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A QUARTERLY PUBLICATION OF THE POTTER-RANDALL COUNTY MEDICAL SOCIETY

Spring 2017 | VOL 27 | NO. 2



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President's Message: *Changes to the ACA*

by Rouzbeh K. Kordestani, M.D., MPH

It is a new administration and a new set of rules and laws — this statement possibly has never rung more true.

As the recent travel ban and the political mayhem from it cascade over the land, it is easy to get distracted. I myself am Iranian and came here with my parents looking to a better future. I have strong personal opinions about how this travel ban can potentially damage the quality of health care and health care systems here in the United States. However, this magazine is not a vehicle for political opinion. It is a vehicle for communication about health and health care issues, and the patient community here in the Panhandle of Texas.

I would like to take this chance to ask our members for their indulgence. I forewarn our members to prepare themselves for the changes that will come with the possible revamping of the ACA or Obama Care. As the new President has already begun to dismantle the ACA, many patients will be confused and

frightened. For many people, the ACA has been a good opportunity to get insurance. These newly enrolled patients have been a part of a system that for too long did not really include them. Now with the supposed changes, they may be confused and scared that they may again lose their insurance and be excluded. No one wishes to have to visit the Emergency Room to find a doctor. Every American deserves a good physician with a knowledge base that appropriately handles the patient's problem. Previously, there were many faults with the insurance system. Even with Obama Care, there are faults; Obama Care is an attempt at a fix. As everyone is aware, it fell short — but it tried. I would like everyone to understand that it was a worthy attempt. Now, the President has started dismantling the program without an effective replacement. This will invariably cause more change. That being said, I am hopeful that between physicians, the American Medical Association, Congress, the many insurance companies, and the individual

State Departments of Health, answers can be found. For this to happen, everyone needs to keep an open mind and be able to work effectively with one another.

For the physician in the Panhandle, it is my hope and wish that you take the time to educate your patients about what truly is needed, what the system can afford them and what the system will be able to do. For far too long, patients have been ignorant of the system they live in — that needs to change!! Education and understanding are the keys to this change.

Patients look to their physicians for help, kindness, leadership and compassion. Regardless of the politics, I ask everyone to lend a hand to those patients in need, who are scared and confused. They will need you to walk them through to the other side of this political and health policy quagmire, until a better, more effective health care system can be delivered to us, and through us to them.

I hope to have your support in this.

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Our Next Issue Of

Panhandle Health

Features:

Patient Advocacy

Alliance News

by Irene Jones, Co-President

March 2017

The Potter-Randall County Medical Alliance is pleased to announce the success of the 2016 New Year's Eve Gala benefiting Our Children's Blessing. The event sold out with 200 attendees and raised over **\$20,000**. Our Children's Blessing will receive sixty percent of the proceeds. Co-Chairs Kristen Atkins and Lacie Schniederjan will present a check to our local Children's Miracle Network with the remaining proceeds at Doctor's Day on March 30th at the Metropolitan Speakeasy Bar.

SHOUTOUTS!

Thank you to our Great Gatsby Sponsors \$2,500: **Amarillo Commercial Roofing** and **XF Enterprises**. Thank you to our Golden Age Sponsors \$5,000: **High Plains Dermatology Center** and **Jake and Rachelle Tuls**. A big thank you to our Al Capone sponsor \$7,500: **Panhandle Weight Loss Center**. We are so thankful for all of our sponsors and all of the people who purchased a ticket/table to the event.

Thank you **Kasey Daniels & Christi Rush** for stocking the Hygiene Closet the last two months. Also shout out to **Jennifer Langley & Amy Slaton** for providing a meal to the Ronald McDonald House in January and February. We appreciate you ladies.

Thank you to **Kiki Brabham** for planning our 1st Quarterly meeting at Burn Studio.

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Hope to see you at our upcoming events!

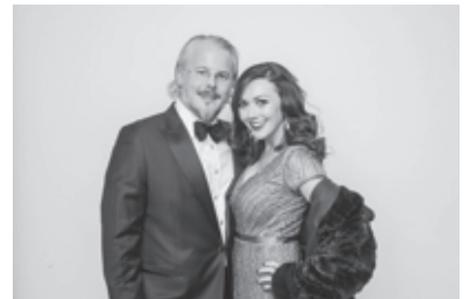
March 7th: Ladies Spring Social – Home of Lara Assadourian 6:30p.m.

March 30th: Doctor's Day Reception – Metropolitan Speakeasy Bar 6:00pm

April 25th: 2nd Group Quarterly Meeting TBD



2016 New Year's Eve Great Gatsby Gala



Moms Playdate



Annual Society Meeting



Burn Studio 1st Group Quarterly Meeting



Executive Director's Message

by *Cindy Barnard, Executive Director*

The Spring issue of *Panhandle Health* deals with prematurity. A premature birth is a birth that takes place more than three weeks before the baby is due (a birth occurring before the start of the 37th week of pregnancy, assuming a pregnancy usually lasts 40 weeks). It is astonishing to think that 380,000 babies are born prematurely each year in the United States. Premature birth is the #1 killer of babies in the U.S. and the leading cause of death of children under age 5 around the world. I am happy to report that the rate of premature birth in the U.S. has now been on a steady decline for the last several years. According to the March of Dimes, this decline—to 9.6% today—has saved thousands of babies from premature birth as well as saving our country billions of dollars in excess health care costs. Despite this progress, premature birth and its repercussions remain a serious problem, some of which will be addressed in this issue.

The 114th Annual Meeting of Potter Randall County Medical Society was held January 12th at Amarillo National Bank's Executive Dining Room. The gold-headed cane was passed from Dr. Ed Dodson, 2016 President, to Dr. Rouzbeh Kordestani, 2017 President. Officers for 2017 were installed by Dr. Don Read, President of Texas Medical Association. New officers include President, Dr. Kordestani, President-Elect, Dr. Ryan Rush, and Secretary-Treasurer, Dr. Daniel Hendrick. I want to thank Amarillo National Bank for their continuing and unfailing generosity and hospitality. The dinner was exceptionally delicious and well-attended.

Presidential appointments to Boards and Committees of PRCMS are now ongoing. If you have an interest in serving on a committee, please call the Society office at 355-6854. The core of the Society is its volunteers—the physicians who volunteer for committees and board positions, working on behalf of their colleagues. We truly need you!

If you would like to update your picture for your our 2017-2018 Physician Roster, or if you do not have a picture in last year's Roster, please call 373-1523 to make an appointment for your portrait at Gray's Studio. There is a \$15 sitting fee that PRCMS will pay, and this also includes a free session for a family portrait, if desired. Gray's is located at 3317 6th Street and is open from 9-5, Monday-Friday and 9-12 on Saturday. We would like to have 100% of our doctors' photos in our upcoming Roster.

Get ready for "First Tuesday" at the Capitol. Pack your white coat and travel to Austin on March 4, April 4, or May 5 to participate in TMA's first Tuesdays. Please don't miss the chance to meet with legislators and their staffs to make sure the voice of medicine is heard. Remember, YOU, our physicians, are the best lobbyists for our patients. You will visit with your Senator, Representatives, and their aides about key issues facing your profession, attend committee hearing and house and Senate sessions, and learn about the obstacles medicine faces: taxes, Medicaid, CHIPS, physician ownership, and scope of practice. Physicians are asked to wear white coats while at the Capitol. Legislative talking points and other materials will be provided. A course on lobbying will be conducted early on each First Tuesday. A \$25 charge for each First Tuesday covers your breakfast, lunch, and all materials. For more information, visit www.texpac.org.

On March 30, we will celebrate Doctor's Day which was first observed in Winder, Georgia in 1930. According to Wikipedia, Eudora Brown Almond, a physician's wife, decided to declare a day in honor of doctors. The red carnation was chosen as the symbolic flower for National Doctors Day. In 1958, a resolution commemorating Doctors Day was adopted by the U.S. House of Representatives, and legislation was introduced both in the House and Senate to establish a National Doctors

Day in 1990. President George Bush signed S.J. RES #336 (which became Public Law 101-473) in 1991, forever designating March 30 as National Doctors Day. President Bush wrote in the Proclamation, "In addition to the doctors whose names we easily recognize, there are countless others who carry on the quiet work of healing each day in communities throughout the United States, indeed, throughout the world. Common to the experience of each of them, from the specialist in research to the general practitioner, are hard work, stress, and sacrifice. All those who serve as licensed physicians have engaged in years of study and training, often at great financial cost. Most endure long and unpredictable hours, and many must cope with the conflicting demands of work and family life." President Bush urged that all Americans "observe this day with appropriate programs and activities."

And finally, this Edition's cover is by Roylynn Evans who passed away October 12, 2016. The painting is entitled "The Cottage". Roylynn was born in 1950 in Vernon TX and attended West Texas A&M where he actively pursued his passion as an artist. He and his wife became owners of The Colony Frame & Gallery in 1993. Subjects of Roylynn's acrylic paintings include Southwest scenes, sunsets, barnyard animals (especially chickens!), and landscapes of rural America. He won his first award in a juried art show in 1974 when he began showing and selling his work. He received many accolades over the years, including several Best of Show awards and a featured article in "American Artist" magazine. His pieces hang in many private and corporate collections including the Walt Disney Co. in Florida and the Laura Bush Institute for Women's Health at Texas Tech in Amarillo. His prints of chickens engaged in humorous human activities have been popular everywhere. We have used many of Roylynn's paintings on our covers over the years. He will be missed.



Letter from the Editor: *Prematurity*

by Tracy Crnic, M.D.

In this issue of *Panhandle Health*, I wanted to spotlight a condition that affects most specialties but is often overlooked. Prematurity is the leading cause of newborn death worldwide. It is also a significant cause of morbidity, both in the perinatal period and lifelong. In addition, the financial burden both to the family and to the healthcare system is astounding.

In the United States, currently one in ten infants is born prematurely, or prior to 37 weeks gestation. The rate of premature birth is also increasing, rising by 36% since 1981. The US carries the highest rate of prematurity of any developed country. In Texas, 10.2% of births occur prematurely. Of the approximately 7400 infants born here in a given week, it is estimated that around 1000 of them are premature.

Why is this so? Many theories try to account for this problem. Poor prenatal care, maternal drug exposure, physical abnormalities to the maternal uterine system, even a history of prior premature delivery or genetic predisposition all contribute to the risk. However, continued research on many other factors is ongoing, as is maternal counseling and prevention measures.

Why is this important? Premature infants have multiple medical complications that span their lifetime. As the population of these patients increases, more and more of their medical issues will be trickling through our patient population. Having more information regarding these disease processes and knowing what to look for helps us provide more

comprehensive care. It may also improve our ability to recognize certain conditions, and discuss them and their risks with our patients or potential parents. It also helps us empathize and support the patients and families both psychologically and physiologically. For example, the average cost of delivery and care of a term newborn averages \$4,400, while that increases fourteen fold (over \$54,000) for a premature birth. The financial burden alone can be crippling.

This issue of *Panhandle Health* discusses some of the many health-related complications that afflict premature infants throughout life. While it is not comprehensive, I hope that it can serve as an easily accessible reference for us and our patients to aid in providing care and support. I want to thank all of those who helped create this issue, those who tirelessly continue to care for these special patients.

As a side note: Listed here are a few web sites and organizations available with additional information and updates in care and advocacy: Prematurityprevention.org,

The Alliance for Innovation in Maternal Health (AIM), beforeandbeyond.org, The Coalition for Improving Maternity Services (CIMS), the Genetics and Genomics Competency Center.

Locally, our chapter of the March of Dimes (marchofdimes.org, or phone (806) 374-5783), spotlighted later in the issue, sponsors fund raising for research and aid to these families, and provides information and support, social connections, and referrals for financial aid. Any of our hospitals' NICU units are available to answer questions, counsel families, and provide referral to needed sources of support. Also, a specialized clinic here in Amarillo, The Infant Risk Center, provides prenatal care and counseling, postnatal care and support, and participates in ongoing research on prematurity, its prevention, and care of these infants. They are available at (806) 352-2519.

Thank you for taking the time to read our publication, and for your continued support to the Amarillo community, its continued health, and the Potter/Randall County Medical Society.

POTTER RANDALL COUNTY MEDICAL SOCIETY (PRCMS) OFFERS HELP TO ADDICTED PHYSICIANS

If you, or a physician you know, are struggling with addiction and are unsure what to do or whom to contact, the Potter Randall County Medical Society is here to help. We offer face-to-face confidential sessions with the PRCMS Physician Health and Wellness Committee, made up of your physician peers who know and understand recovery. Please don't struggle alone when help is a phone call or an email away. Whether you are calling for yourself, your practice partner, or as a family member of a physician, contact Cindy Barnard, PRCMS Executive Director, at 806-355-6854 or prcms@suddenlinkmail.com. Membership in PRCMS is not required.

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Neurodevelopmental and Behavioral Sequelae of Prematurity

by Angela A. Huang, M.D., FAAP

Abstract

Due to advances in neonatal care, an increasing number of infants are surviving premature birth, including infants born at or near the threshold of viability. General pediatricians and pediatric subspecialists, including Developmental-Behavioral Pediatricians, are now regularly caring for children born prematurely. This article provides an overview of some commonly encountered neurodevelopmental and behavioral sequelae of prematurity.

Introduction

As neonatal medicine and medical technology advance, more and more infants are surviving premature birth, including extremely preterm (< 28 weeks gestational age) and extremely low birth weight ($\leq 1,000$ g) infants. Both general pediatricians and Developmental-Behavioral Pediatricians now regularly encounter patients with long term neurodevelopmental and behavioral difficulties due to prematurity. These children require and deserve high quality care and follow up for these difficulties. The following is an overview of some of the more commonly encountered conditions and areas affected.

Motor

In infants born extremely preterm, rates of neuromotor impairment increase with decreasing gestational age. In one study of infants born between 22 and 27 weeks gestational age, 11% had cerebral palsy at 5 years old (1). 8/218 children born at 23 – 25 weeks GA had cerebral palsy class 4 – 5 on the Gross Motor Function Classification System for Cerebral Palsy. Children in these classes are nonambulatory. In contrast, 2/246 children born at 26 – 27 weeks GA and no children born after 27 GA had cerebral palsy class 4-5 (1).

Visual-Motor Skills

Visual-motor skills include visuomotor control, visual perception, pencil and paper coordination, visuomotor integration, hand-eye coordination, fine motor skills, and fine motor speed. Many or all

of these areas are affected in extremely low birth weight (ELBW) infants. Visual perceptual and visuomotor integration difficulties are found in as many as 11% to 20% of formerly ELBW infants at school age. Rates of fine motor difficulties are as high as 71% (2).

