

NEONATOLOGY TODAY

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NEONATOLOGY TODAY

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Fresno Community Regional Medical Center Updates Clinical Information System to Meet NICU Challenges with Centricity Perinatal

By Kris Anderson, RN and Stephen Elliott, MD

Providing care for more than 10,000 obstetric patients annually can be challenging, especially when those 10,000 patients include all of the high-risk pregnancies from 30,000 total pregnancies in the region. This is a situation that requires a robust clinical information system. Such was the case at Fresno, California-based Community Regional Medical Center, a 65-bed, level III neonatal intensive care unit (NICU). Given the high patient volume, an electronic medical records (EMR) system had to meet the many complicated challenges associated with delivering a continuum of perinatal care across multiple units. We met this need through the use of GE Healthcare's Centricity Perinatal Information System.

The move to electronic medical records in the maternal and child services division at Fresno Community Regional Medical Center started in 2001 when we implemented a clinical information system in the labor and delivery area. After successfully getting the system up and running, we customized the solution to support work processes in our post-partum unit. This approach has been successful so far.

Certain challenges arose, however, when we tried to implement this system in the NICU in 2007. Although we had previously customized the system to meet the needs of clinicians in the labor and delivery and post-partum units, tweaking the system to meet the needs of the neonatal care unit proved to be more complicated—as the department provides care to a patient popu-

lation that is high-risk, with complex conditions involving prematurity, birth defects and multiple births. Delivering life-saving care to neonatal patients is, in most cases, inherently more complex than treating maternity patients.

Thus, our facility required a robust clinical information solution that could meet the specific, specialized requirements of the neonatology unit. We sought a customizable system that offered the functionality required to:

- Automate data collection from technology such as ventilators, eliminating the need for nurses to manually input data from such devices.
- Collect a wide array of data such as CO₂, pulse oximetry readings, cardio-respiratory monitoring, apneas, heart rate and blood pressure.
- Access information from the fetal strip, which is commonly used to electronically monitor how well the baby is doing within the contracting uterus and for detecting signs of fetal distress.
- Offer the comprehensive interdepartmental information that neonatal clinicians need to treat their patients.
- Provide information on the mother's health or the birthing history – important considerations when treating babies in the neonatal unit.

Previously, clinicians were doing the majority of their charting the old fashioned way – with pen and paper. We took a few of the paper charting forms that the neonatology nurses were using and converted these into electronic versions. Unfortunately, the nurses were not satisfied with this hybrid – manual and electronic – approach, so we began searching for another solution.

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Clinician: Clinician viewing Centricity Perinatal at the bedside.

Upgrading the EMR Experience

Instead of considering this a major setback in our efforts to implement technology advantages, GE Healthcare, Barrington, Ill., worked with us to continue marching forward with GE Centricity Perinatal, a clinical information system that supports documentation of mothers and infants through the perinatal continuum. We were committed to progressing towards an electronic system that would streamline processes in the NICU and help ensure the highest possible quality of care to our patients. Upon customizing the solution, Centricity Perinatal made it possible for the electronic medical records system to accommodate the complex needs of the neonatal area by providing the NICU-specific information and functionality needed to treat patients efficiently.

Documenting care in the patient chart was made easier. Maternal clinical information now flows across units through the Mother-Baby link that automatically updates both mother and baby records simultaneously. In addition, “normal” values can be configured and then selected for individual patients. This helps our clinicians make assessments more quickly and streamline documentation of patient condition. With the system in place, neonatal physicians also have access to historical information on mothers, making it possible to become more proactive in their care delivery. Now, NICU physicians routinely review a mother’s information before she gives birth. If they anticipate that the baby will be born early, they meet with the mother prior to giving birth and prepare her for what to expect in the neonatal care unit.

Centricity Perinatal also builds the discharge summary from the beginning—as soon as the

mother is admitted—eliminating the need for nurses to compile a summary when releasing the patient – thereby easing workflow.

Another benefit is the elimination of steps before a doctor sees a patient. Doctors no longer need to print vital signs before seeing patients. Instead, they simply log into the system to get vital information at the point of care. The system also enables clinicians to access the latest findings in obstetrics and neonatology to ensure adherence to evidence-based clinical standards.

