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## Humidity Levels Inside Newborn Incubators Used in the Neonatal Intensive Care Unit (NICU)

By Nawal Magzoub, MD; Hussam Salama, MD; Ahmad Albaridi, MD; Moaaz Abo Zeed, MD; Joosy Thampan, RN

### Abbreviations

NICU: Neonatal Intensive Care Unit

### Key Words

Humidity, premature, infant, NICU, procedure time, incubator

### Introduction

Humidity is an essential environmental factor to be considered when managing preterm infants below 30 weeks gestation. The epidermis of these infants is underdeveloped, with only a few layers of stratum corneum (which controls evaporative heat loss and trans-epidermal water loss). Therefore, premature newborns are at increased risk of high water loss through their skin, leading to temperature instability, dehydration and electrolyte imbalance, as well as heat and calorie loss.<sup>1</sup>

Humidity up to 90% is used to dramatically reduce the water loss from the skin to the surrounding environment, and can significantly prevent these adverse effects from occurring. After birth, the skin of preterm babies is exposed to a gaseous environment and matures rapidly, both in its epidermal structure and its barrier function.<sup>2</sup> At about 2 weeks after birth, regardless of gestation age, it is like that of a term baby.<sup>3,4</sup>

Premature newborns are usually nursed inside incubators in a wide range of technical facilities. There are a number of models of incubators and these models offer variable levels of humidity containments.. Some incubators have more than 4 windows to facilitate access to the newborn; some have portable side doors, and even a completely detachable roof. There are concerns that frequent opening of those windows by default will

destabilize the humidity level inside the incubator, and will lead to adverse effects.

The objective of this study is to record and evaluate the effect of different levels of humidity interruptions on the magnitude of humidity loss in two commonly used incubators inside the NICU.

### Methods

This study was an observational, prospective study. It did not include patients.

The study was conducted inside the Neonatal Intensive Care Unit of Women's Hospital, Hamad Medical Corporation, State of Qatar. The incubators used in the study were: the Giraffe omniBed<sup>®</sup> and the Dragger Air-Shields<sup>®</sup> Isolette C400. The study was designed to measure the humidity loss associated with the most common clinical procedures performed inside the NICU. The investigators observed ten common clinical procedures. Each procedure was observed 10 successive times. The duration average was recorded followed by measuring the humidity loss when different incubator windows and side doors were opened for 1 to 20 minute periods. Every measurement of humidity loss was followed by measuring humidity restore time to the default humidity level which was set at 85%. The changes in humidity were observed in 6 stages, when one window, 2 windows, 3 windows, 4 windows, roof, and side doors were opened.

In the Dragger incubator, the roof is fixed; hence, humidity loss for its exposure was not measured.

### Results

Humidity loss inside the Giraffe incubator was 1% to 7% loss during the first three minutes of exposure. The humidity loss differences between the two incubators when one and two windows opened were equal throughout the test. With three windows opened, humidity loss was increased in the Giraffe incubator 1%-40%

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versus 3%-20% in the Dagger incubator, particularly when windows are opened more than 5 minutes. When four windows opened, the humidity loss was more preserved in the Giraffe incubator during the first 5 minutes, 1%-19%, versus 9%-31% in Dragger incubator. Beyond the fifth minute, the rate of humidity loss was equal in both incubators, 33%-41% in the Giraffe incubator versus 36%-41% in Dragger incubator. The maximum humidity loss was observed when one side door or roof of the incubator was opened. The minimum humidity level reached was 40% in both incubators (Table 2).

The humidity restore time ranged between 1-10 minutes in the Giraffe incubator, while it ranged between 1-15 minutes in the Dragger incubators (Table 3).

### Discussion

There is a rational and logic practice behind reducing the frequency of interrupting the incubator humidity system, while caring for the newborn babies inside the NICU. The main reasons behind this practice are to reduce both nosocomial infections, and preserve humidity within the incubators to reduce total insensible water loss. In this study, we investigated the effect of different levels of humidity interruption by testing

the humidity loss when incubator doors, windows and/or roofs were opened. In this context, the test correlated such interruptions with the time period required in most commonly practiced clinical procedures inside the NICU (Table 1). In addition, the humidity restore time to an 85% level was measured to assess the common perception that frequent interruption of the incubator humidity was associated with loss of humidity that takes a long time to restore. The study showed that humidity restore time was changing between 1 minute to a

***“Clinically, this data indicates that humidity loss is not significant during those clinical procedures which last less than 5 minutes. In longer procedures; both incubators were able to restore humidity quickly enough not to adversely affect humidity stability inside the incubators.”***

**Table 3. Percentage Loss of Humidity and Humidity Restore Time Measurements**

Table 3. Percentage Loss of Humidity and Humidity Restore Time Measurements													
Time	Giraffe incubator						Giraffe incubator						
(minutes)	% of humidity loss (from 85%)						Restore time needed to return to 85% humidity (minutes)						
Number of Windows Opened	1	2	3	4	Roof	One Side Door	1	2	3	4	Roof	One Side Door	
5 min	2%	5%	18%	19%	40%	40%	1	3	3	3	10	5	
10 min	3%	5%	30%	33%			2	2	3	3		10	
15 min	3%	6%	34%	37%			2	2	3	3		10	
20 min	3%	7%	40%	41%			2	2	3	4		10	
Time	Dragger Incubator						Dragger Incubator						
(minutes)	% of humidity loss (from 85%)						Restore time needed to return to 85% humidity (minutes)						
Number of Windows Opened	1	2	3	4	Roof	One Side Door	1	2	3	4	Roof	One Side Door	
5 min	3%	13%	17%	31%	NA	40%	2	4	3	9	NA	12	
10 min	4%	15%	18%	36%			2	5	3	10		13	
15 min	7%	16%	18%	39%			2	6	3	12		14	
20 min	11%	18%	20%	41%			3	6	4	12		15	



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**Table 1: Humidity Loss During Common Procedures Inside the Incubator**

Name of the Procedures	Incubator Status During the Procedures	Average Time of the Procedure**
Morning care	Two one-side windows	11.5 minutes
Dipper change	Two one-side windows	1.5 minutes
OGT feeding tube insertion	Two one-side windows	4.4 minutes
Blood extraction	Roof and side doors	4.4 minutes
Peripheral line insertion (one side wall)	Two one-side windows	7.6 minutes
PICC line insertion (Roof and 3 side walls)	Roof and side doors	39.4 minutes
Intubation * (Roof and 2 side walls)	Roof and side doors	3.9 minutes
Brain U/S (one window)	One-side window	6.7 minutes
ECHO-Cardiograph	One-side or front window	15 minutes
Applying Nasal CPAP	Roof and side door	9.3 minutes
Surfactant administration	Two to four windows	5 minutes

\*Physical intubation process lasts in average 10 to 25 seconds inside women's hospital NICU  
 \*\* The average time represent an average of ten successive observations.