It should also be noted that children born prematurely are at higher risk for sensory impairments, including vision and hearing deficits. The risk of severe sensory deficits increases with decreasing gestational age. In one study of extremely preterm (EPT) children, all the children who were blind or deaf (3%) were born before 26 weeks GA. When excluding children with severe impairments such as cerebral palsy, blindness, or deafness, 24% still had some type of visual impairment. This included squint, hypermetropia, myopia, astigmatism, or unilateral blindness due to ROP (1).

Cognitive Skills / Intelligence Quotient

There is an inverse correlation between gestational age and IQ scores, particularly in those born at < 33 weeks GA. Increasing evidence shows that for each week of GA <33 weeks, there is a mean decline of 1.7 to 2.5 IQ points. The mean IQs of children born extremely preterm are generally at least 0.66 SD or 10 points lower than their full term counterparts (3).

Academic Achievement

Learning problems or disabilities are one of the main sequelae of preterm birth. One third of children born very preterm (VPT, less than 32 weeks GA) or earlier have more than 1 learning disability in the areas of math, written expression, spelling, or reading. There is also a 25% to 40% rate of grade retention in children born at <32 weeks GA, versus 17% of children born at 34 – 36 weeks (3).

Language

Language skills are highly influenced by cognitive skills, executive function, and environment. With this in mind, a recent

meta-analysis found that children born VPT has language scores 0.35 to 0.77 SD, or 6 – 11 points, below controls. (3).

Executive Function

Executive function refers to a variety of interrelated processes of the brain which are necessary for purposeful, goal-directed behavior. Some of these processes include initiation, planning, working memory, attention, cognitive flexibility, and inhibitory control. ELBW children have been found to have two to three times greater rates of difficulty with starting activities, flexibility in generating strategies for problem solving, holding information in working memory, and planning a sequence of actions (2). This is noteworthy because, although executive function deficits may be subtle, they have a significant impact on cognitive, social, and academic functioning. It has been noted that deficits in executive function seem related to white matter damage. For example, children with PVL and resulting cerebral palsy have been found to have difficulty with inhibitory control (2). Children who were born preterm but did not suffer white matter damage do not demonstrate any differences in executive functioning as compared to full term controls (3).

Behavior

Compared with children born full term, children born extremely preterm have higher rates of internalizing and externalizing behaviors. Internalizing behaviors include emotional reactivity, anxiety / depression, somatic complaints, and withdrawal. Externalizing behaviors include attention problems and aggression. As part of the Extremely Preterm Infants in Sweden Study (EXPRESS), a Child Behavior Checklist for Ages 1 ½ to 5 was administered at 2.5 years of age. The Child Behavior Checklist is a standardized parental rating questionnaire. Parents of EPT children reported significantly higher scores for internalizing problems and

| continued on page 12

externalizing problems as well as a total problem score (4). EPT children also demonstrated a significantly higher prevalence of scores within the clinically significant range compared with full term controls. When looking at internalizing behaviors, 20.9% of EPT children had clinically significant behaviors versus 8% of FT control children. When looking at externalizing behaviors, 19.5% of EPT children had clinically significant behaviors versus 9.2% of FT children. Overall 19.8% of EPT children had a clinically significant total problem score as compared with 8.9% of FT children (4). Previous studies have identified internalizing behavior as a strong predictor of a later psychiatric diagnosis at 11 years old. The EXPRESS results suggest that cognitive, language, and motor development mediate the relationship between prematurity and behavior (4).

Prematurity is a risk factor for Attention-Deficit Hyperactivity Disorder, or ADHD. The prevalence of ADHD is inversely proportional to gestational age. Children born VPT have a 2 to 3 – fold higher rate of ADHD. Those born EPT have a 4 – fold increase in rates of ADHD (3). There is not a strong association between ADHD and other comorbid behavioral conditions in preterm children who have ADHD. Inattention tends to be

more of an issue than hyperactivity/impulsivity (3). This may be due to deficits in attention, working memory and information processing, which are executive function processes as described above.

Current Trends

The relationship between prematurity and Autism Spectrum Disorder has been an area of interest in recent years. This can be difficult to determine because the presence of other developmental disabilities are confounding factors. However, Autism Spectrum Disorder rates of 5 – 8% have been reported in children born prematurely (3). One more recent study found that infants weighing less than 2000g had a 5% prevalence of Autism Spectrum Disorder when followed up at 16 years of age (5). This is approximately 5 times higher than the prevalence in the general population (1 in 88 or 1.1% at the time the data was reported).

Conclusions

Infants born prematurely have a greater chance of long term survival today than ever before. This includes infants born at the earliest gestational ages and lowest birth weights. As these infants grow older, they are at increased risk for a variety of neurodevelopmental and behavioral sequelae. It is important for pediatricians

to be aware of the long term neurodevelopmental and behavioral conditions for which these patients are at risk in order to be able to identify these conditions, ensure early intervention, and provide for the best possible outcomes.

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Born Too Small

by Alison Lunsford, M.D.

A well accepted concept in today's society is that our actions today effect the environment for future generations. Pediatricians, neonatologists and obstetricians now understand that the intra-uterine environment plays a pivotal role in the long-term metabolic health of a human. The term "SGA" or Small for Gestational Age, once only a code used in the neonatal intensive care unit, now carries a lifetime of implications for an infant.

The definition for SGA commonly used in the United States is that of an infant whose birth weight and/or birth crown/heel length is at least ≤ -2 standard deviations below the mean for gestational age (1). The cause of in-utero growth failure rendering infants SGA is multifactorial and may include fetal, placental, maternal or even paternal etiologies (Table 1) (2).

Many infants born SGA spend days or even weeks in the NICU due to transient glucose abnormalities, temperature instability and poor weight gain. The medical problems do not end once a child leaves the NICU for home. Long term consequences commonly encountered include growth failure, metabolic consequences and psychological/psychosocial problems.

Infants born SGA typically exhibit an early acceleration of linear growth

within the first 6 months of life, but may take up to 2 years to complete catch-up growth. Approximately 85% of infants born SGA will catch up by 2 years of age; those that do not typically remain short into adulthood (2). In 2001, the International SGA Advisory Board Consensus Guidelines recommended the use of Growth Hormone (GH) for treatment of children born SGA who have failed to catch up by 2-4 years of age (1). These children should undergo a complete work up to rule out other causes of poor linear growth prior to starting treatment. The ultimate goal is to maximize catch-up growth in prepubertal children and to maintain a normal growth velocity until growth has ceased. Multiple studies have shown that GH should continue until growth plates are fused. Premature discontinuation of GH will cause loss of previously attained height goals (2). Final adult height has improved with the advent of recombinant hGH. Although growth hormone initiated at any age will augment linear growth, the earlier treatment is started the larger are the gains in final adult height. The dosing for SGA infants is higher than typically used in standard growth hormone deficiency. Therefore, long term safety studies have been performed but have not yielded any significant concerns in these children.

To some parents, the final adult height of the young child in front of them is not a major concern. However,

growth hormone can reverse some of the metabolic programming caused by being born SGA that leads to long term health consequences. A decrease in insulin sensitivity is considered the hallmark of the 'programming hypothesis' (3). The intra-uterine environment and growth during early life can influence the development of chronic non-communicable disease, such as type 2 diabetes mellitus and cardiovascular disease. The tempo of weight gain during the first year (fast or slow) affects the metabolic risk, with those gaining rapid weight during the first 3 months of life exhibiting the worst profiles (3). Despite normal childhood BMI, children born SGA have leptin and insulin resistance compared to AGA (appropriate gestational age) peers. Short adults born SGA have elevated systolic and diastolic blood pressure (3).

Now that more metabolic data is available, persuading the remaining hesitant parents into considering growth hormone for their child is less difficult. The treatment has great long term safety data, but most impressively the reversal of the metabolic consequences seen after treatment with growth hormone is undeniable (Table 2) (3).

The last component of the consequences of SGA infants involves the less well-defined psychological and psychosocial manifestations. Do these children end-up with Napoleon Complexes? Many studies do report they have lower paying jobs, never reach manager status, and have lower IQ levels than their AGA matched peers. Obviously, this is multifactorial in nature. Children born SGA due to maternal drug use will likely have lower IQ and lower earning potential versus a child born to middle class parents secondary to placenta previa. Therefore, the treatment goals must be tailored to the individual case.

(Table 1)

Fetal	Chromosomal, inborn error of metabolism, infection, malformation
Placental	Abnormal cord insertion, multiple infarctions, placenta previa, abruptio placenta, multiple gestations, chorioangiomas
Maternal	Poor intake, pre-eclampsia, infection, alcohol, drugs, smoking
Paternal	Diabetes

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SGA must no longer be considered only a NICU diagnosis. This diagnosis at birth carries lifelong implications. These infants must be monitored closely for excessive weight gain and catch-up growth which may indicate increased risk for metabolic disease in adulthood. The 10% who fail to catch up should be evaluated for their poor growth and offered

growth hormone as early as 2-4 years of age. As these children age, they should be monitored closely for hypertension, type 2 diabetes, premature adrenarache, and polycystic ovarian syndrome. There is still much to learn about the effects of the in-utero environment and its lasting effects on the human that resides within it.

(Table 2)

Long-term effects of growth hormone therapy in individuals born SGA
<p><i>Blood pressure</i></p> <ul style="list-style-type: none"> • A decline in systolic and diastolic blood pressure SD scores occurs during growth hormone treatment • At 6.5 years after GH treatment, systolic and diastolic blood pressure SD scores are lower among GH treated adults than untreated adults.
<p><i>Body Composition</i></p> <ul style="list-style-type: none"> • Adipose-tissue mass decreases and lean-body mass increases during GH treatment. • At 6.5 years after GH treatment, adipose tissue mass and lean body mass are similar among GH treated and untreated adults.
<p><i>Glucose metabolism</i></p> <ul style="list-style-type: none"> • Insulin sensitivity decreases and insulin secretion increases during GH treatment. • At 6.5 years after GH treatment, insulin sensitivity and insulin secretion are similar among GH treated and untreated adults
<p><i>Lipid Levels</i></p> <ul style="list-style-type: none"> • The levels of total cholesterol, LDL, and HDL decrease during GH treatment. • At 6.5 years after GH treatment, cholesterol levels are similar among GH treated and untreated adults.

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Respiratory Distress Syndrome of the Newborn

by Sumesh Parat, M.D.; Parth Bhatt, M.D.; Vijay Linga, M.D.; Mubariz Naqvi, M.D.

Key words: Respiratory distress syndrome, surfactant, bronchopulmonary dysplasia

Abstract: Respiratory distress syndrome is a disorder of lung immaturity and pulmonary surfactant deficiency seen primarily in preterm neonates. It is diagnosed by clinical findings consistent with respiratory distress and characteristic chest xray findings. Treatment includes prevention by antenatal use of corticosteroid and use of surfactant replacement therapy along with mechanical ventilation to prevent lung injury. Bronchopulmonary dysplasia is one of the important comorbidities associated with the disease and its treatment. Current practice is to manage babies on non-invasive ventilator support and selective surfactant use to prevent or decrease the risk of bronchopulmonary dysplasia.

Introduction

Respiratory Distress Syndrome (RDS) of the newborn, otherwise known as hyaline membrane disease, is a disease of prematurity due to immature lungs and deficient surfactant formation. This can lead to atelectasis with increased work of breathing and intrapulmonary shunting. This leads to ventilation-perfusion mismatch with subsequent respiratory failure, if left untreated.

Epidemiology

Incidence of RDS is inversely proportional to the gestational age. Incidence is 60% in babies born before 28 weeks, 30% at 28-34 weeks gestation and only 5% for babies born after 34 weeks. Other risk factors are male sex, Caucasian descent, maternal gestational diabetes, multiple gestation and perinatal asphyxia.

Pathophysiology

The advancement in neonatal practices has decreased the period of viability currently to 23 weeks, with some centers resuscitating babies at 22 weeks gestation. There are 5 stages in development of lung namely embryonic, pseudoglandular, canalicular, saccular and alveolar (**Fig 1**).

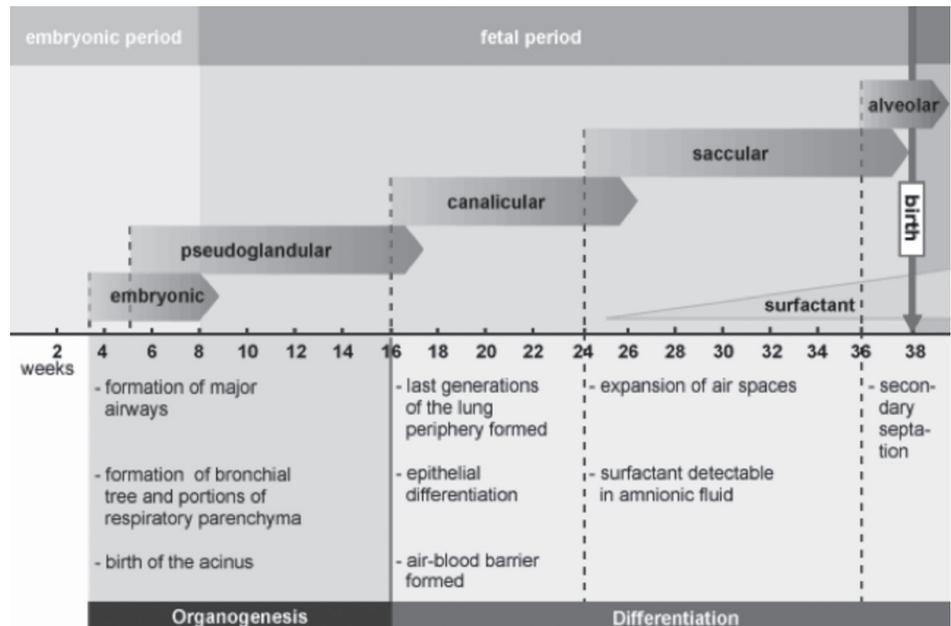


Fig-1: Stages of Lung development in humans.