Perhaps most importantly, the system provides access to specific patient data collected across the continuum of care, so caregivers can view information from any unit while treating patients. Heart monitoring results stored on fetal strips, for example, are electronically accessible to all caregivers. Doctors can even access these fetal strips on their portable handheld devices.

As such, neonatal doctors have more complete information, including the mother’s labor and delivery history at their fingertips to facilitate better care decisions. Such access to information is especially important in the neonatal unit where the delivery of proper care is contingent upon a variety of historical factors.

Case in point: A fetus was diagnosed with congenital anomalies on prenatal ultrasound, and the mother had various medical conditions as well. When the baby was delivered precipitously at our sister facility across town, the infant had to be transferred to the NICU at our regional center. NICU doctors need to have information about the mother, prenatal care and the birth before developing and implementing a treatment plan for the baby. Previously, the systems at Community Regional Medical Center and its sister facility were not integrated; hardcopy charts had to be transported or faxed back and forth, and potential care delays were common. With Centricity Perinatal, however, all of the information is integrated into one common electronic record, making it possible for the neonatologist to access maternal data and thereby immediately treat the baby upon arrival at the NICU.

Realizing Results

GE’s Centricity Perinatal is helping our NICU improve efficiency and reduce costs. For example, it makes it possible to cold feed records to the hospital’s main electronic medical records system. Instead of faxing records and having a staff member scan the information into the system, the data is automatically uploaded into our hospital’s main EMR system.

Through the reduction of paper and streamlined workflow, our hospital is saving more than \$70,000 per year. Additionally, Centricity Perinatal has increased our visibility of patient care activities occurring in each department, which resulted in improved handling of staffing levels in the NICU nursery. The ease of integration

between units and other clinical information systems has been an important success factor.

Centricity Perinatal is also improving care by helping the NICU reduce errors caused by transcription mistakes. As the electronic record is automatically populated with reliable data, it lessens data loss while improving the ability to retrieve patient records. Most obviously, it enables nurses to spend more time delivering patient care and less time entering data into charts. While there is still a learning curve associated with electronic documentation, we have already experienced a corresponding decrease in charting time.

Clinicians are also delivering a higher level of care to our patients. For example, doctors are now using the system much more frequently to access sophisticated clinical information that helps them deliver better care to patients. Remote internet access to Centricity Perinatal allows clinicians to securely view patient records from any location within and outside the hospital.

Centricity Perinatal also offers a clinical alerts feature, which the NICU plans to begin using later this year to help us continue delivering quality care. With this functionality in place, clinicians will be alerted to take specific actions when patient care indicators reach certain levels, enabling faster response to patient events that can potentially improve outcomes.

Updating our clinical information systems to integrate the maternal/infant record across labor and delivery, maternal care, NICU and post-partum units posed a unique challenge that required extensive customization. Given that the system had to accommodate the needs and requirements of users in multiple departments, it was a time consuming process that required our staff to learn new workflows. Ultimately, we rose to the challenge and have made major inroads toward improving patient care—one record at a time. We look forward to connecting our records system with other referring healthcare facilities across the state in the future, enabling the next step toward secure health information exchange.

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Highlights from NEO-The Conference for Neonatology 2010

By Alan R. Spitzer, MD

NEO-The Conference for Neonatology was once again a resounding success in 2010 with nearly 650 attendees at the event. In addition, a second separate meeting, the *Specialty Review in Neonatology 2.0*, formerly held in Chicago and originated by Dr. Dharmapurhi Vidyasagar, was added to the overall event agenda held at the Bonnet Creek Resort in Orlando. Dr. Vidyasagar continued as course director for that meeting, ably assisted by Drs. David Weisoly, Matthew Saxonhouse, and Lucky Jain. *The Specialty Review* drew nearly 400 attendees, and was a major addition to *NEO*.

“NEO-The Conference for Neonatology was once again a resounding success in 2010 with nearly 650 attendees at the event.”

NEO began four years ago as an evolution of the former *Management of the Tiny Baby Conference* and has now become one of the major annual meetings in newborn medicine. This year's meeting addressed a wide range of themes in many of the most critical and controversial areas that affect the practice of neonatology in the rapidly changing environment of health care.

