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## The Neonatal Nurse Practitioner as Surgeon

By Dennis T. Costakos, MD; Lynn R. Dahlen, RNC-NIC; Shawn W. Dunlap, NNP-BC; Theresa J. Heise, NNP-BC; Renee S. Muellenberg, NNP-BC; Jennifer B. Richards, NNP-BC; Jennifer M. Walden, NNP-BC

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**Abbreviations:** NNP: Neonatal Nurse Practitioner

### Introduction

Over the last six decades, the prevalence of United States of America males having a circumcision (penile foreskin removal) is on the order of about 80%.<sup>1</sup> Newborn male circumcision is a common procedure in our local medical practice. Typically, hundreds of newborn male circumcisions are performed per year on our campus.<sup>2</sup>

Our systematic literature review (Pub-Med and Ovid) on October 27, 2014 revealed no peer review papers about Neonatal Nurse Practitioners (NNPs) performing newborn male circumcisions. The search strategy included the following terms: neonatal nurse practitioner and circumcision, NNPs and circumcision, and midlevel provider and circumcision. It is not the typical practice or training of a NNP to perform newborn male circumcisions based on our review. We thought it was important to observe and report our experience of practice outcomes if NNPs do the newborn circumcisions.

### Methods

### Participants and Setting

All circumcisions performed by a NNP in this study were studied under a protocol approved by the Mayo Clinic Institutional Review Board and we were specifically instructed not to compare the NNPs to each other. Our physicians trained the NNPs to perform the circumcision. This ten-month study opened

enrollment on February 15, 2015 and closed enrollment on November 18, 2015. After informed consent for observation was obtained by a study investigator, the following observations were made:

1. Did the NNP obtain informed consent for the circumcision using the Gomco clamp?
2. Did the NNP perform a dorsal penile block with 1% lidocaine, no epinephrine?
3. If acetaminophen post procedure was given.
4. The age of the baby at the time of the circumcision.
5. The length of time to complete the circumcision procedure (1<sup>st</sup> injection lidocaine to release of Gomco clamp).
6. Were there anatomical contraindications such as hypospadias, chordee, or epispadias?
7. Did any baby have bleeding to warrant an addendum to the note in the chart or urologist consult?
8. Were there surgical or infectious complications?

The subjects of this study are the NNPs. The five NNPs had 0 to 20 years' experience. Eighty percent of the NNPs had a Master's Degree. Each NNP was observed performing ten circumcisions with supervision before being credentialed in the second quarter of 2014. One NNP had previous experience performing newborn male circumcisions, and was credentialed for the procedure based on the prior experience. During the study, the NNPs continued their daily routine of medical rounds, delivery room attendance, admissions and care of babies in the well nursery and Neonatal Intensive Care Unit. (NICU) The circumcisions were performed on infants who had transitioned and were in no distress.<sup>3</sup> After the circumcision, petroleum based emollient was applied to the inner aspect of the diaper. Circumcision checks were completed including the Neonatal Pain, Agitation and Sedation Scale by nursing staff.<sup>4</sup>

The charge independent of payer type for the procedure is \$1,035.75 (\$695.75 professional + \$340.00 facility). The hourly compensation by specialty is: for an NNP \$53.74; pediatrician \$94.41; family practice \$115.65; neonatologist \$140.38; obstetrician \$167.16 and urologist \$247.96. Our practice captures the same financial compensation independent of the provider specialty when a newborn circumcision is performed (healthcare value analysis).<sup>5</sup>

Statistics using Microsoft Excel, Redmond, Washington, United State of America, student's t test; Pearson correlation.

## EVIDENCE-BASED WEBINAR

# Early Inhaled Nitric Oxide and Progression of Hypoxic Respiratory Failure (HRF)

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Review various elements of HRF treatment, including:

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- The pathophysiology of HRF
- Optimizing oxygenation in HRF
- Evidence for the earlier use of inhaled nitric oxide in the treatment of HRF



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### Indication

INOMAX is indicated to improve oxygenation and reduce the need for extracorporeal membrane oxygenation in term and near-term (>34 weeks gestation) neonates with hypoxic respiratory failure associated with clinical or echocardiographic evidence of pulmonary hypertension in conjunction with ventilatory support and other appropriate agents.

### Important Safety Information

- INOMAX is contraindicated in the treatment of neonates dependent on right-to-left shunting of blood.
- Abrupt discontinuation of INOMAX may lead to increasing pulmonary artery pressure and worsening oxygenation.
- Methemoglobinemia and NO<sub>2</sub> levels are dose dependent. Nitric oxide donor compounds may have an additive effect with INOMAX on the risk of developing methemoglobinemia. Nitrogen dioxide may cause airway inflammation and damage to lung tissues.
- In patients with pre-existing left ventricular dysfunction, INOMAX may increase pulmonary capillary wedge pressure leading to pulmonary edema.
- Monitor for PaO<sub>2</sub>, inspired NO<sub>2</sub>, and methemoglobin during INOMAX administration.
- INOMAX must be administered using a calibrated INOmax DS<sub>IR</sub>® Nitric Oxide Delivery System operated by trained personnel. Only validated ventilator systems should be used in conjunction with INOMAX.

Please see **Brief Summary of Prescribing Information** on adjacent page.



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# INOMax<sup>®</sup> (nitric oxide gas)

## Brief Summary of Prescribing Information

### INDICATIONS AND USAGE

#### Treatment of Hypoxic Respiratory Failure

INOMax<sup>®</sup> is indicated to improve oxygenation and reduce the need for extracorporeal membrane oxygenation in term and near-term (>34 weeks) neonates with hypoxic respiratory failure associated with clinical or echocardiographic evidence of pulmonary hypertension in conjunction with ventilator support and other appropriate agents.

### CONTRAINDICATIONS

INOMax is contraindicated in neonates dependent on right-to-left shunting of blood.

### WARNINGS AND PRECAUTIONS

#### Rebound Pulmonary Hypertension Syndrome following Abrupt Discontinuation

Wean from INOMax. Abrupt discontinuation of INOMax may lead to worsening oxygenation and increasing pulmonary artery pressure, i.e., Rebound Pulmonary Hypertension Syndrome. Signs and symptoms of Rebound Pulmonary Hypertension Syndrome include hypoxemia, systemic hypotension, bradycardia, and decreased cardiac output. If Rebound Pulmonary Hypertension occurs, reinstate INOMax therapy immediately.

