Perinatal-Pediatrics Bulletin
Sept./Oct. '00

American Association for Respiratory Care

Notes from the Co-Editor

by Doug Petsinger, BS, RRT/RT IV

Greetings! Hopefully, you all had a wonderful Respiratory Care Week, and if you were able to attend the AARC Respiratory Congress, returned with all kinds of helpful information and ideas.

This issue is packed with articles on relevant clinical issues and thought-provoking concerns. As always, I would be most interested in hearing what you think of the content – the positives and the negatives. On that note, I would like to take this opportunity to thank Mr. Allen Bylsma, RRT, for his eloquent reply concerning our recent article on nitric oxide costs. Sir, it was eye opening, but I do not believe that I am brainwashed. However, I do challenge you to compose an eloquent article pertaining to INO or any subject of your fancy and submit it to either Peter Betit or myself.

Peter's "Journal Watch" article in this issue on Vd/Vt in the pediatric patient focuses on another pet topic of mine. I am glad more science is being utilized to justify the benefits of the CO_2SMO+ Respiratory Profile Monitor. As some of you know, I am a huge fan and user of this monitor. We use the VCO_2 to titrate and optimize mean airway pressure and/or PEEP in our patients, as well as access pulmonary blood flow. For more information and scientific studies on this monitor, you can check out the Novametrix web site at www.novametrix.com. They have some interesting research posted. Randy Terry collects scientific data on the variety of uses of the CO_2SMO+ monitor. He is a virtual cornucopia of knowledge and can be contacted at rterry@novametrix.com. So all you CO_2SMO+ users, publish your successes. We will always need more data.

Lastly, I have included a complex case study in this *Bulletin* that I hope you will find intriguing. Is there any interest out there in having a case study each issue? I truly believe that we all can learn from unique and difficult patients and their various forms of medical and/or surgical management. If you agree, please consider sharing a case study with your fellow perinatal-pediatric specialists through this publication. ■

Journal Watch: *Identifying Readiness for Extubation in Pediatrics*

by Peter Betit, RRT

In the June issue of *Critical Care Medicine*, I read with interest a study from researchers at Duke University Medical School that identifies the potential usefulness of deadspace measurements in determining pediatric patients' readiness for extubation. The citation is: CL Hubble, et al. Deadspace to tidal volume ratio predicts successful extubation in infants and children. Crit Care Med 2000;28:2034-2040.

As this paper describes, traditional adult extubation-readiness tools and tests have not been easily applied to infants and children. This study

"Journal Watch" continued on page 2

"Journal Watch" continued from page 1

utilized single-breath CO_2 technology, namely the CO_2SMO Plus monitor by Novametrix. This technology incorporates end-tidal CO_2 and tidal volume measurement via a dual-purpose airway sensor. By means of various calculations and sophisticated software, the monitor "separates out" the amount of gas not participating in gas exchange, that being alveolar and anatomic deadspace. A deadspace to tidal volume ratio, Vd/Vt, is derived along with other respiratory mechanics. This technique is well described in the article.

In the Duke study, 45 patients were deemed ready for extubation by traditional clinical evaluations. Once this determination was made, the patients were switched to pressure-support ventilation, and Vd/Vt measurements were obtained after 20 minutes of equilibration. The aim of the study was to identify the Vd/Vt at which patients were likely to fail extubation and require noninvasive support or reintubation.

In one group in which the Vd/Vt was <50%, 24 of 25 patients were successfully extubated. In a group of patients in which the Vd/Vt was >50% only 8 of 20 patients were successfully extubated. Further analysis identified a group, 6 of 10, that were successfully extubated with a Vd/Vt in the range of 50-65%. Overall in this study, only 7% of the extubation failures required reintubation, with the remaining "failures" (21%) requiring some form of noninvasive ventilatory support.

