Week 4: Neonatology

Neonatal General: NICU Care

Tuesday, July 21 2:30-4:00 pm EDT

Moderators
Kevin Sullivan
Jessica Fry

<table>
<thead>
<tr>
<th>EDT</th>
<th>Abstract</th>
<th>Title</th>
<th>Presenting Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:30 pm</td>
<td></td>
<td>Introduction &amp; General Information</td>
<td></td>
</tr>
<tr>
<td>2:35 pm</td>
<td>3381002</td>
<td>Bioenergetic homeostasis in late preterm and term infants during first 4 months of life</td>
<td>Lea Möllers</td>
</tr>
<tr>
<td>2:45 pm</td>
<td>3373672</td>
<td>PARENTAL STRESS RESPONSIVITY</td>
<td>Fumiyuki Gardner</td>
</tr>
<tr>
<td>2:55 pm</td>
<td>3379493</td>
<td>The Level IV Neonatal Intensive Care Unit (NICU) Experience of infants with Trisomy 18 (T18) and Trisomy 13 (T13): A report from the Children’s Hospital Neonatal Consortium (CHNC)</td>
<td>Kevin Sullivan</td>
</tr>
<tr>
<td>3:05 pm</td>
<td>3379522</td>
<td>High Rates of Withdrawal of Life Sustaining Therapy(WLST) in Early Death (&lt;12 hours) after Transfer to Level IV NICUs</td>
<td>Devika Locke</td>
</tr>
<tr>
<td>3:15 pm</td>
<td>3383406</td>
<td>Elevated Calgranulin Blood Levels in Mother-Baby Pairs Correlate with Histologic Chorioamnionitis in Preterm Gestations</td>
<td>Claire Murray</td>
</tr>
<tr>
<td>3:35 pm</td>
<td>3375487</td>
<td>Infrared camera videography can be utilized for contactless respiratory and temperature monitoring in young infants.</td>
<td>Son Duong</td>
</tr>
<tr>
<td>3:45 pm</td>
<td>3379019</td>
<td>Optimising Infusion Protocols for Stem Cell Therapies in Neonates</td>
<td>Elizabeth Baker</td>
</tr>
<tr>
<td>3:55 pm</td>
<td></td>
<td>Wrap Up</td>
<td></td>
</tr>
</tbody>
</table>

Note: Schedule subject to change based on presenter availability.
CONTROL ID: 3381002

TITLE: Bioenergetic homeostasis in late preterm and term infants during first 4 months of life

PRESENTER: Lea Möllers

AUTHORS (LAST NAME, FIRST NAME): Möllers, Lea³; Rochow, Niels³; So, Hon Yiu²; Sehdev, Lauren¹; Fusch, Gerhard¹; Fusch, Christoph³

AUTHORS/INSTITUTIONS: L. Sehdev, G. Fusch, Pediatrics, McMaster University, Hamilton, Ontario, CANADA; H. So, University of Waterloo, Waterloo, Ontario, CANADA; L. Möllers, N. Rochow, C. Fusch, Paracelsus Medical University, Nuremberg, GERMANY;

CURRENT CATEGORY: Neonatology
CURRENT SUBCATEGORY: Neonatal General

KEYWORDS: IGF, Body Composition, Nutrition.

SESSION TITLE: Neonatal General: NICU Care | Neonatal General: NICU Care
SESSION TYPE: Webinar|Platform

ABSTRACT BODY:

Background: It has been established that early postnatal development is related to long-term health outcomes. Therefore, achieving ideal growth and body composition in preterm-born infants is desirable. Preterm-born infants should develop like a healthy fetus in-utero and also achieve similar functional outcomes. To create optimal growth in preterm infants, parameters impacting postnatal growth in healthy term-born infants have to be studied as a reference model. Furthermore, the entirety of the interplay between nutrition, hormonal and metabolic responses and resulting growth trajectories in these infants has to be established.

Objective: The aim of this study is to analyze this interplay, the bioenergetic homeostasis, in late-preterm and term-born infants to create a model for normal growth.