#### Hypoxemia from Methemoglobinemia

Nitric oxide combines with hemoglobin to form methemoglobin, which does not transport oxygen. Methemoglobin levels increase with the dose of INOMax; it can take 8 hours or more before steady-state methemoglobin levels are attained. Monitor methemoglobin and adjust the dose of INOMax to optimize oxygenation.

If methemoglobin levels do not resolve with decrease in dose or discontinuation of INOMax, additional therapy may be warranted to treat methemoglobinemia.

#### Airway Injury from Nitrogen Dioxide

Nitrogen dioxide (NO<sub>2</sub>) forms in gas mixtures containing NO and O<sub>2</sub>. Nitrogen dioxide may cause airway inflammation and damage to lung tissues.

If there is an unexpected change in NO<sub>2</sub> concentration, or if the NO<sub>2</sub> concentration reaches 3 ppm when measured in the breathing circuit, then the delivery system should be assessed in accordance with the Nitric Oxide Delivery System O&M Manual troubleshooting section, and the NO<sub>2</sub> analyzer should be recalibrated. The dose of INOMax and/or FIO<sub>2</sub> should be adjusted as appropriate.

#### Worsening Heart Failure

Patients with left ventricular dysfunction treated with INOMax may experience pulmonary edema, increased pulmonary capillary wedge pressure, worsening of left ventricular dysfunction, systemic hypotension, bradycardia and cardiac arrest. Discontinue INOMax while providing symptomatic care.

### ADVERSE REACTIONS

Because clinical trials are conducted under widely varying conditions, adverse reaction rates observed in the clinical trials of a drug cannot be directly compared to rates in the clinical trials of another drug and may not reflect the rates observed in practice. The adverse reaction information from the clinical studies does, however, provide a basis for identifying the adverse events that appear to be related to drug use and for approximating rates.

Controlled studies have included 325 patients on INOMax doses of 5 to 80 ppm and 251 patients on placebo. Total mortality in the pooled trials was 11% on placebo and 9% on INOMax, a result adequate to exclude INOMax mortality being more than 40% worse than placebo.

In both the NINOS and CINRGI studies, the duration of hospitalization was similar in INOMax and placebo-treated groups.

From all controlled studies, at least 6 months of follow-up is available for 278 patients who received INOMax and 212 patients who received placebo. Among these patients, there was no evidence of an adverse effect of treatment on the need for rehospitalization, special medical services, pulmonary disease, or neurological sequelae.

In the NINOS study, treatment groups were similar with respect to the incidence and severity of intracranial hemorrhage, Grade IV hemorrhage, periventricular leukomalacia, cerebral infarction, seizures requiring anticonvulsant therapy, pulmonary hemorrhage, or gastrointestinal hemorrhage.

In CINRGI, the only adverse reaction (>2% higher incidence on INOMax than on placebo) was hypotension (14% vs. 11%).

Based upon post-marketing experience, accidental exposure to nitric oxide for inhalation in hospital staff has been associated with chest discomfort, dizziness, dry throat, dyspnea, and headache.

### DRUG INTERACTIONS

#### Nitric Oxide Donor Agents

Nitric oxide donor agents such as prilocaine, sodium nitroprusside and nitroglycerine may increase the risk of developing methemoglobinemia.

### OVERDOSAGE

Overdosage with INOMax is manifest by elevations in methemoglobin and pulmonary toxicities associated with inspired NO<sub>2</sub>. Elevated NO<sub>2</sub> may cause acute lung injury. Elevations in methemoglobin reduce the oxygen delivery capacity of the circulation. In clinical studies, NO<sub>2</sub> levels >3 ppm or methemoglobin levels >7% were treated by reducing the dose of, or discontinuing, INOMax.

Methemoglobinemia that does not resolve after reduction or discontinuation of therapy can be treated with intravenous vitamin C, intravenous methylene blue, or blood transfusion, based upon the clinical situation.

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## Results

There were 200 babies (gestational age at birth of 32 to 41 weeks), average birth weight 3.48 + 0.59 kilograms. One hundred ninety-eight of these newborn males were circumcised by a NNP. Two babies did not have a circumcision performed based on the assessment of the NNP with confirmation by the neonatologist as one patient had a hypospadias and the other had chordee with a dorsal hood. One hundred percent of the time if a NNP did a circumcision, there was an informed consent from parent or guardian before the procedure. One hundred percent of infants circumcised by NNPs received a dorsal block with 1% lidocaine and no epinephrine. The average age of the baby at the time of the procedure was 69.02 + 116 hours, median of 36 hours. None of the babies had a glans injury, and none of the babies had abnormal bleeding requiring suture, urologist consult or a special note in the chart. The circumcision averaged 18 + 4.24 minutes.

Of the 198 patients, the first 99 patients took 19 minutes + 4.76 minutes and the second 99 patients took 17 minutes + 3.24 minutes (student's t-test p value < 0.001 2 tail). There was a negative Pearson correlation of -0.37 of subject number versus time for the NNP to do the procedure.

Forty-one percent of those circumcised received oral Acetaminophen post procedure based on the Neonatal Pain, Agitation and Sedation Scale. There were no observed surgical or infectious complications. None of the babies developed immediate infections (fever) or unresolved swelling. There were no reports from parents, guardians, nurses, NNPs, neonatologists or outpatient providers of any cellulitis, abscess, boil, carbuncle, or cavernitis.

## Discussion

Why does our new intervention of having NNPs routinely doing all the newborn male circumcisions matter? When the NNPs perform the circumcisions, the quality is high as evidenced by 100% informed consent and no immediate complications noted: specifically, no bleeding needing a urology consult or suture of the penis, no evidence of glans injury or immediate infection despite the fact that the literature predicts 0.2 to 0.6% complications.<sup>6,7</sup> The NNPs can identify which babies (1%) should not have a circumcision in the newborn period. We assessed when and how long it took the NNPs to do the circumcisions, anticipating the procedure would take minutes,<sup>8</sup> and with assessments over time, we saw the NNPs get faster (statistically significant difference first 99 babies 19 + 4.76 minutes versus the second 99 babies, 17 + 3.24 minutes). The circumcision procedure time by an NNP averaged 18 + 4.24 minutes over the 198 patients, and when we examined procedure time by subject number, there is a negative correlation of increasing subject number with time. Time is money. The procedure time decreased by each NNP developing their own Plan-Do-Study-Act Cycle to become more organized during the procedure. The NNPs performed their other duties, such as: attendance at delivery, helping with admit to the NICU, inserting umbilical lines, resuscitation including endotracheal intubation and the administration of surfactant, and well baby rounds.