Beginning in 2010, the Maintenance of Certification Program of the American Board of Pediatrics will be in four parts, with Part Four being devoted to the demonstration of meaningful participation in quality improvement. So that conference participants could better appreciate the methodology of CQI, Wednesday, February 10th, was devoted to a full day Pre-Conference Session on this timely issue. Led by Dan Ellsburly, MD, and Robert Ursprung, MD, two national leaders in neonatal CQI, this *NEO* pre-conference session was designed to prepare the clinician to develop sound quality improvement initiatives in the NICU. Dr. Ellsburly and Dr. Alan Spitzer are also currently editing the March/April issue of *Clinics in Perinatology*, which will be available soon and is devoted to CQI in neonatal medicine.

The main sessions of the *NEO Conference* began on Thursday, February 11th, 2009. Dr. Judy Aschner, Chief of Neonatology at Vanderbilt University, led off the first day with a superb review of delivery room management of the infant and the importance of making the correct decisions at the very start of care. Dr. Aschner also pointed out that the neonatologist and the obstetrician must work together to minimize fetal stress while preparing for optimal delivery. Following Dr. Aschner, Dr. Alan Spitzer had to pinch hit for Dr. Jack Lorenz of Columbia University, who was, unfortunately, stranded in New York by one of the fiercest snowstorms in recent history. Dr. Spitzer presented Dr. Lorenz's talk on fluid and electrolyte management in the NICU. Following a break, Dr. Martin Keszler, Director of Nurseries at Georgetown University, gave an outstanding and comprehensive review of the current tools for mechanical ventilation of the neonate. The constant problem of infant substance abuse, and its toll was then reviewed by Dr. Hallam Hurt, Director of the Special Babies Clinic of the Children's Hospital of Philadelphia. Dr. Hurt's many years of dealing with these complex issues and her great compassion for these infants was very evident throughout her talk. The session was closed by Dr. Jon Watchko, Professor of Pediatrics at McGee Women's Hospital in Pittsburgh, who definitively reviewed the current thinking on hyperbilirubinemia in the NICU.

Afternoon sessions, organized by Dr. Steven Donn, Professor of Pediatrics at the University of Michigan, addressed the ever-present and thorny issues of "The Legal Aspects of Neonatal Practice." Dr. Donn was ably assisted by Dr. Jonathan Fanaroff of Rainbow Babies and Children's Hospital and Dr. C. Morrison Farish, a practicing physician in South Carolina. Their talks were reviewed as some of the best of this year's conference, with a very important "take home" message about how to best reduce the risks of litigation.

Day Two of *NEO* confronted the "Nagging Issues in the NICU – the Things That Drive You Crazy." The session began with a presentation by Dr. Christina Valentine of Nationwide Children's Hospital in Columbus that spoke to optimizing milk delivery for the preterm infant. Dr. Jonathan Davis, Chief of Neonatology at Tufts-Floating Hospital, then spoke on "The Chronically Ventilated Patient," an issue that each neonatal practitioner faces daily and about which he is one of our greatest authorities. Dr. Richard Martin, Director of Neonatology at Rainbow Babies' Hospital, followed with a great review of



Alan Spitzer, MD



Dan Ellsburly, MD



Steven Abman, MD

"Apnea of Prematurity," again one of the thornier issues involving neonates that many neonatologists must confront daily. Dr. Frank Greer, Chairman of the AAP Committee on Nutrition and Professor of Pediatrics at the University of Wisconsin, addressed the concern of the infant with osteopenia, and the session was concluded by Dr. Helen Mintz-Hittner, Professor of



Left-to-right: Steven Dunn, MD and Jonathan Farnoff, MD



David Burchfield, MD



Judy Aschner, MD



Robert White, MD

Ophthalmology at the University of Texas in Houston, who described some of her practice-changing work with infants suffering from retinopathy of prematurity (ROP).

Friday afternoon's session was devoted to some of the newer technologies and therapies in the NICU such as "Near Infrared Spectroscopy, Proteomics, and Amplified Integrated EEG in the NICU." These talks were presented by Dr. Adre duPlessis of Harvard University, and Drs. Alan Spitzer

and Robert White of Pediatrix Medical Group.