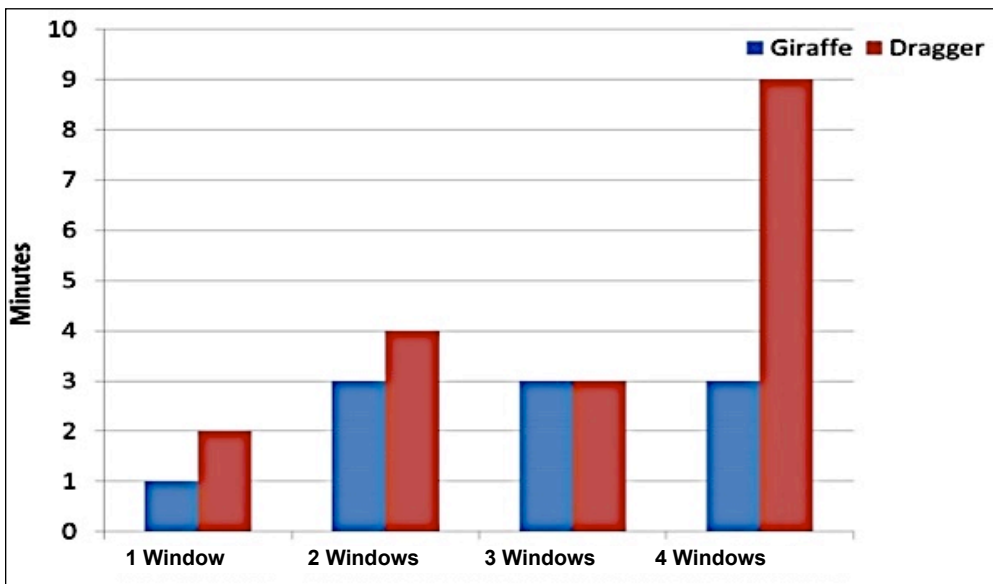


Figure 1. Humidity restore time when windows open for 5 minutes.

maximum 15 minutes, depending on the number of windows open. The 15 minutes restore time was only seen when side doors or the roof were opened. The humidity restore time to 85% was briskly achieved within 5 minutes when only

windows were opened in both incubators. The humidity loss was maximum when side doors or roofs were opened. Even though, with such swift reduction in humidity, the restore time was relatively rapid in both

incubators (Figures 1-3). When comparing, Giraffe incubator was able to re-build the humidity within the incubator more effectively than the Dragger incubator throughout the 20 minute measurements (Figures 1-3).

Clinically, this data indicates that humidity loss is not significant during those clinical procedures, which last less than 5 minutes. In longer procedures, both incubators were able to restore humidity quickly enough not to adversely affect humidity stability inside the incubators.

There is no available similar study addressing the changes in humidity level with different types of clinical interventions. The authors concluded that humidity loss is not that significant when newborn incubator windows are opened for 5 minutes or less. At the lengthiest clinical procedure, humidity loss can be restored within maximum of 10 to 15 minutes when using the modern available incubators.

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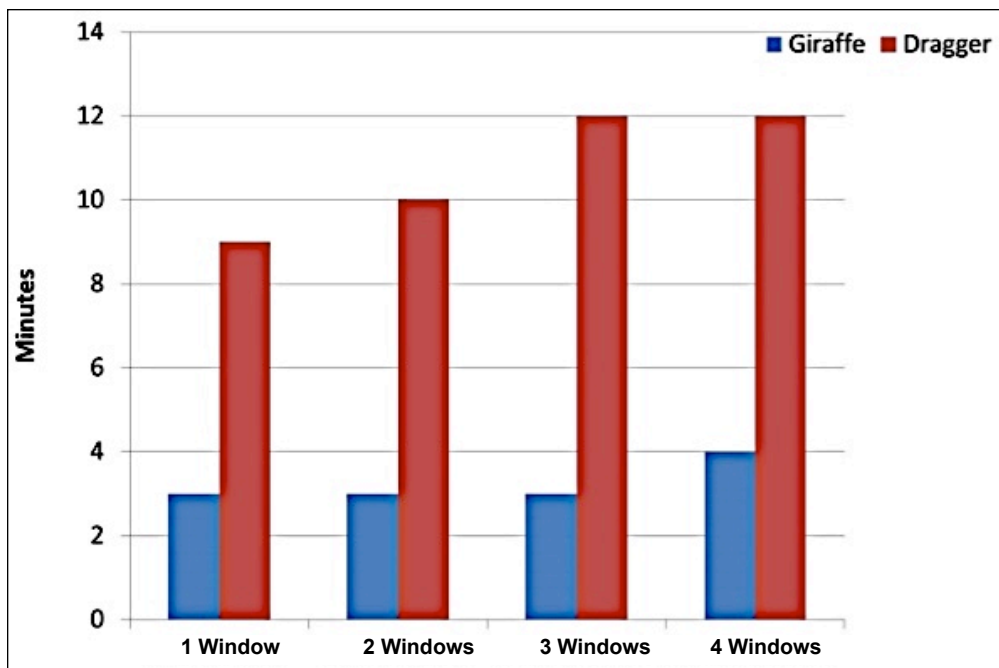


Figure 3. Humidity restore time when windows open for 20 minutes.

