



Perinatal-Pediatrics

Bulletin

July/August '99

2

Dealing with Dying

3

Oxygen-Air Shunting:
A Forgotten Problem

Bacterial Tracheitis
on the Rise: Replacing
Epiglottitis?

4

A Transport Team
Perspective

5

Pertussis: Not Just a
Disease of Infancy
Anymore

Opportunity Knocks!

American Association
for Respiratory Care

Notes from the Guest Editor: a View from Cincinnati, OH

by Jenni L. Raake, BS, RRT, Perinatal-Pediatric Specialist, Children's Hospital Medical Center, Cincinnati, OH

In this issue you will find several articles from practitioners at Children's Hospital Medical Center (CHMC) in Cincinnati, OH, so I thought I would begin by telling you a little about our hospital.

CHMC is a 285-bed institution located in the heart of Cincinnati. Our campus is comprised of eight buildings on the main site and several outpatient facilities scattered throughout the Cincinnati area. We employ over 4000 people, including 78 respiratory therapists.

With a primary focus on patient care, we have a 55-bed level III neonatal intensive care unit, a 30+ bed cardiac/pediatric intensive care unit, and a 12-bed

rehabilitation unit. We are a trauma center, providing high technology services such as ECMO and inhaled nitric oxide.

In addition to patient care, we are active in education, providing CEUs, CRCEs, and CMEs for all staff members. We also participate in community education such as injury prevention, PALS, CPR, and other patient and family focused projects.

Research plays an important part in our institution as well. The Sabin polio vaccine was discovered here decades ago. Since that time, our research facilities have grown to encompass three buildings, all of which have ongoing research projects. ■

ELSO Liaison Report

by Doug Hansell, BS, RRT

My name is Doug Hansell and I am the AARC's liaison to the Extracorporeal Life Support Organization (ELSO) and the ECMO program director at Wake Forest Baptist Medical Center in Winston Salem, NC. I have been a respiratory therapist for 18 years and an ECMO specialist for the past ten. I have served as the liaison since 1994 and find it to be both pleasurable and an honor to represent our profession to the multidisciplinary group that comprises ELSO.

As the ELSO liaison, my primary focus is to maintain a high level of visibility for the respiratory care profession to the members of ELSO, encouraging inclusion of RTs in all facets of ECMO practice. I continue to promote RTs as ECMO specialists and emphasize the versatility and breadth of our background.

As the ECMO patient population has changed from primarily newborns with respiratory failure to patients of all ages with both respiratory and cardiac disease, RTs have become invaluable. The number of RTs serving as ECMO specialists has increased, and the number of pro-

grams staffed solely by RTs has grown as well. Recently, a position statement on the use of RTs as ECMO specialists was published. Hopefully, this statement will assist centers in expanding their scope of practice and encourage the use of RTs as ECMO specialists.

There is an ongoing challenge to include ECMO in the scope of practice in state respiratory care practice acts. Local chapters of the American Society for Extracorporeal Technology (AmSECT), which represents the perfusionist profession, have voiced opposition, presumably because they fear that RTs will attempt to further expand their scope of practice to the cardiac operating room. Despite the non-exclusionary language of our state practice acts — for example, in my home state of North Carolina, we have specifically defined ECMO as a therapy being performed outside the operating room — these challenges remain.

One way we can solidify our role in ECMO is by participating in ECMO research and other activities on a state

"ELSO" continued on page 2

“ELSO” continued from page 1

and national level. I have been actively encouraging RTs involved in ECMO to submit abstracts to the AARC Open Forum. Many RTs are already contributing abstracts and leading roundtable discussions at national and regional ECMO meetings. RTs have also been selected as the ECMO Specialist of the Year several times since the award's inception at the ELSO annual meeting in 1994. James T. Connelly, RRT, from Children's in Philadelphia, was the first to be honored. Additional RTs who have earned this dis-

inction are Philip Rogers, RRT, from Arkansas Children's and Don Lipscomb, RRT, from the Medical College of Georgia. We congratulate them on their accomplishments and contributions.

