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IN THIS ISSUE

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Neonatology Today (NT) is a monthly newsletter for BC/BE neonatologists and perinatologists that provides timely news and information regarding the care of newborns and the diagnosis and treatment of premature and/or sick infants.

Upcoming Meetings
(see website for additional meetings)

PAS/ASPR (Pediatric Academic Societies / Asian Society for pediatric Research)
April 30-May 3, 2011; Denver, CO USA
http://www.pas-meeting.org/2011Denver/default.asp

SAN/AAP District X Section on Perinatal Pediatrics 25th Annual Conference
May 19-22, 2011; Marco Island, FL USA
http://www.southeastneo.org/

Recruitment Ads: Page 2 and 10

Synchronized Ventilation in Neonates: A Brief Review

By Vineet Bhandari, MD, DM

Keywords: mechanical ventilation, nasal ventilation, newborn

Abbreviations

- BPD: bronchopulmonary dysplasia
- BW: birth weight
- CV: conventional ventilation
- Edi: electrical activity of the diaphragm
- ELBW: extremely low birth weight
- ETT: endotracheal tube
- GA: gestational age
- I:E ratio: inspiratory:expiratory time ratio
- IMV: intermittent mandatory ventilation
- FiO_2: fraction of inspired oxygen
- LBW: low birth weight
- MAP: mean airway pressure
- NCPAP: nasal continuous positive airway pressure
- NDI: neurodevelopmental impairment
- NICU: neonatal intensive care unit
- NIPPV: nasal intermittent positive pressure ventilation
- PIP: peak inspiratory pressure
- PEEP: positive end expiratory pressure
- PSV: pressure support ventilation
- RCT: randomized controlled trial
- RDS: respiratory distress syndrome
- SIMV: synchronized intermittent mandatory ventilation
- SNIPPV: synchronized nasal intermittent positive pressure ventilation
- Ti: inspiratory time
- VLBW: very low birth weight
- WOB: work of breathing

Abstract

Mechanical ventilation in neonates has made some considerable strides over the years. This article will briefly review the various modes and clinical experience with synchronized ventilation in newborns. Both invasive and non-invasive forms of synchronized respiratory support will be discussed.

Introduction

One of the commonest methods of providing respiratory support in the neonatal intensive care unit (NICU) is the use of intermittent mandatory ventilation (IMV) mode in a time-cycled and pressure-controlled manner. In this mode, the operator fixes the following variables: inspiratory time (Ti), inspiratory to expiratory time (I:E) ratio, inspiratory flow rate, peak inspiratory pressure (PIP), positive end expiratory pressure (PEEP), ventilator rate and fraction of inspired oxygen (FiO_2). The ventilator provides a "fixed" number of mandatory breaths. The interspersed spontaneous breaths by the infants utilize the fresh con-

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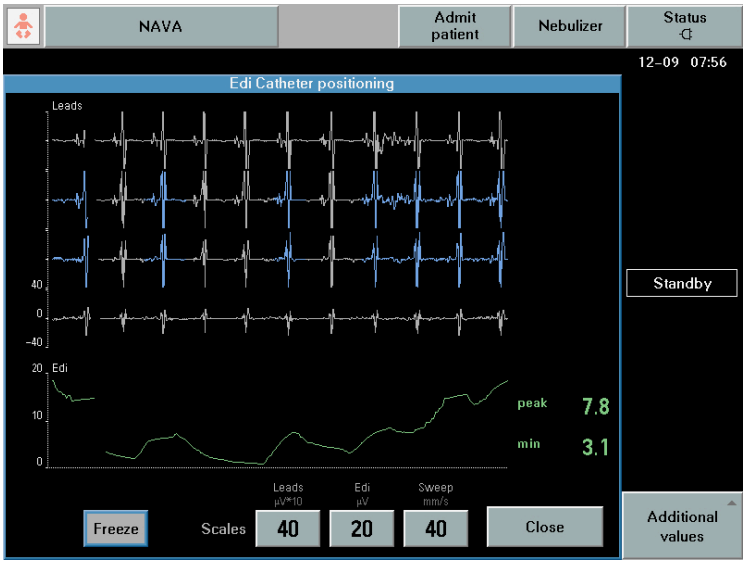

Figure 1. Proper positioning of the Edi catheter is noted by the decreasing amplitude of the esophageal EKG tracings from top to bottom, with "blue" highlighting of the middle two tracings.