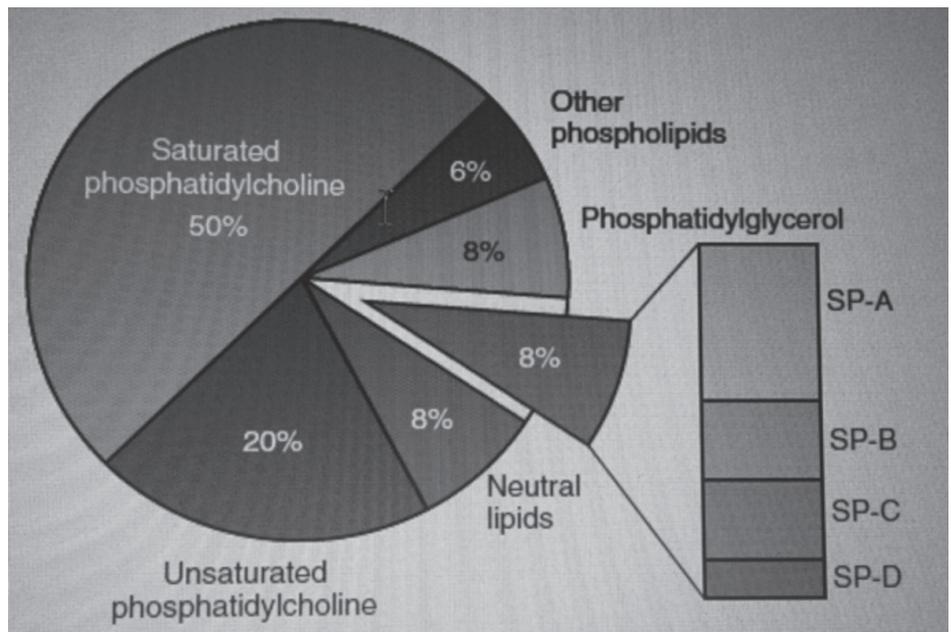


Fig.2: Composition of human surfactant. Major component is phosphatidylcholine. Surfactant protein makes 8% of mass of surfactant.

Around the time of viability, fetal lung begins to transition from canalicular to saccular stage, with enlargement and thinning of the distal airways and maturation of type II pneumocytes. Type II pneumocytes produce surfactant, which is a mixture of phospholipids and proteins which lines the alveolar wall and helps lower the surface tension, preventing collapse of

alveoli (**Fig 2**). Phosphatidylcholine is the most abundant phospholipid in the surfactant molecule. There are 4 surfactant proteins (SP) A,B,C and D, and they facilitate adsorption and spread of surfactant, and regulate its secretion and uptake.

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An infant born early has immaturity of lung development and decreased surfactant production, which necessitates increased work of breathing to keep the alveoli open. This leads to atelectasis and decreased functional residual capacity and subsequent inflammatory changes resulting in lung injury. Consequent hypoxia with acidosis will further affect surfactant production and ultimately progress to respiratory failure.

Diagnosis

The symptoms present at the time or soon after birth and worsen over time. Babies present with tachypnea, nasal flaring, retractions, grunting, cyanosis or even apnea. Diagnosis is confirmed by a chest radiograph which shows diffuse atelectasis with air bronchograms, resulting in the classic “ground glass” appearance (**Fig 3**). Similar chest radiograph appearance can be seen with GBS pneumonia. Blood gas measurements will show hypercarbia with hypoxia and subsequent respiratory and mixed acidosis.

Management

Antenatal administration of steroids (2 doses of betamethasone administered 24 hours apart) to women at high risk of preterm delivery prior to 34 weeks of gestation has been the standard of care since the NIH consensus statement in 1994¹. Steroids decrease the incidence and severity of RDS by accelerating the maturation of fetal lung. In addition, use of antenatal steroids has also shown to decrease the incidence of intraventricular hemor-

rhage (IVH) and neonatal death in babies greater than 28 weeks gestation². These benefits are not as evident in babies born less than 27 weeks, but even these babies have decreased mortality and better neurodevelopmental outcomes when antenatal steroids were administered³. Recent studies have shown that use of antenatal betamethasone in women at 34-36 weeks gestation significantly decreased the rate of neonatal respiratory complications⁴. This has been put forth in a recent American College of Obstetricians and Gynecologists’ practice advisory⁵.

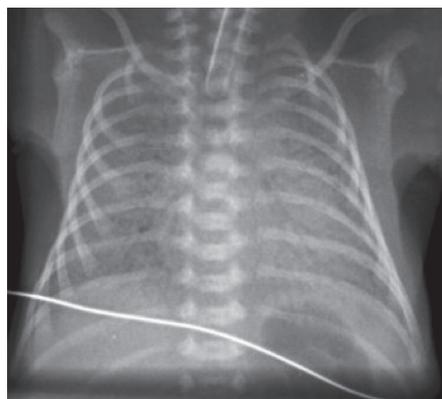


Fig. 3: Chest radiograph of a premature baby with severe RDS. Shown are diffuse reticulo-granular opacities obscuring the cardiac silhouette and air bronchograms.

Surfactant is administered directly into lungs through the endotracheal tube either as bolus, infusion or small aliquots. Regardless of the method of administration, there is no difference in the outcomes⁶. Both natural and synthetic

surfactants have been used and found to be effective in treatment of RDS. Natural surfactants are derived from animal lungs (bovine or porcine) and contain phospholipids with SP-B and SP-C. Synthetic surfactants contain phospholipids and may or may not contain proteins (**Table 1**). Animal derived surfactant use is associated with lower mortality rate and air leaks when compared to first generation protein-free synthetic surfactant (Exosurf)⁷. With second generation synthetic surfactant (surfaxin) the results are comparable to natural surfactant^{8,9}.

Use of exogenous surfactant in preterm infants for RDS has decreased the incidence of air leaks (pulmonary interstitial emphysema and pneumothorax), bronchopulmonary dysplasia (BPD) and neonatal death since it has been approved for use in humans since 1990^{10,11,12,13}. Other morbidities like IVH, necrotizing enterocolitis, patent ductus arteriosus (PDA), retinopathy of prematurity and nosocomial infection have not been affected by surfactant use, which could be explained by the increased survival of preterm babies with surfactant therapy¹⁴. Most babies require only a single dose of surfactant, but additional 1-2 doses at 12 hour intervals can be used if necessary.

Initial practice was to administer prophylactic surfactant to babies at risk of RDS either in the delivery room or after initial resuscitation within the first hour of life. This resulted in overtreatment of babies, especially when gestational age approached

Surfactant	Main phospholipids	Proteins	Suggested dose	Phospholipid per dose
Animal derived				
Beractant (Survanta) Minced bovine lung extract	DPPC (45-65%) PG	SP-B and SP-C	4 ml/kg	100 mg/kg
Calfactant (Infasurf) Bovine calf lung lavage	DPPC (45%) PG	SP-B and SP-C	3 ml/kg	105 mg/kg
Poractant (Curosurf) Minced porcine lung extract	DPPC (40%) PG	SP-B and SP-C	2.5 ml/kg and 1.25 ml/kg	200 mg/kg or 100 mg/kg
Synthetic				
Colfosceril (Exosurf)	DPPC (100%)	None	5 ml/kg	67.5 mg/kg
Synthetic, protein analog Lucinactant (surfaxin)	DPPC (75%) POPG	KL4 peptide as SP-B	5.8 ml/kg	175 mg/kg

Table 1: Composition and dosage of surfactants
DPPC, dipalmitoyl phosphatidyl choline; PG, phosphatidyl glycerol; POPG, palmitoyloleoyl phosphatidylglycerol; SP-B, surfactant protein B; SP-C, surfactant protein C

28 weeks or greater. As surfactant administration requires endotracheal intubation and positive pressure ventilation which can result in lung injury, current practice is to selectively use surfactant in babies who fail non-invasive ventilation. This is termed rescue or selective surfactant treatment strategy. Before the era of routine CPAP use, the prophylactic use of surfactant was associated with decrease in risk of air leak and decrease mortality rate compared to selective surfactant use.¹⁵ But with current routine initial use of CPAP this difference is no longer seen and conversely, in smaller babies, prophylactic surfactant usage is shown to increase the risk of death or BPD¹⁶. The Vermont-Oxford Network trial randomized babies less than 29 weeks to 3 groups; prophylactic surfactant with continued ventilation, prophylactic surfactant and rapid extubation to CPAP (**INSURE – INTubate SURfactant Extubate**) and CPAP without surfactant¹⁷. There was a trend towards lesser risk of BPD or death in the INSURE group (RR 0.78; 95%CI 0.59-1.03) and CPAP group (RR 0.83; 95%CI 0.64-1.09). Also half of the patients in the CPAP group didn't require intubation or surfactant treatment.

Positive pressure ventilation to maintain the functional residual capacity (FRC) and decrease the work of breathing by improving the lung mechanics is the cornerstone of treatment of RDS and has improved survival in preterm babies. However mechanical ventilation can lead to significant co-morbidities like BPD secondary to both barotrauma and volutrauma, and adverse neurodevelopmental outcomes. Non-invasive ventilation strategies have been developed to decrease the risk of co-morbidities associated with invasive mechanical ventilation.

Nasal continuous positive airway pressure (NCPAP) devices have been used for treatment of RDS. It was initially administered via endotracheal tube but currently utilizes nasal mask or bi-nasal prongs as interface for delivery of positive pressure. The pressure is generated by a ventilator, or by placing the distal end of a NCPAP circuit under a known depth of water (bubble NCPAP) or by variable flow devices like infant flow driver. NCPAP distends the easily collapsible upper airways and stents it open preventing obstructive apnea and atelectasis. It also stents open the alveoli

increasing the FRC, and the shearing stress stimulates surfactant production and cause improved remodeling of lung parenchyma. Studies comparing NCPAP to mechanical ventilation have shown no difference in the primary outcome of death or BPD at 36 weeks corrected age. But the infants receiving NCPAP had significantly less use of surfactant, spent fewer days on ventilation and required lesser number of post natal steroids^{14,18,19}. The infants receiving NCPAP has higher incidence of pneumothorax^{14,15}.

Additional forms of non-invasive support have been used recently to improve upon the outcomes of NCPAP use. Nasal intermittent positive pressure ventilation (NIPPV) utilizes a ventilator to provide respiration at peak pressures and rate similar to mechanical ventilation. Bilevel nasal CPAP (BiPAP) provides breath with lower pressures, lower rates and small differences (<5 cm H₂O) between high and low CPAP pressures. Both these measures are used in the non-synchronized mode. Synchronization can be attained by using neurally adjusted ventilator assistance (NAVA) which allows the timing and

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degree of ventilator assist to be controlled by the patient. Here the ventilator measures the infants neural respiratory drive through special electrodes incorporated into a nasogastric tube. These electrodes measure the electrical activity of the diaphragm and send signals to the ventilator which provides a synchronized and proportional respiratory support based on the magnitude of the signals measured at diaphragm. In a clinical guidance document, the committee on fetus and newborn (COFN) stated that synchronized NIPPV decreases the frequency of post extubation failure compared to NCPAP but current data doesn't support the superiority of NIPPV/BiPAP over NCPAP for the management of infants with RDS²⁰. Recent meta-analysis has shown that early NIPPV does appear to be superior to NCPAP for decreasing respiratory failure and the need for intubation and endotracheal tube ventilation among preterm infants with RDS²¹.

Humidified high flow nasal cannula (HHFNC) with flow rates up to 8L/min has also been used. The preconditioning of the gas decreases the resting energy expenditure and has shown to decrease work of breathing and to reduce oxygen requirement by decreasing the inspiratory resistance, nasopharyngeal dead space washout and provision of CPAP. Compared to NCPAP it has comparable efficacy in preterm infants for preventing treatment failure, death and CLD with lesser nasal trauma and reduced pneumothorax. Most evidence currently is available for its use as post-extubation support.^{17, 22}

Complications

A major complication is the development of BPD, which is generally defined as need for supplemental oxygen at 28 days of life and further classified based on the amount of oxygen and ventilator support at 36 weeks corrected gestation. Other complications of RDS include IVH, pulmonary hemorrhage and PDA. Complications of treatment are air leak, ventilator associated pneumonia and endotracheal tube block due to surfactant.

Conclusion

With the use of surfactant and non-invasive ventilation for RDS, the outcomes of these vulnerable babies have significantly improved.

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Preterm Labor: How to Manage

by Mike Hansen, M.S.; Kyle Richardson, M.S.; Hena Tewari, M.D.

A patient enters the ER claiming labor pains, but states that she is less than 37 weeks. What should you do?

This topic is of special importance in the United States. Whereas only 12% of babies are born prematurely, they account for 75% of prenatal deaths. This same 12% make up about half of the neurologically impaired children in the US.

Preterm labor is defined as strong, recurring uterine contractions before 37 weeks gestation accompanied by cervical changes including dilation and effacement. The sooner treatment is initiated, the better the outcome for both baby and mother. Thus it is vital to recognize the signs and symptoms early, understand prevention, and know how to manage preterm labor.

What Tests are Appropriate?

Fetal fibronectin (fFN) is the natural glue that attaches the placenta to the lining of the uterus. It has a strong negative predictive value. Patients without elevated fFN (negative result) are unlikely to go into labor in the next 7 days. However, the positive predictive value is lower, indicating a positive test does not necessarily predict preterm labor.

Transvaginal ultrasound is helpful to assess cervical length as a shorter cervical length before 24 weeks gestation is associated with preterm labor. A cervical length of between 20 and 30 mm may still be associated with preterm labor.

These two measurements each have poor positive predictive values alone, and therefore must be combined with cervical dilation. Cervical dilation above 2 cm, in conjunction with clinical experience, helps determine if the patient is indeed at high risk of preterm labor.

What if Contractions are Present, but Cervical Changes are Not?

This situation is common. Use the above tests to rule out preterm labor. While appropriate to observe these patients for a few hours, only 18% will give

birth before 37 weeks gestation. Evidence does not support use of tocolytics or other treatments in these patients. Expectant management is appropriate.

When Should Corticosteroids be Given?

In a mother between 24 and 36 6/7 weeks gestation who is at high risk of delivery in the next 7 days, administer one dose of corticosteroids (usually betamethasone). This aids in fetal lung maturation, and is linked to better fetal outcomes. Single repeat course (rescue dose) of corticosteroids is considered if a previous dose was administered more than 14 days previously, and birth is predicted to occur within 7 days in women less than 34 weeks of gestation.

When Should Tocolytics be Given?

Tocolytics may be used up to 48 hours to prolong pregnancy. Appropriate choices include nifedipine (calcium channel blocker), indomethacin (NSAID), magnesium sulfate, oxytocin antagonists, and beta-adrenergic agonists. Tocolytics may provide some time for corticosteroids to take effect as described above.

Tocolytic therapy is appropriate for patients within 24-34 weeks gestation in preterm labor confirmed by contractions and cervical dilation.

What is the Role of Magnesium Sulfate?

