FiO_2^2\times-0.016272)+(FiO_2x0.446310)+(-4.497161))$ $CrHb=(Hb \times 0.001388+0.84724)$ **Results:** Every EPF induced variation in both indices. The average CV% for $CrPaO_2$ was 9% with FiO_2 and Hb changes. In contracts, PaO_2/FiO_2 ratio varied by 29% through the range of FiO_2 and Hb. On average for all virtual subjects CV% for PaO_2/FiO_2 ratio was nearly three times vary than the $CrPaO_2$ index. **Conclusions:** The new $CrPaO_2$ index was less affected with the variation induced by EPFs, acceptably accurate, and reliable than PaO_2/FiO_2 ratio. Future investigation of the robustness of new $CrPaO_2$ index in various lung states is essential before it can be validated clinically. Further, developing a computer application for the calculation of the new $CrPaO_2$, will make the clinical implication easy in the critical care area.
Disclosures: None
Sponsored Research - None

2302728

VARIATION OF PULMONARY OXYGENATION INDICES USING A COMPUTATIONAL MODELLING.

Taha Ismaeil[1], Adil Alotaibi[1], Anup Das[2], Declan Bates[2], Mainul Haque[1], Jonathan Hardman[1]; [1]School of Medicine, The University of Nottingham, Nottingham, United Kingdom; [2]School of Engineering, University of Warwick, Coventry, United Kingdom

Background: Clinicians use oxygenation indices to diagnose and treat pulmonary diseases. These indices are acceptably helpful but not representing the lung status if there is a change in the external pulmonary factors such as (fraction of inspired oxygen (FiO_2), haemoglobin (Hb), partial pressure of CO_2 ($PaCO_2$) and oxygen consumption (VO_2)). The aim of our study is to examine the actual variability of existing oxygenation indices using validated computational simulator entitled the Nottingham Physiology Simulator (NPS). **Method:** Six virtual patients were configured using NPS. Each virtual patient had a unique lung defect consisting of a true shunt, and ventilation and perfusion mismatch. All virtual patients were identical in respect to their mechanical ventilator settings and body physiology at FIO_2 30%, Hb 145 g/L, $PaCO_2$ 5.8 kPa, VO_2 250 ml min−1. The external pulmonary factors were varied in isolation and the following oxygenation indices were recorded; alveolar–arterial oxygen tension gradient ($PA–aO_2$), respiratory index ($PA–aO_2/PaO_2$), Mean predicted arterial oxygen tension (MPP), the ratio of arterial oxygen partial pressure to fractional inspired oxygen (PaO_2/FiO_2 ratio) and calculated shunt fraction (Qs/Qt). **Results:** The preliminary results indicated the presence of large maximal variation in oxygen indices occurs with external pulmonary factors' changes even without changing the pulmonary configuration status. This study demonstrated that FiO_2 induced a remarkable variation in comparing to other oxygenation indices whereas (Qs/Qt) and (MPP) were less varied with changing in external physiological factors. **Conclusions:** The findings from this study indicate that (Qs/Qt) and (MPP) could be used as indicators to represent the pulmonary oxygenation defect. It is appropriate for clinician to use the best index according to patient's status. Therefore, there is a need to develop new independent oxygen index that do not vary with the external independent factors and represent a lung condition. **Disclosures:**None
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2287266

AT HOME SLEEP STUDIES, A TOOL AIDING IN THE DIAGNOSIS OF OBSTRUCTIVE SLEEP APNEA.

Jeremy Plambeck; Cardiopulmonary, Providence Seaside Hospital, Astoria, OR

Background: Obstructive sleep apnea (OSA) is a recognized and treatable disease that is experiencing an increase in prevalence as advancement in technology allows earlier diagnosis and pre-screening [1-13]. At home sleep monitors can aid in the diagnosis of OSA. **Methods:** A careful review of scholarly journal articles that are related to at home sleep studies, obstructive sleep apnea, insurance reimbursement, and a comparison of home sleep studies vs lab polysomnographys (PSG). A variety of search engines and medical data bases were used that included Google Scholar, PubMed, Respiratory Care Journal, Journal of Clinical Sleep Medicine, and Uptodate. Those articles were further narrowed down to 13 that were published in the last 8 years and covered a broad non-bias view. Some of the studies reviewed contain information from previous studies done earlier than 2005 and studies are being added on to those previously done. **Results:** With comparison to standard level 1 in-laboratory PSG tests and level 3 in-home sleep tests, both had similar results and could effectively diagnose OSA in adults with a moderate to high risk after a thorough patient assessment and pre-screening and can effectively diagnose OSA in children with a high risk. **Conclusion:** At Home sleep studies can be a reliable tool that can aid in the diagnosis of OSA is patients with a high pre-test probability.

Sponsored Research - None

2255131

OOPS! SOMEONE PLACED SUCTION TUBING IN PLACE OF OXYGEN CONNECTION TUBING FOR A NASAL CANNULA. HOW DOES IT COMPARE TO REGULAR OXYGEN TUBING WHEN PIECED TOGETHER?

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INTRODUCTION: Approximately 50 feet of oxygen tubing may be required for a patient to effectively ambulate in a room for personal care. This can be accomplished by stringing connector tubing to ¼ inch straight adapters. Occasionally some energetic person discovers that there is not enough supply and rigs a suction connection tubing to the mix. There is concern if the tubing becomes kinked, that the amount of flow at the distal end of the nasal cannula will be significantly reduced. This study compares oxygen flow rates for nasal cannula therapy when a suction tube is added in place of an oxygen tube connection. It is hypothesized that an extreme kink will reduce delivery flow of gas to the patient. METHODS: A bench study uses a nasal cannula that was strung with a series of 6, 7-foot oxygen tubing and straight connectors to bring the total length to 49.75 total feet. When a suction tubing replaced a single oxygen tubing at 71 inches, the total length was 48.6 feet. Baseline preset flow was initially set at 1, 3, and 5 liters with the cannula connected to a flow meter from a fixed-wall source. Flow was measured with a Certifier FA Plus Test System, (TSI instruments LTE, Shoreview MN). Once baseline flow was established to the nearest 1000th liter/min, readings were recorded after 5 seconds. Three samples from each setting were taken. A suction connector tubing (Argyle Covidien, Mansfield MA) was randomly placed instead of one of the oxygen tubing lines for the second set of tests. A third test compared both the oxygen and suction tubing with an extreme kink by folding over the tubing at a 10 to 20 degree angle. A total of 36 samples were taken. Data was done in Excel. RESULTS: There was a very slight but non-clinical reduction of flow when suction tubing was added to oxygen connection tubing, even with several connections. Adding an extreme kink in either set of hoses did not impede flow. Measured liter flows are shown in the Table. DISCUSSION: Suction tubing should be switched out to oxygen connection tubing as it is still not recommended for this type of use. CONCLUSION: A suction connection tube will not reduce oxygen delivery nor will it impede flow even with a severe kink.

Sponsored Research - None

Liter flows are shown in mean and ± standard deviation for each trial

	5L	3 L	1 L
5o feet interconnected oxygen tubing	4.997 ± 0.02	3.009 ± 0.01	0.960 ± 0.03
Oxygen tubing + suction connection tubing	4.99 ± 0.01	2.998 ± 0.01	0.954 ± 0.07
Oxygen tubing with kink	4.992 ± 0.04	2.962 ± 0.04	0.999 ± 0.00
Suction tubing with kink	4.974 ± 0.02	2.985 ± 0.01	0.999 ± 0.00

2269673

DELIVERY OF SAFE F_{IO2} IN AN EXPERIMENTAL SUBAMBIENT OXYGEN ENVIRONMENT.

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

BACKGROUND: Experiments have been conducted for space flight exposing human test subjects to atypical atmospheric and oxygen depleted environments. Our investigators proposed testing the effects of low oxygen environments on sleep with experiments lasting several days. This involves exposing human test subjects to a 14% O_2 enriched environment and low levels of CO_2. Our Investigational Review Board (IRB) requires that care providers and data collectors entering the controlled environment be protected from abnormal O_2 concentrations. We wanted to know if a common venturi mask would maintain an F_{IO2} between 21% to 30% for minute ventilation ranging between 3.75 to 12 L/m. **METHODS:** A Hudson RCI #1098 adult venturi mask (Teleflex Medical, Research Triangle Park, NC) with a 31% and 35% adapter were separately connected to a LifeForm LF03699U anatomically correct adult airway trainer, (Nasco, Fort Atkinson, WI). The trainer was connected to an ASL 5000 breathing simulator, (IngMar Medical Ltd, Pittsburgh, PA). Separate RR = 12 and 15 BPM and VT = 220 – 820 mL representing patient predicted VT range of 100 – 300 lb were evaluated. F_{IO2} was measured at the trachea with a 2-point calibrated Teledyne MX-300 oxygen analyzer, (Teledyne, City of Industry, CA). The calculated delivered F_{IO2} of the 31 and 35% venturi adapters in a 14% F_{IO2} environment was: %O2 = ((Air flow x 14) + (O2 flow x 100))/Total Flow.[1] The calculated difference between the delivered and measured tracheal F_{IO2} in a 14% environment was subtracted from the measured difference in a 21% environment for each adapter. The data were analyzed using ANOVA and paired t-tests with $p < 0.05$ considered significant. **RESULTS:** The MD (± SD) comparing delivered to tracheal F_{IO2} was 3.1% (± 3.0%), ($p > 0.05$).The range difference was -2.2 to 6.4%. The calculated delivered F_{IO2} in a 14% environment using the 31 and 35% venturi adapters was 23.6 and 28.3% respectively. The calculated tracheal F_{IO2} with a MV range of 3.75 to 12.0 L/M was 30.5 to 21.9% and 25.0 to 20.4% with the 35 and 31% adapter respectively. **DISCUSSION:** Supplemental oxygen administered by a venturi mask to staff exposed to an abnormal oxygen environment, (when the environmental concentrations are known), appears to protect against hypoxia and hyperoxia. The flowrate adapter rating by the manufacturer of 72 L/m appears sufficient for the total environmental F_{IO2} within the limits of our predicted MV range. [1] Egan D: Fundamentals of Respiratory Care

Sponsored Research - None

2269842

TRACHEAL FIO_2 COMPARED TO 100% O_2 HFNC DELIVERY WITH MAXVENTURI AT INCREASING MINUTE VOLUME.

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

BACKGROUND: A high flow nasal cannula (HFNC) system is reported to assure stable FIO_2 delivery by meeting a patient's inspiratory flow demands. Matching supply and demand can prevent secondary air entrainment.[1],[2] VT, RR, secretions, soft tissue swelling, or nare compression of the prong are important variables but the effects on FIO_2 delivery have not been reported with the HFNC. We wanted to know the effect of these variables on FIO_2 stability. **METHOD:** We used a LifeForm adult airway trainer, (Model LF03699U, Nasco, Fort Atkinson, WI) connected to an ASL 5000 breathing simulator, (IngMar Medical Ltd, Pittsburgh, PA). Spontaneous VT from the simulator was set for a range of 220 – 820 mL, or predicted VT to simulate 100 – 300 lb patients, RR = 8, 14, and 20 BPM. The HFNC setup was a Fisher & Paykel OptiFlow size medium OPT544 cannula connected to an RT202 breathing circuit, (Fisher & Paykel Healthcare, Irvine CA), and a MaxVenturi mixer, (Maxtec, Salt Lake City Utah). The HFNC was attached to the nares of the airway trainer and the MaxVenturi was set to deliver 100% O_2. Tracheal FIO_2 was measured using a Teledyne MX-300 oxygen analyzer, (Teledyne Instruments, City of Industry, CA), located between the airway's carina and breathing simulator. A 2-point calibration of the analyzer was performed for each adjustment of flowrate = 20, 30, 40, and 50 L/m. FIO_2 was measured and recorded after 20 breaths at each setting for a total of 100 measurements. The data were analyzed using ANOVA and paired t-tests with $p < 0.05$ considered significant. **RESULTS:** The MD (±SD) between delivered and tracheal FIO_2 was 21.8% (±17.1%), ($p < 0.01$). The MD (±SD) of baseline FIO_2 with 2 patent prongs compared to 1 occluded prong was 14.3% (± 4.8%), ($p < 0.01$). **DISCUSSION:** Although 100% oxygen was delivered to the nares clinicians must be cautioned when relying on HFNC for stable oxygen delivery. The findings of this study signify an inverse relationship of HFNC FIO_2 with minute ventilation. The results are also indicative of significant FIO_2 variability when the airway or prong patency is compromised. Increasing flow only added slight to moderate increase in FIO_2 at the tracheal level of the airway as minute volume increased. [1] Ward J. High-flow oxygen administration by nasal cannula for adult and perinatal patients. Respir Care. 2013;58(1):98-122. [2] Wettstein R, et.al. Delivered Oxygen Concentrations Using Low-Flow and High-Flow Nasal Cannulas. Respir Care.2005;50(5):604-609.

Sponsored Research - None

2270482

MAXVENTURI FIO_2 VARIABILITY WITH HIGH FLOW NASAL CANNULA.

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

BACKGROUND: The high flow nasal cannula (HFNC) is designed for delivery of supplemental oxygen at a wide range of FIO_2. HFNC delivered by an air–oxygen blender requires a 50 psig source for both gases. The MaxVenturi is a mixer designed to deliver humidified high flow O_2 with air-entrainment. This is convenient when a high-pressure air supply is not available. We wanted to know the accuracy and stability of this oxygen delivery system for HFNC application. **METHODS:** The HFNC setup was comprised of Fisher & Paykel's OptiFlow Size Medium - OPT544 nasal cannula, RT202 breathing circuit, model 850 heater, (Fisher & Paykel Healthcare, Irvine CA), and a MaxVenturi mixer, (Maxtec, Salt Lake City Utah). A 2-point baseline calibration of the MaxVenturi oxygen analyzer was performed with the cannula detached from the patient circuit after adjusting to each tested flowrate of 30, 40, and 50 L/m. The FIO_2 was measured and recorded 3 times at each setting. These measurements included baseline FIO_2 with the cannula detached from the patient circuit, after the Optiflow cannula was attached to the patient circuit, and with one of the prongs clamped to represent a 50% obstruction. Measurements were made at 5% increments of FIO_2 ranging between 30 and 100% for a total of 126 measurements. The data were analyzed using ANOVA and paired t-tests with $p < 0.05$ considered significant. **RESULTS:** The mean difference comparing baseline FIO_2 with cannula attachment, and baseline with 50% occlusion was 10.1% (± 4.8%), ($p < 0.01$) and 18.4% (± 8.6%), ($p < 0.01$) respectively. **DISCUSSION:** This study demonstrated a significant increase in FIO_2 from baseline after attaching the cannula to the circuit. Further increase in FIO_2 from baseline occurred with obstruction of a nasal prong. Clinically, obstruction may occur due to prong compression or secretion accumulation. The HFNC described in this study requires adjustment of FIO_2 after it is applied if obstruction is present within the airways. In contrast, adjusting to the prescribed FIO_2 where obstruction is not detected has the potential of altering the gas mixture if the obstruction is relieved. This has the potential for the delivery of a gas mixture that may not meet the patient's oxygen requirement. Based on our findings, we recommend that clinicians heighten the awareness of FIO_2 variability. It may be reasonable to increase surveillance and provide additional monitoring to your patient using this method of HFNC oxygen administration.

Sponsored Research - None

2294393

OXYGEN ADMINISTRATION IN THE ICU: ARE WEANING PROTOCOLS USED CONSISTENTLY?

Cassandra, RTS Couch, Jessica, RTS Cavazos, David, RTS Dionne, Ruben, MD RRT FAARC Restrepo, Donna, MSHP, RRT, FAARC Gardner; UT Health Science Center, San Antonio, TX

Oxygen protocols have been designed to guide the clinician on the titration and discontinuation of oxygen therapy. Administration of higher than required oxygen concentrations may be associated with side effects. The purpose of this study was to evaluate the use of oxygen therapy in the ICU and the practice of oxygen weaning. **METHODS:** Retrospective chart review of patients >18 years of age recently admitted to a medical ICU in an academic-affiliated institution. Demographic information, vital signs, arterial blood gases, ventilator parameters upon admission to ICU (FiO2, VT, PEEP), and oxygen weaning parameters were collected. The PaO2/FiO2, time it took to change FiO2 after meeting oxygen weaning parameters, and percent change in the FIO2 were calculated and used for analysis. SPSS 22.0 was used to calculate all descriptive statistics. **RESULTS:** Data was collected from 30 patients admitted to a medical ICU between Jan and April of 2015. Variables mean and SD are summarized in table 1. The most common SpO_2 parameter used in the ICU to start weaning O_2 in the ICU was 92%. The majority of patients in this sample had adequate oxygenation (PaO2:101 mm Hg; SaO2 92.7%; and P/F ratio 174.3) upon admission to the ICU. It took an average of 9 hours between the time patient's SpO2 met weaning criteria and the RT changed the FiO2. The average change in the FiO2 was 21.5%. **CONCLUSION:** Our study has demonstrated that despite meeting oxygen parameters it could take almost an entire shift to make the first attempt to wean FiO2 on patients in the ICU. If this delay and the potential for its associated hyperoxia causes significant changes in clinical outcomes needs further evaluation.

Sponsored Research - None

Variable	Age	pH	$PaCO_2$	PaO_2	HCO3-	SaO_2	FiO_2	P/F	PEEP	Time to FiO_2 Δ	% Δ FiO_2
Mean	54.5	7.33	53.2	101.3	23.9	92.7	0.78	174.3	6.5	9.1	21.5%
STD	14.6	.07	26.6	78.5	9.9	7.5	0.26	113.2	2.9	10.6	14.2%

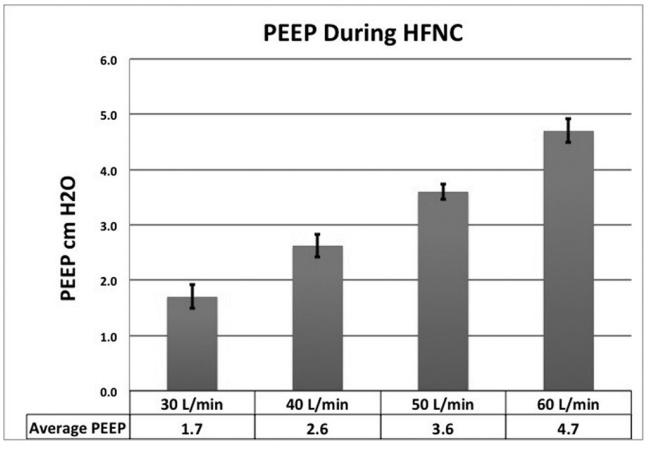
2299272

PEEP GENERATED BY HIGH FLOW NASAL CANNULA AT VARYING FLOW RATES.