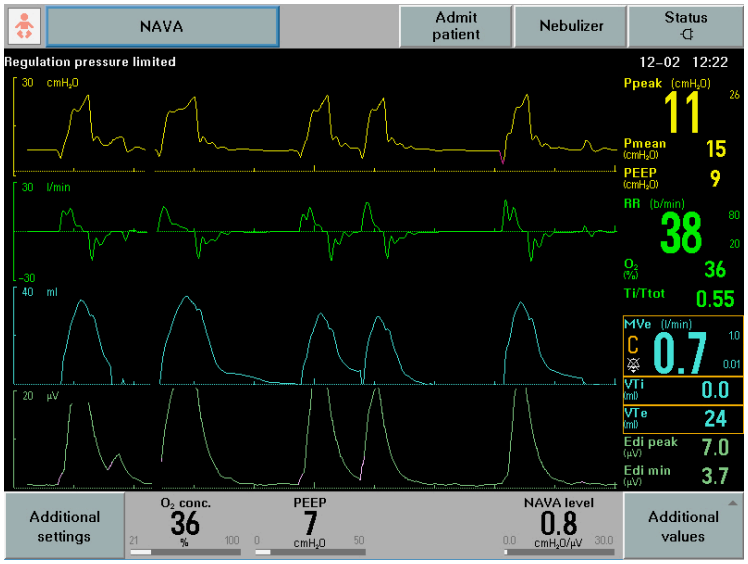

Figure 2. This shows the synchronization of the infant's inspiratory effort (detected by the Edi signal: bottom "green" tracing) to that of the ventilator (top "yellow" tracing) during invasive ventilation in the NAVA mode.

tinuous gas flow in the ventilator circuit. However, there is an obvious element of dyssynchronicity in respiratory support in such a mode as the timing of the "ventilator" and "baby" breaths are not coordinated. The potential adverse effects of such dyssynchronus ventilation include need for increased mean airway pressure (MAP), need for increased FiO_2, blood pressure and intracranial pressure fluctuations. An attempt to counteract such effects has been by using sedation and/or muscle paralysis. Unfortunately, these measures may also have adverse consequences. For example, use of morphine analgesia in ventilated preterm infants prolonged the duration of invasive mechanical ventilation, with worsening respiratory outcomes.[1] Muscle paralytic agents increase the risk of developing anasarca. Sedation and paralysis also interfere with the assessment of the neurological status of infants as well as depress their respiratory drive. Hence, synchronization of the infants' efforts to that of the ventilator has been advocated as a means to overcome the above-mentioned drawbacks.

This article will briefly review the principles of the different methods of synchronization that are currently available in the USA. In addition, modes of synchronized ventilation and the clinical experience with neonates will be highlighted by a few examples. Both invasive and non-invasive synchronized modes of ventilation will be discussed

Methods of Synchronization

Synchronization requires the early detection of inspiratory effort by the infant, which would then trigger the ventilator to coordinate its' own breath with that of the infant. A variety of triggering methods have been used, each having their advantages and disadvantages.[2] Each of these modes will be briefly discussed.

1. Chest wall impedance. The breathing signal is generated by changes in transthoracic impedance that occurs with inspiration and expiration as a result of changes in the ratio of air to fluid in the thorax. It is influenced by blood volume fluctuations in the cardiac cycle. The two chest leads are usually placed in the anterior axillary line on the right and the posterior axillary line on the left, high enough to avoid areas of costal and sub-costal retractions. Sensitivity setting needs to be adjusted to avoid auto-cycling and to have optimal triggering on spontaneous breaths. This system is used in the Sechrist IV-200 SAVI ventilator (Sechrist). This method of synchronization is susceptible to chest wall distortion, and can be influenced by cardiac and motion artifacts.[3, 4] The type of cardiorespiratory monitor used is very important for achieving optimal response time: signal delay.[4]
2. Pneumatic capsule. Since infants exhibit "paradoxical breathing", the outward motion of the abdominal wall can be detected by the Graseby capsule. This method was used in the Infant Star ventilator with the StarSync module (no longer available in the USA). The response time was 53 ± 13 ms. Appropriate placement is essential for the proper detection of the infant's inspiratory effort and subsequent triggering by the ventilator.[4] The capsule signal is usually not affected by cardiac activity, ventilator breaths, water in the circuit or air leak around the uncuffed endotracheal tube (ETT).[4]
3. Airway pressure triggering. This occurs by a change in the airway pressure of 0.5 cmH_2O, as used in the SLE2000 (SLE Ltd.) ventilator.
4. Airway flow triggering. The flow sensor is at the ETT connection with the ventilator. Various types of airflow sensors are used in the different ventilators. The VIP Bird (CareFusion) uses the variable orifice differential pressure flow transducer. The dual hot wire anemometer flow sensor is utilized in the Babylog 8000 (Draeger). The Bear Cub (CareFusion) uses the hot wire anemometer flow sensor. The flow sensor adds about 1ml of dead space, which can be a problem in extremely low birth weight (ELBW) infants. One of the problems with this triggering method is auto-triggering, secondary to ETT leaks. This can sometimes be overcome with decreasing trigger sensitivity. However, if the trigger is less sensitive, more effort will be required by the infant to set it off and can result in a delay in response time.
5. Diaphragm electromyogram (EMG). This method detects the electrical activity of the diaphragm by sensors incorporated in a feeding tube. For proper functioning, the feeding tube needs to be positioned optimally (Figure 1). This system triggers the ventilator by detecting the inspiratory effort based on the electrical activity of the diaphragm (Edi) (Figure 2). This system provides neurally-adjusted ventilatory assist (NAVA) and is used in the Servo-i ventilator (Maquet). ETT leak does not interfere with this method of synchronization.