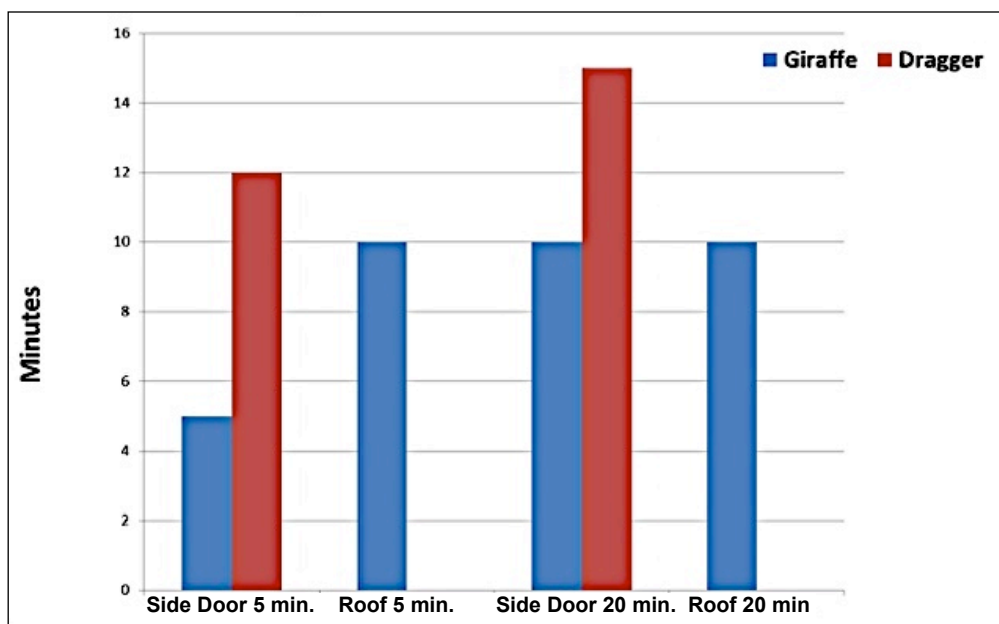


Figure 3. Humidity restore time when roof or side door open for 20 minutes.

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# National Perinatal Association and National Advocates for Pregnant Women Collaborate to Advocate for More Effective Healthcare for Drug-Using Women and Their Babies

By Bernadette Hoppe, MA, JD, MPH

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



Between 2004 and 2013 the rate of NICU admissions nationwide for Neonatal Abstinence Syndrome (NAS) increased almost fourfold, from seven to 27 cases per 1000 infants. In response to the urgent need to address this rapidly growing problem, the *National Perinatal Association (NPA)*, in collaboration with *National Advocates for Pregnant Women*, conducted a Symposium entitled “*Pregnant Women, Drug Use, and NAS: Experts Share Science & Strategies That Help Women, Babies, and Families*” in Nashville, TN on October 2<sup>nd</sup>-3<sup>rd</sup>, 2015. Nashville was a particularly relevant location for this symposium, because in 2014, Tennessee enacted a law that permits the arrest and punishment of pregnant women who use “illegal narcotics” and give birth to babies who are “addicted” or “harmed.”

Many professionals presented during the 2-day symposium, including such renowned experts on NAS as: Loretta Finnegan MD, President of Finnegan Consulting and Karen D’Apolito, PhD, NNP-BC, FAAN, Professor & Program Director, NNP Program, Vanderbilt School of Nursing, as well as neuroscientist Carl Hart, PhD, Professor of Psychology and Psychiatry, Columbia University, who is author of “High Price.” A panel of women who had experienced substance use during their pregnancies, shared the consequences to their own health and to their families.

The approaches that really grabbed the attention of the audience, and resulted in extremely interesting conversations, were those presented by Ron Abrahams, MD, Medical Director of Perinatal Addictions at the BC Women’s Hospital and Health Centre in Vancouver, and Mary Hepburn, MD, MRCGP, FRCOG, Senior Lecturer in Women’s Health at the University of Glasgow. They both presented on variations of “rooming in,” an approach which allows babies and mom to spend their time in the hospital together in the same room during the postpartum period. As a result, these moms breastfed at much higher rates than expected, and appear to be better bonded with their babies upon discharge. The babies also show fewer symptoms of opiate exposure (NAS) with shorter durations. Both Drs. Abrahams and Hepburn repeatedly challenged the use of urine drug screens in pregnancy, and advocated that seeking to meet the psychosocial needs of pregnant women, especially those using opiates, will ultimately improve the health of the neonate.

In addition to medical experts, the symposium also included speakers and participants from the legal system and the child welfare services. Two panels of lawyers and activists addressed the real-life consequences of implementing the Tennessee law, as well as other laws around the country used to prosecute pregnant women who use drugs.

Using the DSM-V definition of “addiction,” medical professionals know that a baby cannot possibly be born “addicted” to anything. Yet the concept of babies being born “addicted” to drugs, particularly opiates, is often used to stigmatize and demonize their mothers. Tennessee lawmakers apparently did not consult obstetricians, pediatricians, or neonatologists when they implemented the 2014 law. To the contrary, they appear to have actively ignored the advice of the medical community. (See an article from the *New York Times* on this from 2014. [www.nytimes.com/2014/04/15/us/politics/specialists-join-call-for-veto-of-drug-bill.html](http://www.nytimes.com/2014/04/15/us/politics/specialists-join-call-for-veto-of-drug-bill.html)).

As expected, the Tennessee law has had a profound impact on how women who use drugs seek prenatal care. Health care professionals know that such women need compassionate, skilled medical and psychological care to ensure the best birth outcomes for both mother and baby. Jessica Young, MD, Assistant Professor, Obstetrics & Gynecology, Vanderbilt University School of Medicine, a presenter at the symposium, shared that more of her patients are delivering out of state, for fear of prosecution under the law. (See, [www.huffingtonpost.com/entry/pregnant-women-tennessee\\_560da1b2e4b0af3706e01fb3](http://www.huffingtonpost.com/entry/pregnant-women-tennessee_560da1b2e4b0af3706e01fb3)).



The Tennessee law results in police, prosecutors, judges, and child welfare officials being involved in the health care of pregnant women, and the subsequent care of their newborns. Every medical professional knows that neonates need to be held and touched by their parents, breast fed, and tended to with extreme care and consistency. Unfortunately, once legal and child welfare professionals are involved, medical professionals often can no longer make decisions about what is best for the baby. If a mom gets incarcerated for using drugs during her pregnancy, she is obviously not available for the hands-on developmentally critical elements that only she can provide for her baby. If a judge issues a restraining order, directing that a mother can only be with her baby for very limited times and only under supervision or is not to have any contact with the baby, then the early critical time period for a baby to bond with its mother is lost.

All of the aspects of appropriate developmental care, which are needed for all babies, are even more necessary with fragile babies, including those exposed to opiates during pregnancy. As neonatologists, you have an important role to advocate for the highest level of evidence-based treatment for fragile babies. As a family lawyer, I am making a special plea for you to take an active role in helping to educate policy makers, lawyers, judges and child welfare officials about the importance of encouraging developmentally appropriate care, such as skin-to-skin contact for all babies, especially those identified as having NAS, and breastfeeding for infants exposed to prescription opiates with recommendations provided by the Academy of Breastfeeding Medicine ([www.bfmed.org/Resources/Protocols.aspx](http://www.bfmed.org/Resources/Protocols.aspx)) and the American Academy of Pediatrics (<http://pediatrics.aappublications.org/content/129/3/e827.full>).