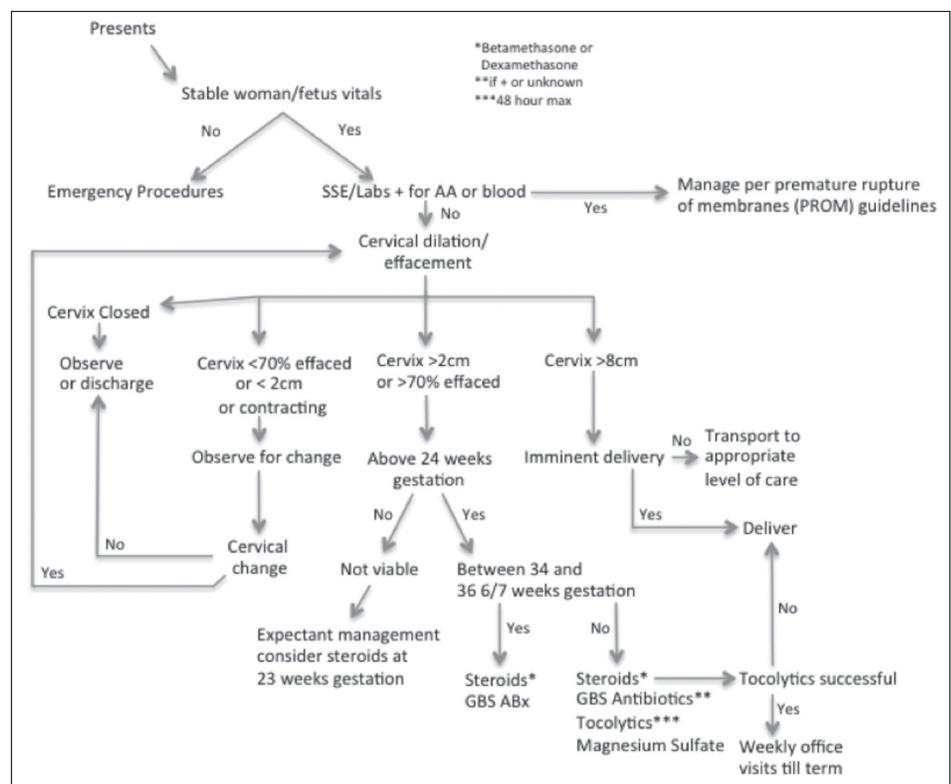
It is well known that preterm infants are at increased risk for neurological deficits. Prenatal exposure to magnesium sulfate has been linked to less frequent neurological impairment, particularly cerebral palsy, if administered in women in labor before 32 weeks of gestation. Magnesium sulfate is often considered “neuroprotective” to the fetus.

What is the Role of Antibiotics?

Though infection is one possible cause of preterm labor, prophylactic antibiotics should not be administered. Antibiotics should be reserved for Group B streptococcus prophylaxis.

What Non-Pharmacological Support is Available?

Pregnancy is a hypercoagulable state. Therefore, strict bed rest is undesirable in pregnant patients due to the risk of



venous thromboembolism. Bone demineralization, muscle loss, and potential employment ramifications also should be considered.

It is recommended that these patients maintain light activity, and continue to attend to their health and nutrition to the best of their ability.

What if the Patient has a Previous Preterm Delivery?

A prior preterm delivery is the number one predictor of future preterm deliveries. Women with a history of preterm singleton delivery should be offered weekly progesterone injections (IM 17-alpha hydroxyprogesterone/Makena®) starting at 16-24 weeks until 36 weeks of gestation or delivery (whichever occurs first) to reduce the risk of preterm labor.

What About Short Cervical Length?

If the patient has a short cervical length (defined as <20 mm on transvaginal ultrasound) before 24 weeks, vaginal progesterone suppositories are recommended regardless of whether or not preterm labor history is present.

Should We Routinely Screen for Short Cervical Length?

Routine cervical length ultrasound measurement screenings are currently under study but are not yet universally recommended. This is currently a decision left up to the mother and her provider. However, if short cervical length is found, proceed as above.

What is Cerclage? What is Its Role in Management of Preterm Delivery?

Cerclage is a procedure where a non-absorbable suture is placed in the cervix to prevent dilation. It is most often used in cases of cervical insufficiency, which is defined as asymptomatic cervical dilation in the second trimester. Cerclage should to be considered in the three following situations:

1. History: A mother has had previous second trimester loss.
2. Physical Exam: Painless cervical dilation is found in the second trimester.
3. Ultrasound: A cervix <25 mm demonstrated on ultrasound before 24 weeks of gestation with history of preterm birth and patient already receiving weekly progesterone.

Note: The suture must be removed

before labor and delivery.

What about Multifetal Gestations?

Tocolytics may increase the risk of untoward outcomes in a mother with multifetal gestations. This includes pulmonary edema. Corticosteroids for fetal lung maturation and magnesium sulfate for fetal neuroprotection are preferred and both are considered acceptable.

Progesterone has not been found to reduce the incidence of preterm birth in multifetal gestations, and is therefore not recommended. Some evidence suggests that cerclage may actually increase the risk of preterm birth in multifetal gestations.

CONCLUSION

Clinical presentation of the fetus does not always fit neatly into specific categories. Clinical experience is invaluable in evaluating and treating patient in preterm labor. When uncertain, it is best to consult a colleague, preferably an obstetrician.

The following is an abbreviated algorithm to guide physicians in the proper management of preterm labor:

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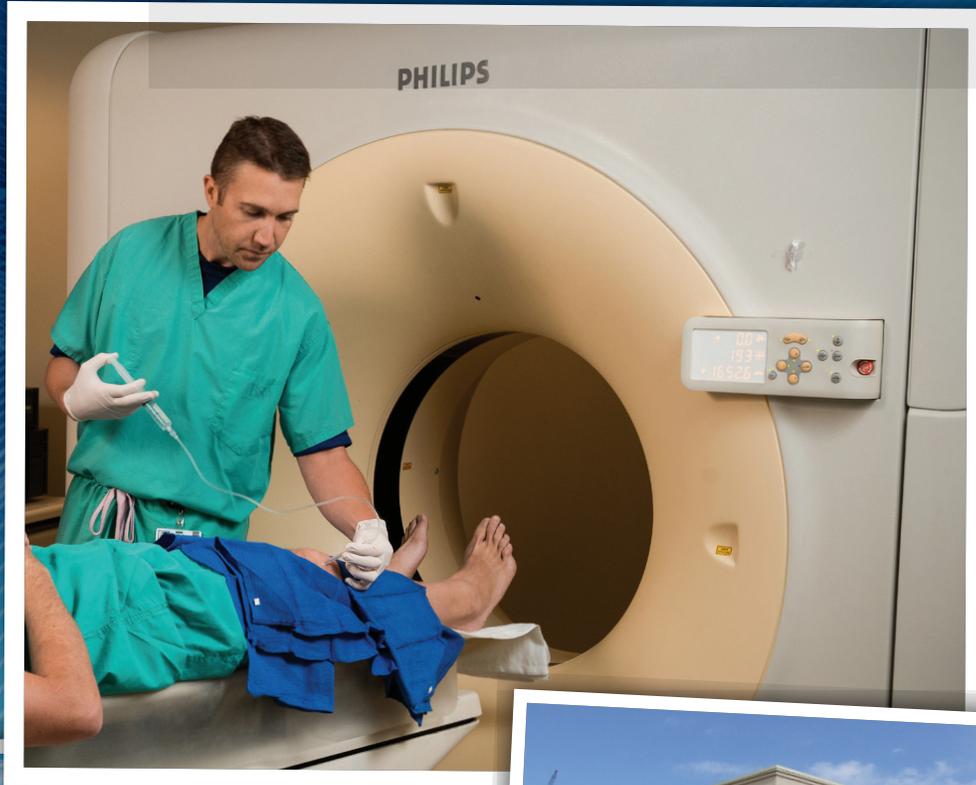
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Small Eyes, Big Vision: Retinopathy of Prematurity

by Tracy Crnic, M.D.

Summary:

Prematurity is one of our nation's most common causes of morbidity and mortality among children. It is becoming increasingly common. Thus an understanding of the complications for both health and lifestyle should be incorporated into any practitioner's database. This serves as a brief introduction to the consequences and care specifically in regards to the visual system. It should be noted that, as with many other systems, the risk to these patients does not end in the Neonatal Intensive Care Unit. Therefore a lifelong approach to management of risks and disease states should be part of the care of all of our patients.

Introduction:

In the United States, 1 in 10 infants born are born prematurely. By definition this means they are delivered before thirty seven of the normal forty weeks of gestation. This rate has risen by 36% since 1981. Prematurity is linked to many serious health challenges and disabilities. These health issues are not only present at the time and shortly after birth but are lifelong, requiring ongoing treatment and follow up.

The Visual Picture:

The eye and its development are amongst the many systems at significant risk for morbidity. Retinopathy of Prematurity or ROP is a disease that occurs in premature infants, causing blood vessels and tissue to grow abnormally in the retina. The retina is the layer of nerve cells in the eye that recognize light and send that information to the brain, like the film in a camera. The eye begins development at 16 weeks gestation. The blood vessels and retina begin forming in the center of the back of the eye around the optic nerve and progress normally toward the periphery. This tissue supplies oxygen and nutrients to the developing eye. Development increases rapidly in the last 12 weeks of pregnancy

and is normally complete a few weeks after delivery. When infants are born early, this growth is halted because of the change in oxygen and nutrient content to the eye. This abnormal tissue produces chemical signals (termed VEGF, or Vascular Endothelial Growth Factor) that cause the now developing tissue to do so erratically. Instead of the normal centrifugal course, these smaller, weaker vessels tend to grow toward the center of the eye. The fibrous gel inside the eye, called vitreous, then places traction on these vessels. This can cause bleeding and detachment of the retina from the back of the eye. These, among other disorders related to ROP, are the leading cause of visual loss in childhood.

Defining the Problem:

The National Eye Institute and National Institute of Health define an infant as "High Risk" for retinal detachment and blindness as one born at or before 31 weeks of gestation, weighing 1250 grams or less, or those who undergo a particularly unstable medical course (1). Of the approximately 28,000 births per year fitting this criteria, 14 to 16,000 develop some level of ROP. 400 to 600 of them are rendered blind before the first year of age. Screening for this disease is done by an ophthalmologist trained and experienced in ROP in the neonatal intensive care unit after pupillary dilation with use of indirect ophthalmoscopy to directly visualize the stage of development. The initial exam is scheduled based on post gestational age (36 weeks or less) or 4 weeks of life. Other mitigating factors may alter this timing somewhat. Based on the findings of this exam, follow up exams are repeated every one to three weeks until growth is complete, post menstrual age exceeds 45 weeks without development of disease, or regression of disease is observed (4) (5).

Retinopathy of Prematurity is divided into three zones surrounding the optic nerve and terminating at the temporal

edge of the peripheral retina. A smaller area of vascularization on exam indicates increasing risk for complications. ROP is also subdivided into five stages based on the condition of the retina and vasculature present. As the stage increases, so does the risk of vision loss or progression. In stage one, a demarcation line surrounding the developed retina indicates lower risk. In stage two disease this line develops height and is termed a ridge. In stage three abnormal blood vessels, referred to as neovascularization, begin to appear in clusters along the edges of the ridge. This is the stage where increasing risk occurs depending on the amount of abnormal vessels and their effect on the vessels that supply them. Stage four and five both involve some degree of retinal detachment. This combination of findings determines when or if the infant requires treatment to prevent or repair progressive disease. Patients are now classified into two categories. Type I patients have disease findings that warrant treatment of the undeveloped retina. These patients have findings only in the posterior most part of the eye, have growth beyond that but have abnormal vessel growth, or have the presence of PLUS disease. In this condition the otherwise normal blood vessels become engorged and tortuous, indicating more severe ischemia. Type II patients include all other findings and are then divided into groups to determine when the next exam should take place.

Current Treatment Protocols:

Type I or threshold disease and patients considered pre-threshold (1) (4), require treatment within 72 hours of diagnosis. Treatment has evolved over the last 20 years but essentially uses one of several methods to destroy the non-vascularized tissue in the retinal area. This decreases the demand on the vessels to produce oxygen and nutrients, thus decreasing VEGF production. Cryotherapy was originally studied to show significant reduction in rates of progression of disease and in regression of

disease (3). This was later replaced by argon laser photocoagulation, done through the same mechanism as the exam. Exams are then repeated to monitor for regression of the abnormal findings. Occasionally multiple treatments are needed. Some patients despite best treatment progress to partial or complete retinal detachment. At this point intraocular surgery to remove the vitreous and vessels causing traction is performed as well as a scleral buckling process to re-oppose the detached tissue. Even in the best circumstances these patients tend to have poor visual outcomes.

Most recently studies are being conducted on using an injection of anti-VEGF medications to turn off the signal creating the abnormal growth. Early studies show a great deal of promise and reduction of complications known to be common from the other two procedures. Because this treatment is relatively new, however, no long term data has been produced regarding late complications or other system involvement.

The Long Term Plan:

Unfortunately this disease process and consequences do not stop, even once the patient reaches complete vascularization. These patients, with or without treatment, have higher rates of myopia, anisometropia, strabismus, glaucoma, cataract

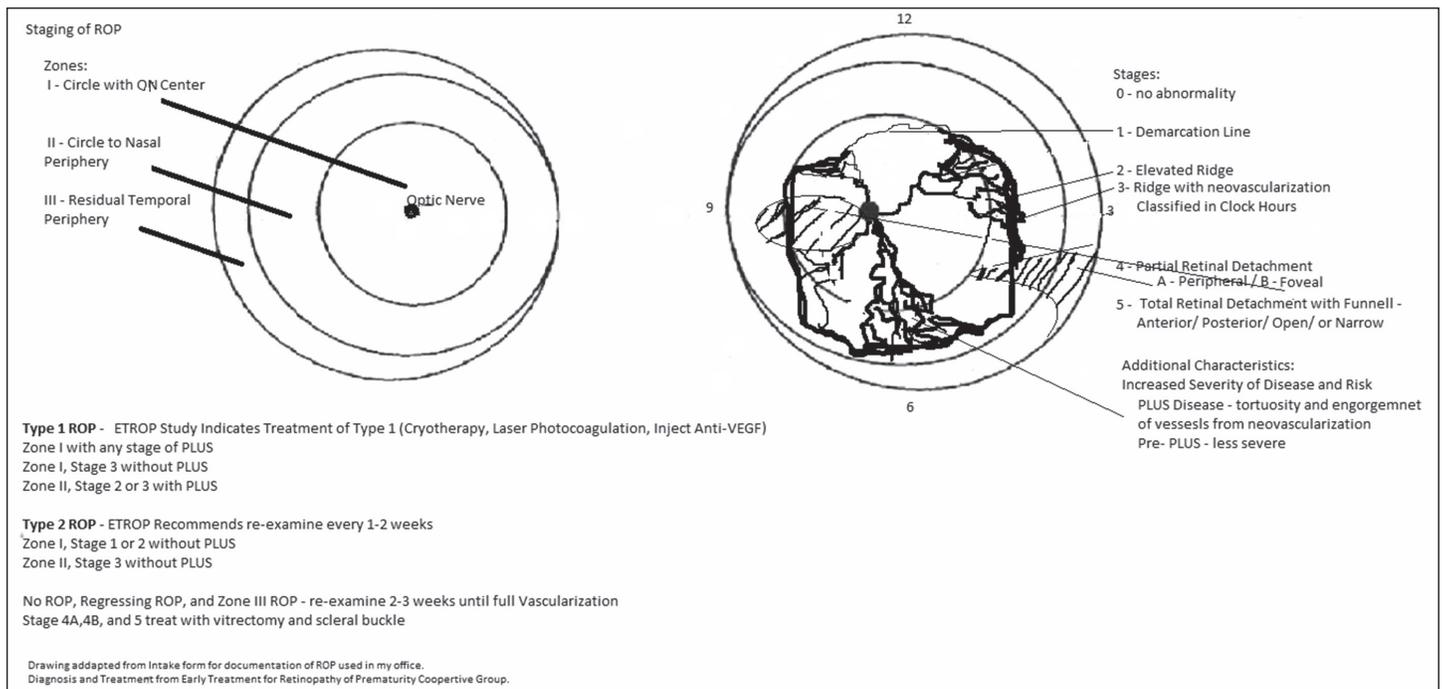
formation, amblyopia, and late retinal detachment. These complications require continuous monitoring at least yearly throughout the child’s visual development. This timeframe is traditionally considered to occur from birth through seven to nine years of age. However, any of these conditions can develop even into adulthood.