Mark S. Siobal[1], Laura Vega[2]; [1]Anesthesia, SFGH/UCSF, San Francisco, CA; [2]Favaloro Foundation, Buenos Aires, Argentina

Background: High Flow Nasal Cannula (HFNC) therapy generates varying levels of PEEP as flow rates are increased. Use of HFNC flow rates up 60 l/min have been reported. We measured PEEP during HFNC in a nasal breathing model at varying flow rates. **Method:** The nasal breathing model was constructed using a ventilator circuit "Y" adapter with the inspiratory and expiratory limb connections attached to two 2.5 inch pieces of size 8.0 ETT using standard fittings to mimic the nares. A Ventrak 1550 flow/pressure sensor was connected to the patient connection side of the "Y" adapter and attached to one end of another size 8.0 ETT. The other end of the ETT was connected to a pressure port adapter with the Ventrak auxiliary pressure line attached. The ASL 5000 breathing simulator was attached to a nasal model using a section of 22mm tubing in the flow pump mode using a sinusoidal flow pattern at peak inspiratory flow rates of 24, 30, and 60 L/min, with Vt of 400 and 600 mL, and frequencies of 20 and 30 breaths/min. The prongs of a large size Fisher-Pakel Optiflow HFNC was inserted to the nasal breathing model nares. HFNC flow rates of 30, 40, 50, and 60 L/min were tested. PEEP was measured by the Ventrak 1550 and recorded at each flow rate and test condition studied. The PEEP at each flow rate setting was average for all test conditions studied. **Results:** The average PEEP increased as HFNC flow rate increased. The average PEEP was 1.7 ± 0.22, 2.6 ± 0.21, 3.6 ± 0.14, and 4.7 ± 0.22 cm H2O at respective flow rates of 30, 40, 50, and 60 L/min. **Conclusion:** These results are consistent with previous reports and confirms that therapeutic levels of PEEP are generated by HFNC in a nasal breathing model.

Sponsored Research - None



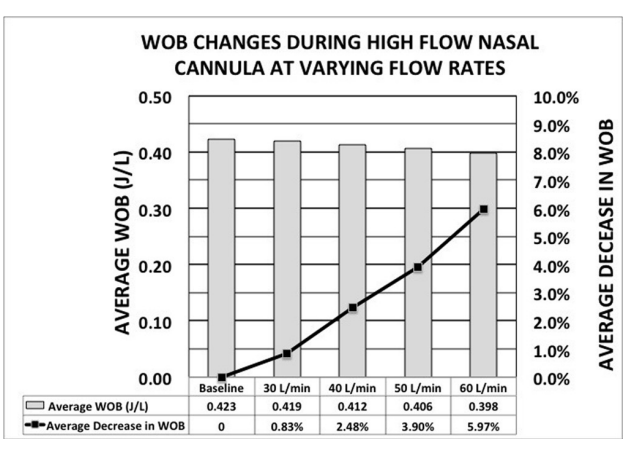
2299275

WORK OF BREATHING DURING HIGH FLOW NASAL CANNULA THERAPY.

Mark S. Siobal[1], Laura Vega[2]; [1]Anesthesia, SFGH/UCSF, San Francisco, CA; [2]Favaloro Foundation, Buenos Aires, Argentina

Background: High Flow Nasal Cannula (HFNC) therapy may reduce work of breathing (WOB) as flow rates are increased. We measured WOB changes during HFNC in a nasal breathing model at varying flow rates. **Method:** The nasal breathing model was constructed using a ventilator circuit "Y" adapter with the inspiratory and expiratory limb connections attached to two 2.5 inch pieces of size 8.0 ETT using standard fittings to mimic the nares. A Ventrak 1550 flow/pressure sensor was connected to the patient connection side of the "Y" adapter and attached to one end of another size 8.0 ETT. The other end of the ETT was connected to a pressure port adapter with the Ventrak auxiliary pressure line attached. The ASL 5000 breathing simulator was attached to a nasal model using a section of 22mm tubing in the flow pump mode using a sinusoidal flow pattern at peak inspiratory flow rates of 24, 30, and 60 L/min, with Vt of 400 and 600 mL, and frequencies of 20 and 30 breaths/min. The prongs of a large size Fisher-Pakel Optiflow HFNC was inserted to the nasal breathing model nares. HFNC flow rates of 30, 40, 50, and 60 L/min were tested. Spontaneous WOB was measured by the Ventrak 1550 and recorded at baseline with no HFNC attached, and at each flow rate and test condition studied. The WOB at each flow rate setting was average for all test conditions studied. The average percent decrease in WOB from baseline and each flow rate test condition was also determined. **Results:** At each test condition, the average WOB decreased in small increments as HFNC flow rate was increased. WOB decreased by 0.003, 0.011, 0.017, and 0.025 J/L at flow rates of 30, 40, 50, and 60 L/min respectively. **Conclusion:** These results confirm that small reductions in WOB occur as HFNC flow rate is increased. Further study is required to determine the clinical impact of these findings.

Sponsored Research - None



2301606

INSPIRATORY FRACTION OF OXYGEN IN HIGH-FLOW NASAL CANNULA THERAPY.

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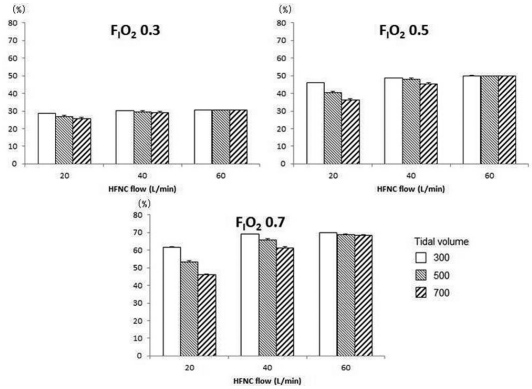
Background High-flow nasal cannula (HFNC) therapy is widely used for patients with acute respiratory failure. HFNC has number of physiological effects. While inspiratory fraction of oxygen (F_IO_2) is considered to be constant, because HFNC is an open system, F_IO_2 varies according to inspiratory flow, tidal volume (V_T), and HFNC gas flow. We investigated the influence of HFNC gas flow and/or respiratory parameters on F_IO_2 in HFNC **Method** Spontaneous breathing (SB) was simulated using a mechanical ventilator (Puritan-Bennett 840, Covidien, CA) connected to the muscle compartment of a model lung (TTL model 1601, Michigan Instruments). The lung compartment passively moved with the muscle compartment, thus inspiring ambient air via a ventilator limb (Smoothbore tube 5000000, Intersurgical). With decelerating flow waveform, simulated V_T were set at 300, 500 and 700 mL, respiratory frequency at 10 and 20 breaths per min, and inspiratory time at 1.0 s. The HFNC apparatus comprised an oxygen–air blender (OA2060, San-You Technology Inc.), a heated humidifier, an inspiratory limb (RT202, Fisher & Paykel), and small, medium, and large nasal prongs (OPT542, OPT544, OPT546, Fisher & Paykel). HFNC flow was set at 20, 40 and 60 L/min, and F_IO_2 at 0.3, 0.5 and 0.7. F_IO_2 was measured using an oxygen analyzer (LZ100, San-You Technology Inc.) for 1 min and data for final 3 breaths were extracted. **Results** The figure shows the results. F_IO_2 decreased as V_T increased. As HFNC flow increased, measured F_IO_2 was closer to set F_IO_2. As set F_IO_2 increased, the difference between set F_IO_2 and measured F_IO_2 increased. Neither respiratory frequency nor prong size influenced F_IO_2. **Conclusions** During HFNC with simulated SB, when HFNC flow was 60 L/min, measured F_IO_2 was similar to set F_IO_2; at 20 or 40 L/min, F_IO_2 was influenced by V_T. **Disclosures** The authors have no conflicts of interest.

Sponsored Research - None



2302484

HIGH FLOW OXYGEN THERAPY IN A SUSPECTED OVERDOSE: A NEW MIDDLE GROUND?

Russell E. Graham[1], Susan Salazar[1], Orland Easton[1], Mandy Hill[2], Na Hu[2], Pratik Doshi[2]; [1]Respiratory Care, Memorial Hermann - Texas Medical Center, Houston, TX; [2]Emergency Medicine, UT -Houston Medical School, Houston, TX

Background: The use of high flow Oxygen (HFOT) to decrease physiologic dead space (Vd/Vt) has been well documented in literature (1). This reduction of Vd/Vt enhances Carbon Dioxide clearance, arguably making HFOT a form of ventilation. Practical application(s) for the use of HFOT have been diverse, but have not prospectively replaced Noninvasive Ventilation (NIV) on a routine basis. The following case presents a scenario in which HFOT avoided an almost certain and possibly unnecessary endotracheal intubation. IRB consent for case study presentation has been obtained. **Case Summary**: Patient is a 23 year old male who presented to the Emergency Department with acute hypercarbia from an unknown intoxicant. Initially, the patient was obtunded with a Glasgow Coma Score (GCS) of 7. Baseline ABG revealed pH 7.25, PaC02 67 mmHg, Pa02 239 mmHg. Glucose was mildly elevated at 103 mg/dL. Electrolytes WNL, VSS. Immediate intervention with NIV was considered, but ruled out due to GCS and fear of aspiration in the event of emesis. It was felt that the effects of the agent would be fairly short-lived, and endotracheal intubation might expose the patient to unanticipated sequella. A trial of HFOT was initiated, with 02 flow at 35 LPM, and a Fi02 of 1.0. Follow-up ABG showed pH 7.23, PaC02 62 mmHg, Pa02 431 mmHg. Vital signs remained stable, and RR decreased from 18 bpm to 14 bpm. GCS improved to 11. Fi02 was weaned, and ABG's 4 hours after instituting HFOT were pH 7.27, PaC02 58 mmHg, Pa02 135 mmHg at 35 lpm and Fi02 0.4. GCS has improved to 13. Patient was weaned from HFOT and discharged home from the ED later that evening. **Discussion**: In this instance, endotracheal intubation was avoided, as was ICU admission. In the closely monitored environment of the ED this patient was successfully treated through an acute hypercarbic event. HFOT was successful in reducing PaC02 by approximately 14%, with a slight improvement in pH. **Conclusions**: The concept of HFOT as a "middle ground" between NIV and Mechanical Ventilation appears to have merit, as evidenced by this experience. In an appropriately monitored environment, it appears that HFOT my offer some benefits of NIV, but with greater comfort and decreased risk of inadvertent aspiration. Further study is warranted in this area.

Sponsored Research - None

2302986

DETERMINING THE EFFECT ON FIO_2 OF RUNNING THE FLOW FROM A 10 LPM OXYGEN CONCENTRATOR THROUGH 25 AND 50 FOOT TUBING.

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

Background Oxygen concentrators are common devices in facilities where bulk oxygen is not available. The standard length of oxygen tubing is 7 or 10 feet. However, there are situations in which longer tubing is necessary. The usual added length is either 25 or 50 feet (plus 7 or 10). The purpose of this study was to determine if the added length would adversely affect the FiO_2 output at flows greater than 5 Lpm Method Using an oxygen concentrator (Invacare Platinum 10) with a maximum flowrate of 10 Lpm, we measured the FiO_2 at each whole number flow setting, beginning at 6 Lpm and running through standard 10-foot oxygen tubing. Flows and FiO_2s were measured using a calibrated concentrator test station (US LX system), allowing for adequate stabilization time. At each flow setting, the flow was verified via the flow rater in the test station. Once the control FiO_2s were recorded, 25 feet of tubing was added and the FiO_2s and flows were re-measured. Then, the 25-foot tubing was replaced by 50 feet and again the FiO_2s and flows were measured. Results Flow Setting FiO_2 at 25 Ft. Flow at 25 Ft. FiO_2 at 50 Ft. Flow at 50 Ft. 6 94.3 6.0 94.4 6.0 7 94.3 7.0 94.5 7.0 8 94.7 8.0 94.3 7.9 9 94.8 9.0 93.8 8.9 10 94.0 10.0 93.6 9.9 Conclusion There was no significant change in either FiO_2 or flow when using either the additional 25 or 50 feet of tubing. The FiO_2 readings equal the measured FiO_2 at each flow setting through the 10 foot tube (rounded to the nearest whole number). The slight observed changes may be related to the tolerance of the equipment. The conclusion is that adding tubing does not affect the FiO_2 output from the 10 Lpm concentrator.

Sponsored Research - None

2302988

DETERMINING THE EFFECT ON FIO_2 OF COMBINING THE INDIVIDUAL FLOWS FROM TWO 10-LPM OXYGEN CONCENTRATORS.

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

Background Oxygen concentrators are common devices in facilities where bulk oxygen is not available. The typical concentrator has a maximum flowrate of 5 Lpm. However, because some delivery devices require flows of 10 Lpm or greater, it is necessary to use a 10 Lpm concentrator or to combine the flows from two such concentrators. The purpose of this study was to determine if combining the flows from two 10 Lpm concentrators would adversely affect the FiO_2 output. Methods Using two oxygen concentrators (Invacare Platinum 10) with a maximum flowrate of 10 Lpm, we measured the FiO_2 at each whole number setting, beginning at 6 Lpm. Flows and FiO_2s were measured using a calibrated concentrator test station (US LX system), allowing for adequate stabilization time. At each flow setting, the indicator ball was set slightly above the indicator line and the concentrators were banked together using standard 10-foot oxygen delivery tubing and the FiO_2 was measured at each combined flow from 11 to 15 Lpm. Results Set Combined Flow Measured FiO_2 Measured Flow 11 (8 + 3) 94 10.3 12 (8 + 4) 94 11.0 13 (8 + 5) 94 11.6 14 (8 + 6) 94 12.8 15 (8 + 7) 94 13.5 Conclusion There was no change in FiO_2 at any combined flow setting. These FiO_2 readings also equal the measured FiO_2 at each individual flow setting (rounded to the nearest whole number). It is noted that the measured flow at each combined setting was slightly lower than the individual settings (average 6%). This could be due to slight changes in ball position or possible back pressure against the flowmeters.

Sponsored Research - None

2303142

DETERMINING THE CLINICAL EFFICACY OF OPERATING A SALTER HIGH FLOW NASAL CANNULA OFF A 10 LPM OXYGEN CONCENTRATOR.

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

Background Oxygen therapy via high flow nasal cannula is a modality normally found in acute care hospitals. However, there are clinical situations for which it may be desirable to apply high flow oxygen in a setting in which piped-in oxygen is not available (e.g. home). The purpose of this study was to determine if the combined flow from two 10 Lpm oxygen concentrators could operate a high flow nasal cannula without adversely affecting output FiO_2. The Salter high flow humidifier that accompanies the nasal cannula (#1600HF) was selected because it is designed to operate at pressures of 9 psi and greater with a flow range of 6 to 15 Lpm. Methods A Salter high flow humidifier was attached to a 10 Lpm oxygen concentrator (Invacare Platinum 10). A second 10 Lpm concentrator was connected to the output tubing from the first via 10-foot oxygen tubing and a wye connector. The flowrates and FiO_2s were checked and verified using a concentrator test station (US LX system). The output pressure from each was also checked and found to be 9 psi. Once the FiO_2s and flows from each concentrator were measured and recorded, the humdifier was attached and the flows combined. The FiO_2 was again measured at various combined flow settings from 6 to 15 Lpm, allowing for adequate stabilization time. Results Combined Flow FiO_2 6 (5 + 1) 93.6 8 (5 + 3) 93.8 10 (5 + 5) 94.2 12 (8 + 4) 94.4 13 (8 + 5) 94.6 14 (8 + 6) 94.6 15 (8 + 7) 94.5 Conclusion The FiO_2 measured at each combined flow setting was stable and corresponded with the FiO_2 measured at each flow setting from both concentrators (rounded to the nearest whole number). Operating a Salter high flow nasal cannula using the combined flows from two 10 Lpm oxygen concentrators does not adversely affect the FiO_2 output.

Sponsored Research - None

2303324

COMPARISON OF MEAN AIRWAY PRESSURE GENERATED BY TWO HEATED HIGH FLOW NASAL CANNULA DEVICES AND NASAL NONINVASIVE VENTILATION IN A SIMULATED PEDIATRIC LUNG MODEL.

Gerald Moody, Andre Finley; Respiratory Care, Children's Health - Children's Medical Center, Dallas, TX

BACKGROUND: Use of nasal cannula to provide support to patients by means of heated high flow nasal cannula (HHFNC) or as an interface for noninvasive ventilatory support (NIV) has been used increasingly over the past years at our institution. There has been some speculation as to how much support, by means of pressure, is being delivered to patients. We conducted tests of two brands of HHFNC delivery systems, Precision Flow (Vapotherm, Exeter, NH) & Optiflow™ Junior (Fisher & Paykel Healthcare, Irvine, CA) and RAM Cannula ® (Neotech, Valencia, CA) to evaluate mean airway pressure (MAP) generated throughout the respiratory cycle at various flows and nare occlusions with both HHFNC devices and with RAM cannula at a CPAP of 5. METHODS: Each HHFNC device and the RAM cannula were attached to a test lung (Ingmar ASL 5000) using the pediatric lung model, via adapters of different diameters to represent 50%, 75% and 90% occlusion of the nares. Each nasal cannula's outer diameter was measured at the midpoint of the prong length to determine diameters. Precision Flow pediatric cannula (5mm), Optiflow Junior nasal cannula (4mm) and RAM infant cannula (4mm) were used in this study. For each HHFNC device MAP was measured at flows of 3, 5, 7, 9, 11, 13, & 15 lpm. A Maquet SERVO i ventilator was used to provide nasal NIV CPAP of 5 with the RAM cannula. RESULTS: There was no significant difference (P > 0.05) in MAP generated between HHFNC devices. With a 50% occlusion of nares, negligible MAP (0-0.17 cmH20) was obtained with HHFNC and 0 with RAM cannula. With a 75% occlusion MAP was measured from 0-2.1 cmH20, and 0.92 cmH20 with RAM cannula. At a 90% occlusion MAP was measured from 0.37-22.3 cmH20, and 2.25 cmH20 with RAM cannula. CONCLUSION: Occlusion of nares by nasal cannula prongs significantly influences MAP delivery. HHFNC can generate comparable and higher MAP than RAM cannula at a CPAP of 5 with flows of 3-9 lpm assuming comparable nare occlusion. Clinicians should also be aware of the high MAP that can be generated at higher flows, especially when nares are more than 75% occluded.