In addition, having a NNP perform the circumcision results in a 2 to 9 times reduction in professional salary expenses compared to other specialists doing the procedure. This best value method for this surgery creates bottom line savings through decreased semi-variable costs. We believe this is a nice example of helping bend back the cost curve, as after all, someone is always paying, but sometimes not the third party payer.<sup>9,10</sup>

In one review, 61% of circumcisions were paid for by private insurance, 36% by Medicaid and 3% by parents. In states where the Medicaid program covers neonatal circumcision, circumcision rates were reported to be more than twice as high (69.6%) when compared to states where state Medicaid programs do not pay for



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medical circumcision (31.2%). For example, in Wisconsin, but not Minnesota, as of 2016, state Medicaid pays for circumcision services. In the United States of America, there are 18 states that do not cover circumcision as of 2015.

The states and the dates circumcision coverage was discontinued by Medicaid are as follows in alphabetical order:

Arizona (2002), California (prior to 1999), Colorado (2011), Florida (2003), Idaho (2005), Louisiana (2005), Maine (2004), Minnesota (2005), Mississippi (prior to 1999), Missouri (2002), Montana (2003), Nevada (prior to 1999), North Carolina (2002), North Dakota (prior to 1999), Oregon (prior to 1999), South Carolina (2011), Utah (2003), and Washington (prior to 1999).

This is unfortunate, because the Centers for Disease Control (CDC) points out that the United States of America patient population that is most likely to benefit from newborn circumcision may be the least able to attain it. In a study, where the number of male newborn circumcisions in the United States 2000-2010 has been studied, it is estimated that 390,000 fewer circumcisions were performed because more babies were on state Medicaid that do not pay for circumcisions.<sup>11</sup> We thought it was important to train and observe NNPs as the surgeons of choice for neonatal male circumcision, even though this is not part of their routine training to increase the provider capacity to perform circumcisions. In many ways, this is a free market practice to help “commoditize” male newborn circumcision in North America. This change in which provider performs it results in decreased professional fees for our multispecialty medical practice. The NNPs currently get paid less per hour to do this procedure compared to other providers. Considering that there were 1.1 million circumcisions in the United States of America in 2008, if the entire country applied this model, the decrease in professional fees over a decade would be \$105,000,000. Independent of the cost saving in professional fees, this may allow greater access to newborn male circumcision. Male newborn circumcision is estimated to decrease the lifetime risk of human immunodeficiency virus by 16% for U.S.A heterosexual males.

In fact, our model may not only have implications for current practice, but likely has implications for what might be added to the routine training and education of NNPs. Currently, newborn circumcision training in NNP education is almost unheard of in the United States of America.<sup>12</sup> We hired one NNP that had already been trained, so despite no evidence in the literature, NNPs in some places must be doing circumcisions, but this is truly rare, a true unicorn. What are the limitations of our study? It's a single practice site of Mayo. We limited the observation to 200 patients. There is even a theoretical limitation. Is it possible that the NNPs did so well because they knew they were being observed (Hawthorne effect)? This is a potential bias of any open observational study design.

What about long-term outcomes, such as documenting if any patient would require a repeat surgery, such as meatotomy for meatal stenosis?<sup>13</sup> This we did not study, and is another limitation. Our observations concerned immediate clinical outcomes as there is a national benchmark of 0.2 to 0.6% immediate complications, and our NNPs performed circumcisions that had no complications. The NNPs did the medical triage well. We observed that they knew not to perform, but to delay newborn male circumcision if not appropriate.<sup>14</sup> It was explained to parents, the procedure did not have to be done, that prepuce and glans develop from the same block of tissue and that painless retraction could be expected to occur at three to six years of child's age. The American Academy of Pediatrics statement was reviewed with the parent. “Evaluation of current evidence indicates that the health benefit of newborn male circumcision outweighs the risks and the procedure's benefits justify access to this procedure for families.”<sup>15</sup> The informed consent made clear that while male circumcision has been shown experimentally to reduce lifetime risk of Human Immunodeficiency virus acquisition, it does not provide full protection.<sup>16,17,18</sup> Furthermore, parents understood that declining the male newborn circumcision does not mean the child will not need penile surgery for medical reasons before 18 years of age, as some estimates from more than one country put that chance at about 2%.<sup>19</sup> The NNPs became the default provider for performing this procedure in our practice. Mayo Health System being a teaching institution, circumcisions are performed by a resident with faculty supervision. In the 10 months before and during the 10 month study, we monitored which providers did neonatal male circumcisions by specialty. Our administrative data reveals that in the 10 months before and during our 10 month study period, residents performed almost the same number of circumcisions (two less).

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***“Our study has implications for what might be added to the routine training and education of NNPs. We estimate that if the entire country applied our model (assuming 1.1 million newborn male circumcisions are performed per year in the United State of America), and NNP's perform the circumcision instead of neonatologists or obstetricians, there would be a decrease in professional fees of \$105 million 2015 United States of America dollars if NNPs perform the circumcisions instead of neonatologists or obstetricians.”***

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We did not request the Mayo Institutional Review Board approval to compare the NNPs as a group to other provider groups.

We conclude training and credentialing NNPs will not be disruptive to their other duties. There are no inventor's costs of training a NNP to perform the newborn male circumcision.<sup>20</sup> Our study has implications for what might be added to the routine training and education of NNPs. We estimate that if the entire country applied our model (assuming 1.1 million newborn male circumcisions are performed per year in the United State of America), and NNP's perform the circumcision instead of neonatologists or obstetricians, there would be a decrease in professional fees of \$105 million 2015 United States of America dollars if NNPs perform the circumcisions instead of neonatologists or obstetricians. Furthermore, independent of the cost saving in professional fees, and the benefits of letting the doctors do other medical activities, and a wider American practice of NNPs doing the circumcisions may allow greater access for circumcision of the newborn male. The neonatal nurse practitioner as surgeon, thus, may even have worldwide implications for better human health.

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## NEONATOLOGY TODAY

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# Challenges in Sustaining Neonatal Nurse Practitioner Presence in NICU

Annie J. Rohan, PhD, RN, NNP-BC

**Financial Disclosure:** There are no financial engagements or conflicts of interests to disclose by the author.

It has been 50 years since the Advanced Practice Registered Nurse (APRN) role of Nurse Practitioner (NP) was first described. Among the first distinct NP specialty roles that evolved, was that of the Neonatal NP (NNP). Even before national certification of NNPs became a reality in the early 1990's, NNP presence in Neonatal Intensive Care Units (NICUs) had been growing exponentially. Across our country, the NNP is now an acknowledged member of the NICU team.