Design/Methods: This observational study collected data from healthy infants born at 34-42 weeks of gestation at three time points: t₁ = 0-5 days of life (DOL), t₂ = 55-65 DOL, t₃ = 115-125 DOL. Anthropometric data (weight, length, BMI, head-circumference, skinfold-thickness), body composition (fat-mass, lean-mass, FMI, FFMI, % body-fat), hormonal levels (IGF-1, IGF-2, IGFBP-2, IGFBP-3, insulin, leptin), biomarkers of metabolism (protein, albumin, triglyceride, cholesterol) and the energy expenditure were measured.

Results: In 94 infants (gestational age: 39.6±1.3 weeks, birth weight 3330±570g) and 18 preterm infants (35.0±1.0 weeks, 2520±660g) positive associations between postmenstrual age and hormonal levels (IGF-1, IGF-2) were found (Fig. 2). Furthermore, a positive relationship between body composition data and these growth promoting hormones was established (Tab. 1). Both, fat mass and lean mass are positively associated with IGF-1, however the association between IGF-1 and lean mass is stronger. Body composition data (percent body fat, fat mass and lean body mass) was found to be lower in the preterm-born group when compared to term-born infants. A positive relationship between lean mass and energy expenditure was observed. When infants were grouped by type of nutrition, formula-fed infants had higher levels of IGF compared with infants that were fed breast milk (Fig. 3).

Conclusion(s): The established interactions of multiple parameters indicating certain growth trajectories may allow for a possibility to fine-tune postnatal growth. At this point, the observed interactions need further studies, especially including preterm-born infants at different postmenstrual ages and levels of maturity.
Figure 1: Bioenergetic homeostasis – interaction of nutritional intake, growth promoting hormones, energy expenditure, metabolic parameters, anthropometric measurements and body composition contribute to postnatal growth in preterm and term-born infants (↑ - positive growth, ↓ - negative growth, IGF – insulin-like growth factor, IGFBP – insulin-like growth factor binding protein, HC – head circumference, BMI – body mass index, SFT – skinfold thickness, fm – fat mass, lbm – lean body mass, %bf – percent body fat, FMI – fat mass index, FFMI – fat-free mass index).

Figure 2: Relationship between postmenstrual age and IGFs in preterm and term born infants with respect to % fat mass. Panel A: PMA and IGF-1, B: PMA and IGF-2.

Figure 3: Effect of nutrition (formula vs. breast milk) on IGFs. Panel A: Correlation of PMA and IGF-1 levels in relation to lean body mass, B: Correlation of PMA and IGF-2 in relation to percent fat mass.

Table 1: Correlation between growth factors and body composition, anthropometry and energy expenditure, pearson correlation coefficients (r)
Panel A: PMA and IGF-1, B: PMA and IGF-2.

Figure 3: Effect of nutrition (formula vs. breast milk) on IGFs. Panel A: Correlation of PMA and IGF-1 levels in relation to lean body mass, B: Correlation of PMA and IGF-2 in relation to percent fat mass.

Table 1: Correlation between growth factors and body composition, anthropometry and energy expenditure, pearson correlation coefficients (r)

CONTROL ID: 3373672
TITLE: PARENTAL STRESS RESPONSIVITY
PRESENTER: Fumiyuki Chin Gardner

AUTHORS (LAST NAME, FIRST NAME): Gardner, Fumiyuki C.; Hozella, Alexia; Fronheiser, Brittany J.; Brelsford, Gina M.; Doheny, Kim K.

AUTHORS/INSTITUTIONS: G.M. Brelsford, Behavioral Sceinces and Education, Penn State Harrisburg, Middletown, Pennsylvania, UNITED STATES; F.C. Gardner, A. Hozella, B.J. Fronheiser, K.K. Doheny, Pediatrics and Neural & Behavioral Sciences, Penn State University, College of Medicine, Hershey, Pennsylvania, UNITED STATES;

CURRENT CATEGORY: Neonatology
CURRENT SUBCATEGORY: Neonatal General
KEYWORDS: Neonatology/ NICU, Parenting, Stress responsivity.
SESSION TITLE: Neonatal General: NICU Care | Neonatal General: NICU Care
SESSION TYPE: Webinar|Platform

ABSTRACT BODY:

Background: Neonatal intensive care is a highly stressful environment that not only influences parents’ perceptions surrounding their infant’s birth, but continues to inform their perceptions post-hospitalization. Stress perceptions, the way an individual cognitively processes and interprets a situation, influence responses to an event. Stress responsivity is measured using biomarkers such as salivary cortisol (sCort) and skin conductance (SC). Sex differences in biological stress responsivity are well-documented in healthy young adults, with greater, more acute responses in men vs. women. However, psychobiological stress responsivity has not been reported in parents of former NICU infants post-discharge.