Sponsored Research - None

Table 1

HFNC Flow	MAP (cmH20) 50% Nare Occlusion			MAP (cmH2O) 75% Nare Occlusion			MAP (cmH20) 90% Nare Occlusion		
lpm	Vapotherm	Optiflow	RAM CPAP 5	Vapotherm	Optiflow	RAM CPAP 5	Vapotherm	Optiflow	RAM CPAP 5
3	0	0		0	0		0.7	1.7	
5	0	0		0.15	0.29		1.65	3.9	
7	0	0		0.3	0.57		4.2	6.9	
9	0	0	0	0.6	0.92	0.92	9.4	11.5	2.25
11	0	0		0.8	1.27		13.4	15.9	
13	0	0.1		1	1.62		17.8	18.3	
15	0	0.17		1.3	2.1		22.3	19.8	
P Value	0.164360463			0.284961023			0.773401434		

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2275814

CLINICAL OUTCOMES ACCORDING TO OPIOID USE IN CARDIAC ARREST PATIENTS.

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Background: Opioid is a potent respiratory depressant. Recently some literatures report that respiratory depression affected by opioid analgesics can lead to cardiac arrest requiring resuscitation and sometimes even to mortality. But there is a paucity of literatures about the relationship between opioid use and cardiac arrest. The purposes of this study were first to investigate the prevalence of opioid use within 24 hours preceding the event of cardiac arrest that occurs in the general ward, and to know the clinical outcomes of cardiac arrest according to the administration history of opioid. **Method:** We retrospectively collected cardiac arrest data of non-cancer patients who were admitted from January 1, 2008 to August 31, 2012 to the general ward of Asan Medical Center with approximately 2,700 beds. We analyzed the rate of opioid analgesic administration within 24 hours before a cardiac arrest event, the cardiac arrest characteristics, the survival rate, and the opioid prescribed patterns. Data were expressed as the n (%). Normal variables were compared using the Chi-square test or Fisher exact test. Significance was defined as a 2 sided p value < 0.05. This study was approved by the ethics committee of Asan Medical Center (No.2013-383). **Results:** In total, 193 patients were identified to have sustained cardiac arrest, of which 30% (58 patients) administered opioid (the opioid group) within 24 hours before cardiac arrest. The survival rate was not significantly different between the two groups. In opioid group, acute pain-related administration showed a lower in survival for 24 hours (12 patients [44.4%] vs. 24 patients [77.4%], p = 0.035). And as-needed administration also showed a lower in survival for 24hours (9 patients [33.3%] vs. 20 patients [64.5%], p = 0.030). **Conclusions:** Among cardiac arrest patients, those with opioid analgesics use for acute pain or as-needed basis within 24hours before cardiac arrest were associated with a lower survival rate. A heightened attention is warranted for at least 24 hours in patients who is given as-needed opioid analgesics. Disclosures: All authors were not any relationship with industry for the previous 2 years.
Sponsored Research - None

Comparison of the Prescribed Pattern of Opioid between Survival and Non-survival for 24 hours

Variable	Survival (n=27)	Non-survival (n=31)	Total (n=58)	p-value
Pain-related diagnosis				.035
Acute pain	12 (44.4)	24 (77.4)	36 (62.1)	
Non-cancer chronic pain	10 (37.0)	5 (16.1)	15 (25.9)	
Sedation	5 (18.5)	2 (6.5)	7 (12.1)	
Opioid fill type				.030
Regularly scheduled	9 (33.3)	3 (9.7)	12 (20.7)	
As-needed	9 (33.3)	20 (64.5)	29 (50.0)	
Simultaneous as-needed and regularly scheduled	9 (33.3)	8 (25.8)	17 (29.3)	

2299934

EFFECT OF FLOW RATE, HEAT AND HUMIDITY ON ALBUTEROL DELIVERY IN A SPONTANEOUSLY BREATHING ADULT LUNG MODEL WITH ACTIVE OR PASSIVE EXHALATION USING HIGH FLOW NASAL CANNULA.

Arzu Ari[1], Luciana Alcoforado[2], Armele Dornelas[2], James Fink[1]; [1]Georgia State University, Atlanta, GA; [2]Universidade Federal de Pernambuco, Recife, Brazil

Background: Although the use of high flow nasal cannula (HFNC) in adults has gained widespread support, the amount of aerosol delivery with HFNC at different flow rates, heat and humidity is not reported. Therefore, the objective of this study was to determine the effect of flow rate, heat and humidity on albuterol delivery in a spontaneously breathing adult lung model with active or passive exhalation using HFNC. **Method:** An in-vitro model was used to simulate a spontaneously breathing adult lung model with a tidal volume of 500 ml, 12 bpm and I:E 1:2. Using the Aeroneb solo nebulizer (Aerogen Inc, Ireland), albuterol sulfate (2.5 mg/3 mL) was administered through a small HFNC (Optiflow, Fisher Paykel) with 100% oxygen at 10 L/min, 30 L/min and 50 L/min. A temperature of 37° C was held constant. To stimulate exhaled humidity (active exhalation), the collecting filter was connected to a passover humidifier (37C and 100% relative humidity) simulating BTPS exhaled humidity at the bronchi. A filter attached at the bronchi of the teaching mannequin was used to collect aerosol, eluted and measured using spectrophotometry at 276 nm. Paired-samples t-test and one-way ANOVA were conducted for data analysis (p<0.05). **Results:** The % inhaled dose (mean ± SD) is presented in the table below. Regardless of using the heated humidifier, increasing flow rate significantly decreased aerosol delivery in both active and passive exhalation. When the heated humidifier was on, aerosol delivery with active exhalation was less than passive exhalation as opposed to the experiments without heat and humidity tested in this study. Turning on the heated humidifier decreased drug delivery up to 50% in active exhalation at 10 L/min, 30L/min and 50L/min (p=0.029, p=0.051 and p=0.012, respectively) and increased delivery efficiency of HFNC in passive exhalation (p=0.018, p=0.234, p=0.37, respectively). **Conclusion:** Reducing flow rate of HFNC increases aerosol delivery in adults. When the heated humidifier was on, simulating active exhalation reduced aerosol delivery distal to the bronchi compared to passive exhalation. Further studies are warranted.
Sponsored Research - None

HFNC Flow Rate	Heated Humidifier Off		p value	Heated Humidifier On		p value
	Active Heated Exhalation	Passive Exhalation		Active Heated Exhalation	Passive Exhalation	
10 L/min	13.7 ± 0.94	11.6 ± 1.04	0.010	11.4 ± 0.27	16.5 ± 0.24	0.003
30 L/min	7.01 ± 0.63	5.91 ± 0.21	0.150	5.33 ± 0.18	6.30 ± 0.30	0.001
50 L/min	4.51 ± 0.28	3.96 ± 0.37	0.247	2.66 ± 0.08	2.87 ± 0.08	0.199
p value	0.0001	0.0001		0.0001	0.0001	

2302071

AN IN-VITRO EVALUATION OF HEAT AND MOISTURE EXCHANGERS AND EXHALED HUMIDITY ON AEROSOL DEPOSITION IN A VENTILATOR DEPENDENT ADULT LUNG MODEL WITH TRACHEOSTOMY.

Arzu Ari, Khalid Alwadeai; Georgia State University, Atlanta, GA

Introduction: Heat moisture exchangers designed to allow aerosol delivery (HME-AD) without removal from the circuit have been developed but research evaluating their effectiveness in aerosol delivery is limited. The purpose of this study is to determine the effect of exhaled humidity and HME-ADs on aerosol deposition in a simulated ventilator dependent adult model with tracheostomy. **Methods:** An in-vitro lung model was developed by intubating a teaching mannequin with a tracheostomy tube (8.0 mm ID) connected to a ventilator (Vt 450 ml, RR 15/min, PIF 50 L/min, PEEP 5 cmH_2O, and I:E ratio 1:3). The bronchi of the teaching mannequin were attached to a test lung via a collecting filter in experiments without exhaled humidity. To stimulate exhaled humidity, a cascade humidifier (37C and 100% relative humidity) was placed between the test lung and filter. HME-ADs that were tested in this study include Circuvent (Smiths-Medical, Keene, NH), Humid-Flo (Hudson-RCI, Arlington Heights, IL), and Airlife (Carefusion, San Diego, CA). As a control, albuterol sulfate (2.5 mg/3mL) was delivered with a mesh nebulizer (Aeroneb Solo, Aerogen) placed at the Y adapter without any HME-AD in the circuit and the same procedure was repeated with each HME-AD, with and without exhaled humidity. Each experiment was repeated in triplicate (n=3). Dependent t-test and ANOVA were used for data analysis (p<0.05). **Results:** The table shows mean±SD percent of dose delivered distal to the bronchi with each HME- AD and control. Drug delivery without exhaled humidity trended higher aerosol deposition obtained with exhaled humidity in all conditions tested in this study. Statistical significant difference was found in comparisons of HME-ADs with and without active exhaled humidity (p=0.009 and p=0.025, respectively). Delivery efficiency of the Circuvent was lowest compared to control. The Humidflo and Airlife were similar to control. **Conclusions:** Aerosol delivery with exhaled humidity trends lower than values obtained without exhaled humidity. The efficiency of aerosol delivery of Humidflo and Airlife were similar to control, with Circuvent was marginally lower. Further research is warranted.
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	Control	Airlife	Circuvent	Humidflo
With Exhaled Humidity (%)	10.0 ± 0.9	9.4 ± 0.2	8.4 ± 0.8	10.0 ± 0.1
Without Exhaled Humidity (%)	10.3 ± 0.6	10.2 ± 0.3	8.8 ± 0.5	10.5 ± 0.4
p value	0.614	0.113	0.519	0.140

2301422

THE TREND OF PRESCRIPTION OF INHALATION DEVICES – A NATION-WIDE DATABASE COHORT STUDY.

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Background: Vary types of aerosol generator were used to treat the patients who suffer from respiratory symptoms. This study aim to analysis the trend of prescription of aerosol therapy in three dosage form, liquid form (solution), dry-powder inhalers (DPIs) and pressurized metered-dose inhalers (pMDIs) in Taiwan to offer optimize aerosol therapy service in patients. Methods: This study used longitudinal study from Health Insurance Database, a part of National Health Insurance Research Database, to identify the trend of prescriptions for inhaled agent from 1995 to 2011. Total 1,743,437 prescriptions for inhaled agents were selected, including 319,714 DPIs (18.3%), 637,686 pMDIs (36.6%), and 786,037 solution agent (45.1%), from the drug code that was established by Taiwan Bureau of National Health Insurance. A total of 1,743,437 prescriptions were selected and applied chi-square test to explore where the three type aerosol agents used. This study was approved by the Institutional Review Board of the study organizations. **Results:** From the trend of the used quantity, the aerosol therapy with solution agent was the highest among three dosage-forms from 1996 to 2011. The highest used amount of DPIs and pMDIs were in patients' age 60-79 years (40.28% and 38.55%), in gender was men (61.96% and 63.95%), and in medical setting was outpatient department (96.29% and 93.35%). The highest used amount of solution agent were in patients' age 60-79 years (42.06%), in gender was men (62.95%), and in medical setting was inpatient department (60.85%).From the result data showed that solution form aerosol agent were most used in the hospital, but the DPIs and pMDIs were most used in outpatient. **Conclusions:** The pMDIs and DPIs were common used in outpatient, but liquid form was used in hospital and emergency department. However, why the used quantity increase and who was treated outside of the hospital, we suggest need further to assess. **Keywords:** Pressurized metered-dose inhaler; dry-powder inhaler; aerosol therapy
Sponsored Research - None

Distribution of medical visits among three types medicine

	DPIs n=319,714		pMDIs n=637,686		Solution form n=786,037		
	n	%	n	%	n	%	P value*
Age, year							<0.0001
<20	41412	12.95	117017	18.35	122354	15.57	
20-39	41668	13.03	76063	11.93	36043	4.59	
40-59	80754	25.26	131626	20.64	97530	12.41	
60-79	128766	40.28	245807	38.55	330588	42.06	
≧80	27114	8.48	67173	10.53	199522	25.38	
Gender							<0.0001
Women	121626	38.04	229887	36.05	291231	37.05	
Men	198088	61.96	407793	63.95	494806	62.95	
Medical setting							<0.0001
ED	1722	0.54	7430	1.17	151858	19.32	
IPD	10126	3.17	34980	5.49	478281	60.85	
OPD	307866	96.29	595276	93.35	155898	19.83	

*Chi-square test
DPIs= dry-powder inhalers; pMDIs=pressured metered-dose inhalers.
ED=emergency department; IPD=inpatient department; OPD=outpatient department

2303092

COMPARISON OF EFFICIENCY OF NOVEL SMALL-VOLUME NEBULIZERS.

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BACKGROUND: Much of the workload of a respiratory therapist involves administering aerosol therapy via small-volume nebulizers (SVNs). Performing therapeutic procedures in less time allows more patients to be treated. To perform aerosol therapy quickly and efficiently, one must use devices requiring less time to deliver the same volume of solution. **METHODS:** Two SVNs (Salter Nebutech® HDN® and Carfusion Airlife™ Misty Max™) were compared to determine completeness of nebulization, and duration. Each nebulizer was injected with 3 mL of sterile water, and was powered by a flow of compressed air of 10 L/min. Ten (10) trials were performed with each brand of SVN. Nebulization was considered complete when the SVNs began to "sputter." A bacterial filter, placed on the output orifice of each nebulizer, was weighed pre- and post-nebulization to determine a difference in weight. This weight difference represented the nebulized quantity of solution, and was used as an index to compare the efficiency of the SVNs. Nebulizer duration was also compared. **RESULTS:** The Salter Nebutech® HDN® reached nebulization completion much faster than the Carefusion Airlife™ Misty Max 10™. The mean duration of nebulization for the Salter Nebutech® HDN® was 3.57 minutes, and that for the Carefusion Airlife™ Misty Max 10™ was 5.74 minutes. The mean duration of nebulization difference between the two nebulizers was 2.17 minutes ($p < 0.05$). However, the post-nebulization weight of the saturated bacterial filter was greater with the Carefusion Airlife™ Misty Max 10™ than with the Salter Nebutech® HDN®. The Carefusion Airlife™ Misty Max 10™ achieved a mean post-nebulization bacterial filter weight of 1.1078 grams (SD 0.071), while the Salter Nebutech® HDN® achieved a mean post-nebulization bacterial filter weight of 0.8288 gram (SD 0.077). The mean difference in the post-nebulization bacterial filter weight between the two nebulizers was 0.2790 gram ($p < 0.05$). **CONCLUSION:** The Salter Nebutech® HDN® nebulized faster, but a relatively larger dead volume proved to be a performance-limiting factor. The Carefusion Airlife™ Misty Max 10™ required more time; however, its completeness of nebulization is a desired quality. Time saved with the Salter Nebutech® HDN® may be attributed to its larger dead volume, and therefore it should not be considered superior to the Carefusion Airlife™ Misty Max 10™.

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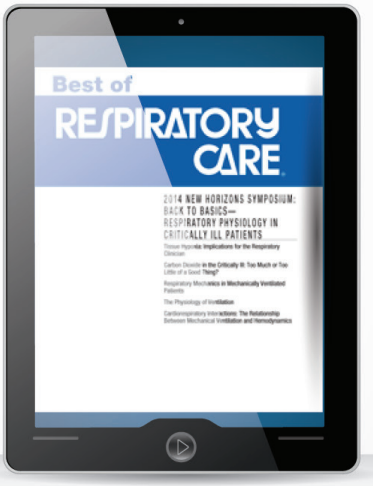

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2204943

ACCURACY OF MOUTH OCCLUSION PRESSURE MEASUREMENT USING THE AVEA VENTILATOR P_{100} MANEUVER.

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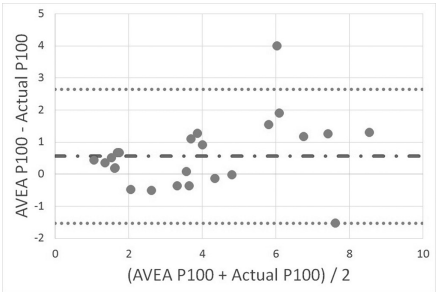
Background: Mouth occlusion pressure (P_{100}) is the pressure drop during the first 100 milliseconds of an inspiratory attempt against an occluded airway. P_{100} has been shown to be useful for indicating respiratory drive, patient work of breathing (WOB), successful weaning and setting the level of pressure support ventilation. Many ventilators have an integrated maneuver for measuring and reporting P_{100}. The maneuver closes the inspiratory valve and determines onset of inspiration as the time when the airway pressure drops a user determined value below PEEP. We designed a study to evaluate the reliability of this P_{100} maneuver which is integrated into the AVEA ventilator (CareFusion, San Diego, CA). **Methods:** A respiratory waveform and parameter data set was previously collected from an IRB-approved study of an acute lung injury pig model. For this previous study, correct placement of the esophageal balloon catheter was confirmed using the occlusion technique. The maneuver duration was set to 10 seconds and the maneuver specificity was set to 0.5 cm H_2O. The data from this study included P_{aw} and P_{es} waveforms collected at 100 Hz. Patient WOB was provided by the AVEA ventilator. When determining actual P_{100} values, a clear pressure deflection indicated the onset of an inspiratory attempt and P_{100} was reported as the difference between the pressure at and the pressure 100 ms after the onset of inspiration. For maneuvers in which several attempts to inspire were made, P_{100} was determined from the first inspiratory attempt. The delay of the maneuver's P_{100} inspiration onset measurement and occurrence of false inspiratory attempts while using 0.5 cm H_2O specificity were recorded. For each maneuver, the maneuver P_{100} value was compared to the actual P_{100} value. **Results:** In 25 separate P_{100} maneuvers, no false breaths were reported. The maneuver determined onset of breathing a mean time of 46 ± 19 (SD) ms after the actual onset of breathing. Linear regression analysis of the maneuver and actual P_{100} values reported an r^2 of 0.86. The mean difference between the maneuver P_{100} value and actual P_{100} value was 0.56 ± 1.06 (SD). **Conclusions:** A specificity of 0.5 cm H_2O, as opposed to the ventilator default of 3.0 cm H_2O, can be used without reporting false inspiratory attempts. Although inspiratory onset was delayed, The AVEA P_{100} maneuver reliably measured P_{100} values. The AVEA P_{100} maneuver can be used to accurately indicate patient status and comfort.