Modes of Synchronized Invasive Ventilation

In a recent survey of ventilation practices, the three most common modes of synchronized ventilation for respiratory support in the NICU were synchronized IMV (SIMV) (60%), assist control (31%) and pressure support ventilation (PSV) (3%).[5]

Figure 3. This shows that the ventilator adjusts the level of support proportional to the infant's inspiratory effort during invasive ventilation in the NAVA mode. Compare the last four tracings on the right in the bottom "green" tracing to the similar ones on the top "yellow" tracing.

1. SIMV.[2] It is the same as IMV mode, except that the "mandatory" breaths are synchronized with the infant's "spontaneous" breaths. Importantly, breaths over and above the "mandatory" breaths are not synchronized. This can lead to uneven tidal volumes and increased work of breathing (WOB). This can be further worsened by high airway resistance (for example, using a smaller diameter ETT), diminished muscle strength and excessively compliant chest wall of the premature infant.
2. Assist control.[2] In this mode of ventilation, the ventilator synchronizes with all "spontaneous" breaths of the infant. An apnea back-up rate is set, and weaning is done by decreasing PIP, as the infant controls the "effective" ventilator rate.
3. PSV.[2] Similar to assist control, except termination of breath occurs when inspiratory flow decreases to a preset threshold (~10-20% of flow). Each "spontaneous" breath is given a "pressure boost." This mode of ventilation can be used to support "spontaneous" breaths when on SIMV mode, which can be useful in weaning.
4. NAVA. In this mode of ventilation, the ventilator adjusts the level of support proportional to the infant's inspiratory effort (Figure 3). It is essential to have an apnea back-up rate as this mode is dependent upon and is influenced by the proper functioning of the respiratory centers in the brain.

Clinical Experience with Synchronized Invasive Ventilation

1. Chest wall impedance. This was evaluated in LBW infants (BW: 450-1250g; n=110) in a non-randomized study.[6] Infants receiving respiratory support by the SAVI ventilator had a shorter duration of ventilation and oxygen therapy.[6] In addition, there was decreased progression of intraventricular hemorrhage to ≥ Grade III in these infants.[6] Another study (median BW: 943g; median gestational age (GA): 28 weeks; median study age: 11 days; median study weight: 838g; n=10) was conducted to determine effectiveness of the trigger signal.[3] The response time between the beginning of inspiratory flow and the occurrence of trigger signal (signal delay) was 44 msec. The response time between the beginning of inspiratory flow and the occurrence of triggered breath (trigger delay) was 176.5 msec. The rate of auto-triggered breaths was 11.25%. The authors concluded that, given the long trigger delay and the high susceptibility to false triggering, it was not a reliable trigger signal for synchronized ventilation in preterm infants.[3]
2. Pneumatic capsule. This was studied in a prospective, multicenter, randomized controlled trial (RCT) in neonates with respiratory distress (mean GA: 30.6 weeks, mean BW: 1654g; n=327).[7] Infants on SIMV (n=167) (using the Infant Star with StarSync) were compared with IMV (n=160), and were found to have a reduction in mean ventilator pressures in all. In certain sub-groups (BW: 1000-2000g; SIMV n=75; IMV n=69), oxygenation significantly improved at 1h in the SIMV group.[7] In the sub-group BW >2000g, the duration of mechanical ventilation was shorter in the SIMV group (n=47) versus IMV (n=46). In addition, the rate of bronchopulmonary dysplasia (BPD) was decreased in the sub-group BW<1000g in the SIMV-exposed infants (n=45), compared to those managed with IMV (n=45).[7] In another randomized, cross-over study in very LBW (VLBW) infants (BW: 777 ± 39g; GA: 25.1 ± 0.3 weeks; n=18), IMV was compared with SIMV (using the Infant Star with StarSync). Infants on SIMV had significantly lower number and lesser duration of hypoxemia episodes.[8] As mentioned earlier, this ventilator is no longer available in the USA.
3. Airway pressure triggering. In this study using the SLE200 ventilator, preterm infants (≤28 weeks GA; age ≤2 weeks; n=10) were studied.[9] The comparison was done with airflow trigger (using the Babylog 8000). Airway pressure triggering had 74% versus 97% sensitivity with airflow sensing (p=0.005).[9]
4. Airway flow trigger. In seven neonates, the median trigger delay was 80 ms.[10] In these infants on SIMV mode using airway flow trigger (hot wire anemometer), oxygenation, tidal volume of spontaneous breathing and minute volume were improved.[10] The resistive WOB was decreased.[10] The authors concluded that this mode may lessen inspiratory muscle fatigue.[10] In another study of LBW infants done to determine effectiveness of the trigger signal, the response time between beginning of inspiratory flow and the occurrence of trigger signal (signal delay) was 0.0 msec.[3] The response time between beginning of inspiratory flow and the occurrence of triggered breath (trigger delay) was 135.5 msec.[3] The rate of auto-triggered breaths was 0.55%. The authors concluded that given the acceptable trigger and low rate of auto-triggering, it was a clinically useful trigger signal.[3] A RCT was conducted in LBW infants (BW: 500-1000g) comparing SIMV (n=54) versus SIMV+PSV (n=53).[11] The proportion of infants requiring mechanical ventilation at day 28 was significantly lower in the SIMV+PSV group, with no differences in BPD or mortality.[11]
5. Flow vs. pressure-cycled ventilation. Two small, short-term, randomized, individual cross-over trials have been conducted.[12] Both trials reported on lung mechanics and short-term respiratory physiology outcomes but not on clinical morbidities or mortality.[12] The authors concluded that there was insufficient evidence to determine the safety and efficacy of flow-cycled compared to time-cycled synchronized ventilation in neonates.[12]
6. NAVA. A study was conducted using the Servo-i ventilator in LBW infants (n=7) with a mean GA of 26 weeks, BW of 936g and postnatal age of 12 days.[13] The infants were studied over a brief period i.e. Sixty min baseline +20 min NAVA-intubated +20 min NAVA-extubated. There was good correlation between ventilator-delivered pressures and Edi.[13] In another study reported as an abstract (Stein, HM and Howard, D. E-PAS 2010;4407.333), the NAVA mode was compared with SIMV/pressure control with PSV. The LBW infants (BW: 470-1440g; GA 22-32 weeks; n=41) on NAVA mode had their PIP decreased by 23% and FiO2 decreased by 16% after 1 hour. Neonates with pH <7.34 or pCO_2 ≥ 50 mmHg significantly improved their blood gases on NAVA, which were sustained over 24 hours.