There are a number of efforts that are coming out of the symposium. One of the projects is a model policy for hospitals in managing the care of mothers who having

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***“All of the aspects of appropriate developmental care, which are needed for all babies, are even more necessary with fragile babies, including those exposed to opiates during pregnancy. As neonatologists, you have an important role to advocate for the highest level of evidence-based treatment for fragile babies.”***

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admitted to using illicit or prescription drugs inappropriately, including opioids. Another project is a toolkit for parents who find themselves in such a situation.

If you are interested in getting involved in either of these projects please contact the NPA via [klove@nationalperinatal.org](mailto:klove@nationalperinatal.org). If you would like to review any of the presentations and the data from the symposium, visit the NPA website at [nationalperinatal.org](http://nationalperinatal.org). We invite you to join the NPA in working together to improve the care of babies and families during the perinatal period.

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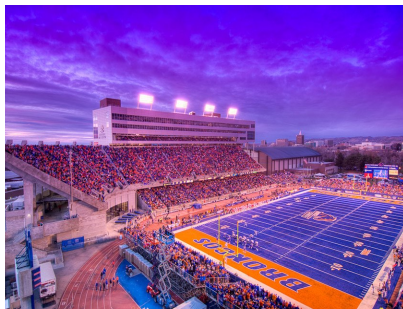
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## Neonatal Nurse Practitioner St. Luke's Children's Hospital - Idaho!

### Boise

St. Luke's Children's Hospital in Boise seeks an NNP to assist with coverage in our NICU's. The Neonatology team is comprised on 10 BC Neonatologists and 10 NNP's. The Children's Hospital provides a full complement of Pediatric Subspecialty services with the exception of ECMO & complex congenital heart surgery. The level IV Boise NICU is a modern 61-bed unit with 900 admissions annually providing advanced technology support (HFV, iNO, therapeutic hypothermia, noninvasive ventilation), semi-private rooms and a priority of family-centered care. The program is supported by a skilled Obstetrical department including 5 full-time MFM specialists. At this facility NNP's provide daily rounding support and in-house night coverage along with a Neonatologist. In addition, the team provides coverage at our 12-bed, Level IIb NICU in Meridian, ID 0 just 10 miles from Boise. NNP's provide weekend coverage and home call at this facility.

Known as the "City of Trees," [Boise](#) is Idaho's capital city—both a cultural center and a playground for those who love the outdoors. A vibrant downtown area affords fine dining, theatre, music, and college and semi-professional sports. Whole Foods, Trader Joe's, The Boise Co-op, and seasonal farmers markets are within a mile of the hospital. The Greenbelt follows the beautiful Boise River corridor for more than 30 miles, and the Boise foothills are home to miles of hiking and biking trails.

### Twin Falls

St. Luke's Children's Hospital seeks an experienced NNP to join the team in our Twin Falls location! This position currently covers nights with opportunity for future daytime coverage. The ideal candidate for this position is an experienced NNP with strong teaching skills and a desire to educate front-line staff to the higher skill set that a Level II NICU demands. Built in 2011, this state-of-the art 18-bed Level IIIa NICU with 250 admissions annually, and excellent growth potential. While based in Twin Falls, this position rotates regularly through the NICU at St. Luke's Children's in Boise. This provides opportunity to maintain a higher acuity skillset and consistency across the Health System NICUs. Additionally, as part of this larger practice group, coverage for time off and conferences is well-supported.

Twin Falls is located in an area of Idaho referred to as the Magic Valley. It has a population of 44,000 and is the fastest growing city in south central Idaho. It is located in the heart of a rich agricultural area of the state along the mighty Snake River. Housing is affordable, and recreational opportunities abound, with rafting, hiking, skiing, and fishing easily accessible in the immediate area. South central Idaho has a mild, 4-season, high-desert climate. Summers are hot with low humidity, great for outdoor activities. In winter, the valley is largely protected from the cold arctic fronts by the mountains to the north, with occasional snow within the city. Sun Valley, Idaho is just an hour away with excellent skiing in the winter and abundant outdoor recreation in the summer.



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# Medical News, Products & Information

Compiled and Reviewed by Tony Carlson, Senior Editor

## Graham's Foundation has Acquired the Mobile App, *MyPreemie*

Graham's Foundation has acquired a groundbreaking, transformative support tool for families of premature babies: it is a mobile app, called *MyPreemie* (<http://grahamsfoundation.org/resources/the-mypreemie-app/>), that offers emotional, intellectual and practical help to parents right on their smart-phone or tablet.



*MyPreemie* is unique in the field of prematurity and among other medical apps. Created and donated to Graham's Foundation by the experts who wrote *PREEMIES: The Essential Guide for Parents of Premature Babies*, *MyPreemie* supports families with babies in the NICU at every step of their journey:

- Providing the information they need to understand, immediately and as their situation changes

- Suggesting the right questions to ask doctors and nurses, to become active partners in their baby's care;
- Promoting awareness of their own emotions, through a curated diary they are encouraged to fill in, and then keep forever;
- Providing easy tools to keep track of their baby's growth;
- Providing a more private way than social media to keep in touch with friends, by sharing pages of their daily diary;
- Reminding parents they are not alone, and offering them realistic hope, which is at the very essence of our mission.

Graham's Foundation is the only organization laser focused on improving the outcomes of babies born prematurely and supporting their parents. Since their founding in 2008, they have fulfilled thousands of requests for care packages, provided peer-to-peer support to hundreds of families, and given hundreds of thousands of preemie parents a place to connect online.

Their new *MyPreemie* app is a huge opportunity and challenge. With it, they can ease the experience of least 200,000 families of preemies every year in the US and potentially improve their health outcomes, in terms of shorter hospital stays for babies and reduced psychosocial consequences - such as post-traumatic stress disorder and depression - among parents.

You may download the Apple app version at the App Store: [https://itunes.apple.com/app/id931150109\\_](https://itunes.apple.com/app/id931150109_)

For more information on Graham's Foundation, please visit: [www.grahmfoundation.org](http://www.grahmfoundation.org).

Editors note: *MyPreemie* was reviewed by Dr. Alan Spitzer in the September, 2013<sup>th</sup> issue of *Neonatology Today*. See page 14 for the review: [www.neonatologytoday.net/newsletters/nt-sep13.pdf](http://www.neonatologytoday.net/newsletters/nt-sep13.pdf).