This study concludes that Vd/Vt measurements are useful in determining pediatric patients' readiness for extubation. It suggests that pediatric patients with a Vd/Vt of <50% will likely be successfully extubated, whereas patients with a Vd/Vt >65% may be likely to have respiratory difficulties following extubation and may even require reintubation. The study further suggests that patients with a Vd/Vt in the range of 50-65% may have some difficulties following extubation but should be considered for extubation. The authors conclude that Vd/Vt measurements may be a useful screening tool and may minimize the inherent variability in determining a patient's readiness for extubation. They suggest that the use of Vd/Vt in guiding decisions to extubate may hasten the decision-making process and may expedite the ventilator course.

I found this to be a well-conducted study and one that put new technology to good use. I sometimes think that, as clinicians, we embrace (and spend a lot of money on) new technology without putting it through its clinical paces. Additionally, I think studies such as this can assist benchmarking/quality improvement initiatives. In my experience on ICU QI committees, statistics such as unplanned extubation rates and extubation failure rates are frequently discussed. What is a reasonable extubation failure rate in a PICU? If a PICU has a very low extubation failure rate, it would suggest that extubations occur too late, whereas a PICU with a high failure rate may be extubating too soon. Tools such as Vd/Vt may help in setting the barometer for extubation failure rates and provide clinicians with an intervention for improvement and evaluation. (*Critical Care Medicine* can be accessed on the Society for Critical Care Medicine web site, www.sccm.org.) ■

Perinatal-Pediatrics Bulletin
is published by the
American Association for Respiratory Care
11030 Ables Lane • Dallas, TX 75229-4593
(972) 243-2272 • FAX (972) 484-2720
e-mail: info@aarc.org

Kelli Hagen
AARC communications coordinator

Debbie Bunch
Bulletin managing editor

Edwards Printing
Bulletin typesetting

Section Chair and Bulletin Co-Editor
Peter Betit, RRT
Children's Hospital
300 Longwood Avenue
Boston, MA 02118
(617) 355-6118
FAX (617) 738-0338
e-mail: betit@hub.tch.harvard.edu

Co-Editor
Doug Petsinger, BS, RRT/RCP IV
Children's Healthcare of Atlanta
Egleston Campus
Sibley Heart Center/CICU
1405 Clifton Rd. NE
Atlanta, Georgia 30322
(404) 325-6577
Pager (770) 353-7651
FAX (404) 315-2806
email: doug.petsinger@choa.org

Medical Advisor
Mark Wilson, MD (ACAI)
(402) 354-5624
FAX (402) 354-5725
email: mwilson@chsomaha.org

Consultant Panel
Mike Czervinske, RRT
University of Kansas Medical Center
Department of Respiratory
Care Education
3901 Rainbow Blvd.
Kansas City, KS 66106-7606
(913) 588-4631
FAX (913) 588-4632
email: mczervin@kumc.edu

Where Do We Go from Here?

by Doug Petsinger, BS, RRT/RT IV

The United States is currently experiencing a nationwide nursing shortage that is only going to get worse. The question is, how will it affect our role as therapists? Already here on the Egleston campus of Children's Healthcare of Atlanta, we are feeling the effects of high acuity and an increasing nurse-to-patient ratio – luckily, without any negative outcomes so far. We have maintained quality care, in part, because of our expanded use of RTs.

As I stated in a previous article concerning decentralization, the management team in the Sibley Heart Center CICU has started utilizing RTs in a nontraditional approach we call "charge." This has also occurred in the PICU, as well as in the general care areas (all of Egleston Campus). In our management meeting yesterday, we all agreed to increase the number of RTs trained to take an active role as a charge person. This will involve increasing my number of full-time equivalents (FTEs) to compensate for pulling a therapist out to perform a charge role, thus ensuring that we can still cover the respiratory

"Where do we go from here" continued on page 3

"Where do we go from here" continued from page 2

needs safely in the CICU.

The concept of utilizing RTs in this nontraditional manner is not unique to our hospital. In late July of this year, there was a large conference in Washington, DC, that addressed the nursing shortage and staffing issues. My nursing manager attended that conference. One of the points that was made was to utilize licensed professionals, such as respiratory therapists, in a nontraditional manner for patient care. So, ladies and gentlemen, these ideas are being mulled over nationally. We need to embrace this notion that an RT can be of even greater benefit at the bedside. I am very excited that our discipline has this opportunity to gain greater stature.