For those of you who wish to participate in online discussions regarding ECMO, the University of Washington maintains the “ECLS-net.” Membership is limited to health care professionals with an interest in ECLS. Once you join, you can send messages which will be distributed via the internet to all of the subscribers, each of whom can then post a reply. To subscribe, e-mail: list-

proc@u.washington.edu. The message should contain a single line: subscribe ecl-net<your name & title>.

I would like to encourage the members of this section to contact me at the following address/numbers with any questions or concerns they might have regarding RTs and ECMO: Doug R. Hansell, BS, RRT, ECMO Program Coordinator, Respiratory Care Services, Wake Forest University Baptist Medical Center, Winston Salem, NC 27157, (336) 716-1049, FAX: (336) 716-6121, Page: (800) 277-7654, e-mail: dhansell@wfbmc.edu. ■

Dealing with Dying

by **Jerry Edens, RRT**

I wish I could say there is a tried and true way to appropriately process the death of your patient. Unfortunately,

most of the literature is geared to the surviving family members. That is why I started my own research into the topic, which showed that we definitely need to collect more data to make any further assumptions. There are insights to be gained, however, from talking to fellow health care practitioners about the subject. Here are a couple of contributions that I found particularly valuable:

Mommy May I: Annamarie Borich, Children's Hospital Medical Center, Cincinnati, OH

Dying children sometimes need permission to leave. They need to know they are safe and their family and friends are safe and comfortable with them leaving. Then they can pass peacefully.

But the loss is still unbearable. The pain and echo of a mother's cry is unforgettable, total anguish. It makes you feel the grief and the void, then the silence. It is so very sad, and yet so powerful. At times you feel at a loss for words, but a hug always feels right to me. Whispering to a family member that they've been a good mom or sister or dad is always appreciated and feels comfortable. And there is always reminiscing. Favorite stories bring comfort. There is an incredible strength that children and their families show throughout the dying process. It is always a lesson.

A Prayer: Jackie Caccia, RRT, Jewish Hospital, Cincinnati, OH

She tiptoed in, and throwing an apologetic look, whispered, “Sorry to bother you, this will just take a minute.” I watched her carefully. Every movement choreographed as she dipped to drain the tubing, twisted to press the overhead monitor keys, and stretched to grab the clipboard.

The patient was a 61-year-old male. He was dying. He was my father.

If you've ever been in this situation, maybe you'll understand. If you haven't, I hope you never have to face it. Please know that there is a time when “enough is enough.” We were blessed with better than average understanding and a physician who wasn't afraid to admit that further interventions probably wouldn't change anything. Not every family is as lucky as we were.

Late one Saturday afternoon, the physician, therapist, and nurse unhooked the wires and the tubes and stood vigil with my family for the few minutes it took for my father to finish dying. I've performed that same act as a part of my duties both before and after my father's death. I don't do it lightly. I never have. I offer a silent prayer. A prayer for the patient, for those left behind, and for those who offer themselves as warriors against death. ■

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 Editor

Peter Betit, RR T

Children's Hospital
300 Longwood Avenue
Boston, MA 02118
(617) 355-6118
FAX (617) 738-0338
e-mail: betit@a1.tch.harvard.edu

Medical Advisor

Mark Wilson, MD (ACAI)

(402) 390-5624
FAX (402) 354-5746
email: mwilson@childrens_omaha.com

Consultant Panel

Mike Czervinske, RR T

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

“Disease Management of Asthma” • September 24-25, 1999 – Cleveland, Ohio

The course you have been asking for!

**Developed Using National Institutes of Health Asthma Guidelines
for the Diagnosis and Management of Asthma**

Earn 11 hours of CRCE credit!