Friday evening was highlighted by one of the unique features of the *NEO Conference*, the annual "Legends of Neonatology" awards. Starting in 2007 at the first *NEO Conference*, an effort to acknowledge and show our appreciation to some of the most legendary figures in the history of Neonatology was started. This year's honorees were Dr. George Gregory, MD, who performed much pioneering work in neonatal



Mark Mecurio, MD

lung diseases, but who is most highly regarded for his development of continuous positive airway pressure (CPAP), and John Clements, MD, one of the true greats in the field of lung physiology and metabolism, and the discoverer of surfactant. Their contributions dramatically changed the care of the neonate and are the reasons why Respiratory Distress Syndrome, once virtually synonymous with death, now has a survival rate that exceeds 90% in virtually all NICUs. Dr. Spitzer reviewed the history leading up to the contributions of these "Legends" and showed how their work has become the core upon which much of modern newborn medicine is founded. That night, as always, was a special event and a memory that will long be remembered by attendees.



From left-to-right: Keith Barrington, MD; George Gregory, MD and John Clements, MD - NEO's 2010's Legends of Neonatology; and Martin Keszler, MD



Richard Martin, MD

“Next years’ NEO Conference 2011 will be held at the Walt Disney World Swan and Dolphin hotels from February 24th-27th, 2011...”

Colorado and one of the discoverers of inhaled nitric oxide therapy for the neonate, gave a superb review of the use of this drug in the premature neonate. The hazards of post-natal steroids were then reviewed by Dr. Kristi Watterberg, Chief of Neonatology at the University of New Mexico, who is acknowledged as one of the nation’s most accomplished investigators in this area. The morning concluded with an outstanding review of neonatal seizures by Dr. Jeffrey Perlman, Chief of Neonatology at Cornell Medical Center. Attendees should be able to manage many of these problems more capably after this session.

The final day of NEO 2010 was devoted to a series of thoughtful and provocative discussions on the complexities of the ethical dilemmas of neonatal medicine. Dr. John Lantos, Director of the Children’s Mercy Bioethics Center in Kansas City, started with an insightful talk on the limits of viability. Dr. Elena Gates, Professor of Obstetrics and Gynecology at UCSF, followed with a

superlative assessment of the obstetrical dilemmas that occur with a malformed fetus. The Director of the Yale Pediatric Ethics Program, Dr. Mark Mercurio, then outlined the stresses that confront both parents and physicians in attempting to deal with the many dilemmas of decision-making in the NICU. That talk was one of the best-reviewed of the entire meeting. Finally, Dr. Brian Carter, Professor of Pediatrics at Vanderbilt University, admirably outlined the processes for deciding on surgery in the near-futile patient. Overall, this day’s series of talks was highly regarded by all attendees at the meeting.

NEO 2010 was a terrific meeting and a great success. Next years’ NEO Conference 2011 will be held at the Walt Disney World Swan and Dolphin hotels from February 24th-27th, 2011, and the agenda is shaping up to be even better than this year. It will be an event that you won’t want to miss!

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Global Neonatology Today: A Monthly Column

By Dharmapuri Vidyasagar, MD, FAAP, FCCM

MDG (Millennium Development Goal) #2

In the April issue of *Neonatology Today*, we discussed MDG #1. This month we will look at MDG #2.

MDG # 2:

The goal of MDG #2 is to achieve universal primary education and to reduce the illiteracy rate to 20% by 2015.

The key indicators for the progress of goals are to improve:

1. Net enrollment ratio in primary education.
2. Proportion of pupils starting Grade 1 who reach last primary grade.
3. Literacy rate of 15-24 year-olds, in both women and men.

Why This Goal is Important?

In the general scheme of human development, education is pivotal. Education is a proxy to economics, and thereby for better living and better health. There is ample evidence that supports the positive impact of maternal education on infant mortality; higher maternal education lowers the IMR (Infant Mortality Rate) of the country. Many developing countries suffer from low rates of literacy, or conversely, high rates of illiteracy.

How Is Literacy Defined?

While, the exact definition of illiteracy varies from country-to-country, The United Nations defines, "...an illiterate person as someone who can not, with understanding, both read and write a short, simple statement on his or her everyday life. A person who can only read but not write, or can write but not read is considered to be illiterate. A person who can only write figures, his or her name or a memorized ritual phrase is also not considered literate." In 1970, the U.S. Office of Education considered at least six to eight years of schooling to be the criterion for functional literacy. In 1990, over 5% of the adult population living in the United States did not meet that criterion.