## Therabron Therapeutics Announces Favorable Infant Outcomes with Six-Month Follow-Up of a Phase 1b Recombinant Human C10 Clinical Trial

Therabron Therapeutics, Inc., a specialty biotechnology company dedicated to advancing a new standard in respiratory care, today presented a retrospective analysis of long-term follow-up data from a Phase 1B trial of recombinant human CC10 protein (rhCC10) in premature infants at risk for chronic respiratory morbidity (CRM). The data was presented at the *Hot Topics in Neonatology Annual Meeting* in December, 2015 in Washington, DC.

This clinical trial was double-blinded, randomized, and placebo-controlled, involving 24-29 week corrected age (CA), 600-1250 gram premature infants that were intubated to treat Respiratory Distress Syndrome (RDS) and at risk for CRM. Twenty-two infants were enrolled in three treatment groups; placebo, 1.5-mg/kg rhCC10, and 5-mg/kg rhCC10. Infants received a single intratracheal dose in a constant volume of 2-mL/kg within four hours of the first dose of surfactant.

Follow-up at six months corrected age (CA) was conducted in 17 of 20 surviving infants.

The data from this study suggest that a single dose of rhCC10 on the day of birth may have a clinically meaningful impact on infant's CRM risk. A reduced rate of both re-hospitalization from respiratory causes and the requirement for bronchodilator therapy was observed in rhCC10-treated infants compared to placebo controls. Zero of eleven infants in the combined rhCC10-treated groups required re-hospitalization for respiratory causes within the six-month period, while three of six infants in the placebo group were re-hospitalized in the same time period. Additionally, none of the 11 rhCC10-treated infants required bronchodilators through six months CA, while all but one of the placebo-treated infants did ( $p < 0.05$  for both observed outcomes).

"We are encouraged by the data generated to date in our CG100 clinical development program. While several therapeutics have been developed to address the acute needs of preterm infants for viability, our product candidates have the potential to meaningfully impact the long-term respiratory sequelae of prematurity" said Dr. Aprile L. Pilon, Founder, Executive Vice President and CSO of Therabron. "rhCC10 has the potential to provide a significant respiratory health benefit for preterm infants following discharge from the Neonatal Intensive Care Unit."

Therabron's lead recombinant human CC10 protein product candidate (CG100), is a secretory protein that is believed to play an important protective role in the lung via maintenance of airway epithelia and is delivered by intratracheal instillation in intubated neonates. CG100 has the potential to improve long-term clinical outcomes in preterm infants and significantly reduce the economic burden beyond the infant's initial in-patient stay. Clinical study investigators previously reported suppression of inflammatory mediators in the respiratory tract and evidence of reduced lung injury in CG100 treated infants (Levine et al., Pediatric Research). This follow-on outcomes assessment suggests that the potential protective aspect of rhCC10 may persist well beyond the acute period, post-discharge.

Therabron is completing patient enrollment in a larger, Phase 2 trial in preterm infants, with multiple data releases expected in 2016 and 2017. The ongoing Phase 2 study is supported, in part, by a grant from the US FDA Office of Orphan Product Development.

#### *About Chronic Respiratory Morbidities in Preterm Infants*

Over half a million preterm infants are born in the US every year. Of those infants, about 60,000 are very low birth weight (VLBW) and experience respiratory distress; and up to 15 percent of this vulnerable patient population dies. Of those who survive, up to 15,000 will develop neonatal BPD, a chronic lung disorder that predisposes the child to potentially life-threatening respiratory infections and asthma. These infants typically experience repeated hospitalizations for respiratory complications, the need for numerous respiratory medications, and frequent doctor visits throughout their infancy and childhood. An estimated \$26 billion are spent annually on medical care during the first year of life in these

VLBW premature infants and the emotional cost of families impacted by having a child with this condition is substantial.

Therabron Therapeutics, Inc. is a clinical-stage biotechnology company, founded in 2007 and located in Rockville, MD. Therabron is focused on the development of protein therapeutics to address respiratory disease. The company's product candidates aim to restore the natural immune balance in the lungs of respiratory patients through the administration of synthetic human CC10 proteins. The family of CC10 proteins, also known as secretoglobins, have the potential to change the course of acute and chronic respiratory diseases, representing large markets into which few truly novel drugs have been introduced. Therabron's product candidates have the potential to be first-in-class, disease-modifying, breakthrough biologic therapeutics. For additional information, please visit [www.therabron.com](http://www.therabron.com).

#### **Ultrasound Fade Could Be Early Detector of Preterm-Birth Risk**

Newswise — Ultrasonic attenuation — an ultrasound's gradual loss of energy as the sound waves circulate through tissue — could be an early indicator of whether a pregnant woman is at risk for delivering prematurely, according to a new study at the University of Illinois at Chicago College of Nursing.

Premature birth — delivery before 37 weeks of pregnancy — is the leading cause of long-term health problems, accounting for 75% of abnormalities such as cerebral palsy and developmental delay. Premature births cost the U.S. health care system more than \$26 billion in 2005, according to the Centers for Disease Control and Prevention.

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#### **The 2<sup>nd</sup> International Neonatology Association Conference (INAC 2016)**

Jul. 15–17, 2016; Vienna, Austria  
[2016.worldneonatology.com](http://2016.worldneonatology.com)

UIC Nursing researchers led by Barbara McFarlin, Associate Professor and Head of Women, Child and Family Health Science, predicted that an ultrasound exam should detect changes in water absorption and collagen makeup as the cervix remodels, offering a noninvasive way of measuring changes in the cervix that occur prior to delivery.

Current methods to predict risk of preterm delivery rely on measuring the length of a woman's cervix.

"Cervical length assessment has become a widely used clinical measure for identifying women at high-risk for preterm birth," McFarlin said. "The risk of premature birth is greater in women with a short cervix than [in] women with a longer cervix," she explained.

But the measurement is of limited usefulness, she said, because most women identified as having a short cervix are still able to carry their pregnancies full term.

In a new study published in the journal *Ultrasound in Medicine and Biology*, almost 240 ultrasounds were performed on 67 African-American women to examine cervical length and signal attenuation during the ultrasound exam. The analyses focused on the early gestational periods — from 17 to 21 weeks, and from 22 to 26 weeks.

At 17 to 21 weeks gestation, ultrasounds already showed significant differences in attenuation between the group who later delivered prematurely and those who carried to term. There were no significant differences in cervical length between the two groups.

None of the women had a cervical length of less than 2.5 centimeters — the most commonly used cut-off to identify women at risk for premature birth who are candidates for progesterone therapy before 27 weeks of pregnancy.

"As the cervix changes from a firm to a supple, soft structure, estimates of attenuation from an ultrasound can provide clinicians with early tissue-based information, rather than waiting for symptoms of preterm birth," McFarlin said. "In the future, this can be a feature added to clinical ultrasound systems."