Objective: Explore differences in perceptions and biological responses to stress in former NICU parents.

Design/Methods: We enrolled a cross-sectional cohort of 39 parents, excluding those with conditions affecting autonomic functioning (Table 1). Subjects performed Trier Social Stress Test (TSST) with 5-min each of mental preparation, telling their NICU story, and a math exercise. Free-flow saliva samples 10-min pre-TSST (baseline) and 20- and 40-min recovery were stored at -80 C and sent to Salimetrics® for analysis. SC was measured continuously via palmar electrodes from baseline to 20-min recovery. Perceived Stress Scale (PSS 10-item) and analog Distress Thermometer (DT) were given at 40-min recovery.

Results: Mothers reported significantly higher distress and heightened Physical distress vs. fathers by PSS and DT (Table 2). There were no associations between perceived distress and biological responses. Mothers and fathers had similar baseline sCort levels; however, responsivity patterns were different. In mothers, sCort continuously decreased from baseline to 40-min recovery whereas fathers’ sCort peaked at 20-min and fell to near baseline at 40-min (Fig1). Log sCort showed mothers as significantly less responsive vs. fathers after adjusting for PSS at 20, and 40-min recovery; moreover, between-phase sCort difference scores also identified mothers as less responsive than fathers.

Conclusion(s): Mothers showed blunted sCort responses vs. fathers after accounting for PSS, which may represent dysregulated cortisol responsivity driven by sex-related biological differences or attenuation due to chronic stress. Ongoing care and stress/coping interventions in the NICU and post-discharge may be most beneficial to promote parental well-being.
Table 1: Sample characteristics

<table>
<thead>
<tr>
<th>Total Sample (N = 39)</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mothers (%):</td>
<td>74</td>
<td>5</td>
<td>32</td>
<td>35</td>
</tr>
<tr>
<td>Maternal Age (years):</td>
<td>39.9</td>
<td>5.4</td>
<td>22</td>
<td>43</td>
</tr>
<tr>
<td>Paternal Age (years):</td>
<td>35.2</td>
<td>11.1</td>
<td>24</td>
<td>64</td>
</tr>
<tr>
<td>Infant Age (months):</td>
<td>16.1</td>
<td>5.0</td>
<td>4</td>
<td>35</td>
</tr>
</tbody>
</table>

Table 2: Diabetes Mellitus and Perinatal Morbidity

<table>
<thead>
<tr>
<th>Diabetes Mellitus</th>
<th>N (%)</th>
<th>Pre-Natal</th>
<th>Perinatal</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1 DM</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Type 2 DM</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Gestational DM</td>
<td>20</td>
<td>10</td>
<td>10</td>
<td>30</td>
</tr>
</tbody>
</table>

**IMAGE CAPTION:**

**CONTROL ID:** 3379493

**TITLE:** The Level IV Neonatal Intensive Care Unit (NICU) Experience of infants with Trisomy 18 (T18) and Trisomy 13 (T13): A report from the Children's Hospital Neonatal Consortium (CHNC)

**PRESENTER:** Kevin Michael Sullivan

**AUTHORS (LAST NAME, FIRST NAME):** Niehaus, Jason³; Acharya, Krishna⁴; Shah, Anita N.⁵; Datta, Ankur⁶; Wraight, Catherine L.⁷; Wymore, Erica⁸; Weiner, Julie⁹; Matoba, Nana¹⁰; O'donnell, Brighid M.¹¹; Rose, Rebecca¹²; Schlegel, Amy¹³; Coghill, Carl H.¹⁴; Wojcik, Monica H.¹⁵; nayak, Pritha¹⁶; DiGeronimo, Robert¹⁷; Natarajan, Girija¹⁸; Leuthner, Steven R.¹⁹; Ling, Con Y.²⁰; Dereddy, Narendra²¹; Seale, Jamie N.²²; Williams, Helen²³; Jackson, Laura²⁴; Fry, Jessica T.²⁵; Sullivan, Kevin M.²⁶