NNPs have been described to provide patient care in both inpatient and outpatient settings, for both sick and well patients. The vast majority of NNPs, however, provide care to sick patients in the inpatient NICU hospital setting. In this setting, they are typically responsible for day-to-day and emergency management of hospitalized neonates and infants, as well as delivery room stabilization and transport of these patients.

There is mounting concern that the number of NNPs needed to meet future demands is increasingly insufficient (Staebler, 2016). The future of the NNP as a member of the NICU provider team is threatened by rapid declines in the number of programs preparing nurses for this advanced practice role, and a significantly smaller pool of interested, qualified applicants to NNP programs. Importantly, and in contrast to factors that contribute to other national nursing shortages, it does not appear that the primary problem in generating an adequate number of future NNPs is one of insufficient faculty to educate student NNPs, or a dearth of clinical sites to support practical training experiences.

The mismatch between the increasing number of NNP providers needed to meet market supply and the diminishing number of available slots in NNP programs across the country has been confirmed by a survey of NNP program directors in 2012 (Freed, 2015). Analysis of data revealed that one-fourth of all NNP education programs had recently closed, and that spots in existing programs were not all filled. Furthermore, despite the growing shortage of NNPs, several existing programs were soon to halt receipt of applications or had plans to close.

The changing landscape can perhaps be best explained by changes in national initiatives and legislation impacting NP practice. In 2010, the landmark Institute of Medicine (IOM) report, "The Future of Nursing: Leading Change, Advancing Health," was released [www.nationalacademies.org/hmd/Reports/2010/The-Future-of-Nursing-Leading-Change-Advancing-Health.aspx](http://www.nationalacademies.org/hmd/Reports/2010/The-Future-of-Nursing-Leading-Change-Advancing-Health.aspx).

This report acknowledged the need for nurses to take a leadership role in our changing healthcare system, and recommended that nurses practice to the full extent of their education, training and licensure. The recommendations, while receiving some initial pushback from physician and hospital groups, are moving forward to address a primary care physician deficit, an aging population with chronic diseases that are amenable to nursing interventions, and an unsustainable percentage of gross national product spent on healthcare.

Also in 2010, President Obama set into motion a major health care reform by signing the Patient Protection and Affordable Care Act (ACA) into law. ACA seeks to extend health coverage to more than 30 million Americans, focusing on remaining healthy and managing illness before it becomes acute. NPs have been identified as key players in providing cost-effective care solutions in the reform. Together with funding from the National Health Service Corps (NHSC) and the American Recovery and Reinvestment Act (ARRA) educational funding and loan repayment has been channeled into programs to train primary care providers, especially those who plan to work in low-resource settings.

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In the five years since the release of the IOM report, 22 states have moved legislation to allow for full independent practice of NPs ([www.aanp.org](http://www.aanp.org)), including the ability to evaluate, diagnose, order and interpret diagnostic tests, initiate and manage treatments, (including prescribing medications) under the exclusive authority of the state board for nursing.

Schools of nursing are benefitting from the changes in legislation. ACA has stimulated applications to programs preparing registered nurses, and to programs preparing primary care NPs. ARRA and NHSC have provided robust mechanisms to provide financial support to a significant number of these students. Unfortunately, neither ACA, ARRA nor NHSC target NNP education programs or NNP students. NNPs are recognized for their work in acute hospital care, so NNP students are not easily funded under the new mechanisms.

There remain questions about how NNP practice will evolve as states continue to move NP independent practice legislation forward. Currently, NNPs provide direct NICU patient care in hospitals almost exclusively either under the supervision of a physician, or within the context of a formal collaborative agreement with a physician. In states with independent NP practice legislation, it is not clear whether hospitals or healthcare organizations have been willing to provide NNPs with the opportunity to practice without physician oversight or collaboration, or be granted independent admitting privileges. Models by which NNPs independently contract with hospitals to

provide care of patients in the NICU are currently not well-described.

Another issue impacting NNP program sustainability may relate to a perceived NNP scope limitation by potential future students. The population served by the NNP is narrow compared to the population served by other NP specialists, and also overlaps with that of other NP specialists. The population served by NNPs is inclusive of neonates and infants (including those born preterm) and toddlers through two years of age. NNP educational curricula address primary, chronic and acute care across this two-year age continuum. The population served by the Pediatric NP and the Family NP similarly includes neonates and infants, but extends well beyond the limit of toddlerhood. PNP and FNP educational curricula similarly address primary, chronic and acute care across the infant and toddler age continuum, albeit in less depth so to address the broader population scope. Consequently, the capacity for a PNP and FNP to serve an inpatient population of neonates and infants is not restricted by license or certification, but rather by local and institutional preference or guidelines. Properly designed mentorships, residencies and continuing education programs are particularly useful in addressing new graduate gaps in knowledge or skill.

Changes in work hours for pediatric residents have recently impacted NICU staffing plans, primarily calling for increased use of nonresident physicians, such as NNPs. An urgent call to action is now again needed for addressing the looming provider deficit that will inevitably result from rapid declines in the number of programs preparing nurses to practice in the NNP role. While there is certainly opportunity for current NNPs to evolve and develop their role as independent practitioners, it is important to consider novel opportunities for filling the gap in providers that is being created by the diminishing number of graduating NNPs. Models are beginning to emerge in which NNPs share their workspace with Physician Assistants (PAs), Pediatric NPs and Hospitalists. In addition, there is increasing interest and precedent for expanding the interprofessional education of PAs and NNPs.

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***“Before facing a workforce crisis, now is the time to develop creative and collaborative solutions. In order to safely meet the needs of our smallest, most vulnerable patients, an interest and willingness to support innovative structures and processes for care must supersede our desire to retain long-established – yet increasingly unsustainable – team configurations.”***

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While we have long-enjoyed expansion of NNP attendance in the NICU, numerous factors now threaten continued expansion – or even maintenance – of this structure. Before facing a workforce crisis, now is the time to develop creative and collaborative solutions. In order to safely meet the needs of our smallest, most vulnerable patients, an interest and willingness to support innovative structures and processes for care must supersede our desire to retain long-established – yet increasingly unsustainable – team configurations.

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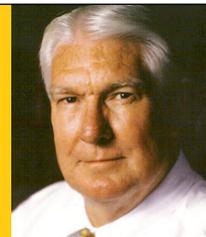
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## NeoHeart: Cardiovascular Management of the Neonate

March 22-25, 2017 | San Diego, CA  
[www.choc.org/neoheart](http://www.choc.org/neoheart)

## NeoHeart

Dr. William I. Norwood, Jr.  
Featured Keynote Speaker



# Fetal Alcohol Spectrum Disorders (FASDs)

By Vincent C. Smith, MD.