Of utmost importance is ensuring the family understands the process their child is undergoing and the significance of maintaining strict follow up protocols. Parents are exposed to many health issues and life threatening situations in this time period from multiple sources, so repeated conversations are helpful. Once the patient is discharged from the hospital, follow up with a Pediatric Ophthalmologist trained in caring for these patients is recommended to continue with long term monitoring.

Thankfully research continues for these smallest of our patients to provide safer and more efficacious treatments. Several references are easily accessible to any practitioner or patient through the American Academy of Ophthalmology (aao.org), the American Association of Pediatric Ophthalmology and Strabismus (aapos.org), and the American Academy of Pediatrics (aap.org). In addition articles are readily available on pub med or webMD sites.

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Provision of Compassionate Perinatal/Neonatal Palliative and End of Life Care

by Michael Hansen, M.S.; Kyle Richardson, M.S.; Mubariz Naqvi, M.D.

Abstract:

Each year in the United States 15,000 children are born who will not survive. Therefore, palliative care for the neonate is of increasing importance. The goal of palliative care is to relieve physical and other suffering of the neonate, family, and healthcare providers. Palliative care must take into consideration ethical, legal, emotional, spiritual, cultural, religious and physical aspects surrounding the death of the neonate. Respect, sensitivity, compassion, and communication play a prominent role in palliative care. Communication between hospital staff and the family of the dying neonate ought to take place in a quiet, calm, comfortable environment. Questions ought to be answered in plain terms to facilitate understanding. Encouragement should be offered without providing false hope. Every effort should be made to make the transition from life to death a meaningful one. Special consideration can be given to providing a Memory Box of personal items such as hand/foot prints/molds, locks of hair, ID bracelets, and baby blankets. The grieving process must be respected. After the patient's death, healthcare personnel should follow up with the grieving family several times in the coming weeks. Adherence to these principles and methods provides the most compassionate and effective care in a difficult situation for all involved.

What is Palliative Care for a Newborn?

Palliative care for a newborn is holistic and extensive care for an infant who is not going to get better. Palliative care is an entire milieu of care to prevent and relieve an infant's pain and suffering. The purpose is to improve the conditions of an infant's living and dying.

What is the Goal of Palliative Care?

The goal is to relieve the physical, psychological, social, emotional and spiritual suffering of the dying infant, the family, and the health care providers themselves. Planned interventions aim to show respect for the infant's time on Earth, as

well as to support the family's experience with empathy, punctuated with cultural and religious sensitivity. Palliative care focuses on managing the symptoms of pain, difficulty breathing, and seizures.

What is Necessary for an Environment of Palliative Care?

Palliative care may be executed in the home or hospital as needed. It requires planning, training and commitment by healthcare staff. Staff must be familiar with palliative care, and ready to implement such care for both the infant and the parents. Team members often involved include: neonatologist, nurses, hospice, social services, ethics committee, spiritual and/or religious support services, child life specialists, developmental experts and case managers.

How Can Effective Communication Occur Between Physicians & Parents?

The Munson Communication Tool Box is a method by which healthcare professionals may communicate with the family of a dying neonate in both an effective and compassionate way. Elements include: meet in a quiet and private place, refer to baby by name, convey empathy, speak directly, offer choices if possible, be honest, focus on questions, wait quietly, review the goals, guide parents through the process, and address spirituality and religion.

What Type of Training is Necessary for Palliative Care?

Palliative care training should include knowledge about the transition from life-extending care to palliative care. Healthcare professionals should know well the symptoms of death, skin care, mouth care, pain control, dyspnea control, light and sound management, and promotion of self-regulation such as sucking and grasping. Community-specific considerations ought to be considered: community resources, organ procurement services, and cultural and religious aspects. Ethics, grief stages, stress management, coping mechanisms,

conflict resolution, and crisis intervention theory also are important aspects to consider.

How Does a Newborn Qualify for Palliative Care?

Several different categories or conditions meet the qualifications for palliative care. Neonates born at or below the threshold of viability—defined as <24 weeks gestation and/or <500 grams without growth restriction—qualify. Many genetic problems are incompatible with life, and palliative care is often necessary. Renal disorders (Potter syndrome, renal agenesis), CNS disorders (anencephaly, massive intraventricular hemorrhage, severe hypoxic ischemic encephalopathy), cardiac abnormalities (acardia, inoperable cardiac defects), and severe structural defects (giant anterior abdominal wall defects, congenial diaphragmatic hernia with hypoplastic lung) may likewise qualify for palliative care.

How Can Palliative Care be Introduced to Parents?

First and foremost, let the family know that they will not be abandoned. Continue to provide medical information to the family. Sit down with them in a quiet, private, comfortable place. Always have a third party present. Invite spiritual/religious support personnel to be present. Use simple layperson language. Avoid mentioning "withdrawal of treatment," and emphasize that care will be continuously given to both baby and family.

What Actions are Taken in Palliative Care?

Invasive care ceases. Medical machinery, artificial feeding, and frequent vital sign checks are minimized. All medications are removed except those that provide immediate comfort. Skin care and hunger are managed. Oxygen and/or suction may be continued. Nursing staff continues observation and gentle assessment. Physicians document level of care and palliative care orders. Ventilators

should be removed in a private, respectful manner. Family may or may not wish to be present. Pressors and antibiotics should be stopped. Maintain IV access for pain control.

How Should Sensitive Post-Death Topics Be Discussed?

A physician who has worked with the family should lead these discussions. Discussion may include the options for organ donation. Autopsy may be desirable for medical staff—especially for pictures for educational use—but the family must approve such actions. Always respect the family's wishes and religious beliefs. These conversations must be held in a comfortable, private environment. Show compassion. Walk with the parents as they depart from the hospital.

How Can the Healthcare Team Show Additional Compassion?

One way to show support and care to the family is the use of a Memory Box. Families are more likely to allow photos to be taken of their child if these photos are included in a Memory Box that is provided to the family. Other mementos can be included as appropriate, including a photo of the infant's care staff. Other items to be considered: locks of hair, hand & foot prints or molds, record of baby's weight and length, and ID bracelets.

How Can Continuity of Care be Maintained?

Follow up with the family of terminal neonates one week after death.

Consider a 4 or 6 week follow up as well. Discussions of autopsy, lab reports, etc. may be discussed at either of these times, if not previously discussed.

How Does Palliative Care Affect Healthcare Staff?

Provision of palliative care is physically, intellectually, and emotionally demanding on all healthcare staff. It is appropriate to provide spiritual, religious, moral, emotional and behavioral health support for staff. They are overcoming a loss as well.

"Paulinia's Story", narrated by Dr. Clifford Straehley of University of Hawaii

"Paulinia was a beautiful and intelligent child. She was seven years old and very ill with a massive abdominal tumor. I had performed a laparotomy in the hope that the tumor would prove to be resectable, but it surrounded the aorta, all of its visceral branches, and the vena cava. All I had been able to do was biopsy the tumor, which proved to be a liposarcoma. Paulinia was unable to eat, although she could retain oral fluids.

"A few days after the biopsy, Paulinia asked me, 'Dr. Straehley, am I dying?'"

"Many years ago, during medical school and my surgical residency, I was told that one informs the family, but protects the child from the knowledge of impending death. But I knew that if I lied to her she would lose faith in me. I answered, 'Yes, Paulinia, God has decided to take you to heaven with him.'"

"Then she made an interesting request. 'Dr. Straehley, please take me to the Waikiki Pancake House one more time.'"

"On the following Sunday, the chief nurse and I took Paulinia on a gurney in an ambulance to the Waikiki Pancake House. We had called the manager beforehand, and he had set up a table and alerted all of his employees. They came out to greet her as she was wheeled in. Paulinia smiled and laughed as several of the employees kissed her and wished her aloha. One of them brought her a lei.

"After we returned to the hospital, Paulinia asked me, 'Dr. Straehley, will you sit beside me and hold my hand when I die?'"

"I left orders that when her vital signs began to fail, I should be called regardless of the time of day. Several nights later I received the expected call. As I sat at her bedside and held her hand, Paulinia said, 'You came.'"

"Shortly thereafter she died. On her face there rested a beautiful smile. Paulinia had died in peace."

When neonates or children are taken from the Earth, it always seems premature. A skillful, compassionate healthcare team can make the transition easier for the patient, family, and all others involved.

Key Words: Neonate, End of Life Care, Palliative Care, Perinatal Mortality

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From Womb to Cradle:

The Journey a Newborn takes to His Mother's Arms An Update on Newborn Classification

by Nadia Aurora, M.D.; Fizza Naqvi, M.D.; Mubariz Naqvi M.D.

In 2012 the National Institute of Child Health and Human Development, American Congress of Obstetricians and Gynecologists (ACOG), American Academy of Pediatrics (AAP), Society for Maternal-Fetal Medicine, March of Dimes, and World Health Organization (WHO) convened to reassess the classification of neonates. Before 2012 "term" was considered 37 0/7 to 41 6/7 weeks gestation, with the assumption that infants born in this five week range would have healthy outcomes. However, numerous studies have shown this is untrue, particularly regarding respiratory outcomes. Studies show that the time period between 39 0/7 to 42 6/7 weeks gestation have the fewest adverse outcomes in uncomplicated pregnancies^{1,2}. With the increased morbidity and mortality outside of this range, mem-

bers at the 2012 conference deemed it necessary to adjust the definition of "term" in order to improve maternal and neonatal health outcomes, and to update the overall classification system (Table 1).

After the neonate is born, the baby is assessed by the pediatric staff. In addition to a thorough physical examination, an APGAR score is recorded at 1 minutes and 5 minutes after birth. It is used to determine the status of the neonate in his first few minutes of life and to assess appearance, pulse, grimace, activity, and respiratory status (Table 2). Each component is rated on a score of 0-2, with the highest total score being 10. If a neonate scores between 7-10, no further resuscitation is needed, and the baby can be transferred to a level one newborn nursery or family care

unit. A score of 4-6 is classified as moderately abnormal, and a score of 0-3 is low. If a newborn scores below 7, then an APGAR score should be taken at 5 minute intervals for up to 20 minutes³. Every infant, regardless of APGAR score, undergoes routine resuscitation measures, which includes maintaining adequate temperature by placing infant underneath a warmer, making sure the airway is clear from any secretions by manual suction of nose and mouth, and tactile stimulation. If a newborn does not respond to these efforts, then more extensive measures are taken. If there has been adequate ventilation for 30 seconds, and the infant's heart rate is still less than or equal to 60 bpm, then chest compressions are started. APGAR scores

| continued on page 32

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should not be used to determine resuscitation; however, they are useful to see if the newborn is responding to resuscitation. If APGAR score is 0 at 10 minutes, studies show that there is a high risk of long term morbidity and mortality. At that point, it is reasonable to make a decision to discontinue resuscitation efforts⁴. Even though the initial APGAR scores are a good indicator of how the baby is performing after birth, they do not predict long term outcomes, such as neonatal mortality or neurologic damage.

Shortly after birth and stabilization of the infant, the gestational age of the neonate is determined. The New Ballard Score (NBS) takes into account physical maturity, as well as factors such as appearance of skin, breast, eyes/ears, genitalia and lanugo to score the infant on a scale of -1 to 5 (Images 1 and 2). The composite score is correlated with gestational age, and the newborn can then be classified. The Ballard score was developed in 1979, and was expanded in 1991 to include extremely premature infants. However, it was found in 1999 that, for extremely premature infants (less than 28 weeks), the gestational age was overestimated by 1.3 to 3.3 weeks⁷. NBS is most reliable if it is performed between 30 to 46 hours of life, and even earlier for preterm infants. Establishing the gestational age is important to determine what additional mea-

asures, such as administering surfactant, need to be taken for the infant to have the best long term prognosis. After the assessment of gestational age, the neonates are further classified into large for gestational age (LGA), small for gestation age (SGA), and appropriate for gestational age (AGA) based on their birth weight. LGA is above 90th percentile, while SGA is below 10th percentile.

Preterm birth is classified as birth between 24 to 34 weeks gestation, and subclassified into extremely preterm (less than 28 weeks) and very preterm (28 to less than 32 weeks)¹⁰. Unfortunately, preterm births are increasing in incidence worldwide. In the United States 9.6% of births in 2015 were classified as preterm, meaning that nearly one in every ten neonates had increased morbidity and mortality compared to those born at term¹¹. Preterm birth is the leading cause of death within the first 28 days of life, and complications from preterm birth are the leading cause of death of all children under age five worldwide¹⁰.

Only one third of all preterm births are indicated to preserve the health of either the mother or the fetus. Just under half of preterm births are a result of spontaneous labor with intact membranes, while the remainder are due to preterm premature rupture of membranes¹². The pathophysiology behind spontaneous preterm birth

includes maternal-fetal stress response with activation of the hypothalamic-pituitary axis, infection or inflammation, hemorrhage of the deciduum, and excess uterine distention. Maternal risk factors for preterm birth include previous preterm births, African-American race, maternal age less than 20 years or greater than 35 years, and low body-mass index¹².



Preterm

Increased mortality of the preterm infant results from low birth weight, congenital defects, and most notably, lack of surfactant. Surfactant is produced in small quantities starting between 24 to 28 weeks gestation. Without adequate amounts of surfactant to maintain open alveoli, preterm neonates are likely to suffer from Neonatal Respiratory Distress Syndrome (NRDS), negatively impacting their long term outcomes. Preterm infants also have increased rates of hypothermia, hypoglycemia, apnea, hyperbilirubinemia, feeding difficulties, and increased need of evaluation for sepsis, ventilatory support, and IV fluids¹³.