Sponsored Research - None



2302887

AUTOMATED CONTROL OF ENDOTRACHEAL TUBE CUFF PRESSURE DURING SIMULATED FLIGHT.

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Background: Successful mechanical ventilation requires that the airway be controlled by an endotracheal tube (ETT) with an inflatable cuff to seal the airway. ETT cuff pressure > 30 cm H_2O can damage tracheal mucosa damage and cuff pressures < 20 cm H_2O may allow contamination of the respiratory tract with oropharyngeal secretions. Aeromedical evacuation represents a unique challenge in which to manage ETT cuffs. We evaluated three methods of automatic ETT cuff pressure adjustment during changes in altitude in an altitude chamber. Methods: Size 7.5- and 8.0-mm ETTs that are currently included in the Critical Care Air Transport Team allowance standard were used for the evaluation. Three automatic cuff pressure controllers—Intellicuff, Hamilton Medical; Pyton, ARM Medical; Cuff Sentry, Outcome Solutions—were used to manage cuff pressures. The fourth group had cuff pressure set at sea level without further adjustment. Each ETT was inserted into a tracheal model and taken to 8,000 feet and then to 16,000 feet at 2,500 ft/min. Pressure was allowed to stabilize for 10 minutes at each altitude. The cuff pressure at sea level was approximately 25 cm H_2O. Cuff pressures were continuously recorded every second to a data logger. Each test was completed a minimum of two times. A t-test was used to determine statistical significance ($p< 0.05$) between initial cuff pressure and cuff pressure at altitude. Results: Mean and peak cuff pressure at both altitudes: Control arm mean pressure 137 ± 62 cm H_2O; peak pressure 246 cm H_2O, Pyton mean pressure 25 ± 1 cm H_2O; peak pressure 27 cm H_2O, Cuff Sentry mean pressure 19 ± 0.3 cm H_2O; peak pressure 19 cm H_2O, Intellicuff mean pressure 28 ± 8 cm H_2O; peak pressure 80 cm H_2O. The mean time that cuff pressure was > 30 cm H_2O using Intellicuff at both altitudes was 176 ± 24 seconds. Pressure differences from baseline in the control arm and with Intellicuff were statistically significant. Measured cuff pressure with the Cuff Sentry tended to be lower than indicated on the device. Conclusion: Mean cuff pressures were within the recommended range with all three devices. Intellicuff had difficulty regulating the cuff pressure initially with increases in altitude but was able to reduce the pressure to a safe level during the stabilization period at each altitude. The Pyton and Cuff Sentry allowed the least variation in pressure throughout the evaluation, although the Cuff Sentry set pressure was less than actual pressure.

Sponsored Research - None

	Baseline		8,000 ft		16,000 ft		Sea Level after flight	
Methods	7.5	8.0	7.5	8.0	7.5	8.0	7.5	8.0
Control	25 (1.2)	24 (2.0)	124 (12.7)*	126 (1.7)*	217 (20.1)*	224 (19.7)*	13 (4.6)	8 (0.6)*
Intellicuff	26 (1.5)	25 (0.7)	54 (0.6)*	68 (17.0)	51 (1.7)*	53 (0.7)*	26 (1.5)	27 (0.7)
Pyton	25 (1.2)	24 (0.6)	27 (0.6)	27 (0.6)	27 (0.6)	27 (0.6)*	24 (0.6)	23 (1.2)
Cuff Sentry	23 (0.6)	24 (1.2)	24 (1.2)	19.5 (0.7)	24 (1.2)	19.5 (0.7)	23 (0.6)	19 (0.7)

Table 1. Mean peak pressures (SD) at each altitude with 7.5 and 8.0 ETT and each method.
* $p < 0.05$

2282544

DIFFUSION LUNG CAPACITY CHANGES IN HODGKIN LYMPHOMA PATIENTS BEFORE AND AFTER ABVD CHEMOTHERAPY.

Muhammad Abdullah, Shoaib Alam, Waleed Zafar; Internal Medicine, Shaukat Khanum Memorial Cancer Hospital & Research Centre, Lahore, Pakistan

Background: Chemotherapy consisting of Adriamycin, Bleomycin, Vinblastine, and Doxorubicin (ABVD), which is the mainstay of treatment in Hodgkin's Lymphoma (HL), is associated with both acute and long term pulmonary toxicity primarily due to Bleomycin. Bleomycin induced pulmonary toxicity (BPT) is clinically detected using diffusing lung capacity for carbon monoxide (DLCO). **Objective**: To evaluate changes in DLCO in HL patients before and after ABVD chemotherapy. **Methods:** Medical records of all adult HL patients treated with ABVD chemotherapy at a single center in Lahore, Pakistan during one year were analyzed. Patients with pre-existing pulmonary dysfunction, history of thoracic surgery and smokers were excluded. **Results:** A total of 369 HL patients were identified during the study period who received ABVD chemotherapy. Out of these, 93 (25.20%) patients had received both a pre- and post-chemotherapy DLCO. The remaining patients had only one DLCO reading as clinically indicated and were not included in the analysis. The mean percentage difference between pre- and post-chemotherapy values for DLCO (5.49%; 95% confidence interval [CI] 1.56%-9.43%) and for Hemoglobin-adjusted DLCO (8.24%; 95% CI 3.90%-12.57%) were statistically significant at $p<0.01$. DLCO values declined from pre-treatment to post-treatment by 1-10% in 23 (24.7%) patients, by 10-20% in 19 (20.4%) patients, by 20-30% in 10 (10.8%) patients and >30% in 10 (10.8%) patients. After adjusting for age, a 1mg/m^2 increase in dose of Bleomycin was significantly associated with 0.14% (95% CI: 0.03%-0.25%) decline in DLCO and 0.13% (95% CI: 0.10%-0.26%) decline in hemoglobin-adjusted DLCO from pretreatment value. **Conclusions:** Mild to moderate dysfunction in diffusion lung capacity is common after ABVD chemotherapy. DLCO and hemoglobin-adjusted DLCO value decreased by increasing age and dose of bleomycin. **Keywords:** Hodgkin's Lymphoma, chemotherapy, diffusion lung capacity, Pakistan, cancer

Sponsored Research - None

Paired comparison of Diffusion Lung capacity

	Mean ± SD	p Value
Pre and post DLCO	5.46 ± 19.10	0.007
Hemoglobin adjusted Pre and post DLCO	8.24 ± 21.06	0.001

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2213643

REDUCTION OF SOUND LEVEL ON HEATED HIGH-FLOW NASAL CANNULA OXYGEN THERAPY.

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INTRODUCTION : Heated high-flow nasal cannula oxygen (HFNC) can improve oxygenation by delivering humidified oxygen and decrease the ventilator requirement by washing out dead space of the upper airway. However, patients using HFNC declared that they were being disturbed by the noise. For this study, we selected using an O_2/air entrainment device of Venturi type, for the cases when hospital gas outlet was not accessible (e.g. in sickroom or during walking training) . We digitized the sound level of Venturi-typed HFNC. We also digitized how many levels of sound were decreased by using a inhalant filter for the dust free air . METHOD : We located a Venturi-typed HFNC system (Max Venturi combination O_2/air entrainment device with RT202 and medium-sized nasal cannula; Fisher and Paykel Healthcare, Ltd.) at the center of our hospital sickroom (4.2m × 3.4m × 2.7m) . We measured the sound level with the distance of 1.0m from the front of Venturi-typed HFNC while alternating total flow(30,40,50,60LPM) and FiO_2(0.4,0.6,0.9). Firstly, we measured the sound level in sickroom. Secondly, we measured the sound level at each alternated parameter. Thirdly, we measured the sound level of Venturi-typed HFNC with the filter (mechanical filter351/5410Z and electrostatic filter350/5865Z : Mallinckrodt DAR™ S.r.l Italy) attached as a inhalant filter while alternating each parameter. RESULTS : The sound level was quite high when the total flow and FiO_2 increased. In the group without the inhalant filter, it became 57.3dB when FiO_2 was 0.4 and the total flow was 30LPM. Then, it became 63.5dB when FiO_2 was 0.9 with the total flow of 30LPM, 70.1dB when FiO_2 was 0.4 with the total flow of 60LPM, and 71.4dB when FiO_2 was 0.9 with the total flow of 60LPM. In contrast, in the group with the inhalant filter, the sound level became 48.3dB when FiO_2 was 0.4 with the total flow of 30LPM, 49.7dB when FiO_2 was 0.9 with the total flow of 30LPM, 59dB when FiO_2 was 0.4 with the total flow of 60LPM, and 58.4dB when FiO_2 was 0.9 with the total flow of 60LPM. The sound level significantly went down in the group with the silencer compared with the group without the inhalant filter($p<0.05$). The noise decreased 13.8dB at the maximum in the former. CONCLUSION : Our study proved that the sound level of Venturi-typed HFNC could be reduced by attaching a inhalant filter . Sponsored research None
Sponsored Research - None

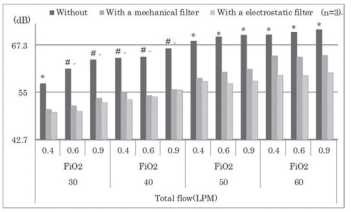
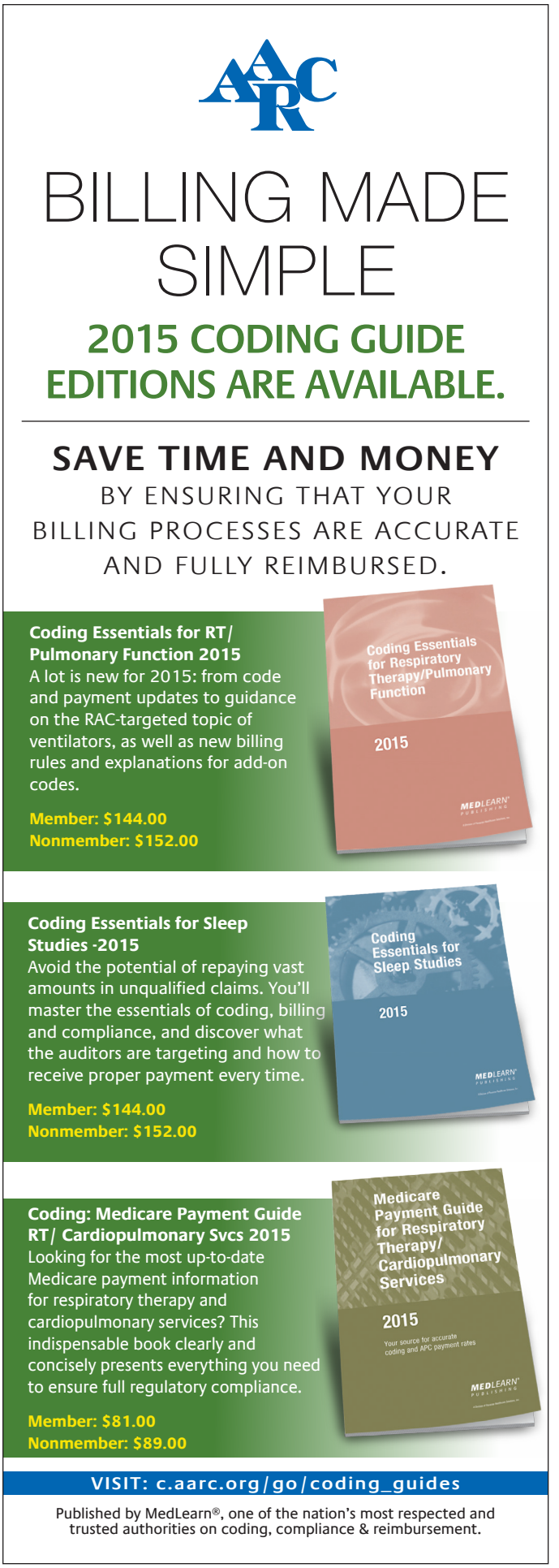


Figure. Sound pressure with and without a inhaler filter in each total flow and oxygen concentration. *:$p<0.05$ #:$p<0.001$.

Sound level with and without a inhaler filter in each total flow and oxygen concentration.



2286975

COMPARISON OF PRESSURIZATION IN THREE VENTILATORS AVAILABLE FOR TRANSITION FROM CRITICAL CARE TO HOME IN PEDIATRIC PATIENTS.

Karen M. Muirhead[1], Kristin E. Smith[1], Thomas H. Shaffer[1,2], Yan Zhu[1,2], Joel M. Brown[1]; [1]Respiratory Care, AI dupont Hospital for Children, Newark, DE; [2]Nemours Research Lung Center, Wilmington, DE

Background: In an ongoing bench evaluation of ventilators to compare benefits in our acute to chronic pediatric population with severe lung disease, we have previously shown superiority in triggering sensitivity of the Trilogy (Philips). We continue with the same model to evaluate pressurization capacity, as this must be adequate in order to generate the necessary peak flows to support work of breathing. The LTV (Carefusion) appears to have strong pressurization. We compared the pressurization capacity of the LTV 1200, Revel (Carefusion), and Trilogy 200 ventilators. **Method:** A dual chamber Michigan test lung was set to mimic a spontaneously breathing patient using a clip placed between chambers. The first chamber was set for a compliance of 4 ml/cmH_2O and airway resistance of 50 cm$H_2$0/L/s. A Philips NM3 monitor sidestream adapter was placed between the first chamber and each test ventilator patient circuit (active circuit used for the Trilogy). The second chamber was connected to a driving ventilator which was set on PRVC mode, rate = 25 b/min, and 3 different tidal volumes for flows to mimic low, medium, and high patient demand = 64, 80, and 112 mls (approximate flows were 15, 20, and 30 L/min). The T_i and PEEP were adjusted as needed for triggering. Each ventilator was tested in Pressure Support (PS) mode at settings of 5, 10, and 15 cmH_2O above PEEP of 5 cmH_2O at the 3 demand levels for a total of 9 conditions for each ventilator. Sensitivity was adjusted when necessary. For each test condition, 3 typical breaths were used to determine the pressure-time product (PTP) which was calculated as the area under the pressure-time curve from breath onset to 0.3 s. **Results:** Mean PTP differed significantly (P<0.002) only between the LTV and Trilogy when compared across all conditions by t-test. The mean PTP in cmH_2O/s (+/- SD) for each ventilator was as follows: LTV: 2.77 (0.66), Revel: 2.39 (1.39), Trilogy: 2.19 (0.85). **Conclusion:** The LTV had the largest pressurization capacity and least variation overall. The Trilogy showed consistent, expected increases in PTP for all but the high demand/high PS condition, which may not have been clinically significant. The Revel had the widest variation overall and had extremely low PTPs in 2 of the low demand conditions. Also, the Revel was negatively affected by the highest patient demand at all PS levels. Thus, the Revel is least likely to respond to fluctuating patient demand and to reliably support work of breathing.

Sponsored Research - None

2288431

IMPROVED SURVIVAL RATE FOR VENTILATED PATIENTS BY A RESPIRATORY CARE TEAM.

Nishigami Masami, Masahiro Shinozaki, Seizi Kawamura, Hiromi Joho; Kishiwada Tokusyukai Hospital, Kishiwada, Japan

Background Although a lot of respiratory care therapists work in hospitals, clinics, and companies in the world, we do not have a national license to be a respiratory care therapist in Japan. An RCT (respiratory care team) group made up in our facility on May 1, 2010. The respiratory care team consists of experienced doctors, nurses, physical therapists, pharmacists, and clinical engineers. The aim of this study is to investigate the respiratory care team in our facility that improved the survival rate for over 48-hour-ventilated patients. **Methods** 284 subjects were enrolled from ICU and general wards in this study. 146 ventilated patients (male 93, female 53) screened for six months before April 30, 2010 were enrolled in an intervention group, and age was 71.7±13.4. 138 ventilated patients (male 88, female 50) screened for six months after May 1, 2010 were enrolled in a control group, and age was 72.4±12.5. We collected levels of Pao_2/FIo_2, creatinine, platelets, and T-Bil both soon after and 48 hours after patients were ventilated in both groups. We also compared mortality rate. Statistical analyses were performed using the Chi-square test and the Wilcoxon rank-sum test. The values were presented as mean ±SD. Significance was set at P value of .05. **Result** There was no significant difference of sex, age, and ventilation days in the both groups. P/F ratio, Cr, Plt and T-Bil soon after intubation in the control group were 258.5±155.4, 3.1±17.8 mg/dl, 16.5±8.8×10^4/μl, 1.7±1.6 mg/dl, respectively. They were 273.8±159.7, 1.8±3.2 mg/dl, 17.4±8.5×10^4/μl, 1.8±1.9 mg/dl, respectively in the invention group. P/F ratio, Cr, Plt and T-Bil 48 hours after intubation in the control group were 225.9±103.3, 1.9±2.4 mg/dl, 12.5±8.4×10^4/μl, 2.0±1.8 mg/dl, respectively. They were 241.6±156.0, 2.0±2.8 mg/dl, 14.0±8.0×10^4/μl, 2.1±2.7 mg/dl in the invention group, respectively.There was no significant difference in the both groups. A significant difference was found between the mortality rate (55.5 % vs 38.4 %) in the control group and the invention group (P= .004). **Conclusion** We concluded that the respiratory care team in our facility improved the survival rate for over 48-hour-ventilated patients. The team work among several professionals improved the outcome. We suggested that the factors were team discussion, practice of a weaning protocol, SBT (spontaneous breathing trial), chest physiotherapy, proper medications, and appropriate transfusion.

Sponsored Research - None

2301546

THE "F/VT" RATIO CAN BE ACCURATELY MEASURED WITH THE MECHANICAL VENTILATION TO PREDICT THE WEANING OUTCOME?