Members of the NPA write a regular column in *Neonatology Today*.



Prenatal alcohol exposure is the leading preventable cause of mental retardation and developmental disabilities in the western world. The results of prenatal alcohol exposure are variable and challenging to predict such that no amount of alcohol should be considered safe during pregnancy.

Fetal Alcohol Spectrum Disorders (FASDs) describes the group of conditions that a person may have after prenatal exposure to alcohol. Although the exact number of individuals with a FASD is hard to know due to under-diagnosis, it has been estimated that there are approximately 40,000 infants in the United States affected by FASDs each year.<sup>1</sup> Prevalence of FASDs among the foster care population is especially high with an estimated rate of 15 cases per 1,000 children.<sup>2</sup> For comparison, the prevalence of Autism Spectrum Disorders is estimated to be 12.5-15 cases per 1,000 children, and the prevalence of Down Syndrome is approximately 1.2 cases per 1,000 live births.

FASD is an overarching phrase that encompasses a range of possible conditions, including Fetal Alcohol Syndrome (FAS), Partial Fetal Alcohol Syndrome (pFAS), Alcohol-related Birth Defects (ARBD), Alcohol-related Neurodevelopmental Disorder (ARND), and Neurobehavioral Disorder Associated with Prenatal Alcohol Exposure (ND-PAE). The term FASD is not meant to be used as a specific clinical diagnosis, but rather, encompasses a range of clinical presentations. Signs and symptoms of FASDs range from mild to severe and include a combination of physical, mental, behavioral, and learning problems with each individual affected slightly differently.

Ongoing work seeks to define specific diagnostic criteria for each of the FASD conditions along the continuum, such as has been possible for FAS.<sup>3</sup>

## Fetal Alcohol Syndrome (FAS)

FAS is often considered the most involved diagnosis under the FASD umbrella and is the only diagnostic term with explicit diagnostic criteria. FAS includes the following features: three facial abnormalities (i.e. smooth philtrum, thin vermilion border, and small palpebral fissures); growth deficiency (height and/or weight at or below the 10<sup>th</sup> percentile at any age); and structural, neurological, or functional central nervous system (CNS) abnormalities.

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***“The results of prenatal alcohol exposure are variable and challenging to predict such that no amount of alcohol should be considered safe during pregnancy.”***

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## Partial FAS (pFAS)

Partial FAS is a condition where some of the features of FAS (but not enough to meet criteria) are present. Most often this term is used for children who do not meet the growth criteria, or who have only 1 or 2 of the facial anomalies.

## Alcohol-Related Birth Defects (ARBD)

Alcohol-Related Birth Defects are significant birth defects affecting the heart, eyes, kidneys, and/or bones resulting from prenatal alcohol exposure. Hearing may also be affected. Generally, children receiving this diagnosis do not meet criteria for CNS structural or functional abnormalities.

## Alcohol-Related Neurodevelopmental Disorder (ARND)

Alcohol-Related Neurodevelopmental Disorder is a cluster of symptoms that may include intellectual disabilities, as well as problems with behavior and learning resulting from prenatal alcohol exposure. People with ARND may also have a CNS anomaly. They often perform poorly in school, and have difficulties with math, memory, attention span, judgment, and impulse control.

## Neurobehavioral Disorder Associated with Prenatal Alcohol Exposure (ND-PAE)

In ND-PAE, three major areas of impairment are seen, including: neurocognition, self-regulation, and adaptive functioning. These areas of deficit, along with evidence of in utero exposure to alcohol, childhood onset, and significant distress or impairment in social, academic, occupational, or other important areas of functioning, form the basis of the ND-PAE diagnostic criteria.

There is no cure for an FASD. However, affected individuals can have better medical, psychological, and vocational outcomes with early diagnosis, longitudinal intervention, and treatment regimens that maximize protective factors and build capacity in identified strengths.<sup>4-9</sup> The main roles of the neonatal provider, pediatrician, and the medical home regarding FASD include: being knowledgeable about the disorder to increase awareness and support prevention; to suspect and screen for FASD; and to recognize, manage, and refer patients.<sup>3</sup> The American Academy of Pediatrics created a FASD evaluation and management flow



diagram to facilitate greater clinical recognition of children with FASDs.

## Resources

- AAP FASD Toolkit. [www.aap.org/fasd](http://www.aap.org/fasd)
- Centers for Disease Control and Prevention. [www.cdc.gov/fasd](http://www.cdc.gov/fasd)
- NOFAS National and State Resource Directory: [www.nofas.org/resource-directory](http://www.nofas.org/resource-directory)
- Substance Abuse and Mental Health Services Administration (SAMHSA), Fetal Alcohol Spectrum Disorders (FASD) Center for Excellence: [www.fascenter.samhsa.gov](http://www.fascenter.samhsa.gov)

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***"There is no cure for an FASD. However, affected individuals can have better medical, psychological, and vocational outcomes with early diagnosis, longitudinal intervention, and treatment regimens that maximize protective factors and build capacity in identified strengths.<sup>4-9</sup> The main roles of the neonatal provider, pediatrician, and the medical home regarding FASD include: being knowledgeable about the disorder to increase awareness and support prevention; to suspect and screen for FASD; and to recognize, manage, and refer patients.<sup>3</sup>"***

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## Upcoming Medical Meetings

### **NEO - The Conference for Neonatology**

*Feb. 23-26, 2017; Orlando, FL USA  
[www.neoconference.com](http://www.neoconference.com)*

### **30<sup>th</sup> Annual Gravens Conference on the Physical and Developmental Environment of the High Risk Infant, in Collaboration with the March of Dimes**

*Mar. 1-4, 2017; Clearwater Beach, FL USA  
[www.tinyurl.com/GravensConference](http://www.tinyurl.com/GravensConference)*

### **NPA 38<sup>th</sup> Annual Conference - Perinatal Mental Health: Advocating for the Health and Wellbeing of Families**

*Mar. 9-11, 2017; Atlanta, GA USA  
[www.nationalperinatal.org](http://www.nationalperinatal.org)*

### **NeoHeart: Cardiovascular Management of the Neonate**

*Mar. 22-25, 2017; San Diego, CA USA  
[choc.org/neoheart](http://choc.org/neoheart)*

### **14<sup>th</sup> National Advanced Practice Neonatal Nurses Conference**

*Apr. 19-27, 2017; Waikiki Beach, HI USA  
[www.academyonline.org](http://www.academyonline.org)*

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# 3 BIG THINGS



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In nearly 20 years of successfully matching great physicians with great opportunities, I've learned that the right physician placement depends on three primary factors – location, work life and money!