Late preterm births are classified as those between 34 0/7 to 36 6/7 weeks gestation. Late preterm births have similar pathophysiology and risk profile as preterm, with similar long term health outcomes.

(Table 1)

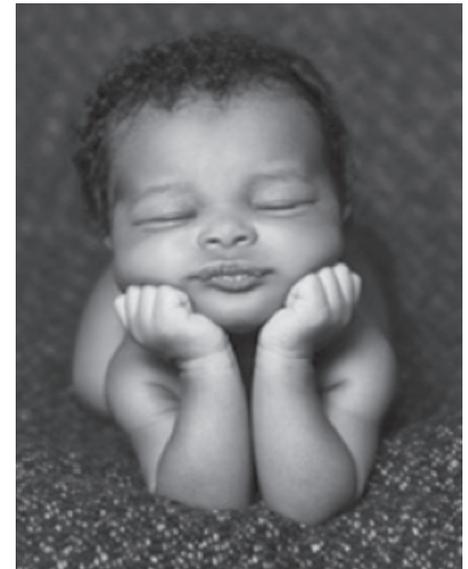
Preterm	24 0/7 to 34 0/7 weeks
Late preterm	34 1/7 to 36 6/7 weeks
Early term	37 0/7 to 38 6/7 weeks
Term	39 0/7 to 40 6/7 weeks
Late term	41 0/7 to 41 6/7 weeks
Post term	42 0/7 weeks and greater

(Table 2)

APGAR Criteria	0 point	1 point	2 points
Appearance (skin color/oxygenation)	Totally blue	Bluish extremities	Pink
Pulse (strength, regularity of heart rate)	None	≤ 100 bpm	≥ 100 bpm
Grimace (reflex to irritable stimuli)	Silence	Whimpering	Crying
Activity (muscle tone and movement)	Limp	Moderate	Active
Respiratory (lung maturity)	None	Irregular	Regular

Image 1

Physical maturity													
	-1	0	1	2	3	4	5						
Skin	Sticky; friable; transparent	Gelatinous; red; translucent	Smooth; pink; visible veins	Superficial peeling and/or rash; few veins	Cracking pale areas; rare veins	Parchment deep cracking; no vessels	Leathery; cracked; wrinkled						
Lanugo	None	Sparse	Abundant	Thinning	Bald areas	Mostly bald							
Plantar creases	Heel-toe 40 to 50 mm: -1 <40 mm: -2	>50 mm; no crease	Faint red marks	Anterior transverse crease only	Crease anterior 2/3	Creases over entire sole							
Breast	Imperceptible	Barely perceptible	Flat areola; no bud	Stripped areola; 1 to 2 mm bud	Raised areola; 3 to 4 mm bud	Full areola; 5 to 10 mm bud							
Eye/ear	Lids fused Loosely: -1 Lightly: -2	Lids open; pinna flat; stays folded	Slightly curved pinna; soft with slow recoil	Well-curved pinna; soft but ready recoil	Formed and firm with instant recoil	Thick cartilage; ear stiff							
Genitals (male)	Scrotum flat, smooth	Scrotum empty; faint rugae	Testes in upper canal; rare rugae	Testes descending; few rugae	Testes down; good rugae	Testes pendulous; deep rugae							
Genitals (female)	Clitoris prominent; labia flat	Prominent clitoris; small labia minora	Prominent clitoris; enlarging minora	Majora and minora equally prominent	Majora large; minora small	Majora cover clitoris and minora							
Maturity rating													
Score	-10	-5	0	5	10	15	20	25	30	35	40	45	50
Gestational age (weeks)	20	22	24	26	28	30	32	34	36	38	40	42	44



Term

fold higher risk of NRDS than those born at 38 weeks gestation, and 7.5-fold higher risk than infants born at term¹³. Increased morbidity was found in infants born vaginally or via Cesarean section, indicating that neither form of delivery outweighs neonatal immaturity.

Term births are classified as those between 39 0/7 to 40 6/7 weeks gestation. Term infants are overall considered to be the healthiest of all classification levels. A literature review studying respiratory morbidity found that infants born at term had incidence of transient tachypnea of 3.1%, respiratory distress of 0.25%, and persistent pulmonary hypertension of the newborn of 0.17%¹⁶. These rates are significantly lower than infants born even at early term, but demonstrate that every infant, regardless of gestational age, must still be carefully evaluated.

Late term infants are classified in the range of 41 0/7 to 41 6/7 weeks gestation. These constituted about 8.3% of births in 2013. Late term births have greater complications than term infants, but less morbidity and mortality when compared to postterm infants. Studies have shown that late term babies have a 33% increased mortality than term infants.

Image 2

Neuromuscular maturity							
	-1	0	1	2	3	4	5
Posture							
Square window (wrist)	>90°	90°	60°	45°	30°	0°	
Arm recoil		180°	140-180°	110-140°	90-110°	<90°	
Popliteal angle	180°	160°	140°	120°	100°	90°	<90°
Scarf sign							
Heel to ear							

Early term births are classified in the range of 37 0/7 to 38 6/7 weeks gestation. Indications for medically induced early term birth include intrauterine growth restriction, multiple gestation, and chronic maternal hypertension or mild pre-

eclampsia¹⁴. Infants born before 39 weeks have an increased risk of NRDS, transient tachypnea of the newborn, ventilator use, NICU admission, and respiratory failure¹⁵. A retrospective study found that infants born at 37 weeks gestation have a three-



Post-term

infants. A prospective cohort study conducted in 1992 found that postterm infants born at 42 weeks have twice the risk of

mortality than babies born at term, a four-fold higher risk if born at 43 weeks, and five to seven fold higher risk if born at 44 weeks. A major complication of postterm births is macrosomia, or a birth weight of greater than 4500 grams. Macrosomia can cause arrest of labor and shoulder dystocia, which increases the risk of birth injuries. Postterm infants have a 20% chance of being dysmature or malnourished. Other complications include death from infection, placental insufficiency,

fetal hypoxia or asphyxia, and meconium aspiration. Risk factors for postterm and late term infants include a history of post term or late term pregnancy, a primigravida mother, obesity, advanced maternal age (older than 35 years), or a family history^{17,18}. Due to adequate and early prenatal care, post term births have significantly decreased in incidence in the US. However, it is seen in mothers who do not seek early care.

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Local family with their newborn.
(Reprinted by permission.)

CONCLUSION:

The updated classification of newborns is important for both the pediatric and obstetric communities. Proper classification of the fetus can prevent unnecessary, and potentially harmful, early births and can lead to better health outcomes for the infant and mother. Additionally, increased awareness of the particular health issues at each gestational age can better guide healthcare providers in administering the most necessary and life-saving care.

This article is dedicated to the infants born in the Texas Panhandle and their families.

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Breastfeeding Jaundice

by Anna Hollingsworth, M.S.; Alli McCabe, M.S.; Amanda Christian, M.D.; Hena Tewari, M.D.

Case Presentation:

A 27-year-old female, G1P0, presents to L&D at 39 weeks gestation for induction of labor. The patient has a history of Wolff-Parkinson-White Syndrome that is followed by her cardiologist. Routine prenatal labs reveal she is Rh negative with a negative antibody screen. She received Rhogam during pregnancy and again after delivery. Her pre-pregnancy BMI was 23 and she gained 21 lbs. during the pregnancy. A 50gm glucose screen was elevated at 159, but subsequent 100gm oral glucose tolerance test was normal. Induction of labor was initiated with Dinoprostone 10 mg PV, followed by oxytocin administration. Membranes were artificially ruptured and clear fluids were present. She underwent spontaneous vaginal delivery of a live vigorous female weighing 3.193 gm, pH=7.198, base excess = -3. The neonate was transferred to the nursery for transient tachypnea of the newborn (TTN). Breastfeeding was initiated post-partum, and there were no complications. Patient and infant were discharged home. On day of life (DOL) #4, the patient re-presented with her infant with signs and symptoms of breastfeeding jaundice. Infant was admitted for inpatient management.

Discussion:

The infant was diagnosed with breastfeeding jaundice. This is an unconjugated hyperbilirubinemia with bilirubin accumulating faster than it can be metabolized and excreted. This can cause hypotonia, lethargy, and severe manifestations later in fetal life such as kernicterus.

Pathophysiology:

Breastfeeding jaundice can be broken down into two main causes: 1) insufficient milk production by the mother or 2) insufficient intake of breastmilk by the infant.⁴ Regardless of the etiology, unconjugated hyperbilirubinemia ultimately results in a physiological jaundice. The jaundice typically presents DOL #3-#5 in exclusively breastfed infants. The etiology of this syndrome is unknown, but the lack of gastrointestinal bacteria in the infant, increased bilirubin from increased heme degradation, and a reduction in

the amount of Uridine-Diphosphate-Glucuronosyltransferase 1A1 (UGT-1A1) are contributing factors.¹³ UGT-1A1 is responsible for converting unconjugated bilirubin to its conjugated substrate, which is water soluble and excreted through urine or stool. There is only about 1% of the total adult concentration of UGT-1A1 in neonatal hepatocytes, and it may take several weeks to reach effective enzyme concentrations.

An increase of unconjugated bilirubinemia is a direct result of heme degradation due to 85-day rbc cycles in neonates versus the 120-day cycles in an adult. Hemolytic disease such as isoimmune-mediated hemolysis from ABO and Rh factor incompatibilities can also increase the rate of degradation.¹³ Subsequently, the presence of beta-glucuronidase (a neonatal enzyme that deconjugates bilirubin to the fat-soluble, non-excretable form) increases reabsorption of unconjugated bilirubin back into the enterohepatic circulation.¹¹ Unconjugated bilirubin can cross the blood-brain barrier leading to kernicterus. Severe hyperbilirubinemia is characterized by total bilirubin (TB) >25 mg/dL or > 95th% on the hour-specific Bhutami nomogram.¹³

For the first several days of life in the exclusively breastfed neonate, the neonate is supplied with colostrum until milk production is sufficient. In addition to hydration, colostrum supplies the neonate with proteins, electrolytes, and may act as a mild laxative increasing passage of stool, which also helps in excretion of bilirubin. A reduction in weight is normal for infants in the first several days postpartum, as long as it is not more than 7% of birth weight and weight is regained after the first two weeks of life.¹³ Low volume colostrum or mechanical errors in feeding can lead to decreased intake by the neonate, hypovolemic contraction and subsequent weight loss from insufficient caloric intake.

Risk Factors:

Any congenital syndrome that increases unconjugated bilirubin, such as Crigler-Najjar type I and II and Gilbert, due to deficiencies of UGT-1A1,

can cause breastfeeding jaundice.¹³ Polycythemia, cephalohematoma, or sequestration of blood can increase heme breakdown leading to jaundice.¹¹ Any intestinal blockage or peristaltic depression can increase enterohepatic circulation of bilirubin also leading to jaundice.¹¹ Maternal diabetes or infrequent feedings can reduce the amount of breastmilk transferred. Late preterm infants born in the 34th-37th week of gestation may also have reduced feedings due to the immaturity of swallowing mechanisms and oro-buccal coordination.¹³ Risk factors for delayed lactogenesis include diabetes, PCOS, obesity, preeclampsia, and caesarean delivery among others.^{5,9,12} Improper lactation education and a lack of breastfeeding counseling and support are also considered risk factors which can reduce the infant's access to colostrum.

Signs/Symptoms:

The accumulation of bilirubin in the serum can lead to decreased feeding time, poor nutritional intake, and caloric deprivation.⁴ The higher the total bilirubin, the more pronounced the skin yellowing and scleral icterus. Kernicterus is characterized by extreme lethargy as well as loss of startle reflex.

Incidence:

Breastfeeding jaundice is relatively common, with more than 1 in 10 (10-18%) exclusively breastfed infants affected.^{3,7} When compared to all term and late preterm neonates, it is exceptionally common with estimates as high as 60% developing some form of jaundice-like symptoms. Rates of developing kernicterus are far less common and also require more medical treatment.³

Classification:

Neonatal hyperbilirubinemia can be divided into unconjugated and conjugated forms.^{7,8} Unconjugated hyperbilirubinemia can be further subdivided into hemolytic unconjugated or non-hemolytic unconjugated jaundice.^{7,8} Common causes of non-hemolytic unconjugated hyperbilirubinemia include breastmilk jaundice, infants of diabetic mothers, internal hemorrhage, physiologic jaun-

dice and polycythemia.¹⁰ Breastfeeding jaundice is an exaggerated physiologic jaundice because of relative caloric deprivation in the first few days.¹⁰

Work up:

The AAP recommends measuring the total serum bilirubin or the transcutaneous bilirubin levels on all infants jaundiced within the first 24 hours of life.³ These levels then should be interpreted based on the infant's age in hours.^{3,6} Features of pathologic jaundice that require further laboratory evaluation include: jaundice appearing within the first 24 hours of life, a rapidly rising serum bilirubin concentration (increase of more than 5 mg/dL per day), and a total serum bilirubin level higher than 17 mg/dL in a full term newborn.⁷ An infant that has jaundice with a direct bilirubin level above 2 mg/dL needs to have further evaluation for possible liver or biliary problems.⁷

Management:

Breastfeeding jaundice or “non-feeding” jaundice is the result of inadequate breast-feeding.¹⁰ The most important role of the clinician in preventing breastfeeding jaundice is the proper education and support to new mothers. The promotion and education of breastfeeding should begin with the first prenatal visit and should continue through the pregnancy and into the postpartum period. Breastfeeding techniques, including information about positions and latching, should also be discussed throughout prenatal visits and immediately postpartum. Mothers should be supported to form realistic expectations about breastfeeding and should be advised to breastfeed at least 8-12 times a day for the first several days.^{3,7} Providers should encourage their patients, especially those with risk factors for delayed lactogenesis, to attend prenatal breastfeeding classes and to use lactation nurses if any problems occur during the postpartum period. Evaluation of adequate breastfeeding technique and assessing any problems should also occur in the immediate postpartum period. Early skin-to-skin contact between mother and her newborn and initiating breastfeeding in the first hour of life can help to reduce hyperbilirubinemia in the first days of life.⁴

Follow up:

In the postpartum period, the infant should be evaluated within 24-72 hours of

discharge from the hospital for evaluation of jaundice and to assess adequate intake of milk.⁷ Outpatient evaluation should include assessment of weight, intake, voiding, and serum transcutaneous bilirubin levels if the jaundice is increasing. It is important to continue education about proper breastfeeding technique during the postpartum period. The provider should remind the mother that most newborns will not demand to be fed often enough to gain sufficient weight or prevent dehydration.^{5,9,12} She should be encouraged to nurse her baby every 2-3 hours for 15-20 minutes, and should be reminded that her infant may occasionally require more frequent and shorter feedings.