Preregistration required. Register by 8/30 to receive discounted rates (AARC Members \$175/ Nonmembers \$250). Contact the AARC for more information or visit AARC Online at www.aarc.org

Oxygen-Air Shunting: A Forgotten Problem

by Jenni L. Raake, BS, RRT, Perinatal-Pediatric Specialist

In the early 1980s, several journal articles were written about problems with oxygen-air shunting. In these articles, the air supply was contaminated by the oxygen supply. Or worse, the oxygen supply was contaminated by the air supply. The end result was that patients in the intensive care and operating areas were subject to incorrect delivery of oxygen levels. Unfortunately, this problem is not gone, just possibly forgotten. In reviewing some of the articles, common factors were discovered:

1. The patients were all being ventilated either through a mechanical ventilator or anesthesia machine.
2. There were flowmeters, air-oxygen mixers, or ventilators connected to source gases but not in use.
3. The connected devices could be in one patient care area, but the shunting could occur in a nearby area of the hospital.
4. The air pressure set by clinical engineering was higher than the oxygen pressure.

The various journal articles examined ventilators, anesthesia machines, oxygen vs. air pressure, and air-oxygen mixers. Some of the problems experienced and conclusions reached by the investigators were:

1. A two week period of erratic fluctuation in oxygen supply. This was relat-

- ed to a brand-new ventilator blender.
2. Three episodes of hypoxemia during cardiopulmonary bypass. Related to faulty blenders and elevation of air pressure over oxygen pressure.
3. Fluctuating oxygen concentrations from medical gas outlets. This was blamed on faulty check valves on oxygen and air devices.
4. A 14-month-old became severely hypoxic during surgery. Analysis of inhaled gas revealed an FiO₂ of room air. The situation was blamed on a defect of 2mm in the diaphragm of the blender. This created a pressure gradient and allowed the oxygen to be contaminated by the air supply.
5. Inaccurate oxygen concentrations delivered to patients due to malfunctioning check valves and internal diaphragms.
6. During anesthesia, a patient suffered from severe hypoxia. Investigation showed two unused ventilators were connected to medical gases in an adjacent wing.

The investigators concluded that any device that mixes oxygen and air is susceptible to and can cause contamination of source gases. Contamination can occur in the gas source with the lowest wall pressure. Gradients between wall pressure settings can cause contamination. The problem can occur when

unused air-oxygen devices are connected to medical gas outlets. Faulty check valves can create this problem. The problem may occur intermittently because check valves may operate normally even when a malfunction is present. The problem can also be caused by dirt, water, or small pieces of the diaphragm within the blending device, which can cause the check valves to function improperly. Additionally, defects in the diaphragm may create this problem.

Recommendations for resolution of the problem have included:

1. Regular preventive maintenance of all inhaled gas equipment.
2. Safety checks of oxygen supply pipelines, including oxygen analysis.
3. Underwater leak checks of all air-oxygen blending or mixing systems.
4. Oxygen supply pressures should be equal or slightly higher than air pressure.
5. Disconnection of any unused gas devices, including flowmeters, air-oxygen mixers, anesthesia machines, and mechanical ventilators.
6. Continuous analysis of oxygen levels on all ventilators and/or anesthesia machines.

Hopefully, attention to these details will prevent others from experiencing these problems. And then the problem will be gone, but not forgotten. ■

Bacterial Tracheitis on the Rise: Replacing Epiglottitis?

by Jenni L. Raake, BS, RRT, Perinatal-Pediatric Specialist

Jessica is six-year-old female who went to her doctor because of a sore throat, fever, and difficulty breathing. Just a few hours later, she was intubated and placed on a mechanical ventilator due to the severity of her symptoms. While the pediatrician suspected acute epiglottitis, the diagnosis was actually bacterial tracheitis.

Pediatric patients with respiratory distress caused by upper airway obstruction often require endotracheal intubation. Historically, pediatric patients with these symptoms were often suspected of having acute epiglottitis. Since the hemophilus influenza vaccine has become available, epiglottitis may no longer be the diagnosis. Instead, it may be bacterial tracheitis.