Co-authors include: Viksit Kumar and Timothy Bigelow of Iowa State University; Douglas Simpson and William O'Brien Jr. of the University of Illinois at Urbana-Champaign; Rosemary White-Traut of UIC; and Jacques Abramowicz of Wayne State University.

The study was funded in part by a grant from the Irving Harris Foundation, the UIC Nursing Internal Research Support Program, NIH grant 1R21HD062790 and the University of

Illinois Center for Clinical and Translational Science (NIH grant UL1TR000050).

### **Study Shows Babies Born Extremely Premature May Benefit from Proactive, Coordinated Care Among Families, Obstetricians and Neonatologists**

Denise Foyle had been pregnant for just 23 weeks when she gave birth to her daughter, Bryn. Bryn weighed one pound and three ounces, and measured only 12 inches long.

"If you saw Bryn today at age two, other than her being a little small, you would have no idea that she was fighting for her life in the Neonatal Intensive Care Unit for more than five months," said Denise Foyle. "She's a normal preschooler who dances and knows her ABCs."

According to clinician-scientists at Nationwide Children's Hospital and The Ohio State University Wexner Medical Center, there are striking differences across U.S. hospitals in the decision to initiate or withhold treatment at 23 weeks of gestation. The researchers' new retrospective study, published online recently in *Obstetrics & Gynecology*, looked at 101 infants born at 23 weeks gestation between 2004 and 2013 who received comprehensive perinatal and neonatal care. Sixty infants survived to hospital discharge and more than half of the survivors evaluated at 18 to 22 months had little to no neurological complications.

"Our collaborative team at Nationwide Children's Hospital and The Ohio State University are committed to providing the best possible care and counseling of families facing the birth of a premature infant. This study is a small step forward in providing parents with more accurate information to help them make informed decisions about the care of their child," said Carl H. Backes, MD, a neonatologist and cardiologist at Nationwide Children's. "The goal of our team at Nationwide Children's and The Ohio State University is to provide the best care possible, and we believe that starts with optimizing care and counseling of families facing the birth of extremely premature neonates."

The study looked at multiple interventions that can affect outcomes from both obstetrical and neonatal perspectives, including prenatal care, preterm labor, preterm premature rupture of membranes, surfactants in the delivery room and prolonged intubation sequences, to name a few.

"The goal of our care team for births at 23 weeks, whether anticipated or imminent, is to support families by supporting shared decision-making between families and health care providers," said Stacy Beck, MD, Maternal Fetal Medicine

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- **Latest on VBAC Counseling and Offering TOLAC** - *Christina Davidson, MD*
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**Vision for the Future of NPA** - *Raylene Phillips, MD, IBCLC, FABM, FAAP*

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physician at The Ohio State University Wexner Medical Center. "From an obstetrician perspective, when prenatal counseling is possible, we can improve the efficiency of care in the delivery room for these babies born extremely premature."

A typical pregnancy lasts about 40 weeks and the limits of viability are considered to be 22-23 weeks. In past literature, a majority of babies born at 23 weeks have not survived, or had moderate impairment.

"The difference with our study was that obstetricians, neonatologists and families were all on the same page," said Leif D. Nelin, MD, Dean W Jeffers Chair of Neonatology at Nationwide Children's and a Professor of Pediatrics at The Ohio State University College of Medicine. "However, our study only describes outcomes in a best-case scenario, as all the neonates were all singleton pregnancies with time for prenatal counseling, which is not always the case. Larger studies are needed to confirm these findings, and it should be noted that developmental assessments at 18-22 months may not fully predict outcomes later in childhood."

Nationwide Children's has ongoing courses intended for providers throughout central Ohio that focuses on the care of the extremely premature neonate in the delivery room and first 24 hours of birth.

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### **Invasive Staphylococcus Aureus Infections in Hospitalized Infants**

Invasive methicillin-susceptible *Staphylococcus aureus* (*S aureus*) infection (MSSA) caused more infections and more deaths in hospitalized infants than invasive methicillin-resistant *S aureus* infection (MRSA), which suggests measures to prevent *S aureus* infections should include MSSA in addition to MRSA, according to an article published online by *JAMA Pediatrics*.

P. Brian Smith, MD, MPH, MHS, of the Duke University School of Medicine, Durham, NC, and coauthors compared demographics and mortality of infants with MRSA and MSSA at 348 Neonatal Intensive Care Units (NICUs) around the United States to determine the annual proportion of *S aureus* infections that were MRSA, and to contrast the risk of death after invasive MRSA and MSSA infections.

The authors identified 3,888 of 887,910 infants (0.4%) with 3,978 invasive *Staphylococcus aureus* infections. Infections were more commonly caused by MSSA (2,868 of 3,978 or 72.1%) than MRSA (1,110 of 3,978 or 27.9%).

Overall, invasive *S aureus* infections had an incidence of 44.8 infections per 10,000 infants, according to the results. The annual incidence of invasive *S aureus* infection increased from 1997 through 2006 and then declined modestly from 2007 through 2012.

The study indicates invasive *S aureus* infections were more common in infants born at less than 1,500 grams (3,061 of 136,797 or 223.8 per 10,000 infants) than in infants born at 1,500 grams or higher (915 of 748,715 or 12.2 per 10,000 infants).

More infants with invasive MSSA infections (n=237) died before hospital discharge than infants with invasive MRSA infections (n=110). However, the proportions of infants who died after invasive MSSA and MRSA infections were similar at 237 of 2,474 (9.6%) and 110 of 926 (11.9%). The adjusted risk of death before hospital discharge and the risk of death at seven and 30 days after invasive infection were similar between infants with invasive MSSA infection and invasive MRSA infection, the results indicate.

"The absolute numbers of infections and deaths due to MSSA exceed those due to MRSA. Consideration should be given to expanding hospital infection control efforts targeting MRSA to include MSSA as well. Future studies to better define the relationship between MSSA colonization and subsequent infection will help to clarify the importance of such interventions for preventing MSSA disease," the study concludes.

*JAMA Pediatr.* Published online October 19, 2015. doi:10.1001/jamapediatrics.2015.2380.

Editorial: Spreading the Benefits of Infections Prevention in the NICU

In a related editorial, Pablo J. Sanchez, MD, of the Nationwide Children's Hospital, Ohio State University, Columbus, and coauthors write: "In conclusion, the key to minimizing morbidity and mortality from any organism (*S aureus* included) must be prevention of horizontal transmission that can result in NICU outbreaks. We know that horizontal transmission occurs via the hands of health care workers, so hand hygiene as part of standard and transmission-based precautions remains the mainstay of prevention. Hand hygiene is cost-effective and easy to perform. The common goal must remain prevention of transmission, and the most effective prevention strategy is already in our hands."