Leonardo C. de Souza[1,2], Jocemir R. Lugon[2]; [1]Physical Therapy, Universidade Estácio de Sá, São Gonçalo, Brazil; [2]Universidade Federal Fluminense, Niterói, Brazil

Objective: The f/Vt index is recommended and used in intensive care as a weaning predictor. The aim of this study was to compare the performance of this index when calculated by the traditional method described in 1991, with the one obtained directly from the mechanical ventilator (MV). **Methods:** Prospective and observational study, including patients on MV for more than 24 hours and ready for weaning. The f/Vt ratio was randomly obtained with two different methods by the same examiner employing a ventilometer and using the parameters from the ventilator screen. In comparing the values obtained with the two methods, we used the Mann-Whitney test, linear correlation and the Bland-Altman correlation diagram. The performance of the methods was compared by the areas under the ROC curves. P values <0.05 were considered significant. **Results:** Of the 89 selected patients (48 men, mean age 60 ± 18 years), 56 were successfully weaned and 30 had a fatal course. The respiratory rate parameters (f), tidal volume (Vt) and the f/Vt of the two methods showed a statistically significant difference (p <0.001). However, when the two methods were compared, agreement coefficients, variation and intra-observer correlation were, respectively, 0.90 (0.87-0.93); 11.16%; and 0.94 (0.92-0.96). More relevant to the purpose of the study, the areas under the ROC curve of the two methods were similar (0.81 ± 0.04 vs. 0.82 ± 0.04, p = 0.497). **Conclusion:** The performance of the f/Vt index as weaning predictor was no different when calculated by the traditional method or the mechanical ventilator confirming the clinical value of the latter method to obtain this variable.

Sponsored Research - None

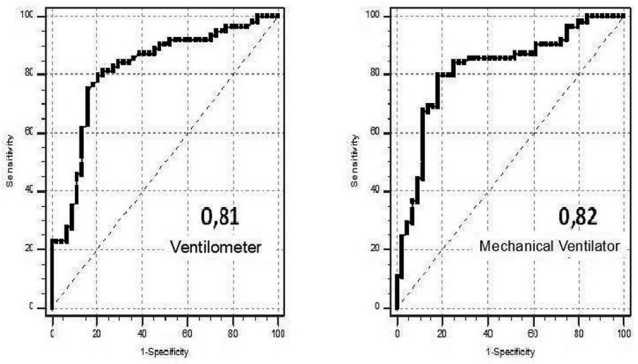


Figure 1. AUC of the ROC curve of the evaluated indexes showing no statistically significant difference in the power predictor of weaning indices f/Vt calculated by the two methods (P=0.935, Hanley & McNeil test for paired comparisons).

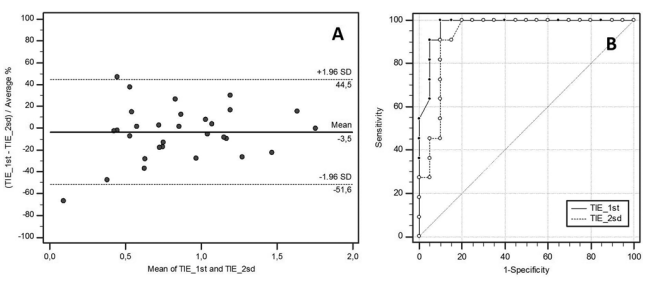
2302128

THE TIMED INSPIRATORY EFFORT "TIE" INDEX: REPRODUCIBILITY ANALYSIS OF THE PATIENTS WITH DIFFICULT WEANING VENTILATION.

Leonardo C. de Souza[1,2], Jocemir R. Lugon[3], Arthur E. Neto[2], Helson L. de Souza[2], Leandro P. Daher[2], André D. Serejo[2]; [1]Physical Therapy, Universidade Estácio de Sá, São Gonçalo, Brazil; [2]Intensive Care, Icaraí Hospital, Niterói, Brazil; [3]Medicina, Universidade Federal Fluminense, Niterói, Brazil

Background: The aim of this study was analysis the reproducibility and the weaning outcome of recent timed inspiratory effort (TIE) index which has been better than all other indexes for predicting the weaning ventilation. **Methods**: It was considered an observational prospective study which included patients undergoing weaning from mechanical ventilation. The exams were evaluate and classified for weaning outcome by two observers independently. After an interval of at least 30 minutes to for the new assessment. In comparing to the values, the analysis of the correlation was obtained by calculating the Kappa coefficient, Bland-Altman diagram and area under the ROC curves. P values <0.05 were considered significant. **Results:** Thirty-one selected patients (mean age 75 ± 16 years), only 11(35.5%) were successfully weaned and 14(45%) had a fatal course. Tracheotomy was necessary in 26(84%) patients, the mean duration of mechanical ventilation was 15.3 ± 6.45 days and APACHE II score was 18.9 ± 5.07. The maximal inspiratory pressure (PImáx), time achieve peak (t) and the TIE index to both measures did not show a statistically significant difference (p >0.05). When the measures were compared by agreement coefficients, variation and intra-observer correlation, respectively showed, 0.83 (0.86-0.96); 14%; and 0.89 (0.90-0.98). More relevant to for the purpose of the study was the areas under the ROC curve of the two measures which were similar (0.96 ± 0.07 vs. 0.95 ± 0.07, p = 0.497). **Conclusion:** The performance of the TIE index as weaning predictor was not different when calculated by two different measures, confirming the reprodutibility and clinical value of the method.

Sponsored Research - None



Comparing the values of TIE index: A) Bland-Altman diagram; B) area under the ROC curves of the two measures.

2301665

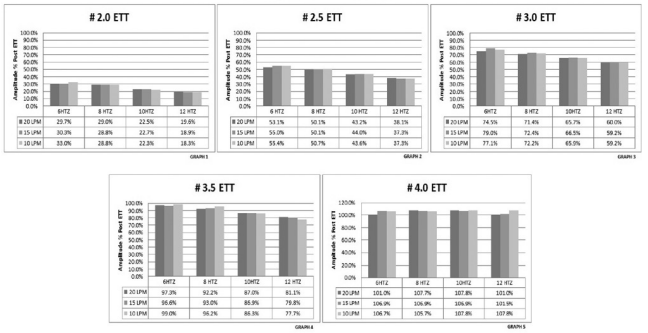
HFOV AMPLITUDE ATTENUATION ACROSS THE ETT USING A NEONATAL LUNG MODEL.

Jeffrey W. Wright, Hana Booth, Kevin Crezee; Respiratory Care Services, Primary Children's Hospital, West Valley City, UT

Introduction: : It has been documented (HFOV owner's manual) that there is an attenuation of the Amplitude (AMP) across the length of an endotracheal tube (ETT) when ventilating with a Care Fusion High Frequency Oscillatory Ventilator (HFOV). The model used was an infant model (1.02 cc/cmH2O). This bench study is to determine the amount of the attenuation of the HFOV AMP across the length of the ETT using a neonatal lung model. **Method**: A performance check HFOV was connected to a 393cc (calculated) ridged neonatal test lung model with a compliance of 0.5 cc/cmH2O with an ETT. A port in the test lung was used to measure pressure. A 3 way stop cock that was placed in the proximal airway pressure line of the HFOV circuit. The 3 way stop cock was utilized to change monitored pressures between the HFOV circuit and test lung. The ETT's used were: #2.0, #2.5, #3.0, #3.5, and #4.0 at their uncut length. A MAP of 12 cm/H2O (+- 0.1) was maintained throughout testing. Settings used in testing: Bias flows of 10, 15, and 20 lpm, AMPs of 15 through 35, and 6, 8, 10, 12 HTZ. The ventilator was set to the test setting: MAP, Bias Flow, and AMP. After a stabilization period the pressures at the wye of the circuit and in the test lung were recorded. . **Findings/Conclusion:** There was attenuation across the ETT in 4 of the 5 tubes tested, and the exception was the # 4.0 ETT. The reduction in the AMPs was as follows: # 2.0 ETT ranged 67% to 82%, # 2.5 ETT ranged 45% to 63%, # 3.0 ETT ranged 21% to 42%, and the # 3.5 ETT ranged 1% to 22% (see graphs 1, 2, 3, 4). The # 4.0 ETT had measured values greater than the set ranging 101% to 108% (see graph 5). There were changes in attenuation with the ETT as the HTZ increased by 10% to 21%, except for the # 4.0 ETT which remained fairly constant at 0% to 7% variation. Bias flow changes had minimal effect on the AMP. The attenuation was 0% to 3% difference from high to low. The # 4.0 ETT where AMPs were measured were larger than set, additional studies are needed to determine possible causes.

Sponsored Research - None

DATA GRAPHS AND TABLES



2302713

REVIEW ON ENHANCED NURSING CARE FOR PATIENTS REQUIRING NON-INVASIVE VENTILATION (NIV).

Shu Wah S. NG[1], Siu Ling Choi[2], Ruth Lau[3], Po Shan Kwan[4], Pik Ki M. Lit[5], Lai Ping A. Yiu[6]; [1]Medicine & Geriatrics, United Christian Hosptial, Hong Kong, Hong Kong; [2]Medicine, Queen Mary Hospital, Hong Kong, Hong Kong; [3]Medicine, Princess Margaret Hospital, Hong Kong, Hong Kong; [4]Medicine & Geriatrics, Pok Oi Hospital, Hong Kong, Hong Kong; [5]Medicine, Queen Elizabeth Hospital, Hospital, Hong Kong; [6]Medicine, Prince of Wales Hospital, Hong Kong, Hong Kong

NIV has been shown to reduce intubation and in-hospital mortality in patients with acute exacerbation of COPD (Chronic Obstructive Pulmonary Diseases) complicated by acute respiratory failure. Nurses can play an important role in initiation, monitoring, titration, optimizing patient's comfort level and complications prevention when patients receive the NIV treatment. These factors significantly contributed to the success or failure of the NIV treatment. A NIV program had been commenced to enhance nursing care for patients with acute exacerbation of COPD requiring NIV in designated beds of five acute hospitals in Hong Kong since November 2013. The NIV usage were 704 times for designated NIV beds and 1875 times for non-designated NIV beds in the Department of Medicine & Geriatrics of the five hospitals in 2014. Objectives To review the compliance with the enhanced nursing care for patients requiring NIV To determine the incidence of adverse effects and mask related skin lesion Methodology We performed a prospective study to review the nursing care for consecutive non-selected adult patients of COPD with acute respiratory failure in the Department of Medicine and Geriatrics in the five hospitals in December 2013. The enhanced nursing care focused on initiation of NIV, choice and fitting of ventilation mask, air-leak management, oxygen titration and assurance of patient-ventilator synchrony. The compliance rate on enhanced nursing care, adverse effects and mask related skin lesion were compared using univariate analysis between the patients allocated in designated NIV beds and non-designated NIV beds. Result There were 88 cases and 78 consecutive cases reviewed from designated NIV beds and non-designated NIV beds respectively in December 2013. It was statistically significant that there were higher compliance of enhanced nursing care, less self-reported adverse effects and less air leakage (Table 1) for those in designated beds. The incidence rate of mask related skin lesion was lower. The incidence of adverse effects was shown in graph 1. Conclusion The review showed good compliance with the enhanced nursing care and minimal discomfort for patients requiring NIV in designated beds. The results could be the basis for the development of key performance indicators and local benchmarking. Also, the enhanced nursing care could contribute to better clinical outcomes.

Sponsored Research - None

Table1: Result of the review

	Designated NIV beds	Non-designated NIV beds	p-value
Compliance rate with enhanced nursing care	98.52%	83.68%	<0.001*
Average number of adverse effects	1.22	1.79	0.08*
Average air leakage, L/min., in the first 24 hours	22.44	32.78	<0.001*
Mask related skin lesion	3%	7.4%	0.173
*p-value< 0.05, independent sample t-test			

2302856

A NON INVASIVE POSITIVE PRESSURE VENTILATION PROGRAM FOR THE PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE COMPLICATED BY ACUTE HYPERCAPNIC RESPIRATORY FAILURE IN DESIGNATED BEDS VERSUS NON-DESIGNATED BEDS IN HONG KONG.

Pui Fan Chan, Shu Wah Ng, Ming Wah Choi, Kit Man Suen, Chung Leung Poon, Yuen Yee Chan, Suet Lai Cheng, Lee Chan, Wah Shing Leung, Siu Keung Tang, Chung Ming Chu; United Christian Hospital, Hong Kong, Hong Kong

Background COPD complicated by AHRF cause a significant mortality worldwide. Besides, the evidence has shown a NIV could reduce the intubation and the hospital stay of patients. Moreover, they would have better clinical outcomes if they are cared by trained personnel in a specialty area. Therefore, a NIV program was initiated in a respiratory unit of a district hospital in HK where the demand was huge with 711 episodes of using NIV in Department of Medicine & Geriatrics in 2014. ***Objectives*** 1. To establish a NIV program in 4 designated beds 2. To enhance patients' care and outcomes 3. To evaluate the effectiveness of the program ***Methods*** The NIV program was established and evaluated according to "NIPPV" as follows: **N - NIV beds** 4 NIV beds were set up in a respiratory unit with enhanced monitoring capabilities. It included various designs of mask interfaces, pressure relief dressing materials, blood gases and physiological monitors, and NIV machines with advanced modes. **I - Initialization of the NIV with specialty guidelines** A Nursing Specialty Guidelines had been developed in Hospital Authority Head Office (HAHO) 2013. The compliance rate with guidelines and the initialization of NIV were compared. **P - Patient's care** Patient's adverse reactions and complications were evaluated. **P - Personnel was trained** 4 training workshops for nurses were conducted in 2013. Pre and post training assessment were evaluated with reference to guidelines from British Thoracic Society. **V - Ventilator days in NIV beds vs general beds** A pilot prospective study was designed to compare outcomes with designated bed (NIV program) and non-designated bed (standard practices). Patients who had non-COPD causes of AHRF were excluded. The first 53 consecutive cases were recruited between Oct and Dec 2013. The ethical approval had been sought. Their demographics, patient's outcomes, and utilization of healthcare were evaluated with the use of SPSS. ***Results*** Among all, 79.2% were male and 20.8% were female with overall mean age 75.5±1.3. The APACHE II was 16.8±0.7 with predicted death rate 26.3±1.7%. The mean score of nurses' knowledge level in the specialty unit was enhanced by 21% from 9.65 to 11.67 (p< 0.05) after the program. The initialization of NIV was 44hr in NIV beds vs 64hr in general beds (p=0.037). The results were shown in Table 1. ***Conclusions*** COPD patients with AHRF would have better clinical outcomes from the NIV if they were cared by trained personnel in designated beds with enhanced monitors.

Sponsored Research - None

	Designated beds with NIV program (28cases = 52.8%)	Non-designated beds with standard practice (25cases = 47.2%)
Compliance Rate with Guidelines	99%	83%
Complications of Mask Related Skin Lesions	3.8%	12.5%
Self-reported Adverse Reactions	9.11%	12.17%
NIV Days (days)	6.04	6.38
NIV Hours (hours)	58.45	91.18
Length of Hospital Stay (days)	8.28	10.28

Table 1: Results between Designated Beds vs Non-Designated Beds.

2303251

AVERAGE VOLUME ASSURED PRESSURE SUPPORT (AVAPS) IN ALS PATIENTS WITH PURE RESPIRATORY INVOLVMENT: A RANDOMIZED CROSSOVER TRIAL.

Lee Guion[2], Jonathan S. Katz[1,2]; [1]Neurology, California Pacific Medical Center, San Francisco, CA; [2]Neurology, Forbes Norris ALS Research and Treatment Center, San Francisco, CA

Introduction: Non-invasive ventilation (NIV) has been shown to improve survival and quality of life in people with ALS who are able to use it successfully. However, there is no data comparing different modes (volume-targeted or pressure-limited) using a prospective crossover design in this patient population. As bulbar dysfunction is a confounding variable in many studies of ALS and NIV we limited our study to patients with an ALSFRS-R bulbar subscore no less than 11 of 12. Our primary end point was to compare adherence to pressure-limited NIV or volume-targeted NIV and determine if symptoms of sleep quality, dyspnea, orthopnea, and quality of life were affected by either mode. **Methods:** We compared modes of NIV using one unit with dual mode capabilities. Enrollment criteria included FVC < 65% of predicted or MIP > -60 cmH20 and patient-reported dyspnea and orthopnea. After screening and randomization, patients were allowed a 2-week lead-in period for acclimation. Patients were then crossed to the alternative NIV mode for 6 weeks and then back to the initial NIV mode for an additional 6 weeks. Adherence was defined as ≥ 4 hours of use each night. **Results:** 12 of 14 patients were able to complete the study. There was no difference (p=0.05) favoring either volume-targeted or pressure-limited NIV across all outcomes tested. (standard deviation: 1.73; t-value: 1.84.) The second intervention period was associated with increased hours of use independent of treatment mode. **Conclusions:** 1. ALS patients with "pure" respiratory failure have high adherence independent of treatment modality. Patient selection may be far more important than treatment modality in NIV adherence. 2. NIV initiation in an ALS clinic with experienced RCPs, a range of interface options, 6-wk follow-up, and support on demand may also contribute to adherence.

Sponsored Research - Philips Respironics
ALS Association

2303281

PROLONGED MECHANICAL VENTILATION AFTER TRAUMA: A SINGLE CENTER REVIEW.