Bacterial tracheitis is characterized by symptoms similar to those of acute epiglottitis: sore throat, fever, and acute

upper airway obstruction accompanied by purulent tracheal secretions. In the past, patients who presented with bacterial tracheitis were often young children. They demonstrated signs of respiratory distress such as stridor and often required endotracheal intubation. These same patients were often cultured and staphylococcus aureus was the most common organism involved.

Today, bacterial tracheitis may be caused by a variety of organisms. Journal reports have included a wide variety of bacteria. Some patients diagnosed with bacterial tracheitis have cultured positive for bacteria such as moraxella catarrhalis, influenza A, corynebacterium diphtheria, staphylococcus aureus, haemophilus influenzae type B, peptostreptococcus, prevotella, porphyromonas, and fusobacterium.

In addition to the change in organ-

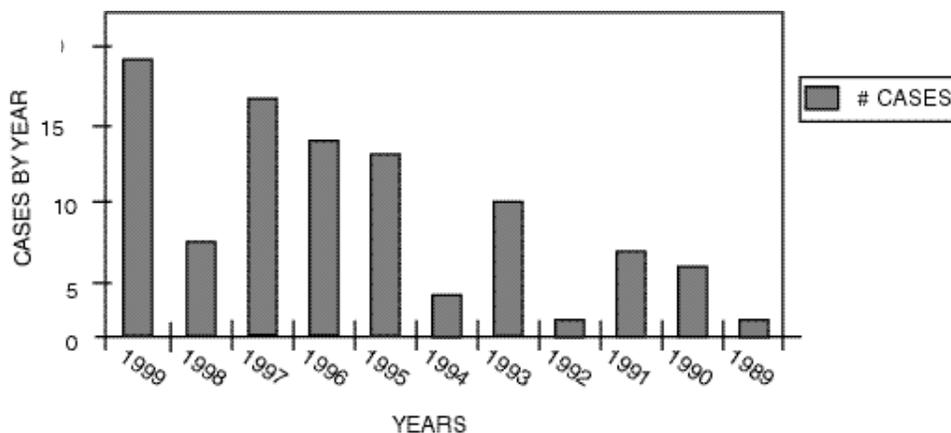
ism, bacterial tracheitis may be having an affect on older pediatric patients as well. In the past, tracheitis was known to have affected younger children. Children, adolescents, and early teenagers have all been diagnosed with tracheitis over the last several years.

At Children's Hospital Medical Center (CHMC), we have seen an increase in the number of bacterial tracheitis cases over the past decade, especially those involving the older pediatric patient. (See Figure 1 on page 4) There was a progressive increase in the number of cases, followed by a marked drop in 1998 and then a sharp rise this year. If the trend continues, the next few years will have more cases than this year.

"Bacterial Tracheitis" continued on page 4

Bacterial Tracheitis" continued from page 3

FIGURE 1



Since January of this year, CHMC has seen 19 patients with bacterial tracheitis. The mean age for this group was 11.42

years. The oldest patient was 17 and the youngest was eight. While the need for intubation has been less with the older

population, the majority of these patients were intubated for two to five days while recovering from bacterial tracheitis. ■

A Transport Team Perspective

by Kie Shelley, RRT, Perinatal/Pediatric Respiratory Care Specialist, Children's Hospital Medical Center Transport Team, Cincinnati, OH

Any respiratory therapist who has ever worked with neonatal or pediatric patients can appreciate how quickly their condition can deteriorate. Oxygen saturations, blood pressures, and heart rates in bottom out in just a few short seconds. Even in the most advanced NICUs and PICUs, these patients can be hard to stabilize and manage. When these patients present at facilities not equipped to handle them, the need for a specialized neonatal/pediatric transport team arises.

At Children's Hospital Medical Center in Cincinnati (CHMC), this dedicated transport team is composed of a 70/30 mixture of RNs and RTs. Physicians from emergency medicine, ICU, and PICU are incorporated into the team for some of these transport runs. The CHMC Transport Team currently transports approximately 850 critically ill children and neonates per year locally, nationally, and internationally via ambulance, helicopter, and fixed-wing aircraft.