*JAMA Pediatr.* Published online October 19, 2015. doi:10.1001/jamapediatrics.2015.2980.

Please see article for additional information, including other authors, author contributions and affiliations, etc.

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### **Using A Specialized MRI of the Fetus in the Womb, U-M Doctors Use a 3-D Printer to Print Models of the Fetus Face**

Megan Thompson was about 30 weeks pregnant when an ultrasound showed a walnut-sized lump on her tiny, unborn



Using a specialized MRI of the fetus in the womb, U-M doctors were able to use a 3-D printer to print models of the fetus face. These models helped determine exactly where and how dangerous the soft tissue mass was.

Courtesy of the University of Michigan Health System.

child's face that could prevent him from breathing after birth.

Thompson was referred to the University of Michigan's C.S. Mott Children's Hospital where doctors had to decide whether baby Conan could be delivered safely through a C-section or needed a rare and complex lifesaving procedure. The tool they used to help make that difficult decision -- 3-D printing.

Using a specialized MRI of the fetus in the womb, doctors were able to use a 3-D printer to print models of the fetus face, helping determine exactly where and how dangerous the soft tissue mass was. The case was outlined in the November issue of *Pediatrics*.

"Based on the images we had, it was unclear whether the mass would block Conan's airway after birth. The 3-D printed model of the fetus allowed us to actually see in person what it looked like and have something in our hands to help us decide the best way to care for the baby," says senior author Glenn Green, MD, Associate Professor of Pediatric Otolaryngology at U-M's C.S. Mott Children's Hospital.

"This is the first case we are aware of that 3-D printing has helped show how severe an airway risk in a fetus was in order to make clinical decisions. 3-D printing may be an incredibly valuable tool to help doctors prepare for complex cases ahead of birth."

The extra information gained from the 3-D printed models helped doctors determine that Conan would not need what's called an Ex Utero Intrapartum Treatment Procedure (EXIT). The EXIT procedure requires a partial delivery of the baby while it remains attached by its umbilical cord to the placenta so that a surgeon can establish an airway to allow the baby to breathe. Instead, Conan was born via a scheduled C-section.

"I was terrified when I found out there was a possibility my baby might not be able to breathe after birth," recalls Thompson, of Wayne County, Mich. "Hearing him cry after he was born was the most incredible, emotional experience because I knew he was OK."

"They told me the 3-D printed models would help give them a more accurate idea of what was going on and what kind of delivery I should have. I was relieved that I didn't need the more complicated and risky surgery and could be awake for the birth of my first baby. I'm glad that what they did for Conan may help other babies and their families in similar situations."

All procedures were done at U-M's C.S. Mott Children's Hospital. The computer designs for the models were created in the lab of Scott Hollister, PhD, Professor of Biomedical Engineering and Mechanical Engineering and Associate Professor of Surgery at U-M. The models were printed by Ann Arbor-based ThingSmiths.

The lead author of the case report was Kyle V. VanKoeveering, MD, of the U-M division of Otolaryngology-Head and Neck Surgery.

Three-dimensional printing has had many medical applications. At the University of Michigan, 3-D printed splints have helped save the lives of babies with severe tracheobronchomalacia, which causes the windpipe to periodically collapse and prevents normal breathing. Green and Hollister are leading efforts to design customized medical implants for those and other patients.

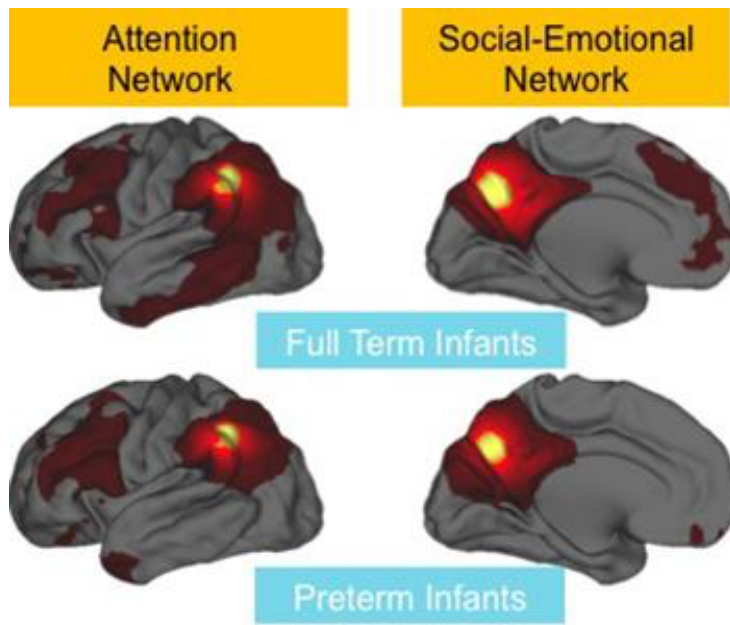
Additional Authors: Robert J. Morrison, MD; Sanjay P. Prabhu, MBBS; Maria F. Ladino Torres, MD; George B. Mychaliska, MD; Marjorie C. Treadwell, MD; Scott Hollister, PhD.

Funding: National Institutes of Health. Dr. Morrison is supported by National Institutes of Health grant (T32 DC005356). Reference: "Antenatal 3-Dimensional Printing of Aberrant Facial Anatomy," Oct., 2015, *Pediatrics*, [www.pediatrics.org/cgi/doi/10.1542/peds.2015-1062](http://www.pediatrics.org/cgi/doi/10.1542/peds.2015-1062).

### Premature Birth Appears to Weaken Brain Connections - Early Intervention May Improve Outcomes

Babies born prematurely face an increased risk of neurological and psychiatric problems that may be due to weakened connections in brain networks linked to attention, communication and the processing of emotions, new research shows.

Studying brain scans from premature and full-term babies, researchers at Washington University School of Medicine in St. Louis zeroed in on differences in the brain that may underlie such problems.



A comparison of brain scans from babies born at full term and at least 10 weeks prematurely shows differences in the activity of brain networks. The red and yellow areas represent coordinated activity. In preemies, the red areas are smaller due to less coordinated activity between these regions.

Courtesy of Washington University School of Medicine.



"The brain is particularly 'plastic' very early in life and potentially could be modified by early intervention," said principal investigator Cynthia Rogers, MD, Assistant Professor of Child Psychiatry. "We usually can't begin interventions until after symptoms develop, but what we're trying to do is develop objective measures of brain development in preemies that can indicate whether a child is likely to have later problems so that we can then intervene with extra support and therapy early on to try to improve outcomes."