Of course, that doesn't mean that this won't be a difficult road to travel. Not every nurse is going to rush up to us to give us a huge hug, pat us on the back, or sing our praises. We, as a group, need to earn nursing's respect by proving that we are competent in our clinical practice. If we are going to expand our role, we must be trained properly or we will fail. This would be disastrous for our patients, as well as for ourselves.

We also need to keep in mind that not every therapist will be able to transition to an expanded role. Choose your candidates well; just as not every nurse is a great nurse, not every therapist has what it takes to assume these new responsibilities. The world is not perfect, and we do not live in a utopian society.

The redefinition of the therapist's role in patient care will vary from institution to institution according to their particular requirements. Will we replace nursing? No, we will always be therapists. But if we demonstrate the ability and knowledge to expand, patient care will be enhanced. Can an RT become a case manager? Can an RT become a nursing unit educator? Can an RT become a nursing unit manager? Yes, and there is so much more that we can achieve. The sky is the limit.

If we can make this work, we will grow as a discipline. Many of you have already seen your role expand from the traditional therapist to the newer nontraditional approach. So, we are already making strides forward, and now that even greater opportunity is presenting itself as a result of the nursing shortage, we need to gladly accept it and succeed with it. We are living in an exciting world with a bright future. ■

Cardiac Ventilatory Strategies

by Doug Petsinger, BS, RRT/RT IV

In the post-operative phase of the congenital heart patient, ventilatory manipulations are equally as important as inotropic manipulations for adequate systemic cardiac output (C.O.). The surgical repair and the type of defect will drive the exact ventilatory strategy. However, when dealing with a "mixed" lesion or repair, we find, as clinicians, that ventilator strategies, as well as inotropic/pressor strategies, can rapidly change from an increased pulmonary blood flow to a decreased pulmonary blood flow strategy. Consider the following case study:

Term 3.7 kg. Asian male born 12-31-99, hypoxemic, intubated, and placed on 60 IMV, 28/4 cmH_2O, 100%, and 0.3 sec Ti. Cardiac echo revealed single atrium, single ventricle, and TAPVR with r/o obstruction. Chest X-ray revealed large right-sided pneumothorax, tx with 12 Fr chest tube. Transported directly to Children's Healthcare of Atlanta's cathlab for a definitive diagnosis. The patient was Dx. with SA, SV, obstructed TAPVR, dextrocardia, situs inversus, sub-valv. pulm. stenosis, muscular, left aortic arch, left SVC/IVC, and hypoplastic main pulmon. artery. The patient was emergently taken to OR on 12-31-99 at 20:15 for Modified Right Blalock-Taussig Shunt and a complete TAPVR repair.

The patient arrived back in the Sibley Heart Center/CICU at 02:20 on modest inotropic and ventilatory support, along with an open mediasternotomy and abdominal Jackson Pratt drain. Ventilatory requirements were 30%, PCV rate of 30 bpm, 28/4 cmH_2O, Paw at 9.0, and 0.5 sec Ti. Initially, the patient required 3 mcg/Kg/min of Dopamine, 0.5 mcg/Kg/min of Epinephrine, and 0.5 mcg/Kg/min of Milrinone. Filling pressures were maintained between 9-11mmHg by intervascular volume replacement with "Cellsaver" and FFP. The patient remained normocarbic and SaO_2s remained mid 70s-80s. Arterial diastolics remained between 40-57mmHg, despite a large shunt, which led to the belief that there was residual pulmonary artery hypertension.

Over the next 24-hour period the patient remained volume sensitive, requiring an increase in epi to 0.1 mcg/Kg/min and a decrease in the milrinone to 0 mcg/Kg/min, along with still modest ventilator support to maintain normal $PaCO_2$s and SaO_2s in the 70-80% range. Lactic acid levels continued to trend downwards and $AVDO_2$ remained in the 4 vol% range.