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**WORK LIFE:** Work life is arguably the most complex consideration to evaluate. Do you like the people you are (or will be) working with? Do they inspire you to do your best? Does the organization appreciate you and your contribution? Are you happy there? Do you look forward to starting work each day?

**MONEY:** Contrary to popular belief, money should never be the primary consideration. Money is always important and if it isn't sufficient it will kill the deal – but money is too often used by employers to mask weakness in other areas of consideration. That might be alright if it offsets location, for example - but money alone is a poor trade-off for the ongoing misery of a bad work life.

Of course, this is just a summary of these three considerations – there is more to it as you drill down on each of these areas and evaluate opportunities. If you would like some personalized help finding a great physician practice, please contact me at [mike@hathawayhealthcare.com](mailto:mike@hathawayhealthcare.com) or 954-603-1192.

I look forward to helping you!

Sincerely,

Mike Hathaway

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# Preview of NeoHeart - Cardiovascular Management of the Neonate, March 22<sup>nd</sup> to 25<sup>th</sup> 2017- Manchester Grand Hyatt Hotel, San Diego, California

By John Patrick Cleary, MD; Amir H. Ashrafi, MD; Anthony C. Chang, MD

The second edition of *NeoHeart - Cardiovascular Management of the Neonate* will be hosted in San Diego in March of 2017. This meeting brings the Neonatology and Cardiology communities together to benefit from each others' knowledge. The need for shared meetings and research has accelerated as more neonates with Congenital Heart Disease receive surgery and cardiovascular management of term and preterm newborns has changed significantly. The need for neonatology input in the CVICU is increasingly recognized; cardiologists are contributing to important management topics in the fetus and newborn, and echocardiography is becoming a shared skill. *NeoHeart* was conceived to support practitioners, accelerate collaboration and share knowledge much like the Pediatric Cardiac Intensive Care Society (PCICS), which launched to meet the needs of cardiac critical care practitioners in 2003. Dr. Anthony Chang was the key catalyst in both of these events. One success of 2017's *NeoHeart* will be establishing the Neonatal Cardiac Society (NCS) to support the growing number of international neonatology practitioners involved in complex cardiovascular management of neonates.

On Wednesday, March 22<sup>nd</sup>, we recognize and honor Dr. William I. Norwood as our Keynote Speaker. The *NeoHeart* chairs see our opening dinner as symbolic of the need for collaboration, and a chance to thank leaders who have impacted both Neonatology and Cardiology. At our first meeting we honored Dr. Jacqueline "Jackie" Noonan, MD, who recognized the syndrome which bears her name, and contributed to the education of countless neonatologists, cardiologists and surgeons. Dr. Noonan's words and presence at the first *NeoHeart* displayed what is possible through passion and collaboration. For 2017, we could

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***"This meeting brings the Neonatology and Cardiology communities together to benefit from each others' knowledge."***

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The authors (back row from left-to-right), Drs. John P. Cleary, Anthony Chang and Amir Ashrafi presenting an award at the first NeoHeart to Dr. Jacqueline Noonan.

imagine no physician with greater impact on neonatal cardiac care than Dr. Norwood. His reflections on a career in congenital heart surgery will inform, inspire and prepare our minds for the provocative discussions which follow.

The core of the meeting includes 4 sessions on Thursday and Friday which address key areas and concepts. All sessions are structured with brief didactics and maximal time for moderated discussions between our outstanding faculty. These conversations between leaders and with the audience are uniquely *NeoHeart* - think *Ted Talk* meets *Talk Show*.

In Session 1, we focus on The Neonatal Myocardium and Hemodynamics. Key Faculty in this session include: Andrew Redington, MD, Patrick McNamara, MBBS, Keith Barrington MBBS and Wyman Lai, MD. Dr. Redington's talk on unique aspects of The Neonatal Myocardium is relevant to all sessions within the meeting. Dr. McNamara is a *NeoHeart* alumnus who returns to help lead this session. He has been given the challenge of "Defining and Treating Shock in the Newborn." Dr. Barrington and others will join the stage to discuss such topics as permissive hypotension, the status of medical therapy for shock and controversies in treatment of

the ductus arteriosus. We will then have case-specific teaching and discussion differentiating treatment of septic shock, the hypertrophic heart, shock in the setting of arrhythmia, etc.

The final hour of Session 1 will have key leaders discuss "Expanding Point of Care Echocardiography into the hands of NICU and PICU physicians."

Session 2, Thursday afternoon's focuses on "Controversies in Congenital Heart Disease." This session features pioneering surgeon Dr. Frank Hanley, who will open with "Tetralogy of Fallot -- Pulmonary Atresia with MAPCAs, Past and Future Management." Leaders from multiple disciplines will have in-depth discussions of management of specific lesions including: Tetralogy of Fallot, Pulmonary Atresia and Hypoplastic Left Heart Syndrome. In addition, within this session, Dr. Mjaye Malawi will present "How Computational Medicine Helps Predict Cardiovascular Collapse." To close the session, key leaders will present and discuss care models including: the concept of a CV-NICU, and the role of neonatologists in the CVICU.

Thursday evening will feature a poster session and symposium displaying original research and team-based quality

## GUEST FACULTY

### Neonatology

Keith J. Barrington, MBBS  
Shazia Bhombal, MD  
Christine Bixby, MD  
Vijay Dhar, MD  
John Kinsella, MD  
Anup Katheria, MD  
Ganga Krishnamurthy, MD  
Victor Levy, MD, MSPH  
Annie Janvier, MD, PhD, FRCPC  
Patrick McNamara, MBBS  
Denise Suttner, MD

### Anesthesia

Dean B. Andropoulos, MD, MHCM

### Cardiothoracic Surgery

Richard Gates, MD  
Frank Hanley, MD  
John Lamberti, MD  
William I. Norwood, Jr., MD (*Keynote Speaker*)

### Cardiology

Mitch I. Cohen, MD, FACC, FHRS  
Wyman Lai, MD  
Daniel J. Penny, MD, PhD  
Andrew Redington, MD  
Pierangelo Renella, MD  
Wayne Tworetzky, MD

### Pulmonology

Steven H. Abman, MD

### Cardiac Intensive Care

Ronald A. Bronicki, MD  
Paul A. Checchia, MD  
David S. Cooper, MD, MPH  
Peter Laussen, MBBS, FCICM  
Mjaye L. Mazwi, MD  
David Wessel, MD

### Nursing

Dorothy M. Beke, CPNP-PC/AC  
Dawn Tucker, DNP, RN, CPNP-AC

improvement impacting neonatal cardiac care. Presenters will be guaranteed good attendance as the session is positioned with a view of San Diego harbor and timed with a cocktail reception and appetizers. There will be a faculty walk and featured abstracts. The hotel is located within walking distance to San Diego's Seaport Village and Gaslamp District to facilitate team-building and catching up with colleagues.