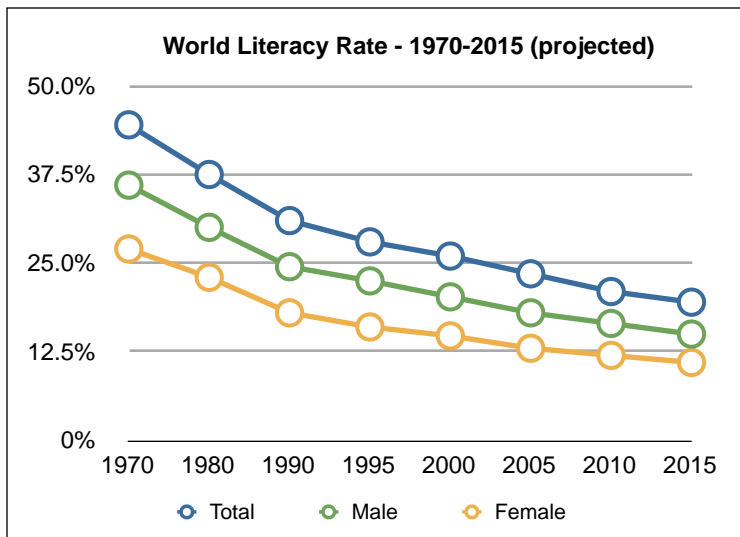
What Are the Global Trends of Illiteracy?

The graph shows the trend in adult illiteracy rates around the world over the last 30 years. There is a steady downward trend, suggesting that the literacy rate is increasing, a good sign indeed. However, there is a wide gap in the illiteracy rates between male and females, and by region. Female illiteracy is far higher in developing countries of the world. The male / female gap is also higher. As noted above, female illiteracy is a leading indicator for high rates of IMR in a country.

Evidence for Progress

In almost all regions of the world, many countries are close to achieving universal primary enrollment. The number of children of primary school age who were out of school fell 30%, from 103 million in 1999 to 73 million in 2006. This data underscores that much can be accom-

plished with: (1) the political will of governments, and (2) adequate support from development partners. Despite this drop, 73 million children are still out of school. In sub-Saharan Africa, the net enrollment ratio has only recently reached 71%, despite a significant jump in enrollment that began in 2000. Around 38 million children of primary school age in this region are still out of school. In Southern Asia, the enrollment ratio has climbed to 90%; yet more than 18 million children of primary school age are not enrolled.



It is interesting to note an analysis of the literacy rate in India of the age group 15-24 years, showed that the highest literacy rate was among the youngest, 15 year olds, suggesting the positive impact of initiatives taken a decade ago.

What Should Individuals Do?

We should: (1) engage in promoting universal education, (2) increase the awareness with parents and in the community regarding the importance of literacy, and (3) participate in the activities of NGOs (non-governmental organizations) working on MDG #2 goals.

The Clock is ticking!

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Medical News Products & Information

Risk of Stillbirth is Four Times Higher After IVF/ICSI Compared to Spontaneous Pregnancies

Women who become pregnant with a single foetus after in vitro fertilization (IVF) or intracytoplasmic sperm injection (ICSI) have an increased risk of a stillbirth, according to new research.

The study of over 20,000 singleton pregnancies, published in Europe's leading reproductive medicine journal, *Human Reproduction* IVF and stillbirth: a prospective follow-up study. (Human Reproduction journal. doi:10/1093/humrep/deq023), found a four-fold increased risk of stillbirths for women who had IVF/ICSI compared with women who conceived spontaneously or after fertility treatment that did not involve IVF or ICSI.

However, the authors of the Danish study say that these results should be interpreted carefully. Dr Kirsten Wisborg, who led the study, said: "It is important to remember that the risk of stillbirth is still very low among women pregnant after IVF/ICSI. At this stage we do not know whether the increased risk in women pregnant after IVF/ICSI is due to the fertility treatment or to unknown factors pertaining to couples who undergo IVF/ICSI. This needs further investigation."