Dina Gomaa, Kyle Deryer, John O. Shinn, Richard D. Branson, Dennis Hanseman, Bryce Robinson; Surgery, University of Cincinnati, Hamilton, OH

Background: Mechanical ventilation following traumatic injury supports oxygenation and ventilation after a myriad of injuries. Injuries to the chest and head may result in prolonged illness. Prolonged mechanical ventilation (> 21 days of ventilatory support) in traumatically injured patients has not been described. We undertook this analysis to determine factors associated with PMV in trauma patients. **Methods**: Following IRB approval we queried our institutional registry consisting of all mechanically ventilated trauma patients over the last two years. All data were prospectively collected, daily by research assistants and included, demographics, injury patterns, injury severity score (ISS) including abbreviated injury scores (AIS) for each body region, gas exchange, ventilator settings complications and discharge disposition. Patients were stratified by duration of mechanical ventilation in to two groups; >1-21 days and > 21 days. Categorical data are reported as counts and percents and are compared between groups using chi-square tests. Continuous data are reported as medians and interquartile ranges and are compared using rank-sum tests. **Results**: Over 24 months, 531 subjects were evaluated; 408 (76.8%) were male, ethnicity was predominately Caucasian 376(70.8%) with smaller groups for African- Americans 131(24.7%), Hispanics (15 (2.8%) and others 9 (1.7%). The majority of injuries were blunt 387 (72.9%) or penetrating 137 (25.8%). Acute respiratory distress syndrome (ARDS) was seen in 60 (11.3%) of patients. Duration of ventilation was less than 21 days in 476 (89.6%) patients (median 5 days, IQR 2-11) and 55 (11.4%) patients had PMV (median 28 days, IQR 24-35). PMV was associated with male gender (p=0.02), ARDS (p<0.01), PaO2.FIO2 < 200 in the first 7 days (p<0.01) ISS (p<0.01) and chest AIS (p <0.01). Of note, head AIS was not a predictor of PMV (p=0.68). Discharge disposition for the entire cohort included long term acute care facility 126 (23.7%), nursing home 62 (11.7%), rehabilitation center 96 (18%) and psychiatric facility 12 (2.6%). **Conclusions**: In this single center study, PMV following traumatic illness was lower (11%) than is commonly reported in the literature for medical diagnoses. Risk factors include male gender, chest AIS, hypoxemia (PaO2/FIO2 < 200) in the first 7 days and development of ARDS at anytime during the hospital stay.

Sponsored Research - None

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2273051

COMPARISON OF TWO ENDOTRACHEAL TUBE CLEANING DEVICES IN REDUCING AIRWAY RESISTANCE FOR THE MECHANICALLY VENTILATED PATIENT.

Linda C. Schofield, Densie E. Burkhart, Jeffery B. Washington; McLaren Northern Michigan, Petoskey, MI

Background: Endotracheal tube (ETT) intra-luminal volume loss due to mucus and biofilm is associated with longer periods of time on mechanical ventilation and increased imposed work of breathing. Previous studies conducted at McLaren Northern Michigan hospital have demonstrated that daily cleaning of the ETT decreased the median airway resistance from 27 $cmH_2O/L/sec$ to 15 $cmH_2O/L/sec$, ($p<0.01$). This result was associated with a decrease in average time on the ventilator by 1.09±4.70 days, and a decrease in the length of stay in the ICU and hospital by 1.50±5.51, and 1.72±7.44 days respectively. **Purpose:** The primary objective of this study was to determine the non-inferiority of the new Mucus Shaver (MS) device in daily removal of adherent ETT secretions prior to weaning trials compared to the endOclear (ECD) device. The MS is a flexible, sterile, single use, concentric inflatable catheter and the ECD device is a rigid, sterile single use, mechanically operated wiper. **Method:** This study is an IRB approved, non-inferiority, prospective, randomized, controlled, single centered study to evaluate the efficacy of the MS device (test treatment) compared to the ECD device (control treatment). The primary endpoint of this study is the detection of a difference in airway resistance reduction (ΔRaw) before and after the cleaning maneuver no greater than 3 $cmH_2O/L/sec$ between the two treatment groups. Based on our previous study, a ΔRaw of 3 $cmH_2O/L/sec$ or less between the two groups can be considered not clinically relevant. A sample size of 170 subjects was calculated for power of 0.90 with a two-sided alpha of 0.05. Data presented as mean±SD. **Results:** The ΔRaw with the original ECD device was 1.6±4.9 $cmH_2O/L/sec$ and the ΔRaw with the MS device was 1.9±4.8 $cmH_2O/L/sec$. Non-inferiority was established after enrollment of 101 subjects (N=188/192 ECD/MS cleaning maneuvers) and the study was ended. The results of the difference between MS device and the ECD device were significantly smaller than the established non-inferiority margin of 3 $cmH_2O/L/sec$ ($p<0.01$). **Conclusion:** The MS device is as effective as the ECD device at removing adherent secretions from the ETT prior to weaning trials, resulting in lower ETT resistance and therefore decreased work of breathing for patients after treatment with either device.

Sponsored Research - We currently purchase the original endOclear device and use it daily on patients vented greater than 24 hours. The endOclear(R) Mucus Shaver (TM) was provided by endOclear LLC.

	Airway Resistance (mean cmH20/L/sec)			Peak Inspiratory Pressure (mean cmH20)			Tidal Volumes (mean ml)		SpO2 (mean %)	
	Before	After	ΔRaw	Before	After	ΔPIP	Before	After	Before	After
endOclear®	16.93	15.29	1.6±4.9	24.40	23.43	1.0±3.2	576	580	97.95	98.38
Mucus Shaver™	16.56	14.68	1.9±4.8	24.57	23.63	0.9±3.8	623	629	98.58	98.95

endOclear(R) and Mucus Shaver™ data before and after cleaning ETT

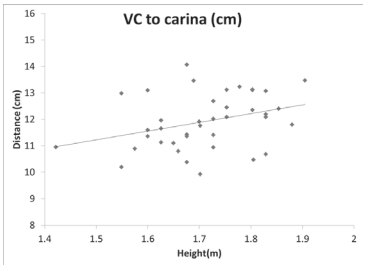
2302979

IMPROPER POSITIONING OF ENDOTRACHEAL TUBES WITHIN THE TRACHEA NECESSITATES NEW METHODS OF CONFIRMATION.

Wenyuan Liu[1], Paul Ford[2], William Mileski[3], Norbert Rios[1], Kristin Casey[4], Donald S. Prough[1]; [1]Anesthesiology, UTMB at Galveston, Galveston, TX; [2]Anesthesiology, University of Arizona College of Medicine, Tucson, AZ; [3]Surgery, UTMB at Galveston, Galveston, TX; [4]Radiology, UTMB at Galveston, Galveston, TX

Introduction: Proper positioning of endotracheal tubes (ETs) is necessary to ventilate both lungs and to prevent complications such as atelectasis and damage to the vocal cords and the carina. We performed a retrospective study of patients receiving a first chest radiograph in the Emergency Department after emergent intubation. **We hypothesized that many ETs are malpositioned after placement and that a combination of external anatomic landmarks and radiographic landmarks could be used to improve positioning. Methods:** In a study approved by the IRB, first, in 35 adult patients intubated pre-hospital or in the ED between 1/15/2008 and 3/24/2010, we measured distances between key radiographic landmarks and one external anatomic landmark: ET tip to carina (tracheal length), top of ET cuff to ET tip, and length of ET cuff above the sternal notch. Second, in a convenience sample of 49 non-intubated adult patients who had undergone neck CT imaging, we measured distances between key landmarks: vocal cords (VC) to carina and VC to sternal notch (SN). Data were analyzed using descriptive statistics (mean, standard deviation (SD) and ranges. Spearman's correlation coefficient was used to correlate tracheal length with height. **Results:** Mean ET tip to carina was 3.0 cm ± 2.0 cm (SD). In 8/35 (23%) of patients, ET tip to carina was ≤ 1 cm. In 6/35 ET tip to carina was ≥ 5 cm. VC to carina distance (tracheal length) was 11.9 ± 1.2 cm (SD) (Figure). VC to SN was 6.7 ± 1.3 cm. The top of ET cuff to ET tip was 6.8 ± 1 cm. The mean length of cuff above SN was 4 ± 2 cm. In 4/26 patients the length of ET cuff above the SN suggested impingement on the larynx or vocal cords. **4. Discussion:** In 12/35 patients, the ET was positioned too proximally or distally within the trachea. In this sample of adult patients, the mean distance from the top of the ET cuff to the tip of the ET was 6.8 ± 1 cm, while total tracheal length (VC to carina) was 11.9 ± 1.2 cm (Figure). Assuming that the distance from the VC to the distal edge of the larynx (not measured in this study) is ~ 3 cm and that the tip of the ET should be ~ 3cm from the carina, precise positioning is essential to limit the complications of endotracheal intubation. Patient care could be improved by use of an ET position confirmation method that is facilitates frequent or continuous monitoring.

Sponsored Research - None



Vocal Cord to Carina Distance in Male and Female Adults

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2299065

INCREASED RISK OF HERPES ZOSTER IN PATIENTS WITH ASTHMA: A POPULATION-BASED COHORT STUDY.

Yi-Hao Peng[1], Ching-Hua Su[2], Wei-Chih Liao[3]; [1]Department of Respiratory Therapy, China Medical University Hospital, Taichung, Taiwan; [2]Section of Respiratory Therapy, Taichung Hospital, Ministry of Health and Welfare, Taichung, Taiwan; [3]Division of Pulmonary and Critical Care Medicine, Department of Internal Medicine, China Medical University Hospital, Taichung, Taiwan

Background/Objective: The association between asthma and herpes zoster has rarely been studied. We investigated whether asthma increased the subsequent risk of herpes zoster in adults by using a nationwide, retrospective, population-based cohort study. ***Methods/Patients:*** We used data from the National Health Insurance Research Database in Taiwan. The study cohort comprised 24 399 patients with newly diagnosed with asthma between 2000 and 2005, and the comparison cohort involved 73 197 patients without asthma. Both cohorts were followed up until the end of 2011. Cox proportional hazard regression analysis was used to compute the hazard ratio of herpes zoster in the patients with asthma relative to those without asthma. ***Results:*** The risk of herpes zoster was 1.41-fold higher in the asthma cohort than in the comparison cohort, after adjustment for age, sex, comorbidities, and systemic and inhaled corticosteroids use. Additional stratified analyses revealed that the risk of herpes zoster was significantly higher in both sexes and in all age groups beyond 35 years. ***Conclusions:*** Adult patients with asthma have a significantly higher risk of developing herpes zoster than that of the general population.

Sponsored Research - None

2302738

COPD CARE IMPROVEMENT THROUGH OUTPATIENT PULMONARY REHABILITATION.

Diane M. Pullins; Pulmonary Rehabilitation, Piedmont Healtcare, Atlanta, Atlanta, GA

Background: The Center for Medicare and Medicaid Services is focusing on reducing acute care readmissions within 30 days of discharge through its Hospital Readmissions Reduction Program. Beginning in October 2015, Medicare reimbursement will be reduced for acute care hospitals whose rates for Chronic Obstructive Pulmonary Disease (COPD) admissions exceed a predetermined threshold. Therefore, healthcare organizations are compelled to improve COPD care and commit resources to develop programs that are designed to reduce readmissions. As it stands COPD related exacerbations rank as the third most frequent cause for readmission to hospitals within 30 days. COPD is a common preventable and treatable disease. In order to prevent COPD related re-hospitalization healthcare clinicians are tasked with understanding the cause of a patient's decompensation then pursue strategies for intervention that would prevent readmissions. The American Thoracic Society defines Pulmonary Rehabilitation as evidence based intervention designed to reduce symptoms and optimize functional status. Can Outpatient Pulmonary Rehabilitation (PR) be an effective intervention for hospital readmissions by providing an established protocol and standard of care to program participants centering on self-efficacy and physical conditioning? ***Method:*** The Outpatient pulmonary rehabilitation program at Piedmont Healthcare, Atlanta is an AACVPR Pulmonary Rehabilitation certified program. This certification requires that patients receive education related to their diagnosis. As a measure of program effectiveness 18 patients attending outpatient PR were reviewed for hospital admissions one year prior to attending the PR program and then again one year post program. Prior to attending PR 8 of the 18 patients had hospital admissions for COPD exacerbation. There was an associated average cost of 3,902$ per day, per person and an average length of stay of 3.2 days (99,891$). After attending the PR program, hospital admissions dropped by 25% with an effective cost savings of 74,919$ (75%). ***Conclusion:*** Pulmonary Rehab encourages patients to be active participants and accept the responsibility for self-care. This is essential to the management of chronic pulmonary disease. Programs that empower patients through education can help individuals achieve control of symptoms for prolonged periods of wellness. Such programs are an effective tool to help reduce hospital readmissions and improve financial outcomes.

Sponsored Research - None

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2302190

GREEN SHEET PROTOCOL: PREVENTING ICU READMISSIONS VIA IMPROVED MULTIDISCIPLINARY COMMUNICATION.

Robert Bayer, Margarete Pierce, Edward Tollok, David Domzalski, Rebecca L. Hoffman, Niels Martin, Jason Saucier, Meghan Fitzpatrick, Boris Tsypenyuk; The Hospital of the University of Pennsylvania, Philadelphia, PA

Background: Patients discharged from the surgical ICU represent a cohort at high risk for clinical deterioration. Early recognition of risks & efforts at prevention represent promising areas to decrease readmission. Using quality improvement methodology, we aimed to develop a time-sensitive, multidisciplinary intervention focused on coordinating care following transfer out of the ICU. **Method:** Two provider teams, consisting of physicians, nurse practitioners, nurses & respiratory therapists, worked together to implement the intervention which required verbal hand-offs, time sensitive patient evaluations, & multiple visual cues. Once identified as high risk for readmission by the ICU team, a "green sheet" containing specific risks was completed and subsequently posted outside the patient's room on the acute care floor. The acute care physicians needed to assess the patient within one hour of arrival and respiratory therapists within two hours. The intervention took place over a three month period between a 24 bed SICU & two surgical floors at a large, urban, university based hospital. **Results:** Median arrival times for the primary team & respiratory therapists were 30 and 47.5 minutes, respectively. The need for ICU re-admission decreased from 14.4% to 12.7 (p=0.76), the rate of re-intubation decreased from 40% to 25% (p=0.47) in the intervention group. In 60% of the cases, the respiratory therapist made additional therapeutic recommendations upon arrival to the floor. There were 2 deaths in the control and 1 in the intervention group. A respiratory specific survey taken after 11 months showed 75% of therapists felt the green sheet improved patient care & 70% felt the green sheet should become the standard of care. **Conclusion:** Providers found that a time-sensitive focused protocol enhanced hand-offs and coordination of care at the time of ICU transition to an acute care setting was a valuable adjunct to patient care. The process involves careful coordination of multiple care providers, which means that only small process changes are needed by any one group in order to accomplish a large process design. The combination of a physical component with a process made the intervention strategy tangible, measurable, & served to bring providers to the bedside. Without the need for additional funding, we have shown that with a dedicated QI team, this is an easily adaptable strategy to improve communication around the transfer of high risk patients. **Disclosures:** None
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2300889

LOW- VERSUS HIGH-FIDELITY SIMULATION TRAINING IN LARYNGEAL MASK AIRWAY PLACEMENT AND ENDOTRACHEAL INTUBATION.

Tyler T. Weiss, J. B. Scott, Jessica L. Reed, Meagan N. Dubosky, David L. Vines; Respiratory Care, Rush University Medical Center, Chicago, IL

Background: The use of simulation-based education is increasing in medical training. This teaching tool has the potential to improve learner knowledge by providing a fixed and stable environment that may influence the learner's clinical skills. This study compared high-fidelity simulation versus low-fidelity simulation on the placement of laryngeal mask airways (LMA) and endotracheal tubes via direct laryngoscopy. **Methods**: Respiratory therapy students and licensed respiratory therapists (n=24) were randomly divided into either the experimental group (LMA/intubation training with high-fidelity simulator), or the control group (LMA/intubation training using low-fidelity simulator). Cognitive pre-tests and affective surveys determined the study participant's baseline knowledge and level of confidence before the educational intervention. Cognitive post-tests and affective surveys determined the participant's gained knowledge and confidence level after the educational intervention. A psychomotor checklist was used to evaluate performance after the educational intervention. These tools were used to determine if there is a difference between low-fidelity and high-fidelity simulation when teaching proper placement of LMA/endotracheal intubation via direct laryngoscopy. **Results:** High-fidelity confidence scores increased from 3.51 to 4.22 (p-value < .05) and low-fidelity scores increased from 3.37 to 4.18 (p-value < .05) after education and training (5-point Likert scale 1 = very low; 5 = very high). Mean cognitive scores using high-fidelity simulators increased from 66% to 69.5% (p-value= 0.29) after education and training. Mean cognitive scores using low-fidelity simulators increased from 69.5% to 73.5% (p-value= 0.19) after education and training. There were no significant differences in confidence, cognitive, or mean psychomotor checklist scores between pre or post-training using low or high-fidelity simulation. **Conclusion:** Placement of LMA/endotracheal intubation via direct laryngoscopy using both simulation modalities shows a statistically significant increase in confidence. However, there is no statistical difference in gained knowledge and psychomotor skills when comparing low- versus high-fidelity simulation. Additional studies should be conducted to validate these findings.

Sponsored Research - None

2301282

A RRT-ACCS TEACHING ADULT MICU RESIDENTS IMPROVES FEEDBACK AND FUNDING.

SUNITHA PALANIDURAI[1], DR. SEOW_PING LOW[2]; [1]Division of Critical Care, NATIONAL UNIVERSITY HOSPITAL, Singapore, Singapore; [2]Division of Respiratory and Critical Care Medicine, NATIONAL UNIVERSITY HOSPITAL, Singapore, Singapore

Background:In our academic medical centre, Post graduate year II residents have a mandatory 2 months rotation in Adult Medical Intensive care unit. Residents find the MICU posting always the busiest and most challenging compared to other postings. All staffs being very busy with sick pateints, lots of invasive procedures and everyday rounds, the teaching before was only ad hoc and bedside discussions. A teaching program was formulated for the Residents which has a protected and dedicated time for learning with the most experienced and the highly qualified staffs from different specialities. **Method**: A Lecture Series including Mechanical Ventilation and BIPAP which are 2 among the 8 topics, covering the whole 8 weeks (2months) was started back in 2011. Since then every resident rotating through MICU has to undergo this teaching program. Every year there are 6 batches and each batch consists of 7 residents. So a total of 5 (years) x 6 (batches) x 7 (Residents) x 2 (classes MV and BIPAP) = 420 Sessions done for this program. A RTT_ACCS runs the whole teaching which is hands-on and interactive. This lecture covers the commom modes of Ventilator, wave forms, Lung mechanics, ARDS protocol, Indications of BIPAP and usage of BIPAP to facilitate Extubation etc. Most importantly, a consultant will always be present through out the lecture to supervise and also to make sure the residents are complete and punctual.This teaching program Value adds the Residents with protected and dedicated time for learning and provides the basic core knowledge of ventilator management and BIPAP. It also equips the post gradutate year II students with better clinical reasoning and bedside management in day to day practice. **Results**: In this observational study, feedback scores were collected by the hospital twice a year and the scores have been tremendously improved from 7 to more than 8, putting MICU in the first place among all other divisions under University Medicine Cluster (UMC). This high Feedback score validates the teaching and learning of residents rotating through MICU and also contributes to the overall high standing and funding of the National University Health System Internal Medicine residency Program in Singapore. **Conclusion**: The RRT-ACCS credentials not only sharpens the knowledge about adult critical care management but also helps BETTER ANSWER the Residents' questions and that improved feedback and funding.