Friday morning's Session 3 turns our attention to "The Pulmonary Vascular Bed." This session was so well-received at our first *NeoHeart*, and the research in the field

so active, that it had to be repeated. Topics such as "iNO in the Preterm," "Combination Therapy for Pulmonary Hypertension," and "PH in Chronic Lung Disease and Heart Disease" will be featured. So many of our faculty are expert in this area that expansive discussion is assured. Dr. Steve Abman will open with "The Neonatal Pulmonary Vascular Bed - Science Behind our Therapies," followed by Dr. John Kinsella describing "State-of-the-Art Management of PPHN." Later in the session, Dr. David Wessel reviews "Pulmonary Hypertension in Congenital Heart Disease." After a break, Session 3 will close with a review of our biases and cultural practices within each discipline, provocatively titled, "It Drives Me Crazy When...."

Session 4 includes some of the most important areas where the *NeoHeart* creators believe we can make progress through collaboration across disciplines. Dr. Wayne Tworetzky will raise questions as he reviews the "Status of Fetal Cardiac Interventions." Dr. Annie Janvier has been asked to help expand our thinking as to, "How Do We Include Families in Complex Decision-Making?" Annie makes complex topics practical, and will lead group conversations in how we speak to families about life and death issues, and the provocative question "When should we provide surgery in the setting of Trisomy 18 or 13?" After a break, Dr. Dean Andropoulos will present "Neurodevelopment Outcomes in CHD: What are the Opportunities for Improvement?" Roundtable discussions will include: potential brain-protecting strategies, the negative impact of anesthetics and sedatives, and the optimal timing of cardiopulmonary bypass.

The final hour of *NeoHeart* is forward-looking as we bring partners from Industry and the Hospital C Suites along with families to help us ask "How Are We Defining and Measuring Success?" and "Are the Present Metrics Misleading?" We know we can make progress in the future, and finding the right data to measure will be key.

The core sessions described above are surrounded not just by the beauty of Southern California, but by opportunities for focused education. Pre- and Post-conference workshops on the afternoon of Wednesday, March 22<sup>nd</sup> are repeated the morning of Saturday, March 25<sup>th</sup>. Workshop A offers didactic and hands-on experience with "Targeted Neonatal Echocardiography," Workshop B, "Essentials of Neonatal Cardiology," and Workshop C, a Nurse Practitioner-led session designed to provide value to NP, PA and RN attendees titled, "Advanced Care for the Neonate with Heart Disease."

We hope that the readers of *Neonatology Today* and *Congenital Cardiology Today* will

join us in San Diego for *NeoHeart* and contribute to advancing this important area of care. The research presented, questions generated, protocols developed and the growth of a Neonatal Cardiac Society should be seen in this space in the future.

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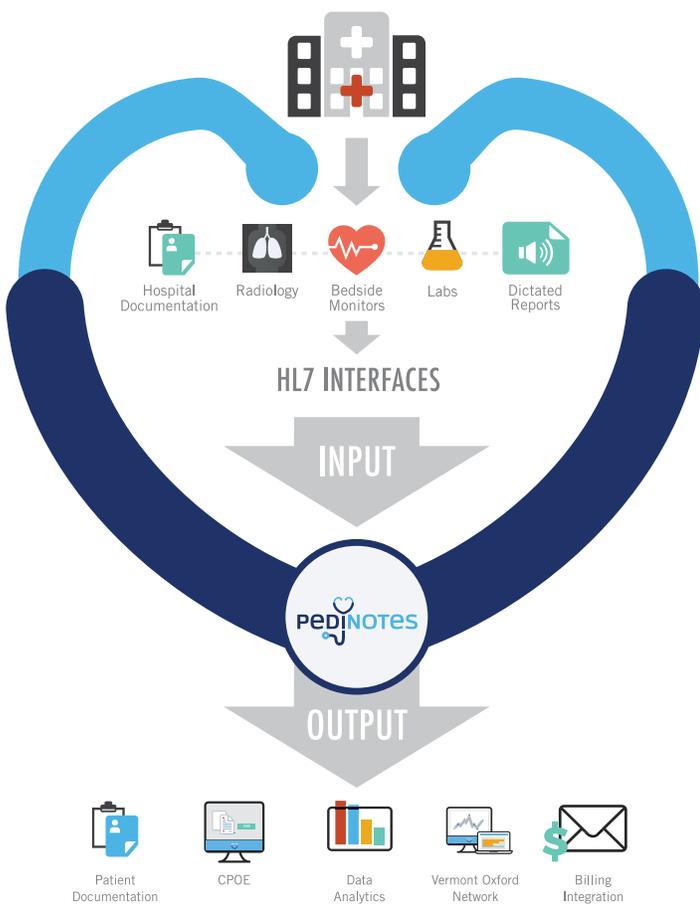


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# Why Do We Keep Treating Reflux in Preemies?

Michael Narvey, MD

## Originally Published on:

### 99NICU

<http://99nicu.org/blogs/entry/201-why-do-we-keep-treating-reflux-in-preemies/>  
and

### All Things Neonatal

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Choosing Wisely is an initiative to “identify tests or procedures commonly used whose necessity should be questioned and discussed with patients.” The goal of the campaign is to reduce waste in the health care system and avoid risks associated with unnecessary treatment.

The AAP Section on Perinatal Pediatrics puts the following forth as one of their recommendations: “Avoid routine use of anti-reflux medications for treatment of Symptomatic Gastroesophageal Reflux Disease (GERD) or for treatment of apnea and desaturation in preterm infants.

Gastroesophageal reflux is normal in infants. There is minimal evidence that reflux causes apnea and desaturation. Similarly, there is little scientific support for the use of H2 antagonists, proton-pump inhibitors, and motility agents for the treatment of symptomatic reflux. Importantly, several studies show that their use may have adverse physiologic effects as well as an association with necrotizing enterocolitis, infection and, possibly, intraventricular hemorrhage and mortality.”