One of the most important factors in the success of our team is our cohesiveness. Our close-knit family atmosphere promotes the trust that is essential to perform as a true team. The team members cross-train in each other's duties to be able to work as a coordinated unit while transporting a critically ill child. By joining together, the RNs and RTs trust the assessments and decisions made by their transport colleagues. Transport team members come from a wide variety of backgrounds, such as the PICU/CCU, ICU, and pediatric emergency room.

Communication is one of the most important elements of a successful team. Effective communication between team members, the medical control physician, the referral hospital, the receiving unit, and the ambulance or air service is essential to promote a seamless transition in care. The RN and RT collaborate on a "game plan" during the trip to the referring facility, then improvise on this plan based on the patient's condition on arrival at the facility.

The skills required to be a transport therapist differ from usual hospital based skills. Included are: PALS, NRP, BTLIS (Basic Trauma Life Support). Some RTs are also ACLS certified. Other skills include: endotracheal intubation, IV insertion, emergency UVC placement, x-ray interpretation, excellent assessment skills, fluid management, air transport safety, and flight physiology. The transport therapist must also be able to resist getting "ambulance face" (otherwise known as motion sickness). This dreaded condition often occurs from traveling a long distance in the back of a warm, noisy ambulance while facing backwards.

Diplomacy and public relations are of paramount importance. The first impression of CHMC most parents, patients, and referral facilities receive is of the therapist and the nurse from our transport team. These scared and overwhelmed persons look to us as the experts and place their trust in us to safely transport their child to CHMC (often from another

city or state).

Transport therapists must give excellent care to these critical patients while dealing with issues and conditions not normally encountered by hospital-based therapists. These conditions can consist of working with limited gas supplies when using transport ventilators, auscultating a patient in a noisy ambulance, intubating at night in the ambulance, or changing IV fluids in a swaying ambulance while trying desperately not to fall upon the patient.

Equipment can also pose interesting challenges. While several companies make transport equipment, it usually needs modification to work with our neonatal and pediatric population. Differing sizes among the pediatric and neonatal populations that we transport can pose a multitude of equipment challenges. Having to configure specialized transport isolettes and stretchers to fit into multiple aircraft designs can prove frustrating. A team member who happens to be mechanically inclined can be a valuable asset at these times.

As the future unfolds for our team, we look forward to advanced technology equipment, such as improved transport ventilators, and transporting patients on medical specialty gases such as nitric oxide and nitrogen. As CHMC and the Transport Team expand their horizons, this advanced equipment and these advanced team skills will meet the needs of patients into the new century. ■

Pertussis: Not Just A Disease Of Infancy Anymore

by Beverly L. Connelly, MD, associate professor of pediatrics, division of infectious diseases, Children's Hospital Medical Center, Cincinnati, OH

Pertussis or "whooping cough" is the toxin mediated disease caused principally by infection with *Bordetella pertussis*. The disease progresses through three clinical stages: the catarrhal stage, the paroxysmal stage, and the convalescent stage. During the catarrhal stage, which may last a week or more, pertussis is like any other mild upper respiratory infection. It is during this stage that the infection may be the most contagious. This stage is followed by the paroxysmal stage, during which prolonged bouts of forceful coughing are often followed by the characteristic inspiratory "whoop" in toddlers and young children. Coughing may be so forceful as to result in conjunctival and scleral hemorrhages, CNS hemorrhages, upper body petechiae, umbilical and inguinal hernias, subcutaneous emphysema, pulled muscles, and even broken ribs. Post-tussive vomiting is often described following paroxysms as well and may result in dehydration and nutritional compromise in young infants. Symptoms resolve gradually during the convalescent stage, which may take weeks.