Sponsored Research - None

2302850

THE EFFECTIVENESS OF E-PORTFOLIO FOR THE POST-GRADUATE TWO YEARS CLINICAL TRAINING PROGRAM OF RESPIRATORY THERAPIST.

Chia-Chen Chu[4,2], Chin-Jung Liu[3,1]; [1]Respiratory Therapy, China Medical University Hospital, TaiChung, Taiwan; [2]Biomedical Engineering, Chung-Yuan Christian University, Taoyuan, Taiwan; [3]Respiratory Therapy, China Medical University, Taichung, Taiwan; [4]Respiratory Therapy, China Medical University & Hospital, Taichung, Taiwan

Background: Taiwan Joint Commission on Hospital Accreditation (TJCHA) was commissioned by the government since 2007, to evaluate various medical professional licensing new staff within four years to the service of the teaching hospital were the two-year on job training course. The aim of this study was to assess the effectiveness of e-portfolio for the post-graduate two years clinical training program of respiratory therapist. **Methods:** Based on the two-year training course, changing the process of Leavitt diamond component, the questionnaire was designed include teaching evaluation, foundation courses, core courses and professional courses four parts, each part has fifteen questions except the teaching evaluation only seven. This questionnaires used the five-level Likert item, it is: very satisfied: 5 points; satisfied: 4 points; fair: 3 points; dissatisfied: 2 points; very dissatisfied: 1 point, each line item out 5 scores.) satisfaction survey questionnaire to be designed to meet student input and evaluation requirements of the e-learning portfolios. The questionnaire data was analysis with paired t test **Results:** There were 17 trainees through teaching evaluation, foundation courses and core courses of the program design took the pre-test and after the amendment was a post-test, but the professional courses only 14 trainees took the pre-test and post-test. The result showed teaching evaluation was more useful through pre-test and post-test compare (3.29±0.88 vs 3.84±0.63, p<0.05) .**Conclusions:** The e-portfolio not only can let the students save their own learning portfolio at the end of the training, the program moderator can monitor student learning progress, and quickly learned that students learn trends and compare with their peers, and reduce the unit to store file share their learning space, but also can improve the teaching evaluation. The e-portfolio for the post-graduate two years clinical training program of respiratory therapist may be useful, but need the further study to identify the effectiveness in other professionals. **Keywords:** respiratory therapist, two years clinical training program, E–portfolio

Sponsored Research - None

The effectiveness of e-portfolio was assessed by compare to pre-test and post-test by the trainees

	Pre-test	Post-test	
Items	Mean SD	Mean SD	P value
Teaching evaluation (n=17)	3.29±0.88	3.84±0.63	0.024*
Foundation courses (n=17)	3.38±0.78	3.80±0.70	0.059
Core courses (n=17)	3.47±0.74	3.79±0.73	0.102
Professional courses (n=14)	3.43±0.76	3.94±0.56	0.055

*p<0.05.

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2299672

THE RISK AND RELATED FACTORS OF RE-INTUBATION SUBJECTS WHO WEANED MECHANICAL VENTILATION WITHIN THE FOURTEEN DAYS–A NATIONWIDE POPULATION-BASED COHORT STUDY.

Chia-Chen Chu[2,3], Chin-Jung Liu[4,1], Pei-Tseng Kung[5], Yuh-Show Tsai[3], Wen-Chen Tsai[6]; [1]Respiratory Therapy, China Medical University Hospital, TaiChung, Taiwan; [2]Respiratory Therapy, China Medical University & Hospital, Taichung, Taiwan; [3]Biomedical Engineering, Chung-Yuan Christian University, Taoyuan, Taiwan; [4]Respiratory Therapy, China Medical University, Taichung, Taiwan; [5]Healthcare Administration, Asia University, Taichung, Taiwan; [6]Health Services Administration, China Medical University, Taichung, Taiwan

Background: According to integrated delivery system (IDS) policy, prolonged mechanical ventilation patients followed successful weaning in accordance with step-down care, but too early discharge will affect the 14 days readmission of quality index, so we try to explore the risk and related factors of re-intubation patients who weaned mechanical ventilation within the fourteen days. **Method:** A retrospective cohort of mechanical ventilated subjects whose age ≥17 year old using a population-based database from the Taiwan National Health Insurance Research Database for the period from January 1, 2006 to December 31, 2010. A total of 15,840 subjects were weaned from mechanical ventilation and applied chi-square test and logistic regression analysis to explore whether the weaned mechanical ventilation subjects re-intubation within fourteen days or not, and the related factors. This study was approved by the Institutional Review Board of the study organizations (IRB No.: 20130603C). **Results:** A total of 449 subjects were re-intubated within 14 days; the total re-intubation rate was 5.78 %. Logistic regression analysis results showed that the factors related higher risk of re-intubation were whether to join the IDS plan, the reasons of ventilator used, complications, hospital accreditation level, in charge of patient physician's service volume and the care stage of weaned ventilator. The risk of re-intubation was higher when the subjects join the IDS plan than non-IDS group (OR=1.26, p <0.05);The COPD subjects had higher risk of re-intubation than those without COPD (OR=1.32, p <0.05);The subjects without pneumonia were used as the reference group, the risks of re-intubation for with COPD subjects was 1.41 times that of those without pneumonia (p <0.05);The risk of re-intubation was the highest in the district hospital and others and was 3.53 times that in the medical center (p <0.05);The risk of re-intubation was the highest in the high in charge of patient physician's service volume and was 2.79 times that in the low in charge of patient physician's service volume (p <0.05);Weaning ventilator in the RCW and RHC exhibited the highest risk of re-intubation, which was 2.32 times that of the ICU (p <0.05). **Conclusions:** The above factors related to the care setting level and quality, so the higher risk subjects should be pay attention and assessment after weaned from mechanical ventilation to prevent re-intubation and readmission.

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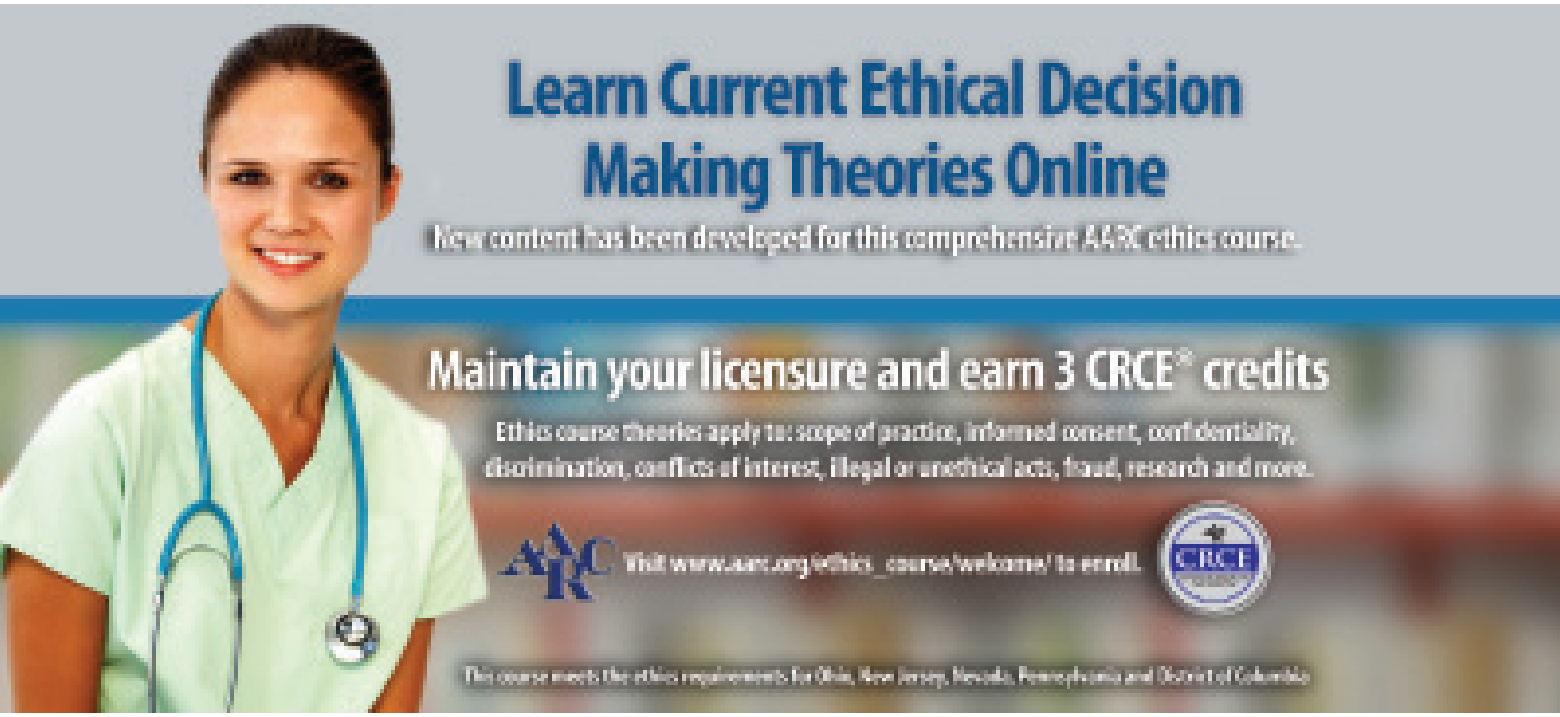

2302698

THE BURDEN AND NEEDS OF CAREGIVERS CARING FOR HOME VENTILATOR-DEPENDENT PATIENTS: THE IMPACTS OF GENDER DIFFERENCEST.

HSIUMEI LEE[1], Jui-Fang Liu[1,2], Su-Chyn Lin[3], Mei-Lien Tu[1], Ying-Jui Lin[4], Shih-Feng Liu[4], Man-Chi Lu[1], Meng-chih Lin[4]; [1]Division of Respiratory Therapy, kaohsiung Chang Gung Memorial Hospital, Kaohsiung, Taiwan; [2]Department of Respiratory Care, Chang Gung University of Science and Technology, Chiayi, Chiayi, Taiwan; [3]Nursing Department, Taitung hospital, Taitung, Taiwan; [4]Division of Pulmonary and Critical Care Medicine and Department of Respiratory Care, Kaohsiung Chang Gung Memorial Hospital, Kaohsiung, Taiwan, Kaohsiung, Taiwan

Background Previous studies revealed female caregivers bear more physical, mental, and socio-economic stress than male caregivers in caring chronic obstructive pulmonary disease(COPD) patients. As our knowledge, few studies focus on gender difference in caregivers' burden in caring chronic home-ventilator dependent patients. This study aims to explore whether different gender caregivers of home-ventilator dependent patients have different burden. **Methods** This prospective, cross-sectional study included caregivers of adult chronic home-ventilator dependent patients (defined as continuous ventilator usage for more than 21 days) from June 2010 to October 2010 in Taiwan. The caregivers who was younger than 18 years old, illiterate or disagree the study were excluded. We used structured questionnaires for patients' baseline characteristics, caregiver's information and the burden assessment scale (BAS) . **Results** A total of 83 patients and 83 caregivers(59 female and 24 male) were included for investigation. The average age of female caregivers was 49.191±3.73years old and most of them were married. 30.6% of them got bachelor degree and 33.9% of them had senior high school diploma. The average age of male was 54.541±6.47years old and most of them were married. 25.0% of them got bachelor degree and 41.7% of then had senior high school. The patients cared by female caregivers tend to be less with clear consciousness(66.1% VS 70.8%), longer in mechanical ventilation usage duration(35.329 months VS 20.2 months) and more common tracheostomy usage(96.6% VS 79.2%). When compared to male caregivers, female caregivers were more likely to feel taking care of patients reduce the feeling of contacts with friends and family(3.42 VS 2.71,p<0.01). Female caregivers were more likely to get family or friends support and comfort (4.03VS 3.58,P<0.01) and hope to join the association which assemble of same sufferer and family, exchange ideas and feelings.(3.20 VS2.75,P<0.01) **Conclusion** This study revealed that comparing to male caregivers, female caregivers had more likely to feel taking care of patients reduce the feeling of contacts with friends and family, hope to join the association which assemble of same sufferer and family for exchange ideas and feelings(p<0.001). We suggest clinical staff and professionals provide female caregivers more support and help on social burdens and social needs to decline burdens of female caregivers of home-ventilator dependent patients.

Sponsored Research - None

2302736

BURDEN AND NEEDS OF CAREGIVERS FOR PATIENTS WITH PROLONGED MECHANICAL VENTILATION:IMPACT OF TIME DIFFERENCES.

Man Chi Lu[2], Jui Fang Liu[2,3], Ching-wan Tseng[2], Su Chyn Lin[4,3], Mei Lien Tu[2], Ying Jui Lin[2], Meng chih Lin[1], Shih-Feng Liu[1]; [1]Division of Pulmonary and Critical Care Medicine and Department of Respiratory Care, Kaohsiung Chang Gung Memorial Hospital, Kaohsiung, Taiwan, Kaohsiung, Taiwan; [2]department of respiratory therapy, Chang Gung University of Science and Technology, Kaohsiung, Kaohsiung, Taiwan; [3]Department of Respiratory Care, Chang Gung University of Science and Technology,Chiayi, Chiayi, Taiwan; [4]Nursing Department, Taitung hospital, Taitung, Taiwan

Background Previous studies revealed that Prolonged Mechanical Ventilation patient's caregiver had taken stress of body, psychological, mental, socieco-monic stress,and there are many different requirements. As to our knowledge, few studies focus on difference of care time in caregiver's burdens that took care of Prolonged Mechanical Ventilation patients.This study will analyze the relationship between care duration and caregivers' burden in caring the patients with prolong mechanical ventilation. **Methods** This prospective,cross-sectional study focused on caregivers who care the patients under continuous ventilator support for more than 21 days. The patients younger than 18 years old,illiterate or disagree of our study were excluded. The data collection was started from June 2010 to October 2010 in south Taiwan. The caregivers were divided into two groups: group I had care-duration less than 1 year and group II had care-duration more than 1 year. We used structured questionnaire for patient's baseline characteristics, caregiver's information and the burden assessment scale(BAS) **Results** A total of 241patients and 241 caregivers were included for investigation. There are 87 caregivers belong to group I and the other 154 caregivers belong to group II. The average age of caregivers was 50.73±14.68 years old and most of them were married and did not quit their job when taking care of patients. There is no statistics significance between two groups in the aspects of body, psychological, mental and socieconomic burdens. However, the group I had higher social (14.05 VS 12.90,p<0.001) and economic needs (16.05 VS 14.73,p<0.001). **Conclusion** The study revealed that care-duration less than one year caregivers had more social and economic needs than care-duration more than one year caregivers(p<0.001). We therefore suggest clinical staff and professional provide home-caregivers necessary society support and economic help to decline the burdens of care-duration less than one year caregivers of prolonged mechanical ventilation patients.

Sponsored Research - None

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2299899

THE IMPACT OF IMPOSED RESISTANCE ON VENTILATOR PERFORMANCE DURING NON-INVASIVE CPAP VIA NASOPHARYNGEAL PLACED ENDOTRACHEAL TUBE IN A PEDIATRIC PATIENT.

Tracey Roberts[2], Barbara Gretler[2], Mihaela Damian[2,1]; [1]School of Medicine, Stanford University, Palo Alto, CA; [2]Lucile Packard Children's Hospital Stanford, Palo Alto, CA

INTRODUCTION: Nasopharyngeal prongs have been used for noninvasive CPAP delivery since its inception. We report a case where imposed expiratory resistance via a nasopharyngeal placed endotracheal tube in an 11-month-old infant with severe tracheolmalacia and respiratory failure resulted in compromised exhalation. **CASE SUMMARY** An 11month old, ex 32 week female with severe BPD and tracheomalacia presented to the PICU with acute respiratory failure. She was briefly mechanically ventilated then extubated to mask CPAP of 14cmH_20. The next 24 hours resulted in significant desaturation events attributed to right mainstem collapse observed during bronchoscopy. Additionally, agitation resulted in marked respiratory acidosis and contributed to the failure of mask CPAP. A 4.0 nasal ETT was placed purposefully in the phaynx with the same CPAP pressure in an attempt to minimize agitation. **DISCUSSION** Initially the patient was placed on the V500 Drager ventilator in pediatric NIV mode: CPAP 14cmH_20. Whilst her desaturation episodes decreased with the nasopharyngeal tube in place she exhibited increased tachypnea over the next 12hrs. Bilateral breath sounds revealed limited expiratory flow and increased variable flow rates between 35-40LPM on the ventilator. Increased concerns for her ability to adequately exhale were brought to the medical team's attention, which wanted all options to be considered prior to reintubation. A Drager VN500 ventilator was calibrated with a 4.0ETT inline which allowed for the ventilator to adjust for the imposed resistance of the tube. When the patient was transitioned to the VN500, a set flow of 12LPM was adequate to maintain the CPAP target pressure and reduce her work of breathing. Immediately her respiratory rate decreased and effort was observed on the ventilator graphics. Expiratory breath sounds became distinctly audible. The patient was successfully weaned from CPAP 14cmH_20 over the next 5 days to HFNC. **CONCLUSION** When considering non-standard NIV interfaces for patient care, it is vital to consider the effects of imposed resistance and flow characteristics observed in the ventilator selected. In this case, both played a role in patient response. Having the ventilator measure the imposed resistance and controlling flow was key for success in this situation.

Sponsored Research - None

Table 1. Observed response to interventions

Observed Parameter	V60	V500	VN500
Circuit configuration	Single limb	Pediatric dual limb	Infant dual limb
CPAP Interface	Nasal mask	Nasal ETT	Nasal ETT
CPAP Pressure (cmH20)	14	14	14
Measured ventilator flow rate (LPM)	15-20	35-40	12
Flow characteristics	Variable	Variable	Set
Inspiratory Resistance (cmH20/L/sec)	2.0	20.9	79.6
Expiratory Resistance (cmH20/L/sec)	2.0	8.0	74.5
Desaturation events (Spo2<40%)	12	3	0
Heart rate average	150-170	119-154	120-145
Respiratory rate average	26-41	18-40	18-28

2303035

IMPLEMENTATION OF A CHECKLIST FOR PATIENT AND EQUIPMENT CHECK IN ECMO PATIENTS AN INTERDISCIPLINARY PEDIATRIC INTENSIVE CARE UNIT.