Modes of Synchronized Non-invasive Ventilation

Non-invasive ventilation is essentially providing IMV using the nasal continuous airway pressure (NCPAP) interface. Most studies that reported the use of synchronized nasal intermittent positive pressure ventilation (SNIPPV) in neonates have used the Infant Star ventilator with StarSync (no longer available in the USA), which used the Graseby capsule to achieve synchronization. One study used a nasal-flow synchro-

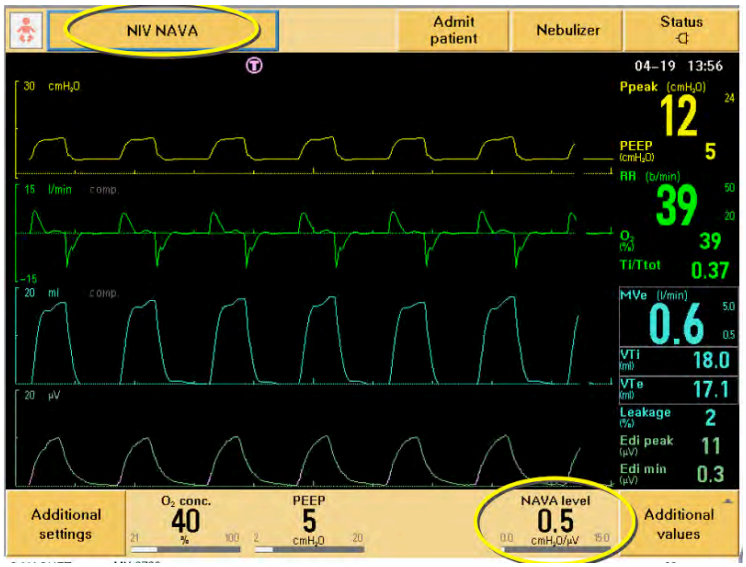

Figure 4. This shows the synchronization of the infant's inspiratory effort (detected by the Edi signal: bottom "green" tracing) to that of the ventilator (top "yellow" tracing) during non-invasive ventilation in the NAVA mode. Note that the level of support provided by the ventilator is proportional to the infant's efforts.

nized ventilator (Giulia, Ginevri, Rome, Italy).[14] Non-invasive ventilation using NAVA was proportionally synchronized to infants' breaths (Figure 4) as reported over 20 minutes in a small study of five LBW infants.[13]

It is important to clarify that the SNIPPV mode of ventilation is different from the respiratory support provided by the Infant Flow SiPAP Comprehensive (CareFusion) ventilator (not available in the USA). The latter is a bi-level device, providing higher and lower pressures, with much longer Ti, compared to SNIPPV mode. The PIPs generated by the SiPAP device are typically[9-11] cmH_2O. A detailed description of the methodology, clinical experience and evidence-based guidelines of SNIPPV in neonates has recently been published.[15]

The "primary mode" of SNIPPV refers to its use soon after birth.[15] This may or may not include a short period (≤2 hours) of ETT intubation to deliver surfactant, prior to extubation. The "secondary mode" of SNIPPV refers to its use following a longer duration (>2 hours to days to weeks) of invasive (ETT) mechanical ventilation.[15]