The findings were being presented Oct. 19<sup>th</sup> at *Neuroscience 2015, the annual scientific meeting of the Society for Neuroscience* in Chicago.

One of every nine infants in the U.S. is born early and, thus, with increased risk of cognitive difficulties, problems with motor skills, and attention deficit-hyperactivity disorder (ADHD), Autism Spectrum Disorders and anxiety.

To get a better picture of how premature birth affects the brain, Rogers, along with senior author Christopher D. Smyser, MD, Assistant Professor of Pediatric Neurology, and colleagues in the Washington University Neonatal Development Research Lab used functional magnetic resonance imaging and diffusion tensor brain imaging to compare 58 babies born at full term with 76 infants born at least 10 weeks early. Each full-term baby was scanned on his or her second or third day of life. Each premature baby, meanwhile, received a brain scan within a few days of his or her due date.

The researchers found that some key brain networks -- those involved in attention, communication and emotion -- were weaker in premature infants, offering an explanation for why children born prematurely may have an elevated risk of psychiatric disorders.

"We found significant differences in the white matter tracts and abnormalities in brain circuits in the infants born early, compared with those of infants born at full-term," said Rogers, who treats patients at St. Louis Children's Hospital.

White matter tracts in the brain are made of axons that connect brain regions to form networks. The researchers also found differences in preemies' resting-state brain networks, particularly in a pair of networks previously implicated in learning and developmental problems.

Among these resting-state networks is the default mode network, which tends to be most active when people are least active. The greatest differences between full-term and preterm babies were seen in this network and in the frontoparietal network. Both encompass brain circuits

associated with emotion and previously have been linked to ADHD and Autism Spectrum Disorders.

Rogers said these brain circuit abnormalities likely contribute to problems that materialize as the children get older.

To see whether that's true, Rogers and her colleagues are continuing to follow the babies, having completed follow-up evaluations when the children reached age 2, and again on some at age 5. The researchers plan another series of brain scans in a few years as the original study participants reach the ages of 9 or 10.

"We're analyzing the data we've already gathered, but we want to bring the children back when they are 9 or 10 and continue to follow their development," she said. "We want to look at the evolution of brain development in full-term versus preterm babies, and we want to know how that may affect who is impaired and who is not."

That information may help doctors and scientists target abnormalities in the brains of preterm babies and, potentially, change the course of their development.

This work was funded by the National Institute of Mental Health, the National Institute of Neurological Disorders and Stroke and the Eunice Kennedy Shriver National Institute of Child Health and Human Development, of the National Institutes of Health (NIH). Additional funding comes from the McDonnell Center for Systems Neuroscience, the Child Neurology Foundation, the Cerebral Palsy International Foundation and the Dana Foundation.

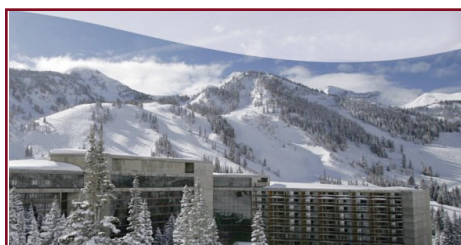
Rogers C, Herzmann C, Smyser T, Shimony J, Ackerman J, Neil J, Smyser C. Impact of preterm birth on structural and functional connectivity in neonates. Abstract was presented at *Neuroscience 2015*, in Chicago.

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### Email, Text or Web Portal? New Study Probes Patients' Preferences for Receiving Test Results

Newswise — The results of common medical tests are sometimes delivered to patients by email, letters or voice mail, but are these the most preferred methods? According to one of the first studies to look at this question, the answer is no.

The Georgetown University Medical Center (GUMC) survey, published today in the *Journal of the American Board of Family Medicine*, finds that the largest portion of participants was comfortable receiving test results through password-protected websites or portals. (The survey did not include in-person communications.)



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The survey of 409 participants suggests that while password-protected web portals are highly preferred, participants don't mind a variety of non in-person communication methods including email, texts or voicemail for receiving results of common tests such as blood cholesterol levels.

However, that is not the case for two very sensitive tests — non-HIV sexually transmitted infections (STIs) and genetic test results. In those cases, receiving the results via a password-protected patient portal/website was highly preferred.

“Communication with patients may need to be on a case-by-case basis — every individual may have a personal preference, and there may be a way to indicate those preferences in the patient's record. The goal of this study was to try to better understand these preferences, so we can improve doctor-patient communication,” says the study's lead researcher, Jeannine LaRocque, PhD, Assistant Professor of Human Science in the School of Nursing & Health Studies at GUMC.

It is not uncommon for a physician to call or email a patient with results to common tests without any idea of which is preferred in different contexts, but “this study makes clear that the majority of people prefer something different than what we've been doing,” says the study's senior researcher, Daniel Merenstein, MD, Director of Research Programs in the Department of Family Medicine at GUMC.

The survey tested the desirability of seven different methods of non-in-person communication in receiving three different kinds of tests: common tests such as blood cholesterol and colonoscopy results; non-HIV STIs; and genetic testing (predisposition to a disorder, carrier of an inherited gene linked to a disease and a carrier of a genetic disorder).

The seven methods of communications surveyed were a password-protected patient portal website, phone voicemail, personal email, letter, home voicemail, fax and mobile phone text.

Researchers found that in all categories, patients were least comfortable receiving information via fax.

Half or more preferred receiving cholesterol or colonoscopy results in four methods: password protected patient portal websites, personal voicemail, personal email or letter. The majority did not want to receive a home voicemail, mobile text message or a fax.

For receiving results of STIs, only one method was preferred by the majority (51%) of participants — password-protected websites. No single method was preferred for genetic test results; the closest, at 46%, was also password-protected websites.

LaRocque, a researcher focused on genetics and molecular biology, is interested in how sensitive information is transmitted to patients. “With these highly sensitive medical results such as genetic test results, patients may not trust the privacy of methods such as personal voicemail or email, whereas password-protected websites provide an added level of security, which may be necessary as these tests become more prevalent in primary care practices,” she says.

But other studies have found that a minority of patients has signed up for available patient portals, and only half have actually activated their sites, the researchers say.

The researchers point out one potential bias in the study: since the majority of completed surveys were administered online, those who participated may be innately more comfortable with electronic communication.

Study co-authors are: Christina Davis and Tina P. Tan from GUMC and Frank J. D'Amico from Duquesne University in Pittsburgh. There was no external funding or financial support for this study.

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