Discussing lactation and providing support for women, especially those with increased risks of delayed lactogenesis, during pregnancy and after delivery, helps to prepare the mother for difficulties that may arise. Providing resources to new mothers regarding lactation support groups, lactation nurses, and a lactation hotline may help prevent infant problems before they arise and may help many breastfeeding mothers reach their breastfeeding goals. It is also important to provide mothers resources to help them determine if their infant is getting enough milk and if or when they should supplement with donor milk or formula. By DOL#4, the infant should begin to have at least six wet diapers and four dirty diapers a day. Indications for supplementation include severe hypoglycemia not responsive to breastfeeding, maternal illness or separation, inborn errors of metabolism, infants unable to feed due to congenital malformations or illnesses, and any maternal issues such as incompatible medications or contraindicated illnesses such as HIV.^{1,2} It is important to continue to encourage the mother and to provide support to help her achieve successful breastfeeding.

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The Forefathers (and Mothers) of Neonatal Care

by Rouzbeh K. Kordestani, M.D., MPH

Neonatal science and neonatal intensive care therapies were in part developed due to the diligence of many young physicians in the middle part of the last century. Of particular note are the contributions of Drs. Mary Ellen Avery, Murdina Desmond, Arnold “Jack” Rudolph, and William Silverman. Each of these physicians in their own way contributed immeasurably to the field of neonatal care. Each of these doctors made their mark and made neonatal care the science it is today.

Dr. Mary Ellen Avery

Mary Ellen Avery was born in New Jersey in 1927. She initially became interested in pursuing a study in medicine since her neighbor and mentor was the famous pediatrician, Dr. Emily Bacon. Following the lead of her mentor, she was accepted into Johns Hopkins School of Medicine in 1952 (Harvard still did not accept women into their medical school classes at that point). Soon after graduating from Johns Hopkins, she contracted tuberculosis. As was customary at that time, she was relegated to a sanitarium for a year for medical management and treatment. During her year-long hiatus, she became interested in respiratory diseases and their cures. More specifically, she had the chance to pursue research in respiratory diseases of young infants, called respiratory distress syndrome (RDS). While completing her research on infants with RDS, she noticed the presence of a frothy proteinaceous material in young infants who would not suffer from RDS. She soon reasoned that the proteinaceous material was necessary for the newborn to survive. This chemical was soon identified and later named surfactant.

The discovery of surfactant as the critical chemical needed to survive in RDS and other respiratory diseases in infants was a key factor in the developing field of neonatal science. Because of Dr. Avery’s discovery, it is calculated that approximately 830,000 infant lives have been saved over the last 40 years.

Her discovery helped to establish the science of neonatal care and to make the field a well-respected subspecialty of pediatric and intensive care.

Following her discovery, Dr. Avery went on to become the first woman to chair a major department at Harvard Medical School. She also became the first woman Physician-in-Chief at Children’s Hospital, Boston. Amongst her other achievements, she was President of the American Association for the Advancement of Science.

In 1991, Dr. Avery was given the National Medal of Science by President George W. Bush for her contributions to the field of medicine and pediatrics.

Dr. Murdina Desmond

Murdina Desmond was born in Scotland in 1916 and emigrated to the United States in 1923. She then attended high school and college in the East Coast. She enrolled in Temple School of Medicine and graduated with distinction in 1942. Since World War II had just begun for America (Pearl Harbor was in December of 1941), Dr. Desmond joined the ranks of the Naval Medical Corps. Upon her return, she completed her pediatric training with a fellowship in newborn care. She then moved to Houston to help establish the Pediatric Department at Texas Medical Center at Baylor. At that time, Texas Medical Center only had two buildings.

With the help of Dr. Murdina, interest in pediatrics and pediatric care grew quickly. In 1950, Baylor established a newborn service at Texas Medical Center. Because of the Baby Boom experienced by the returning military forces, the pediatric service grew rapidly during the years between 1950 and 1960. Dr. Desmond’s interests in newborn science and maternal diseases did much to bring attention to the department at Baylor. Starting in early 1960, her scientific work brought in grants and monies from the Hartford Foundation benefiting the department and helping to establish a transitional

nursery at Baylor/Texas Medical Center. Again, because of Dr. Murdina’s leadership, in 1967 the Medical Center established a program for high-risk infants and an intensive care unit for maternal-infant care.

In 1972, Dr. Desmond helped to transition all pediatric services from various locations in the Texas Medical Center to their new home at Texas Children’s Hospital, an independent tertiary hospital and care center for children, infants and neonates.

Dr. Murdina’s leadership was responsible for the development of much of the pediatric/neonatal and pediatric/neonatal intensive care in the southern United States. Her diligence and foresight contributed to the creation of Texas Children’s Hospital and its ability to take care of the more intensive needs of high-risk children/infants/mothers.

Dr. Arnold “Jack” Rudolph

Dr. Jack Rudolph was an established pediatric physician when he joined the pediatrics department at Baylor under the guidance of Dr. Desmond. He soon established his leadership and excellence in teaching. With the development of the Neonatal Division in Houston, Dr. Rudolph’s abilities were soon recognized. Upon Dr. Desmond’s retirement, neonatology and the resources of the Texas Children’s Hospital were placed in the capable hands of Dr. Rudolph. Under his leadership, the department continued its growth and was internationally recognized for its advancements.

Dr. Rudolph’s greatest impact was through his publications and pictorials, in the *Atlas of the Newborn*, 1997. In this five-volume archive, Dr. Rudolph catalogued and listed the most comprehensive photographic archive in history of diseases and disorders of the newborn. Volume 1 included issues about neonatal and perinatal medicine. Volume 2 contained a catalogue of musculoskeletal disorders and congenital deformities. Volume 3 listed and described head and neck, eye and cen-

tral nervous system issues and pathologies. Volume 4 contained a graphic pictorial of dermatologic and perinatal infections. Volume 5, the last volume, contained thorax, abdomen, blood, endocrine and metabolic disorders. In these five volumes, Dr. Rudolph compiled 50 years of knowledge and exposure to detail the most up to date understanding of diseases of the newborn along with the most comprehensive pictorial atlas available of these same disease processes. This book series continues to be the most used atlas in newborn studies throughout the world.

Dr. William Silverman

William Silverman was born in 1917 in Cleveland, Ohio. His family moved to Los Angeles soon thereafter. He completed his secondary and college education there and enrolled in the School of Medicine at UCSF. He then completed his residency at Columbia in New York. He then was appointed instructor in general pediatrics at Columbia. There he began his interest in neonatology under the legendary Dr. Richard Day.

Dr. Richard Day was famous for his ability to test accepted treatment modalities. He was well regarded for his abil-

ity to question untested methods and to use scientific therapies. Dr. Day taught Dr. Silverman how to think and how to question. Soon after his appointment, Dr. Silverman was faced with his first case of retinopathy of prematurity (what was then called retrolental fibroplasia). Until then, the pathology was ill defined and treatment was not available. With the use of newly discovered adrenocorticotrophic hormone (ACTH) and its established anti-inflammatory properties, Dr. Silverman was able to correct the vision of the young infant. On the basis of this one case, Dr. Silverman and colleagues obtained permission to attempt this therapy on a series of infants at Columbia in a prospective trial. This was a randomized controlled trial on live infants; this had never been done before. Unfortunately, the trial failed horribly. Many of the control children survived without a problem while a third of those undergoing the intervention with ACTH went blind. The trial was stopped. Later on, the toxicity of the oxygen therapy, previously thought to be innocuous, was noted to be the factor causing the retinopathy. This was a hard lesson. It however set the precedent for Dr. Silverman and his later accomplishments.

With the belief that many of the interventions used in neonatology were simply by convenience rather than by science, Dr. Silverman and his colleagues chose to visit and re-establish the understanding of modern neonatology from its foundation core. All therapies and all chemicals were revisited. He and his colleagues forced the field to become scientifically pure and statistically proven. Any and all conclusions were questioned. In this manner, the field of neonatology was rediscovered. Dr. Silverman is one of its true scientific fathers.

Dr. Silverman soon was elevated to the level of professor at Columbia. He was, however, unable to acquire for neonatology its adequate support and respect. For this reason, he resigned his chairmanship and moved. He became head of the intensive care neonatal service at San Francisco Children's Hospital. There he was able to more fittingly apply his understanding and to solidify the field of neonatology. Dr. William Silverman was honored after his death by the creation of the Bill Silverman Prize by the Cochrane Collaboration and by the creation of the William A. Silverman Lectureship by the American Academy of Pediatrics.

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The March of Dimes

by Carla O'Neil – MOD

I delivered my son Hunter 6 weeks early by emergency C-section. He immediately turned blue and was taken to the low stimulation room of the Neonatal Intensive Care Unit (NICU) and put on oxygen. Because he was so early, his body had not yet produced surfactant, a substance found in babies' lungs that allows tiny sacs to fill with air. March of Dimes funded research that led to the development of surfactant therapy, where artificial surfactant is given to babies too young to produce their own. Hunter was given three doses of this life-saving treatment. Each day in the NICU was like a roller coaster ride with scary alarms, hard fought feeding sessions, and weight gains and losses. The hardest moment for me was leaving the hospital without my baby boy, but after 6 heart-wrenching weeks we got to bring him home. Early on, evidence of his early birth was obvious; he struggled with allergies, asthma, and had a gift of picking up every illness that was in the air. But now, thankfully, Hunter is 22 years old and 6'2" tall with no signs of his premature beginning. Until I was faced with prematurity, the only thing I knew of the March of Dimes was putting dimes in the slotted cardboard boxes that we brought home from school. I now know that March of Dimes saved my son's life as well as millions of others.

But it is not all about prematurity; ALL babies born benefit from the March of Dimes. One example is that every new-

born in the state of Texas is now screened for 31 disorders soon after birth. These disorders can all have devastating, life-threatening consequences if not detected early, but all have treatment when caught early. A few years ago Texas was only screening for seven of these disorders. March of Dimes lobbied for Newborn Screening Expansion that now saves so many. March of Dimes also secured legislation to have the nation's grain supply fortified with folic acid to help prevent neural tube birth defects like anencephaly and spina bifida.

March of Dimes advocates on behalf of women and children on all levels of government to get approval for many healthcare initiatives, like The Children's Health Act of 2000 (which put in place a National Center on Birth Defects and Developmental Disabilities at the Centers for Disease Control and Prevention) and the PREEMIE Act, (a bill to focus federal programs on prevention, education and research on preterm birth). In 2016 March of Dimes led a coalition of almost 100 health, public health, provider and other organizations in successfully championing Congressional approval of \$1.1 billion for research and prevention efforts to combat Zika virus.

It was his personal experience with polio that inspired President Franklin Roosevelt to found the March of Dimes in 1938 to defeat the crippling disease. But we didn't stop there; March of Dimes funds

research leading to advances in prevention and treatment of premature birth and birth defects. In 2017 alone, March of Dimes is funding over \$82 million in research grants across the nation. That includes over \$5 million in research grants to 24 institutions in Texas.

The prevention of preterm birth is top priority for the March of Dimes. The preterm birth rate rose steadily for 20 years until its peak in 2006 when it began to decline. Seven straight years of decline followed. Implementing interventions to reduce the risk of preterm birth has made a difference, but after these years of decline we have seen a slight increase once again. This is a call for us to re-double our efforts to address preterm birth by doing what we know works and by supporting new and innovative research to find additional answers to this complex problem. The March of Dimes is supporting eight emerging and established interventions: **Reducing non-medically indicated (elective) deliveries; increasing use of progesterone for women with a history of prior preterm birth; reducing tobacco use among pregnant women; encouraging women to space pregnancies at least 18 months apart; expanding group prenatal care; increasing use of low-dose aspirin to prevent preeclampsia; advancing interventions for women diagnosed with a short cervix; and reducing multiple births conceived through Assisted Reproductive Technology.** While we know some of what works to prevent preterm birth, there remains much to be learned, so March of Dimes has made prematurity prevention its top research priority. We seek not mere incremental advances, but transformative discoveries, just as vaccines were for polio. Traditional approaches to the problem have not been successful. This is why we have launched five Prematurity Research Centers to foster new models of collaboration. These Centers integrate scientists from individual disciplines to form innovative collaborations that can accelerate research discoveries.



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The unique approach of transdisciplinary research was developed in response to the multiple factors involved in triggering premature birth and the complexity of the problem. The strength of this method lies in the diversity of the participating investigators, reflecting the multiple possible causes. These causes involve many interactive biological factors that will not be uncovered by searching for singular risks from isolated disciplines. The more lines of inquiry we can pursue, the better the chance of finding solutions. In addition to physical scientists, such as pediatricians, obstetricians, and reproductive scientists, who have long attempted to illuminate the scientific basis of labor, we are bringing together scientists from divergent disciplines, many of whom were not previously engaged in prematurity research. These new “recruits” come from the fields of genomics, social sciences, bioinformatics, microbiology, bioengineering, physics and many others. At Stanford University, the Ohio Collaborative, Washington University in St. Louis, and University of Pennsylvania, interdisciplinary teams of researchers are collaborating to find causes and cures. By raising **\$75 million**, we can put their breakthrough discoveries to work, and end the crisis of premature birth.

Our goal is to reduce the incidence of preterm birth to 8.1% nationally by 2020 and 5.5% by 2030. Achieving these goals will result in an estimated 1.3 million fewer babies born preterm between 2014 and 2030 and an associated savings of \$67 billion in health and societal costs. With the nation’s preterm birth rate at 10.4%, Texas’ rate at 10.2% and our local rate at 9.8%, we need your help to reach our goals. Now is the time to get involved! March for Babies, our largest fundraiser, is just around the corner. Established in

1970 as WalkAmerica – this event was the first volunteer community-based walk and has raised \$2.1 billion to help give babies a healthy start in life. On **April 29, 2017**, over 1500 walkers will come together to raise a goal of \$300,000 to help our tiniest of Texans! The kick off for March for Babies season will start February 9th with a lunch at the Civic Center Grand Plaza 11:30-1:00. Everyone is welcome to attend this free event where we will celebrate our 2016 accomplishments, hand out supplies, and discuss how to achieve our hefty goal for 2017. If you are unable to attend, but would still like to participate in our walk, you can sign up on line at www.marchforbabies/amarillo.org. We have many exciting changes for our walk this year, including moving the walk location to Town Square Village. We will start the event with a “Superhero Sprint” and “Diaper Dash” fun run for kids up to age 10. The walkers can also enjoy our festival area with face painting, games, music, and a free lunch. The walk will start at 10:00 am. The 2.5 walk route will be comprised of three sections: **hope, remember and celebrate**.