Clinical Experience with Synchronized Non-invasive Ventilation

1. Primary mode. Infants in a prospective, observational pilot trial of 28 to 34 weeks GA with Respiratory Distress Syndrome (RDS) requiring surfactant (n= 24) with early extubation to SNIPPV had a shorter duration of intubation, and decreased need for oxygen as compared to conventional ventilation (CV) (n=35).[16] A subsequent RCT compared outcomes of premature infants (600-1250g BW) who were randomized to either immediate extubation to SNIPPV following surfactant administration (n=20) or continuing on CV (n=21).[17] More babies in the CV group had the primary outcome of BPD/death, compared to the SNIPPV group (52% versus 20%, p=0.03), with no difference in other common neonatal morbidities.[17]
2. Secondary mode. It has been shown that SNIPPV (n=34) was significantly better than NCPAP (n=30) in preventing extubation failure within 72 hours (and even after including "late failures") in infants recovering from RDS.[18] The efficacy and safety of this technique has also been reported by others.[19-21] Introduction of SNIPPV in a NICU with no prior experience with that modality resulted in infants having significantly less need for supplemental oxygen and decreased BPD, without affecting the incidence of other short-term morbidities.[22] Furthermore, there were no differences between the two groups in nutritional intake or growth parameters.[22] In another RCT, successful extubation was accomplished in 90% in the SNIPPV group (n=32) versus 61% in the NCPAP group (n=31) (p=0.005).[14]
3. Long-term outcomes. In the RCT utilizing primary mode SNIPPV that reported long-term outcomes, no differences in the Mental or Psychomotor Developmental Index scores were noted in infants managed with SNIPPV or continued on CV.[17] A retrospective data set was used to evaluate the use of SNIPPV in infants ≤1250g BW, in three BW sub-groups (500-750, 751-1000, 1001-1250g).[23] After logistic regression analysis, adjusting for significant covariates, infants who received SNIPPV (compared to those who received NCPAP) in the BW category 500-750g were significantly less likely to have the long-term outcomes of BPD (p=0.01), BPD/death (p=0.01), neurodevelopmental impairment (NDI) (p=0.04), and NDI/death (p=0.006).[23]

Conclusions

In a meta-analysis, compared to conventional ventilation, use of synchronized (invasive) ventilation demonstrated a shorter duration of ventilation.[24] It was concluded that further trials were needed to determine whether synchronized ventilation is associated with other benefits. In addition, the authors recommended that optimization of trigger and ventilator design should be encouraged prior to embarking on further clinical studies.[24] Furthermore, the authors stated that it was essential that newer forms of triggered ventilation be tested in adequately powered RCT with long-term outcomes prior to being incorporated into routine clinical practice.[24]

A meta-analysis, comparing secondary mode SNIPPV with NCPAP in the post-extubation period, reported that SNIPPV was more effective than NCPAP in preventing failure of extubation, with a reassuring absence of side-effects.[21, 25] This initial meta-analysis appears to be

"More data from adequately powered RCT with long-term outcomes are needed to evaluate the benefits of SNIPPV use in the primary mode (with or without surfactant), prior to making definitive recommendations.[15] "

borne out with more recent studies.[15] Additional studies are needed to assess the usefulness of SNIPPV to manage apnea, as a means to avoid intubation. More data from adequately powered RCT with long-term outcomes are needed to evaluate the benefits of SNIPPV use in the primary mode (with or without surfactant), prior to making definitive recommendations.[15]

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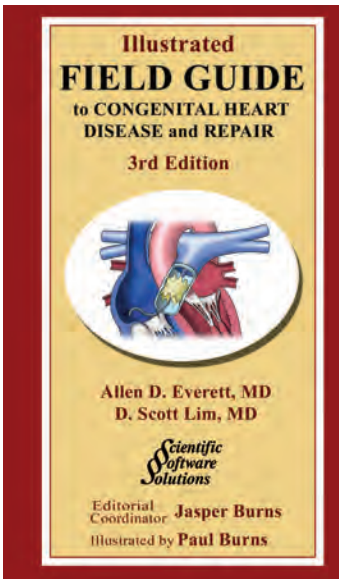
Book Review: Illustrated Field Guide to Congenital Heart Disease and Repair, Third Edition

By John W. Moore, MD, MPH

Even if you have the First or Second Editions, take a serious look at the *Illustrated Field Guide to Congenital Heart Disease and Repair.* The Third Edition is now available, and it takes this useful guide to a new level!

The Third Edition improves on the previous editions with new chapters on Hybrid Procedures and Percutaneous Valve Implantation. Every chapter has been revised and up-dated, especially the ICU and the Pharmaceutical chapters. The art work, one of the Guide's strongest features, just gets better, with over one hundred new or modified diagrams and a more realistic style. Like earlier editions, the Third Edition is published by Scientific Software Solutions, Inc. in Charlottesville, Virginia. (www.pedHeart.com)



The principle authors are Allen Everett and Scott Lim, and the illustrations are by Paul Burns. Contributing authors include the following: Marcia Buck, Jane Crosson, Howard Gutgesell, Luca Vricella, Stacie Peddy, Marshall Jacobs, David Cooper and Jeffrey Jacobs. There are ten chapters: The Normal and Fetal Heart, Congenital Heart Defects, Echocardiography, Catheterization Lab Interventions, Percutaneous Valve Insertion, Hybrid Therapies, Congenital Heart Surgeries, Cardiac ICU Topics, Electrophysiology, and Cardiac Pharmaceuticals. The chapters are quick reads and provide essential information, as well as many important details about congenital heart disease and clinical practice.