Dr Wisborg, who is a consultant in the neonatal and intensive care unit at Aarhus University Hospital (Aarhus, Denmark), and colleagues analysed data that had been collected prospectively from unselected, pregnant women taking part in the Aarhus Birth Cohort. The study included information on women booked for delivery between August 1989 and October 2006. Information on obstetric history, including waiting times to pregnancy and fertility treatments, age, smoking habits during pregnancy, alcohol and coffee intake during pregnancy, marital status, education and any psychological problems was collected in two questionnaires completed before the first routine antenatal visit at 16 weeks gestation.

Out of a total of 20,166 singleton, first-time pregnancies, 16,525 (82%) were conceived spontaneously after less than 12 months, 2,020 (10%) after more than a year of trying

(classified as sub-fertile), 879 (4%) conceived after non-IVF fertility treatment and 742 (4%) conceived after IVF/ICSI. There was a total of 86 stillbirths, giving an overall risk of stillbirth of 4.3 per thousand pregnancies.

The risk of stillbirth in women who conceived after IVF/ICSI was 16.2 per thousand; in women who conceived after non-IVF fertility treatment it was 2.3 per thousand; in fertile and sub-fertile women, the risk was 3.7 per thousand and 5.4 per thousand respectively.

Dr Wisborg said: "After adjusting for maternal age, body mass index, education, smoking habits and alcohol and coffee intake during pregnancy we found a significant, four-fold increased risk of stillbirth in women who conceived after IVF/ICSI compared with fertile women. The risk of stillbirth in sub-fertile women and women who conceived after non-IVF fertility treatment was not statistically significantly different from the risk in fertile women.

"Until now, there has been speculation that the increased risk of adverse outcomes, such as stillbirths, in assisted reproduction might be due to factors related to the underlying infertility of the couples. However, we found the risk was similar between sub-fertile couples, women who had conceived after non-IVF fertility treatment and fertile couples. This may indicate that the increased risk of stillbirth is not explained by infertility and may be due to other, as yet unexplained factors, such as the technology involved in IVF/ICSI or some physiological difference in the couples that require IVF/ICSI."

She added, "IVF and ICSI patients represent a group resistant to low-technology infertility treatment and have a longer infertility period; they may, accordingly, be selected by unknown factors associated with an increased risk of stillbirth."

Dr Wisborg and her colleagues are continuing to collect data in order to find answers to some of the questions on the association between stillbirths and fertility treatment. "One of the very important things to study in detail is the causes of stillbirth. We know from our data that gestational age at delivery was four weeks lower in stillborn infants of IVF pregnant

women compared to stillborn infants of women who conceived spontaneously. However, despite the size of our study we did not have enough data to study this question in more detail," she said.

She concluded: "Hopefully, the results from our study emphasize the need for continuous follow-up of the outcome of fertility treatments, so that the information given to infertile couples seeking treatment can be differentiated to their individual circumstances."

Between 1989 and 2006 there were several changes and improvements made in IVF techniques. However, the researchers say this is unlikely to have influenced their results as analyzing data stratified according to an early and a late study period made no changes to their conclusions. In addition, to preterm births, another potential confounding factor could be the so-called "vanishing twin" phenomenon. Around 10% of singleton pregnancies are thought to originate from twin gestations because of the transfer of two or more embryos. Compared with singleton conceptions, these pregnancies carry an increased risk of preterm delivery and low birth weight. However, the authors believe this is unlikely to be the sole reason for their results because the risk of stillbirth in non-IVF pregnancies was similar to that in fertile women.

Treating Neonatal Meningitis – Is Nitric Oxide a Foe or a Friend to Bacteria?

Current research suggests that nitric oxide may play a role in the pathogenesis of neonatal meningitis. The related report by Mittal et al, "Inhibition of inducible nitric oxide controls pathogen load and brain damage by enhancing phagocytosis of *Escherichia coli* K1 in neonatal meningitis," appeared in the March 2010 issue of *The American Journal of Pathology*.

Bacterial meningitis, or inflammation of the membranes that cover the brain and spinal cord, is often fatal, even when treated with antibiotics. In neonates, mortality occurs in 25 to 35% of all patients, and long-term neurological and psychological effects are reported in up to 50% of survivors. One of the most common causes of neonatal meningitis is a serotype of *Escherichia coli* that expresses the capsular



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antigen K1, which is similar in structure to proteins expressed in the brain.