**AUTHORS/INSTITUTIONS:** K.M. Sullivan, Pediatrics/Neonatology, AI duPont Hospital for Children/Thomas Jefferson University, Wilmington, Delaware, UNITED STATES;
J.T. Fry, Pediatrics/Neonatology, Northwestern University, Chicago, Illinois, UNITED STATES;
J. Niehaus, Pediatrics, Indiana University, Indianapolis, Indiana, UNITED STATES;
K. Acharya, Pediatrics, Medical College of Wisconsin, Milwaukee, Wisconsin, UNITED STATES;
A.N. Shah, Neonatology, CHOC Childrens Hospital, Rancho Santa Margarita, California, UNITED STATES;
A. Datta, Pediatrics, Division of Neonatology, Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, Illinois, UNITED STATES;
C.L. Wraight, Pediatrics, University of Wisconsin, Madison, Wisconsin, UNITED STATES;
E. Wymore, Neonatology, University of Colorado, Aurora, Colorado, UNITED STATES;
J. Weiner, Neonatology, Children's Mercy Hospital, Kansas City, Missouri, UNITED STATES;
N. Matoba, Pediatrics, Northwestern University Feinberg School of Medicine, Chicago, Illinois, UNITED STATES;
Background: The experience of infants with T13 or T18 who are admitted to children’s hospitals NICUs has not previously been reported. T18 and T13 are chromosomal anomalies, which were previously uniformly described as lethal; few interventions were performed on these neonates. A review of a large Canadian database showed that although early mortality was common, children who underwent surgery had high 1 year survival. Birth-weight and major anomalies have been described as influencers of medical decision-making but the surgical and level IV NICU experience has not been captured.

Objective: To characterize the level IV Children’s Hospital NICU experience for infants with T18 and T13.

Design/Methods: CHNC includes 34 level IV NICUs across the US and Canada that prospectively collects data on all neonates. This is a retrospective cohort analysis using data collected from 2010-2016. All infants admitted with the diagnosis of T13 and T18 were included. Statistical comparisons based on parametric and non-parametric tests were completed.

Results: During the study period, 467 patients (317 with T18 and 150 with T13) were admitted and 235 (50%) survived to discharge. A majority of patients were born at >37 weeks (57%) with a median (IQR) admission age of 1 (0-4) day, birth weight of 1500-2499 grams (55%) and were outborn (88%). In the delivery room (DR), 130 (28%) infants had a 1-minute APGAR score of less than 2 and 284 (61%) received positive-pressure ventilation and a third underwent endotracheal intubation. No surgical interventions were performed in 350 (75%) infants, 52 (11%) received one surgical procedure and 65 (14%) received 2 or more surgical procedures. Tracheostomy (2.7%) was rare. Of survivors, 157(84%) were discharged home with a feeding ostomy and 92(49%) with home oxygen. Infants with T13 were of lower birth weight, less likely to be intubated in the DR and less likely to survive to discharge.

Conclusion(s): Among infants with T18 and T13 admitted to CHNC institutions survival to NICU discharge was possible. Surgery was performed in 25% of patients, mainly related to feeding stomas, while C-section and DR intervention were frequent. Surviving infants required significant discharge support with high rates of assisted feeding and oxygen. Next steps include identifying inter-center variations in care, changes in management over time and linking DR decision-making to surgical intervention and long-term parental satisfaction.
<table>
<thead>
<tr>
<th>N</th>
<th>Rate of Death</th>
<th>Timing 1</th>
<th>Timing 2</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>88.3</td>
<td>71.9</td>
<td>0.06</td>
</tr>
<tr>
<td>1</td>
<td>50.78</td>
<td>86.11</td>
<td>74.62</td>
<td>0.005</td>
</tr>
<tr>
<td>2.5</td>
<td>48.04</td>
<td>86.11</td>
<td>74.62</td>
<td>0.005</td>
</tr>
<tr>
<td>5</td>
<td>38.6</td>
<td>86.11</td>
<td>74.62</td>
<td>0.005</td>
</tr>
</tbody>
</table>