The drawings, illustrations and diagrams continue to be the single outstanding feature of the Field Guide! They are accurate, numerous, and attractive to view. They are well–labeled and simple to understand. Also, the colors reinforce the relevant cardiovascular physiology. The echo still-frames are relatively few, but of adequate quality; however, the few angiogram stills are low quality and need improvement.

The Field Guide continues to be available in pocket size, which fits easily in your lab coat pocket for use on rounds and quick reference on the run. It is also available in a larger size with large print and diagrams suitable for use in the office or clinic for education of patients and families, and for medical education. Both sizes are sturdy ring-bound paperbacks.

The *Illustrated Field Guide to Congenital Heart Disease and Repair*, Third Edition is highly versatile and fills several important educational niches. For patients and families, it is an excellent reference and an aid to their understanding of the heart defect and the clinical approach that cardiologists and surgeons are taking to treat it. For nurses, technologists, medical students, and residents, it provides easy-to-access essential educational material about congenital heart disease and clinical practice. This allows them to "get up to speed" with the clinical dialogue and treatment of patients they encounter in the clinic or on the ward, and to converse intelligently with cardiovascular physicians. For "adult" cardiologists, pediatricians, internists, and other practicing physicians; it provides a quick updated review of congenital heart defects and current clinical practice. This may be helpful in their general care of patients with congenital heart disease, and in communication with congenital cardiovascular specialists.

Like most of you reading this review, I remain "in the field" most of my professional time. This Guide looks more useful than ever to me, so I plan to get the Third Edition for my lab coat pocket and some copies of the larger edition for the Rady Children's Hospital Cardiology Clinic. I'm also thinking about giving a copy to our new fellows as they arrive for orientation.

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June 10;, 2011; Fiddler's Elbow Country Club, Bedminster Township, NJ USA
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Who Should Attend:
Physicians, Fellows, Residents, NNPs. RN's, RT's and others related to the field.

Overview:
Conference will highlight innovative and contemporary approaches to neonatal care with a focus on fostering collaboration and dialogue among neonatology groups in the greater NJ area to improve infant outcomes.

This activity will be submitted for AMA PRA Category 1 Credit™. This program has been accredited 6 CRCE's. Applications for CEU/CME's will be submitted.

Guest Speakers:
- Eduardo H. Bancalari, MD, *Professor of Pediatrics and Obstetrics & Gynecology; Director, Division of Neonatology*, University of Miami, Leonard M. Miller School of Medicine; Jackson Memorial Hospital
- Richard A. Ehrenkranz, MD, *Professor of Pediatrics and Obstetrics, Gynecology & Reproductive Sciences*; Yale-New Haven Children's Hospital; Yale University School of Medicine
- Neil N. Finer, MD, *Professor of Pediatrics; Director, Division of Neonatology*; University of California San Diego Medicine Center; University of California San Diego School of Medicine
- Kristi L. Watterberg, MD; *Professor of Pediatrics; Vice Chair, Department of Pediatrics; Chief, Division of Neonatology;* University of New Mexico School of Medicine

One-Day Program:
- Lectures by internationally renowned speakers
- Clinical forum with open discussions among all attendees
- Academic poster presentations by regional neonatal health care professionals
- Sponsor exhibits

Newborn Screening Increases Survival Outcome for Patients with Severe Combined Immunodeficiency

A study published January 27th in *Blood, the Journal of the American Society of Hematology* (ASH), demonstrates that babies with Severe Combined Immunodeficiency (SCID) who are diagnosed at birth and receive a hematopoietic stem cell transplant (HSCT), which is the transplantation of blood-forming stem cells, have significantly improved survival.

SCID is a rare group of genetic disorders characterized by severe abnormalities of the development and function of the immune system due to a defect in the specialized white blood cells that defend the body from infection. Patients with SCID lack almost all immune defenses, are prone to serious, life-threatening infections within the first few months of life, and require major treatment for survival beyond infancy. The most effective treatment for SCID is HSCT from the bone marrow of a healthy person. According to the Immune Deficiency Foundation, if a baby with SCID receives a bone marrow transplant in the first 3.5 months of life, the survival rate can be as high as 94%.

"If diagnosed early enough, it is probable that every baby with SCID could be treated, and most likely, cured," said Fabio Candotti, MD, Vice Chair of the ASH Scientific Committee on Immunology and Host Defense and Head of the Disorders of Immunity Section in the Genetics and Molecular Biology Branch of the National Human Genome Research Institute at the National Institutes of Health. "Research that promotes early screening and diagnosis is vital for advancing the idea of universal adoption of testing."