Nitric oxide plays a key role in the pathogenesis of meningitis; however, it remains unclear whether it plays a pro- or antimicrobial role. To determine the role of inducible nitric oxide synthase (iNOS), responsible for the production of nitric oxide in meningitis, a group led by Dr. Nemani Prasadarao of the Children's Hospital Los Angeles examined the effects of *E. coli* K1 infection in brains of neonatal mice. They found that *E. coli* K1 infection induced nitric oxide due to the activation of iNOS and that mice deficient in iNOS were resistant to *E. coli* infection. In addition, treatment with the iNOS-specific inhibitor aminoguanidine cleared the pathogen from circulation and prevented brain damage, likely via increased uptake and killing of bacteria by immune cells. Therefore, iNOS inhibition may provide a new therapeutic strategy for treating neonatal *E. coli*-induced meningitis.

Mittal et al conclude that "further understanding of the complex interactions between *E. coli* K1 and macrophages are important to the identification of novel interventional strategies that can improve the outcome of this deadly disease." Since these studies showed that the prevention of nitric oxide production by *E. coli* also suppressed the production of inflammatory cytokines, inhibition of nitric oxide might also be used as a therapeutic strategy for the prevention of sepsis. In future studies, Dr. Prasadarao and colleagues intend to "develop small molecule inhibitors that prevent the interaction of *E. coli* with its receptor on various cells and thereby reduce the production of nitric oxide."

This work was supported by the National Institutes of Health grant AI40567.

Mittal, R, Gonzalez-Gomez I, Goth KA, Prasadarao NV: Inhibition of inducible nitric oxide controls pathogen load and brain damage by enhancing phagocytosis of *Escherichia coli* K1 in neonatal meningitis. *Am J Pathol* 176:1292-1305.

Women & Infants' Research Team Earns 2010 Collaborative Research Award

A research team from Women & Infants Hospital of Rhode Island has received the 2010 Collaborative Research Award from the Rhode Island Science and Technology Advi-

sory Council (STAC) for their project entitled "New Strategies for Preventing Brain Damage in Premature Infants."

The research team includes principal investigator Barbara S. Stonestreet, MD, neonatologist at Women & Infants Hospital and Professor of Pediatrics at The Warren Alpert Medical School of Brown University; co-investigators Yow-Pin Lim, MD, PhD, President and Chief Scientific Officer of East Providence-based ProThera Biologics Inc., and R. Choudary Hanumara, PhD, Professor of Statistics, Departments of Computer Science and Statistics at the University of Rhode Island; and collaborator James F. Padbury, MD, Pediatrician-in-Chief and Program Director of the COBRE (Center of Biomedical Research Excellence) for perinatal biology at Women & Infants Hospital and Oh-Zopfi Professor of Pediatrics for perinatal research at the Alpert Medical School.

The March of Dimes has recently warned that there is an ever-increasing incidence of preterm birth that contributes to at least 50% of the cases of cerebral palsy (CP) and mental retardation in developed countries. Hypoxic-ischemic brain damage, or damage to the cells in the brain and spinal cord from inadequate oxygen, and inflammatory brain damage are thought to predispose premature infants to CP and mental retardation.

"The focus of our research will be on the development of novel strategies to prevent brain damage in premature infants," explained Dr. Stonestreet. "Currently, our understanding of the causes of brain damage in premature infants is limited, and there are precious few treatment or prevention strategies available."

Dr. Stonestreet continued, "We hope that this award will forge a unique alliance between two academic institutions and a successful commercial research entity that will synergize the technology development and commercialization of novel and promising anti-inflammatory agents to prevent brain damage in infants."

The data obtained from this collaborative study will be used to support a future translational study and to prepare an application for federal funding.

Women & Infants Hospital of Rhode Island, a Care New England hospital, is one of the nation's leading specialty hospitals for women and newborns. The primary teaching affiliate

of The Warren Alpert Medical School of Brown University for obstetrics, gynecology and newborn pediatrics, Women & Infants is the seventh largest obstetrical service in the country with more than 9,000 deliveries per year. In 2009, Women & Infants opened the country's largest, single-family room neonatal intensive care unit.