**Image Caption:**

CONTROL ID: 3379522

**Title:** High Rates of Withdrawal of Life Sustaining Therapy (WLST) in Early Death (<12 hours) after Transfer to Level IV NICUs

**Presenter:** Devika Locke

**Authors (Last Name, First Name):** Locke, Devika; Niehaus, Jason; Acharya, Krishna; Shah, Anita N.; Datta, Ankur; Wraight, Catherine L.; Wymore, Erica; Weiner, Julie; Matoba, Nana; O'donnell, Brighid M.; Rose, Rebecca; Schlegel, Amy; Coghill, Carl H.; Wojcik, Monica; Nayak, Pritha; DiGeronimo, Robert; Natarajan, Girija; Leuthner, Steven R.; Ling, Con; Deredy, Narendra; Seale, Jamie N.; Williams, Helen; Jackson, Laura; Fry, Jessica T.; Sullivan, Kevin M.

**Authors/Institutions:** D. Locke, K.M. Sullivan, Pediatrics/Neonatology, Al duPont Hospital for Children/Thomas Jefferson University, Wilmington, Delaware, UNITED STATES; J.T. Fry, Pediatrics/Neonatology, Northwestern University, Chicago, Illinois, UNITED STATES; J. Niehaus, Neonatal-Perinatal Medicine, Indiana University, Indianapolis, Indiana, UNITED STATES; K. Acharya, Pediatrics, Medical College of Wisconsin, Milwaukee, Wisconsin, UNITED STATES; A.N. Shah, Neonatology, CHOC Childrens Hospital, Rancho Santa Margarita, California, UNITED STATES; A. Datta, Pediatrics, Division of Neonatology, Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, Illinois, UNITED STATES; C.L. Wraight, Pediatrics, University of Wisconsin, Madison, Wisconsin, UNITED STATES; E. Wymore, Neonatology, University of Colorado, Aurora, Colorado, UNITED STATES; J. Weiner, Neonatology, Children's Mercy Hospital, Kansas City, Missouri, UNITED STATES; N. Matoba, Pediatrics, Northwestern University Feinberg School of Medicine, Chicago, Illinois, UNITED STATES; B.M. O'donnell, L. Jackson, Pediatrics, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania, UNITED STATES.
Background: The decision to transport a critically ill infant to a higher level NICU is designed to provide therapies to improve survival. Unfortunately, some infants die quickly following transport and little is known about the contributing factors or manner of their death.

Objective: To compare characteristics and end-of-life events of infants who died less than 12 hours after transfer to level IV NICUs with other infants that die later following transfer.

Design/Methods: Children’s Hospitals Neonatal Consortium (CHNC) is a group of 34 level IV NICUs across the US that prospectively collect data on all admitted neonates. This was a retrospective cohort analysis using data collected between 2010-2016. Infants who were inborn were excluded. Demographic factors including race, gestational age, medical diagnoses and interventions were compared for infants who died less than 12 hours after transfer and infants who died greater than 12 hours after transfer. These categories were analyzed using parametric and non-parametric testing as appropriate.

Results: A total of 6035 infant deaths were reviewed with 356 (5.9%) dying at less than 12 hours. Infants dying early were of younger gestational age, lower birth weight, had increased comorbidities, and were more likely to be intubated and paralyzed at admission. Infants who died early more commonly had as their primary cause of death intra-abdominal catastrophes (35.4% vs. 10.8%), including GI perforation (7% vs. 4%) (Table 1). Additionally, a higher percentage of infants with early death had do-not-resuscitate (DNR) orders in place (51.7% vs. 19.8%), and they were less likely to have withdrawal of life-sustaining therapies (WILST) (55.6% vs. 72.9%), or receive cardiopulmonary resuscitation (CPR) around death (38% vs. 55.6%) (Table 2).