The investigators conducted a retrospective cohort study by comparing the outcomes of 60 babies diagnosed at or before birth (between 1982 and 2010) with the outcomes of their relatives who also had the disorder using information gathered from databases from Great Ormond Street Hospital NHS Trust and Newcastle General Hospital in London, UK.

Results from the study show that, in comparison to the family member with SCID, babies diagnosed at birth had a significantly decreased number of infections (89% versus 17%, respectively). Patients in the early-diagnosed group were also transplanted earlier and had a dramatically improved survival outcome following HSCT, regardless of donor match, conditioning regimen (chemotherapy or radiation given immediately prior to a transplant to help eliminate the patient's disease and to suppress immune reactions), or type of SCID.

The study showed that 35.4% (17 patients) of the 48 family members with SCID died before HSCT, and among the 31 of them who underwent HSCT, 38.7% (12 patients) died after the procedure. In comparison, only one patient in the early-diagnosed group died before HSCT and five patients (8.5%) died after HSCT. The transplant survival rate of the early-diagnosed group was 91.5% ($p<.001$) compared to 61.3% ($p<.001$) of their relatives with SCID.

"This is the first study that shows formal comparative data to demonstrate that newborn diagnosis can improve survival in SCID patients, regardless of the type of donor or conditioning regimen used," said H. Bobby Gaspar, MD, PhD, senior author of the study and Professor of Pediatrics and Immunology at University College London (UCL) Institute of Child Health in London, UK. "There is currently no newborn screening for SCID in the UK; the United States is the only country that has started screening for SCID, although only a small number of states are screening at this time."

Care of Late-preterm Preemies May Be Insufficient

In the last 15 years the US has seen a sharp increase in the number of babies born as late-preterm infants, between 34 and 37 weeks' gestation. This is approximately 400,000 children each year, comprising over 70% of all preterm births. Often, late-preterm infants are treated the same as full-term infants since they are commonly a similar size and weight. Growing research is showing that this can be detrimental to a late-preterm infant's health and frequently results in readmission to the hospital within the first month of life.

"Late-preterm infants are often treated as though they are developmentally mature, when in fact they are physiologically and metabolically immature. This makes them more susceptible to developing medical complications, such as respiratory problems, hypothermia, low blood sugar, jaundice and poor feeding," said Ramzan Shahid, MD, Medical Director of the Newborn Nursery as Loyola University Medical Center.

A review of the medical charts of late-preterm infants born at Loyola University Hospital revealed that late-preterm infants who are 36 weeks gestational age and received the same care as full-term infants were almost twice as likely as infants born at 34 or 35 weeks who received care in the NICU to have an emergency room visit in the first month of life. These findings were presented at the American Academy of Pediatrics National Conference and Exhibition held in San Francisco, CA, last Fall.

"This leads us to believe that health-care providers may have a false sense of security when treating late-preterm infants the same as full-term infants," said Shahid.

The review also found that late-preterm infants who were sent home less than 48 hours after birth also were twice as likely to have repeat hospital visits and late-preterm infants who only stayed in the newborn nursery or with their mother were three times more likely to be readmitted to the hospital than those who spent time in the NICU.

"These findings show that late-preterm infants need specialized care. They should not be released in less than 48 hours after birth and need to be in a NICU or monitored closely in a Level 1 Newborn Nursery. Closely monitoring these babies will help to identify potential complications early on and may prevent subsequent readmission," said Shahid.

In response to these findings Loyola University Hospital's Birth Center has created a

protocol for the management and care of late-preterm infants. All infants born less than 35 weeks' gestation are monitored in the NICU. Clinically stable infants between 35 and 37 weeks' gestation are admitted to the newborn nursery where they are closely monitored for respiratory distress, hypothermia, low blood sugar, jaundice and feeding difficulties.

The new protocol includes:

- Nurses checking vital signs at hour one, two and four immediately after birth and then every four hours for the first 24 hours.
- The volume and duration of feedings also are closely monitored. Lactation consultants assist in monitoring mothers who wish to breastfeed. The infant's weight is taken daily to help track feeding changes. If weight loss is greater than 7% from birthweight a change will be made in regard to feeding.
- Late-preterm infants will remain in the hospital for at least 48 hours and until the following criteria are met:
  - Good temperature regulation
  - Stable blood sugar
  - Adequate feeding for 24 hours
  - Stable vital signs for 12 hours preceding discharge
  - Weight loss of no more than 7% of birthweight
- A follow-up visit with a physician will be scheduled for 24-48 hours after hospital discharge.

"It is imperative for us to recognize the complications and risks to these special patients and do all we can to ensure they are safe and healthy when they go home," said Shahid.

The pediatric and obstetric staffs work closely together to ensure parents are aware of the unique care their child will receive once he or she is born. This includes meeting with the obstetrician and being given written information about the care he or she will receive in the newborn nursery.

"Parents are happy to know their child is receiving the specialized care he or she needs and relieved and comforted to know that when it is time to go home their baby will be healthy and there is a lower chance of readmission," said Shahid.