Contact: www.womenandinfants.org

Making a Better Medical Safety Checklist

In the wake of Johns Hopkins' success in virtually eliminating intensive-care unit bloodstream infections via a simple five-step checklist, the safety scientist who developed and popularized the tool warns medical colleagues that checklists are no panacea.

"Checklists are useful, but they're not Harry Potter's wand," says Peter Pronovost, MD, PhD, a Professor of Anesthesiology and Critical Care Medicine at Johns Hopkins University School of Medicine and a patient safety expert. "The science needed to best develop focused, unambiguous and succinct checklists for medicine's thousands of diagnoses and procedures is in its infancy, and there can be unintended consequences of reliance on simple tools."

In a review by Pronovost and other Johns Hopkins researchers recently published in the journal *Critical Care*, the authors say it's clear that use of aviation-like safety checklists based on scientific evidence can work, and that more hospitals should use them to help prevent errors and reduce costs associated with medical mistakes.

But says Pronovost, whose eponymous checklist is credited with preventing thousands of central-line infections at Hopkins, throughout the state of Michigan and elsewhere, they need to be accompanied by a "change in the culture of arrogance still widespread in medical care."

Culture change, he says, "insists," for example, that nurses are empowered to question doctors who don't follow the steps properly and that every single member of the health care team toss out long-held beliefs that infections are an inevitable cost of being in the hospital.

"Just having a checklist on a piece of paper isn't going to be enough," he says.



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In the Critical Care review, Pronovost and his colleagues took a step back and applied a rigorous scientific analysis of checklists, looking especially for which ones have the potential to work best in varying situations.

For example, some checklists are like grocery lists, a basic catalog of what needs to be accomplished by just one person in order for a process or procedure to be completed properly. In an operating room, the anesthesiologist has a checklist that assists her in making sure that every step is followed to ensure the anesthesia machine is working properly before a patient is put under.

"But that sort of checklist doesn't work in all cases," Pronovost says. "Central-line infection checklists work best, for example, when there is what we call a challenge and response, in which one person reads a series of items and a second person verifies that each item had been completed. With the check and balance of another person, the list is more likely to be completed properly."

Pronovost also warns of checklist overload. "Creating too many checklists — especially those that are not proven to improve patient safety — or using checklists where they are not truly needed can be distracting and time-consuming," he says, "and over-reliance on them can lead to a false sense of safety."

"Each step in the diagnosis, treatment and monitoring process poses risks for error that we need to defend against," the Johns Hopkins researcher says. "We do not know how many checklists are too many, when they are most useful, when we have overloaded the checklist users or how strictly the benefits are being measured."

In fact, the Johns Hopkins team says, the underuse of checklists that do work is a problem in part caused by the paucity of scholarly research on how best to use them, how to build and implement them, how to measure their effectiveness in improving patient outcomes, and how they can best be sustained in a culture that is slow to change.

Pronovost's central-line safety checklist was created after reviewing the literature and guidelines on how to best prevent bloodstream infections in ICUs, and selecting the five for which evidence showed they were most likely to accomplish that goal. The checklist was piloted in a small setting (one ICU at The Johns Hopkins Hospital) before undergoing a test on a larger scale (the state of Michigan's ICUs). After the work was published in the *New England Journal of Medicine*, he got calls from not only doctors asking him to design checklists for them, but CEOs, financial-industry executives and even a man who wanted a checklist for sailing a boat.

While standardization is at the heart of any checklist, Pronovost says checklists need to be continually assessed to be sure they are still accomplishing their goals — in this case, keeping bloodstream infection rates near zero. It is important not only to be able to tell patients that the checklist is being used, but to be able to answer the bigger question: Am I safe in the hospital?

"There's a lot more research to do and a lot of work to be done," Pronovost says.

Other Johns Hopkins researchers on the paper include: Bradford D. Winters, MD, PhD; Ayse P. Gurses, PhD; Harold Lehmann, MD, PhD; and J. Bryan Sexton, PhD, MA.

For more information:
www.safetyresearch.jhu.edu/QSR/index.asp



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The final manuscript may be between 400-4,000 words, and contain pictures, graphs, charts and tables.

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