Anke Helleken, Monika Haegele, Petra Goertz, Matthias Kumpf, Malte Hanelt, Ines Gerbig, Felix Neunhoeffer, Ellen Heimberg, Michael Hofbeck; Kinderheilkunde II, University Children's Hospital Tübingen, Tuebingen, Germany

Aims and objectives: Checklists are an instrumental method in coordination and survey of complex processes. A consistent application of checklists may increase patient safety and can therefore be an important tool in the contemporary intensive care setting. The aim of the presented work was to develop and implement a checklist for patient and equipment survey in patients treated with extracorporeal membrane oxygenation on an interdisciplinary pediatric intensive care unit (PICU) and thereby improving handling of ECMO units by the staff and the patient safety. **Methods:** The checklist was developed on a 12-bed university hospital interdisciplinary pediatric intensive care unit with staff working in a three shift system with 17 doctors and 67 nurses in full- and part-time employment. ECMO is applied in approximately 20 cases per year by cardiothoracic surgeons and cardiovascular technologists with ICU staff taking care of monitoring and handling. Process: Step 1: The consensus-oriented development of a questionnaire for completion by the nursing staff at the beginning of each shift was performed in an interprofessional ECMO workshop. Step 2: Processing of the questionnaire was done with the senior physicians of the intensive care unit. Step 3: Specification and formulation of a checklist. This was done in two versions to ensure routine application: a short version in laminated DIN-A6 size, which was delivered to every staff member, and a long version in DIN-A5 size, which was positioned on each ECMO unit. **Evaluation:** A survey was conducted after a 12 month period to evaluate the use and impact of the checklist regarding user satisfaction. At this point the checklist was used in about 250 shifts. Results: After a 12 month period, the newly designed checklist was applied in 248 ECMO cases. There was regular application of the list by most of the nursing staff. The majority of questioned persons stated an increase of safety in the handling of ECMO patients. **Conclusion:** A checklist for manipulation of ECMO units should be developed by a consensus-oriented and inter- professional team to increase compliance and subjective contentment as well as standardization of the work-flow. The impact on patient safety should be evaluated in a prospective clinical study.

Sponsored Research - None

2302046

A BENCH EVALUATION OF FLOW DELIVERY THROUGH VARIOUS NASAL INTERFACES IN CPAP.

Rick Carter, Kevin Crezee; Respiratory Care, Primary Childrens Hospital, Salt Lake City, UT

Background: Continuous Positive Airway Pressure (CPAP) is a standard of care in the neonatal population. The effectiveness of CPAP delivery varies based upon interface, device and patient comfort. This study tested two different types of cannulas that are not FDA approved for CPAP. **Method:** An Evita XL (XL) ventilator was calibrated and prepared for use. Measurements were taken after CPAP settings were adjusted. Fisher & Paykel Optiflow Junior (F&P) (Auckland, New Zealand) Premature, Neonatal, Infant and Pediatric sizes were tested. For F&P testing the retention clip was removed and replaced with an F&P RT061 infant circuit adaptor to allow a direct connection to a neonatal ventilator circuit. RAM Cannula (Valencia, California) sizes Micro Preemie, Preemie, Newborn and Infant were tested. Flows were measured via TSI certifier FA Plus (TSI) (Shoreview, Minnesota). The TSI was attached between the ventilator circuit and the cannula being tested. Unimpeded flows were measured on CPAP settings of 5 through 14cmH_2O. **Results:** Flows through the RAM Micro Preemie and Preemie were comparable to the F&P Premature and Neonatal sizes with a +/- 2Lpm. The lowest difference in flows was .2Lpm with the F&P Neonatal being lower than RAM Preemie at a CPAP of 5cmH_2O. The largest difference in flows was 2.7Lpm with the F&P Premature being lower than RAM Micro Preemie at a CPAP of 14cmH2O. Larger differences were measured in flows through the RAM Newborn/Infant sizes and the F&P Infant /Pediatric sizes. The lowest difference in flows was 3.8Lpm with the F&P Infant being higher than the RAM Newborn at a CPAP of 5cmH_2O. The largest difference in flows was 6Lpm with the F&P Pediatric measuring higher than the RAM Infant at a CPAP of 14cmH_2O. **Conclusion:** In testing configurations, CPAP flows were higher than expected in both devises. The RAM Micro Preemie and Preemie sizes have larger flows than the F&P Premature and Neonatal sizes. Larger differences in flows were measured in F&P Infant and Pediatric sizes over RAM Newborn and Infant sizes. Additional IRB approved trials of these devices is needed.

Sponsored Research - None

Unimpeded CPAP Flows

RAM

CPAP	5	6	7	8	9	10	11	12	13	14
Micro Preemie	4.6	5.1	5.7	6.1	6.5	6.9	7.3	7.7	8	8.4
Preemie	3.7	4.3	4.8	5.3	5.8	6.3	6.7	7.1	7.5	7.9
NB	4.6	5.3	6.0	6.5	7.2	7.7	8.2	8.7	9.2	9.7
Infant	5.2	6.1	6.9	7.6	8.2	8.8	9.4	9.9	10.5	11.1

F&P

CPAP	5	6	7	8	9	10	11	12	13	14
Premature	3.3	3.6	4.2	4.2	4.5	4.7	5	5.2	5.5	5.7
Neonatal	3.5	3.8	4.1	4.5	4.8	5.1	5.3	5.6	5.8	6.1
Infant	8.4	9.3	10	10.8	11.4	12	12.6	13.2	13.7	14.3
Pediatric	10.1	11.1	12	12.9	13.7	14.4	15.1	15.8	16.5	17.1

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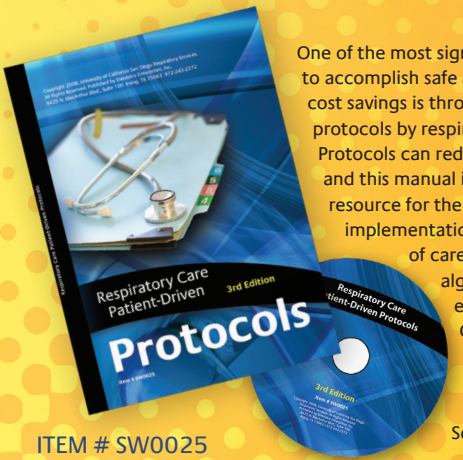

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2299184

WAIT, COLLEGE STUDENTS SLEEP?

Safah A. Esmail[1,2], Amanda L. Roby[1]; [1]Health Professions, Youngstown State University, Youngstown, OH; [2]Health Professions, Mercy Health, Youngstown, OH

The purpose of the research project is to investigate college student's sleep patterns, grade point averages (GPA) and current academic colleges. The lack of sleep, academic curriculum, and certain college requirements of students may make them vulnerable to lower GPA's. The prevalence of sleep patterns, school schedules, and Epworth Sleepiness scores (EES) were all explored. One hypothesis was tested: Some college students get better grade point averages than others because the major or "college" they are in allow them to get more sleep. Methods: A 17 question survey and 8 question Epworth Sleepiness Scale gleaned data to evaluate university student's predisposition to lower grade point averages (GPA). Informed consent was obtained. The survey was distributed on a local college campus to university students. A significant correlation was made between student's "college", ESS and GPA. The students of the College of Health and Human Services reported having an average ESS of 8.69 and GPA of 3.276, where on the opposite side of the issue, the students of the College of Education reported having an average ESS of 4.25 and GPA of 3.905. Conclusions: There is a huge emphasis on the need for sleep education in today's society. Data shows that GPAs are influenced by majors, a heavy school workload and higher ESS scores.

Sponsored Research - None

2299884

EFFECTS OF PHYSIOTHERAPY ON SPIROMETRY AND EXERCISE CAPACITY IN AN INFANT WITH LIVING-DONOR LOBAR LUNG TRANSPLANTATION -A CASE STUDY -.

Masahiko Kimura[1], Shuken Kobayashi[2], Yuuko Namiki[4], Tsuyoshi Ichikawa[4], Manaka Shibuya[4], Ryo Takimoto[4], Tadahiro Kaneko[3], Michinari Fukuda[2], Atsuhiko Matsunaga[4]; [1]Deparrtment of Rehabilitation, School of Allied Health Sciences, Kitasato University, Sagamihara-si, Japan; [2]Department of Rehabilitation, Kitasato University Hospital, Sagamihara-si, Japan; [3]Department of Pediatrics, Kitasato University Hospital, Sagamihara-si, Japan; [4]Kitasato University Graduate School of Medical Sciences, Sagamihara-si, Japan

IntroductionLiving-donor lobar lung transplantation(LDLLT) has recently been proposed to provide a remarkable recovery of lung function, but very few data are available about changes in spirometry, exercise capacity, physical function and activity of daily living after living donor LDLLT in infant recipients. **Case Summery** A 13 year-old boy was suffered from leukemia 3years ago. He had treated chemical therapy followed by stem cell transplantation, finally Bronchiolitis Obliterans required right LDLLT donated from his father in another facility in Japan. According to this clinical course, his physical activity in daily living such as walking and sitting has been decreased. Physical therapy was started from the following day, including breathing reeducation, coughing, stretching, resistance training and aerobic exercise under medical monitoring have been provided continuously. Spirometry(slow vital capacity, forced vital capacity and peak flow), respiratory muscle strength(maximum inspiratory and expiratory oral pressure), grip strength, leg muscle strength, maximal and comfortable walking speed, six-minute walking distance (6MWD) were measured on 12, 18, 24, 36 and 48 weeks after the LDLLT. Both of spirometry and muscle strength were increased in 48 weeks compared with 12weeks after LT. However, 6MD still remains poor until 48weeks after LT.Table1 **Discussion** LDLLT is a greater number of lung transplantations than cadaveric donor lung transplantations in Japan. LDLLT has been performed as a life-saving procedure for critically ill patients who are unlikely to survive the long wait for cadaveric lungs (Date H. *et al,* 2014). Respiratory and physical therapeutic care made him to regain his physical function and exercise capacity. This case report demonstrates that spirometry and exercise capacity were increased until 48weeks after LDLLT, but further improvement of exercise capacity is needed for a LDLLT recipient infant.

Sponsored Research - None

Postoperative functional data

weeks after LDLLT	12	18	24	36	48
FVC [L]	0.70	0.79	0.93	1.03	1.05
PEFR [L/min.]	148.1	147.0	139.1	188.0	199.0
PImax [cmH2O]	49.1	63.9	67.5	74.4	76.0
leg strength [kg]	10.1	11.9	15.9	17.7	18.3
6MWD [m]	270	389	385	380	371

LDLLT, living-donor lobar lung transplantation; FVC, Forced vital capacity; PEFR, Peak Expiratory Flow Rate ; PImax, maxmal inspiratory pressure; 6MWD, six-minute walking distance.

2301220

THE IMPACT OF WARM VS COLD BATH ON HUMAN SLEEP: A SYSTEMATIC REVIEW.

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Abstract: The idea that temperature and sleep are interrelated is based on evolutionary history. The human sleep–wake cycle is usually tightly coupled to the circadian time course of core body temperature (CBT). Throughout the 24-hour day, the occurrence of sleep and wakefulness is closely related to changes in body temperatures. Furthermore, recent research has provided new insights into the relationship between thermoregulation and sleep on the basis of neuroanatomical studies showing significant interaction of the two systems. Changes in skin temperature may causally affect the ability to initiate and maintain sleep. Effects of thermal interventions (heating or cooling) on sleep are not easy to investigate. It still remains to be established whether thermal interventions are governed by sleep propensity outcomes. **Objective:** The aim of this review was to investigate whether or not sleep-onset latency and maintenance could be modulated by home-applicable manipulation of the circadian temperature profile (e.g., by means of warm and/or cold baths) as well as to estimate the stereotypical impact of heat or cold exposure on sleep stages in real-life situations. **Methods**: We conducted a systematic literature review of relevant original articles published between January 1976 and December 2012 by searching the MEDLINE database and EMBASE (from 1980 to January 2010). Only those that were published as full-length articles were considered. No language restriction was applied. **Results:** We identified evidence demonstrating that a decline in core temperature actually proceeds, rather than follows, sleep. Furthermore, circadian changes in the distribution of heat over the body may contribute to sleep onset and continuation. Both direct and indirect manipulations of this process may have contributed to sleep improvements involving age-related sleep disturbances. **Conclusions**: Our review addressed all studies that examined the effect of both timing and temperature of the skin, such as with warm baths, and how they play a key manipulation role as well as effectively accelerating sleep onset in young adults. On the contrary, in elderly with sleep onset and maintenance, insomnia seems to be of crucial importance for feasible treatment for segments of sleep.

Sponsored Research: None. There is no commercial support for this study.
Sponsored Research - None

2303039

THE IMPACTS OF PULMONARY REHABILITATION THERAPY ON OLD AGE PATIENTS WITH MULTIMORBID AFTER CABG SURGERY.

Jui Liu Fang[1,2], Su-Chyn Lin[3], Mei-Lien Tu[1], Shih-Feng Liu[4], Man-Chi Lu[1], Ying-Jui Lin[4], Meng-chih Lin[4]; [1]department of respiratory therapy, Chang Gung University of Science and Technology, Kaohsiung, Kaohsiung City, Taiwan; [2]Department of Respiratory Care, Chang Gung University of Science and Technology, Chiayi, Taiwan, Chiayi, Taiwan; [3]Nursing Department, Taitung hospital, Taitung, Taiwan; [4]Division of Pulmonary and Critical Care Medicine and Department of Respiratory Care, Kaohsiung Chang Gung Memorial Hospital, Kaohsiung, Taiwan, Kaohsiung, Taiwan

Background Previous studies revealed taking coronary artery bypass graft surgery; CABG patient's respiratory function impacted by surgery could be improved by pulmonary rehabilitation. As to our knowledge, few studies focus on pulmonary rehabilitation patients on old age with multimorbid accepted CABG surgery. This study aimed to know the effect of related-respiratory function during pulmonary rehabilitation therapy on old age patients with multimorbid after CABG Surgery. **Methods** This study included 95 CABG patients from January 2009 to December 2009,used purposive sampling selected up to 65 years old with multimorbid group(n=39) and non-multimorbid group(n=56).Two group patients started pulmonary rehabilitation therapy one week before surgery. Include teaching patients to quit smoking, took respiratory exercise, three times a day,15 minutes each time. Upper and lower limb movement(no weight-bearing upper and lower extreme movement) three times a day,30 minutes each time, Incentive spirometer(Triflo-II) three times a day, IPPB trained three times a day,10-15minutes each time, training insisted 2 weeks after surgery. Collected the first day and the 14th day related data of post-surgery, included pulmonary function test, respiratory muscle power, oxygen saturation, pulmonary complication and Borg scale. Using SPSS to carry out Chi-square test, independent samples T-test, paired T-test to analyze related results. **Results** After pulmonary rehabilitation therapy, multimorbid group had statistics significance on MIPcmH_2O, MEPcmH_2O, PaO_2, respiratory rate, Borg scale, FEV_1, FEV_1/FVC, extrapolated volume; In effect of related-respiratory function after CABG Surgery, multimorbid group's duration of chest tube drainage, respiratory failure, atelectasis are statistical significance more than non-multimorbid group. Pneumonia, bacteremia, wound infection, UTI are not significant difference. **Conclusion** Pulmonary rehabilitation therapy on old age patients with multimorbid after CABG Surgery can improve partial surgery-caused impact of respiratory function. We suggest all CABG surgery patients joined pulmonary rehabilitation therapy as soon as possible, it will be helpful to improve post surgery patients recover to health.

Sponsored Research - None

2303140

THE IMPACT OF A PULMONARY REHABILITATION PROGRAM ON PATIENTS WITH COPD AFTER CABG SURGERY.

LIEN SHI SHEN[1], Jui-Fang Liu[1,2], Ying-Jui Lin[3], Man-Chi Lu[1], Shih-Feng Liu[3], Mei-Lien Tu[1], Su-Chyn Lin[4]; [1]Respiratory Care, Chang Gung University of Science and Technology, Kaohsiung, Kaohsiung, Taiwan; [2]Department of Respiratory Care, Chang Gung University of Science and Technology, Chiayi, Taiwan, Chiayi, Taiwan; [3]Division of Pulmonary and Critical Care Medicine and Department of Respiratory Care, Kaohsiung Chang Gung Memorial Hospital, Kaohsiung, Taiwan, Kaohsiung, Taiwan; [4]Nursing Department, Taitung hospital, Taitung, Taiwan

Background Chronic Obstructive Pulmonary Disease (COPD) patients are at great risk for surgery, especially the elderly. The purpose of this study was to examine the clinical efficiency of a 2-week pulmonary rehabilitation program on COPD patients' pulmonary function after CABG surgery. **Methods** A quasi-experimental research design was used to evaluate 78 participants separated into two groups: 40 COPD patients undergoing CABG (aged 25-84 years ; mean±SD63.02±13.48), and 38 non-COPD patients undergoing CABG (aged 22-91 years ; mean±SD63.59±14.48). Smoking cessation, breathing exercise, limb movements exercise, and incentive spirometry training were performed for one week before CABG surgery in both groups. For both groups, chest physical therapy (CPT) and Intermittent Positive Pressure Breathing (IPPB) training were added after extubation post-surgery until patients were discharged. Data about pulmonary function, muscle strength, oxygen saturation, complications, and degree of dyspnea were collected on the first day and 14th day after surgery. Chi-square test, independent samples t-test and paired t-testwere used to analyze the data, with a statistical significance level of P<.05. **Results** The study showed significant differences in Forced vital capacity(FVC), forced expiratory flow in 25% to75%($MEF_{(25-75)}$),FEV_1/FVC ratio and Maximal inspiratory pressures(MIPcmH_2O), Maximal expiratory pressures(MEP-cmH_2O) between experimental and control groups. However, significant differences existed in pneumonia, degree of dyspnea and respiratory failure. **Conclusion** This study showed that the pulmonary rehabilitation program effectively improved the pulmonary function of COPD patients undergoing CABG surgery. Therefore, for promoting the patients' recovery, This program is suggested as a normal for caring patients after CABG surgery.

Sponsored Research - None

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