JUNE MEDICAL MEETING FOCUS

Evidence-based Neonatology
- Today and Tomorrow

June 2-5, 2011; Karolinska University Hospital, Stockholm, Sweden
http://ebneo.org/

Preliminary Program and Speakers:

- Evidence-Based Medicine: In Sherlock Holmes' Footsteps - *Jörgen Nordenström, Sweden*
- Refining Neonatal Care by Sharing and Comparing Outcome Data - *Shoo Lee, Canada*
- RDS – Surfactant or CPAP, or Both? - *Kajsa Bohlin, Sweden*
- Individual Patient Data Metaanalysis – a Road Map for the Ventilation Strategy - *Filip Cools, Belgium*
- Evidence-based Management of BPD – What Can We Do While Waiting - *Barbara Schmidt, USA*
- Pulmonary Hypertension of the Preterm Infant – Diagnosis and Treatment - *TBA*
- Inotrops in Preterm Infants – Evidence For and Against - *Alan Groves, UK*
- Ductus Treatment – Best Practice Today and Future Prospects - *Bart van Overmeire, Belgium*
- Oxygenation of Term Infants, the Good, the Bad and the Evil Aspects - *Ola Saugstad, Norway*
- Oxygenation of Preterm Infants, What is too Little, What is too Much - *Michele C. Walsh, USA*
- Hypothermia – What Should We Do, Where Do We Go from Here? - *Nicola J. Robertson, UK*
- Symptomatic Treatment of Seizures in Term Infants – When, What and Why? - *Linda de Vries, Netherlands*
- Evidence-based diagnosis and treatment of neonatal septicemia - *Jeffrey S Gerdes, USA*
- Catheter related blood stream infections (CRBSI) - *Timothy Stevens, USA*
- EBM and hyperbilirubinemia in term and preterm infants - *Peter Dijk, Netherlands*
- Prediction and Prevention of ROP - *Ann Hellström, Sweden*
- Management of Procedural and Postoperative Pain - *Marilyn Escobedo, USA*
- Family-centered Care - *Annica Örtenstrand, Sweden*
- Policy making on Extremely Preterm Birth – Practice, Politics and Ethics - *Gorm Greisen, Denmark*
- Evidence-based Neonatology – What Can We Expect Tomorrow? - *Haresh Kirpalani; USA*

Global Neonatology Today: A Monthly Column: *The Millennium Summit 2010 and MDG #4 and 5*

By Dharmapuri Vidyasagar, MD, FAAP, FCCM

The *Summit on Millennium Development Goals* in 2010 focused on MDG (Millennium Development Goal) #4: To Reduce Child Mortality, and MDG #5: To Improve Maternal Health.

One of the main outcomes of the UN *Summit on the Millennium Development Goals* was that it attracted large number of pledges and partners to strengthen the efforts in attaining these goals. There were commitments of more than $40 billion worldwide with involvement of governments, private sectors, foundations, and international organizations. "We know what works to save women's and children's lives, and we know that women and children are critical to all of the MDGs," said the UN Secretary-General Ban Ki-moon, referring the programs to be implemented across the globe.

The United Nations Children's Fund (UNICEF) highlighted the need to focus on the most disadvantaged children. According to a new study by UNICEF, it was recognized that investing in the world's most disadvantaged children and communities can save millions of lives, and help spur progress towards achieving internationally agreed development targets.

Contrary to general thinking, it is now recognized that focusing on the poorest and most disadvantaged children is most cost-effective. Hence, greater emphasis is placed on these children. UNICEF kicked off a major concerted worldwide effort to accelerate progress on women's and children's health.

Over $40 billion was pledged for the Global Strategy for Women's and Children's Health for over next five years. It is estimated that the program has the potential of saving the lives of more than 16 million women and children, preventing 33 million unwanted pregnancies, protecting 120 millions of children from pneumonia and 88 million children from stunting, advancing the control of deadly diseases such as malaria and HIV/AIDS, and ensuring access for women and children to quality facilities and skilled health workers.

The details of the commitments for the $40 billion for Global Strategy for Women's and Children's Health can be found on www.un.org/sg/globalstrategy. Here are some examples:

- Canada reaffirmed its commitment to mobilize more than $10 billion from the G8 and non-G8 leaders, key donors and private foundations over the next five years through the Muskoka Initiative for maternal, newborn and child health.
- Trinidad and Tobago announced the launching of a Children's Life Fund to provide emergency medical care and surgery for children for medical procedures that cannot be accessed in Trinidad and Tobago.
- LifeSpring Hospitals in India has committed to provide an estimated 82,000 Indian women and their families with access to low-cost quality healthcare. Over the next five years, LifeSpring is expected to increase the number of hospitals serving mothers and children throughout India from 9 to 200, which will improve standards of care and reduce maternal and childhood deaths.

There are similar commitments of several non-government organizations (NGOs) and government programs around the globe to reach set MDG #4 and #5 targets. These are all welcome signs. However, only time will tell whether all countries will reach their set target goals.

"***The Clock is Ticking!"***

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