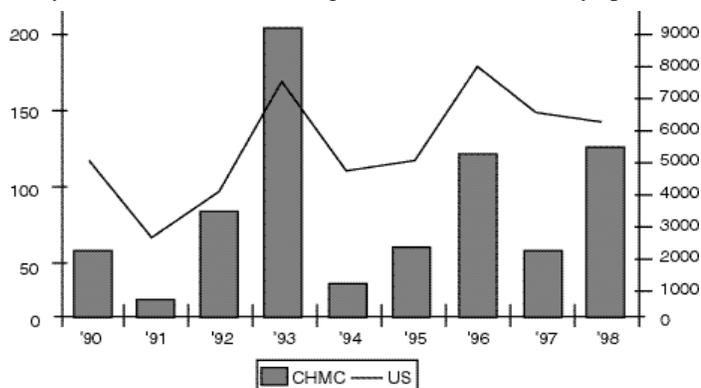
Although widespread use of pertussis-containing vaccines is estimated to be higher than at anytime in the past, the reported incidence of pertussis in the US continues to increase. Following the introduction of whole-cell pertussis vaccine, the number of cases reported in the US fell, reaching an all time low of 1010 reported cases in 1976. Since then, outbreaks have been recognized throughout the US, with the largest outbreak reported from Cincinnati occurring in 1993. Experience in the US over the last couple of decades has demonstrated a three-to four-year cyclic nature to pertussis disease. A similar trend has also been seen in Cincinnati, as shown in Figure 1. Given these recent trends, we anticipate 1999 will be a busy year for pertussis in the Greater Cincinnati area.

In addition to the general increase in pertussis, it is notable that more disease has been reported in older children and adolescents than ever before. The number of culture-confirmed cases seen in school age children in Cincinnati over the past several years has been increasing,

especially in the elementary school age group, a group in which protection from vaccine administration prior to school entry might be expected to be at its highest. During 1998, over half of the pertussis cases reported in the Cincinnati area were in children over five years of age. Of particular note: in Cincinnati in 1999 there was a dramatic increase in cases in middle school age children, which may be attributable to a local school outbreak. The overall reasons for increased pertussis activity in older children are as yet unclear.

These data require additional investigation in order to determine whether immunization status, vaccine potency, vaccine efficacy, or durability of response are responsible for the current trends. However, it is clear that pertussis is no longer a disease of undervaccinated infants and toddlers alone. Health care providers must maintain a high index of suspicion for pertussis in individuals with coughing illnesses to facilitate diagnosis and treatment of infected individuals and to minimize secondary spread. ■

Figure 1:
Pertussis cases from 1990 through 1998, Children's Hospital Medical Center (CHMC) and the US. Only culture-confirmed CHMC cases are shown here. US cases shown are those reported in the *Summary of Notifiable Diseases* published by the Centers for Disease Control and Prevention (CDC)."



Opportunity Knocks!

Does your career need a professional growth spurt? Feel as though you would like to make more of a contribution to the field? Here are two opportunities that may help.

Perinatal-Pediatric Specialty Section Bulletin co-editor: As co-editor you will assist with the composition and compila-

tion of items for this Bulletin. You will facilitate opportunities for the section membership to participate and assist guest editors.

Perinatal-Pediatric Section chair-elect: As chair-elect you will be oriented to the role of section chair. You will join the chair at the 1999 AARC Congress in

Las Vegas and assist with some of the conference activities, including the annual section meeting.

If you are interested please contact Peter Betit at the addresses/numbers listed on page 2. ■

Corrections

Please note the following corrections to the article "VCO₂ Monitoring and Such (Metabolic Ramblings)" which appeared in the May/June issue of the Bulletin. At the top of the third column on page three,

both occurrences of the abbreviation, "VOW" should have been "VO₂" and the abbreviation "WOB" was used for "work of breathing."

If you would like to contact Doug

Petsinger, BS, RRT, the article's author and guest editor of the May/June issue, you may do so by phone, 404/325-6577, email dpetsing@egleston.org, or mail, 382 Danbury Lane, Decatur, GA 30032. ■

American Association for Respiratory Care
11030 Ables Lane
Dallas, TX 75229-4593

Non-Profit Org.
U.S. Postage
PAID
Permit No. 7607
Dallas, TX