Our work is made possible, year after year, thanks to the generous support of more than 3 million volunteers who donate their time, talent and even their voices to help babies. Together we’re improving the lives of babies and families at home and around the world. But with so much of our fundraising dollars going to research, many people want to know how much money helps families right here in Amarillo. *We have over 5 million research dollars that come back to Texas, but the advances brought about by research everywhere benefit babies locally.* There is no way to calculate the benefits afforded every baby by the March of Dimes in any one location. Besides, we do not want

all of the money to remain here because we are able to reap benefits that far exceed the amount raised locally. We are fortunate that March of Dimes is able to use funds raised throughout the nation to fund cutting-edge research, to lobby for policies that benefit moms and babies, and to provide education and community programs to benefit EVERY baby born in the United States, EVERY baby born in Amarillo, Texas.

- Funds raised in Amarillo along with research done in Amarillo couldn’t have found a cure for polio, but almost every baby born receives a polio vaccine.
- Money raised in Amarillo alone couldn’t have funded research in Amarillo that would have developed surfactant therapy, but every day babies born too soon in Amarillo receive surfactant therapy in our NICUs.
- We couldn’t have fortified the grain supply with folic acid to reduce neural tube defects in Amarillo alone, but every woman of childbearing age, regardless of where she lives in the United States, is eating grains fortified with folic acid, reducing her risk of having a baby with a birth defect.
- We couldn’t have expanded newborn screening in Amarillo alone, but every baby born here is screened for 31 disorders.

In addition to these broad March of Dimes benefits, we do have local programs such as “Healthy Babies Healthy Business”, “Go Before you Show”, and Prematurity Awareness month. We provide local education to the public and to health care providers. We provide support to NICU families with our NICU Family Outreach, and NICU graduation program. We provide funds to local projects that advance our mission. March of Dimes is working on every level to ensure that one day, no matter where they are born, every baby will be born healthy.

From school children to scientists, from presidents to parents, from celebrities to citizens, everyone has made a difference. Your support today helps us continue cutting-edge research to determine the causes of birth defects and premature birth. Let’s work together for stronger, healthy babies!



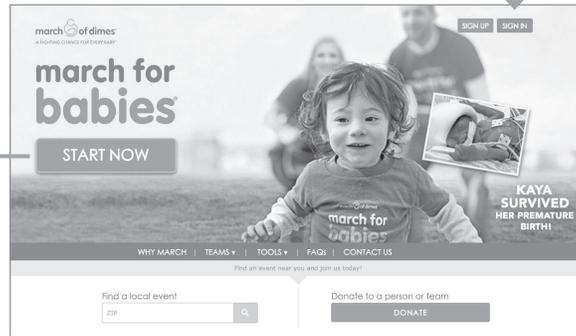
Hope - *Sharing the progress we have made and healthy pregnancy messaging.*

Remember - *Remembering the babies we have lost.*

Celebrate - *Celebrating our NICU and special care graduates.*

Join or start a team

1 Sign up by clicking on start now at marchforbabies.org. If you already have an account, click on sign in.



2 Join or start a team

If you are a **new participant**, select your team option and fill out the form.

Sign up!
It's easy to get started. Returning walkers can click here

Please choose one below.

Join a team. ?

Start a team. ?

No thanks, not right now. ?

First name*

2 Returning walker

Sign in to your account.

Sign in
Simply sign in using your March for Babies account.

Username or email

Password

Remember username/email

SIGN IN

Then, click on your Team tab and choose from the links in the blue menu bar to join or start a team.



3 If you choose to **Join a team**, type the team name in the search bar or choose one of the teams listed in alphabetical order.

Find a team
Use the dropdown menu and type in what you're looking for.

Search by... Team name

Change location
50 mi of 10605

You can also select from our top March for Babies teams.

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ALPHA PHI ALPHA FRATERNITY	MACY'S INC.
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3 If you choose **Start a team**, fill out the information for your new team and click save.

Start a team
Please choose one.*

Family team Company, school, club or organization team

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Team name*

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Be a part of the circle. In 2006, Potter Randall County Medical Society introduced the Circle of Friends, a program designed with the business of medicine in mind. Members of the Circle of Friends are companies that pay an annual fee to participate in Medical Society events. Their financial commitment allows PRCMS to provide quality programs throughout the year, such as the Annual Meeting, Doctors Day, Resident Reception, Family Fall Festival, Retired Physicians Lunch and Women in Medicine. In return, these companies are invited to attend these events and discuss with the physicians the benefits that their companies offer a physicians practice.

We are grateful for the support of these organizations and anticipate another great year of serving the needs of our members. The purpose for Circle of Friends is to provide a valuable base of

resources to assist the physician in the business of medicine so their practice of medicine can improve.

This program has proven to be a valuable resource of services such as liability insurance, accounting, banking and much more. This year, we hope to expand the Circle to include services the physician may use in his or her personal life. Through this program, we can invite businesses serving physicians to support the Society and increase their visibility among its members. Corporate support contributes to the Society's ability to advocate and care for physicians and patients in Potter and Randall Counties.

The Medical Society thanks all of its supporters as it offers new opportunities to its membership. If your business is interested in being a part of our Circle of Friends, please contact Cindy Barnard at 355-6854 or e-mail prcms@suddenlinkmail.com.



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by Tarek Naguib, M.D., M.B.A., F.A.C.P.

Scalp Cooling Prevents Hair Loss in Chemotherapy *JAMA* (2/14) – The effect of scalp cooling for women undergoing chemotherapy with both anthracycline and non-anthracycline therapies revealed near 50% preservation of hair compared with women who did not have scalp cooling.

Compression Stockings Reduce Blood Clots *Annals Intern Med* (1/17) – The use of compression stockings applied to only one leg during travel (more than 4 hour flights) in several studies has shown a reduction of blood clots (DVT) in the compressed leg after the travel compared to the uncompressed leg.

Ankle Sprains Not Benefited from Physiotherapy *JAMA* (1/24) – A study showed that physical therapy does not add to basic self-management in hastening functional recovery of acute simple ankle sprains. Both strategies yielded less than 50% recovery in 3 months duration in this Canadian study.

Telemedicine Management of Diabetes Effective *Am J Med Sci* (1/1) – The use of internet-based monitoring of persons with type 2 diabetes appears to yield better blood sugar control and adherence to care as compared with conventional care.

Falls in the Elderly Suggest Infection *Am J Med Sci* (1/1) – The presentation of elderly persons with a mechanical fall appears to frequently be associated with under-recognized coexisting systemic infection.

Folic Acid Still Recommended *JAMA* (1/10) – The United States Preventive Services Task Force (USPSTF) still recommends folic acid 400-800 mcg daily supplementation for all women who are planning or capable of pregnancy. This is despite some studies that cast some shadow on the benefit due to recall bias. The supplement reduces neural tube defects in the baby.

Pregnant Women Use More Marijuana Lately *JAMA* (1/10) – A study revealed that young females (18 through 44 years) use more marijuana over the last 12 years. The prevalence of marijuana use in in this population in 2014 exceeded that of 2002 by 62%. There was no difference in use between pregnant and non-pregnant women. The authors suggest counseling pregnant women against the use of marijuana.

Screening for Obstructive Sleep Apnea Not Recommended Yet! *JAMA* (1/24) – USPSTF concluded that current evidence

is insufficient to assess screening for obstructive sleep apnea.

WHO Calls off Global Zika Emergency *JAMA* (1/10) – The Zika virus no longer represents a global emergency of public health of international concern, according to the World Health Organization.

C. Dif. Infections Up *Tex Med* (2/1) – US Centers for Disease Control (CDC) released figures for hospital acquired infections on both the national and state levels. In Texas, *Clostridium difficile* infection has increased by 16% in 2014 while MRSA bacteremia has declined by 4%.

Large HIV Vaccine Trial in South Africa *JAMA* (1/24) – A large vaccine trial was launched in South Africa on a modified vaccine hoping to achieve better than the dismal 35% previously achieved prevention rate.

Contaminated Milk Seized *JAMA* (1/10) – US Marshals Service seized about 4 million pounds of dry nonfat milk powder and buttermilk powder that may have been contaminated from a company that has records showing *Salmonella* contamination

in the processing plant and finished product samples.

Asthma is not Always Asthma *JAMA* (1/10) – Asthma diagnosis failed to be confirmed in 33% of persons who were diagnosed previously by a physician but who were not using their daily asthma medications. The authors suggest that the initial diagnosis may not be accurate due to complexity of presentation at times. The study was performed in Canada on 700 persons.

Bigger Waist, More Diabetes and Heart Disease *JAMA* (2/14) – A new study revealed that higher waist-to-hip ratio was associated with increased risk of type 2 diabetes and coronary heart disease.

Surgery Recommended for Advanced Diabetes *JAMA* (2/14) – New recommendations by international diabetes organizations in a joint statement suggested “metabolic surgery” to induce weight loss among severe diabetics with obesity. The recommendations are in part reflective of the finding that gastric bypass yields better diabetes control than equivalent dietary weight loss.

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Fungal Nail Infection: Onychomycosis

by Tarek Naguib, M.D., M.B.A., F.A.C.P.

What is Fungal Nail Infection?

Fungal nail infections are infections that involve the nails of the feet but sometimes are noted in the hands. They are caused by fungus infection. The infection is one of the most common nail conditions.

Mechanisms of onychomycosis

The fungus growth under the nail is promoted nearby skin infection or breach of the toenail integrity in the presence of persistent moisture.

Causes of onychomycosis

The causes of onychomycosis as outlined above are related to persistent moisture and decreased hygiene that is inherent to the use of socks for protracted periods of time. Associated diabetes, HIV, and athlete's foot are all known to predispose to onychomycosis.

Symptoms of Fungal Nail Infection

The nail becomes thickened and may crumble and become discolored. The infection may begin in the tip or the base of the toenail or involve the whole nail. Fungal nail infection is usually not painful but occasionally becomes painful due to the pressure exerted by the thickened deformed toenail.

Diagnosis of Onychomycosis

The diagnosis of fungal nail infection is made by the physician based on visual appearance of the nail. Biopsy is not needed but occasionally a sample from the toenail can be removed and sent for culture to establish the exact type of fungus involved.

Treatments of Onychomycosis

The treatment is not usually needed in mild cases. However, topical antifungal preparations can be used in mild cases, and oral antifungal therapy can be used in extensive cases. The duration of therapy is long (few months) since the normal nail grows slowly allowing shedding of the infected portion.

For More Information

National Library of Medicine
Medlineplus.gov/ency/article/001330.htm
 Based in part on JAMA Patient Page
 Feb 7, 2017:317(5):546.

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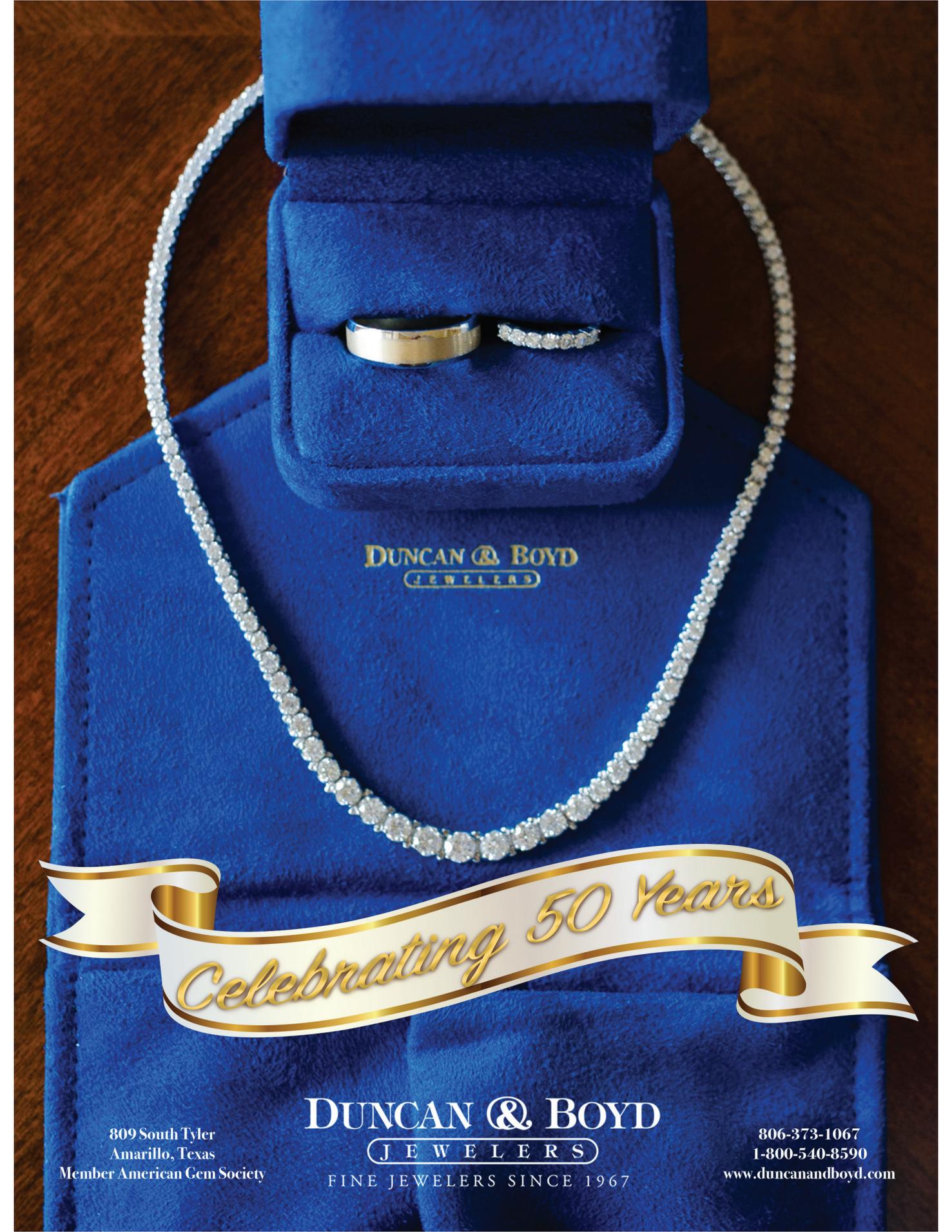
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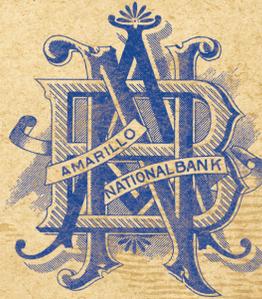
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