The chest X-ray on the morning of 1-2-00 revealed hyperinflation bilaterally and pulmonary interstitial emphysema of the left lung. Our question to the "Team" was, should we convert to HFOV or attempt conventional manipulations? When ventilating in PCV mode, peak expiratory flow and tidal volume are greatly affected by changes in compliance, and with an increase in urine output (UOP) from 1.6 cc/Kg/Hr to 5.6 cc/Kg/Hr, the patient's compliance had changed. We then decided to attempt PRVC with 8-10cc/Kg volumes and increased the rate to maintain minute ventilation and keep the Paw at 12 cmH_2O. The reasoning behind our utilization of PRVC was that we could eliminate the chance for "volutrauma" while maintaining a

"Ventilatory Strategies" continued on page 4

"Ventilatory Strategies" continued from page 3

decelerating flow pattern. While we felt that the PIE issue was being adequately dealt with, the patient's hemodynamics were worsening. The patient's epi requirement increased from 0.1 mcg/Kg/min to 0.13 mcg/Kg/min, then to 0.25 mcg/Kg/min along with continuous volume replacement. Now, we were forced to accept the possibility that the patient's PVR had fallen and were faced with unrestricted pulmonary bloodflow. This is when nitrogen (N_2) ventilation strategy was initiated. FiO_2 ranged from 0.17-0.19 to maintain SaO_2s 65-75% and $Pa0_2$s 30-40 torr. We also maintained a normal pH with $PaCO_2$s 50-60 torr. The change in ventilation strategies and the increase in inotropic support stabilized the patient's blood pressure, along with a further downward trend in lactic acid levels.

The patient's post-operative course continued to be labile. On 1-4-00 the chest remained open, the chest tubes were suctioned out surgically, and the main pulmonary artery was banded to decrease native pulmonary blood flow. The chest was closed on 1-7-00 without any further manipulations of the PA band. Because of failure to progress with weaning from mechanical ventilation, unexplained mixed acidosis, and bilateral pleural effusions, a cardiac cath was performed. The results were less than stellar; a Qp/Qs of 3/1, pulmonary artery hypertension (PAH), and right upper pulmonary vein stenosis (RUPV). The decision was made to attempt to manage medically over the weekend; despite N_2 ventilation and other strategies, surgical intervention was necessary. On 1-18-00 a corset was placed around the 4.0 mm BTS to essentially narrow it to a 3.0 mm diameter. The patient continues to limp along, still mechanically ventilated and essentially unable to wean. ■

Computerized Specialty Exam

Are you are interested in taking or re-taking the Perinatal/Pediatric Specialty Exam? If so, you'll be interested to know that the NBRC is now offering testing by computer, which allows you to receive your results immediately upon completion of the exam. A memo from the NBRC indicated that there are no application deadlines, the exam can be taken at a computer center of your choice, and the credentialing documentation will be mailed one month after successful completion. In addition, the exam can be taken every 90 days, which expands the examination offering from annually to four times each year. There are nearly 100 computerized assessment centers across the country, and the exam is available on a daily basis. Additional information on the NBRC Perinatal/Pediatric Specialty Exam can be found on the NBRC web site, www.nbrc.org. ■

Where Did the Section Go?

If it's been awhile since you visited the AARC web site, AARC Online (www.aarc.org), you might be surprised to find that things have changed. As part of its efforts to streamline the information offered on the web site, the Association has revamped the look and feel of the site, classifying everything into one of ten categories:

- Member Services
- Community
- Resources
- Government Affairs
- Career Center
- Education
- Marketplace
- International
- Foundation
- Patient Care

If you're left wondering what happened to the Perinatal-Pediatric Section homepage, don't worry – it's still there. The AARC simply consolidated all of its networking/communication functions – including the Specialty Sections – under the menu heading "Community." You can find the link to the section by either clicking on this heading on the main site menu or pointing your browser directly to: http://www.aarc.org/community/index.html. You can also learn more about the web sites overall by reading the article on the changes located at: http://www.aarc.org/headlines/guide/. ■

Are You on the Perinatal-Pediatric Section Email List?

Sign Up Today on Your Section's Home Page!

http://aarc.org/sections/section_index.html