Conclusion(s): Infants in this cohort with early mortality after transfer have predictably higher acuity at admission. Surprisingly, the majority of early deaths appear to be anticipated with preceding DNR and WLST along with lower rates of CPR. This study highlights the importance of interdisciplinary decision making to ensure that patient transfers to higher levels of care continue to align with overall family goals of care.
## Table 1

<table>
<thead>
<tr>
<th>Condition</th>
<th>Case 1</th>
<th>Case 2</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>S100A8</td>
<td>0.23</td>
<td>0.23</td>
<td>0.001</td>
</tr>
<tr>
<td>S100A12</td>
<td>0.23</td>
<td>0.23</td>
<td>0.001</td>
</tr>
</tbody>
</table>

## Table 2

**Table Caption:**

Table 1

## IMAGE CAPTION:

Table 1

**CONTROL ID:** 3383406

**TITLE:** Elevated Calgranulin Blood Levels in Mother-Baby Pairs Correlate with Histologic Chorioamnionitis in Preterm Gestations

**PRESENTER:** Claire Danielle Murray

**AUTHORS (LAST NAME, FIRST NAME):** Lawlor, Megan²; Buchanan, Christopher²; Murray, Claire D.¹; Kurian, Shannon R.¹; Lewis, Andrea¹; McQuillan, Jay¹; Koenig, Joyce Marie¹

**AUTHORS/INSTITUTIONS:**

C.D. Murray, S.R. Kurian, A. Lewis, J. McQuillan, J. Koenig, Pediatrics, Saint Louis University, Saint Louis, Missouri, UNITED STATES;

M. Lawlor, C. Buchanan, Obstetrics, Gynecology, and Women's Health, Saint Louis University, Saint Louis, Missouri, UNITED STATES;

**CURRENT CATEGORY:** Neonatology

**CURRENT SUBCATEGORY:** Neonatal General

**KEYWORDS:** Chorioamnionitis, Inflammation, Prematurity.

**SESSION TITLE:** Neonatal General: NICU Care [Neonatal General: NICU Care

**SESSION TYPE:** Webinar|Platform

**ABSTRACT BODY:**

**Background:** Histologic chorioamnionitis (HCA) is a frequently ‘silent’ placental inflammation that may contribute to preterm birth. Calgranulins, inflammatory S100 proteins, have been identified in amniotic fluid in HCA. We hypothesized that circulating calgranulin expression levels in pregnant women or in cord blood might serve to identify gestations affected by HCA.

**Objective:** Our goal was to correlate S100A8 and S100A12 plasma levels in mother-baby pairs of preterm gestations with the presence or absence of HCA.
Design/Methods:
In this prospective observational study we enrolled a cohort of pregnant women (23-34 wk GA) admitted with preterm labor or preterm premature rupture of membranes (PPROM). Exclusion criteria included maternal inflammatory disorders or fetal abnormalities. Maternal peripheral venous blood was collected within 24 h peripartum and venous umbilical cord blood (CB) samples were obtained at delivery. Maternal (M-HCA) or fetal (F-HCA) or the absence of HCA (Ctrl) were identified by placental examination (Redline 2012). S100A8 and S100A12 levels were measured in replicate samples by commercial ELISA.

Results: Plasma S100 protein levels were determined in 41 mother-baby pairs. Demographic data, PPROM incidence and gestational age at delivery were similar between groups. In F-HCA, S100A8 and S100A12 levels were increased 4-fold in CB (P<0.001) relative to Ctrl. In contrast, S100A8 but not S100A12 levels were elevated in maternal blood (p<0.05). In paired comparisons, maternal S100A8 levels were higher (P=0.01 vs. CB) in M-HCA, while in F-HCA, maternal and CB levels were similar.

Conclusion(s): Fetal HCA is associated with elevated circulating levels of S100A8 and S100A12 in preterm gestations. Our data suggest that S100A8 blood levels may identify mothers and neonates exposed to fetal HCA, a diagnosis that currently depends on postpartum placental analysis. Studies to establish the utility of S100A8 and S100A12 as biomarkers of HCA exposure are underway. This work was funded in part by the Gerber Foundation (to JMK).