## How Strong is the Evidence?

The evidence for risk with acid suppression is largely based on either retrospective, or in the case of Terrin G et al, a prospective observational cohort study, “Ranitidine is Associated with Infections, Necrotizing Enterocolitis, and Fatal Outcome in Newborns.” In this study, the authors compared a group of premature infants with birth weights between 401 – 1500g or 24 – 32 weeks gestation, who

## Rate of Patients Presenting Infections During the Study Period

	Not exposed to Ranitidine (n = 183)	Exposed to Ranitidine (n = 91)	P
Overall infections, n (%)	18 (9.8)	34 (37.4)	<.001
Sepsis, n (%)	16 (8.7)	23 (25.3)	<.001
Pneumonia, n (%)	1 (0.5)	4 (4.4)	.043
Urinary tract infections, n (%)	1 (0.5)	7 (7.7)	.002

received ranitidine for reflux symptoms to those who did not. All told, 91 were exposed while 183 were not. The authors are to be commended for standardizing the feeding protocol in the study so that when comparing NEC between groups one could not blame differences in formula consumption or rate of feeding advancement. Additionally, bias was controlled by having those not involved in care collect outcome data without knowing the purpose of the study. Having said that, they may have been able to ascertain that ranitidine was used and have been influenced in their assessments.

The patients, in terms of risk factors for poor outcome including CRIB and Apgar scores, PDA, etc., were no different when explain an increased risk for adverse outcome.

From the above table, rates of infections were clearly higher in the ranitidine group, but more concerning was the higher rate of mortality at 9.9% vs 1.6% P=0.003, and longer hospitalization median 52 vs 36 days P=0.001.

## Results of a Meta-Analysis

Additional evidence suggesting harm comes from a meta-analysis on the topic by More K, “Association of Inhibitors of Gastric Acid Secretion and Higher Incidence of Necrotizing Enterocolitis in Preterm Very Low-Birth-Weight Infants.” This analysis actually includes the study by Terrin and only one other retrospective database study of 11,072 patients by Guillet et al. As the reviewers point out the study by Terrin, while prospective, did not employ the use of multiple regression to adjust for confounders, while the larger study here did. In the end, the risk of NEC with the use of acid suppression was 1.78 (1.4 – 2.27; p<0.00001).

## What Do We Do with Such Evidence?

I can say this much. Although small in number, the studies that are available will make it very difficult to ever have a gold standard RCT done on this topic. This scant amount of evidence, backed by the biologic plausibility that raising the gastric pH will lead to bacterial overgrowth and potential aspiration of such contents provides the support for the “Choosing Wisely” position.

Why do we continue to see use of such medications though? It is human nature, I suspect, that is the strongest motivator. We care for infants and want to do our best to help them through their journey in neonatal units. When we hear on rounds that the baby is “refluxing,” which may be documented by gulping during a brady, visible spit-ups during A&Bs, or through auscultation hearing the contents in the pharynx we feel the need to do something. The question invariably will be asked whether at the bedside or by the parents “Isn’t there something we can do?”

My answer to this is yes. Wait for it to resolve on its own, especially when the premature infants are nowhere close to term. I am not sure that there is any strong evidence to suggest treatment of reflux episodes with gastric acid suppression helps any outcomes at all, and as we see from the Terrin Study length of stay may be prolonged. I am all in favour of positional changes to reduce such events, but with respect to medications, I would suggest we all sit on our hands and avoid writing the order for acid suppression. Failure to do so will likely result in our hands being very busy for some infants, as we write orders to manage NEC, pneumonia and bouts of sepsis.

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# Medical News, Products & Information

Compiled and Reviewed by Tony Carlson,  
Senior Editor

## Is it OK for a Doctor to Attend a Patient's Funeral

Newswise — New research at the University of Adelaide has shed light on how many doctors are attending the funerals of their patients and the reasons behind their choice. The researchers say more needs to be done within the medical profession to openly discuss the issue.

In a study published online ahead of print in the journal *Death Studies*, researchers from the University's School of Psychology and School of Medicine report on the practices and attitudes towards funeral attendance of more than 430 Australian doctors. The publication is part of a nationwide survey of more than 1,000 health professionals.

"Our survey was aimed at better understanding what motivates health professionals to attend their patients' funerals, what barriers they may experience in attending, and their attitudes towards the issue of funeral attendance," says Dr. Sofia Zambrano, who conducted this work as a follow-up to her PhD in the School of Medicine at the University of Adelaide.

The survey found that 57% of the doctors surveyed had attended at least one funeral of a patient – but the number varied greatly depending on which medical specialisation they had pursued. For example, 71% of general practitioners had attended a patient's funeral, 67% of oncologists, 67% of psychiatrists, 63% of palliative medicine specialists, 52% of surgeons, and 22% of intensive care specialists.

"The death of a patient can be a very emotional and isolating experience for physicians, and some may regard it as the ultimate failure of their professional care," says Associate Professor Greg Crawford, study co-author and Associate Professor of Palliative Medicine in the University's School of Medicine.

He says the benefits of attendance may be twofold: "Funeral attendance seems to be a practice that may help physicians deal with their emotions after a patient dies, and in turn, it can also be of comfort for the patient's family."

"However, there are differing views within medicine about whether or not it's acceptable to attend a patient's funeral, with some doctors seeing it as 'unprofessional', and others feeling that their colleagues would disapprove of them attending, which in fact were factors associated to non-attendance to funerals in our study," Associate Professor Crawford says.

The study also found that female doctors were more likely to attend a patient's funeral than their male counterparts, were more open to crying and expressing grief at the funeral, and they actively discussed attending patients' funerals with their colleagues and families. Those who were least likely to attend were young male doctors with fewer years of medical experience.

Dr. Zambrano says that because the decision is a personal one, the paper's authors have refrained from advocating attendance or non-attendance at funerals. "We aim to contribute to a more open discussion about this poorly researched topic, and to provide a clearer picture of actual practices and attitudes of a large sample of physicians and other health professionals," she says.

"The role of peer perception and the hesitation of doctors to discuss funeral attendance and death more broadly with colleagues are important issues to consider. The medical community should ask itself whether funeral attendance needs to – and can – be addressed more openly, whether death and dying should be discussed more candidly among health professionals, and what effects these discussions may have on job satisfaction and on the mental health of medical practitioners."

## NEONATOLOGY TODAY

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# NEONATOLOGY TODAY

News and Information for BC/BE Neonatologists and Perinatologists

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