(No Image Selected)
Results: We considered all 15,625,734 infant births, including 103,703 HB and 71,394 FBC births. Table 2 displays risk factors by birth setting. Among planned HB, 39,705 (38%) /21,707 (21%) /18,944 (18%) did not meet AAP-ACOG/OHA/NICE criteria for low-risk compared with 24,602 (34%) /11,651 (16%) /10,584 (15%) in FBC, respectively (Table 2). Within setting comparisons revealed significantly increased odds of early neonatal mortality in HB for all guidelines, but only for OHA and NICE guidelines in the FBC setting (Figures 1a-f). For all guidelines, elevated-risk HB and FBC births exhibited significantly higher early mortality compared with non-vertex singleton healthy-birthweight term infants delivered by hospital midwives.

Conclusion(s): Between 18-40% of mothers with planned out-of-hospital birth do not meet criteria for low-risk under guidelines of several professional medical associations. Inadequate risk selection is associated with increased early neonatal mortality in out-of-hospital births.

Guidelines for elevated-risk contraindications to home and birth center (H&BC) births by organization. American Academy of Pediatricians (AAP), American College of Obstetricians and Gynecologists (ACOG), Oregon Health Authority (OHA), and the UK National Institute for Health and Care Excellence (NICE).

Early mortality for elevated-risk vs low-risk infants for home birth (HB) and freestanding birth center births (FBC) using guidelines from (a) the American Academy of Pediatricians (AAP), (b) American Association of Gynecologists (ACOG), (c) Oregon Health Authority (OHA), and (d) the UK National Institute for Health and Care Excellence (NICE). Mortality is compared with hospital mortality for singleborn, non-vertex, term (>=37 week gestational age) infants of healthy birthweight (>=2500g) delivered by midwives. Non-overlap in confidence bands indicates significant difference between groups at the p=0.05 level.

IMAGE CAPTION:
Guidelines for elevated-risk contraindications to home and birth center (H&BC) births by organization. American Academy of Pediatricians (AAP), American College of Obstetricians and Gynecologists (ACOG), Oregon Health Authority (OHA), and the UK National Institute for Health and Care Excellence (NICE).

Risk factors of births. Includes pregnancy and pre-pregnancy risk-factors. Guidelines from the American Academy of Pediatricians (AAP), (b) American College of Obstetricians and Gynecologists (ACOG), Oregon Health Authority (OHA), and the UK National Institute for Health and Care Excellence (NICE). FBC – freestanding birth center; HB – home birth; MW – midwife.

Early mortality for elevated-risk vs low-risk infants for home birth (HB) and freestanding birth center births (FBC) using guidelines from (a) the American Academy of Pediatricians (AAP), (b) American Association of Gynecologists (ACOG), (c) Oregon Health Authority (OHA), and (d) the UK National Institute for Health and Care Excellence (NICE). Mortality is compared with hospital mortality for singleborn, non-vertex, term (>=37 week gestational age) infants of healthy birthweight (>=2500g) delivered by midwives. Non-overlap in confidence bands indicates significant difference between groups at the p=0.05 level.

CONTROL ID: 3375487
TITLE: Infrared camera videography can be utilized for contactless respiratory and temperature monitoring in young infants.
PRESENTER: Son Duong
AUTHORS (LAST NAME, FIRST NAME): Duong, Son1; Woods, Jerry3; Griffin, Dayle2; Vats, Kalyani R.4
AUTHORS/INSTITUTIONS: S. Duong, Dept. of Pediatrics (Cardiology), Stanford University School of Medicine,
Background: Current cardiorespiratory monitoring technology involves wired electrodes that can be burdensome in infants and interfere with the mother-baby dyad. There may be a role for technologies that monitor infant vital signs in a contactless fashion to minimize discomfort and optimize developmental care. We explored the application of a lower cost infrared camera system for the contactless monitoring of respiratory rate (RR) and body temperature in newborn infants.

Design/Methods: Utilizing a temperature calibrated infrared thermal camera (Boson 320, FLIR Systems), we performed thermographic videography on newborn infants in a well-baby nursery after obtaining parental consent. RR was measured from nostril temperature as the RR cycle cooled and warmed the nares. This was compared to the RR measured by chest rise visible in the video. We measured the maximum skin temperature of the inner canthus region of the face and compared with axillary temperature.

Results: We recruited 27 healthy newborns. Excluding movement artifact or low signal amplitude, we measured RR in 21 subjects (78%). We found a strong linear relationship between chest movement and nasal temperature change ($R^2=0.954$, $p<0.001$). Excluding poorly calibrated samples and missing axillary temperatures, we measured temperature in 20 subjects (74%). We found a significant linear relationship between inner canthus temperature and axillary body temperature ($R^2=0.234$, $p=0.031$).

Conclusion(s): Infrared thermography can accurately measure newborn infant respiratory rate in the majority of subjects. We can discriminate differences in temperature based on facial temperature, though variability is wide. Further work to characterize test performance in abnormal breathing and temperature states is needed. Infrared thermography may be a useful tool for health monitoring in settings where continuous monitoring is desired but wired devices are unnecessarily invasive, such as intermediate care units or telemedicine applications.
Optimising Infusion Protocols for Stem Cell Therapies in Neonates

Elizabeth Kate Baker

E.K. Baker, The University of Melbourne, Melbourne, Victoria, AUSTRALIA; S.E. Jacobs, P.G. Davis, The Royal Women's Hospital, Parkville, Victoria, AUSTRALIA; E.M. Wallace, Obstetrics and Gynaecology, Monash University, Clayton, Victoria, AUSTRALIA; R. Lim, S.B. Hooper, Hudson Institute of Medical Research, Clayton, Victoria, AUSTRALIA; A. Malhotra, Monash University, Melbourne, Victoria, AUSTRALIA.

CURRENT CATEGORY: Neonatology

CURRENT SUBCATEGORY: Neonatal General

KEYWORDS: Stem Cell Therapy, Preterm Infants.

SESSION TITLE: Neonatal General: NICU Care

SESSION TYPE: Webinar/Platform

ABSTRACT BODY:

Background: Regenerative cell therapies for neonatal morbidities including bronchopulmonary dysplasia and preterm brain injury are entering early phase clinical trials. The reliable delivery of a known dose of cell therapy is fundamental to early safety studies. Infants, particularly extremely preterm infants, require small volume infusions. However, intravenous infusion protocols for delivering cells have been largely adopted from adult protocols and have not been evaluated in infants.

Objective: We aimed to explore the effects of different intravenous infusion parameters on cell delivery to define the optimum protocol for the administration of a leading cell therapy, human amnion epithelial cells (hAECs), to extremely preterm infants.

Design/Methods: Standard cell infusion protocols were modelled. To characterise hAEC delivery the infusate was collected at intervals over 60 minutes. The volume infused (mL) and hAEC density (hAEC/mL) measured. At the end of the 60-minute infusion the hAEC density of the suspension remaining in the syringe and the intravenous line was measured. Infusion parameters including albumin concentration (2% vs. 4%), syringe orientation (horizontal vs. vertical), intravenous line volume (0.2-2.2mL), and flow rate (3-15mL/hr) were varied to determine the influence on dose delivery.

Results: The standard (previously published) cell infusion protocol delivered a mean (SD) of 17.6(9)% of intended hAEC dose. Over the duration of the infusion the hAEC density of the infusate decreased and hAECs accumulated in the intravenous line. Increasing the albumin concentration to 4%, positioning the syringe and intravenous line vertically, and decreasing intravenous line volume to 0.6mL increased hAEC delivery to a mean (SD) of 98(6)% of intended cell dose (figure1). Flow rate had little effect on dose delivery when other conditions were optimised.

Conclusion(s): It is essential that cell infusion protocols are optimised for small volume delivery in preterm infants. We describe the refinement and validation of a cell therapy infusion protocol that offers reliable delivery of intended cell doses, suitable for extremely preterm neonates. Previously published work should be viewed with caution given the possibility that only a fraction of the intended cell dose may have been delivered.

Figure 1: Dose of hAECs delivered by varying infusion parameters.* p<0.05 ** p<0.01

IMAGE CAPTION:
Figure 1: Dose of hAECs delivered by varying infusion parameters.* p<0.05 ** p<0.01