

## PARALLELL SESSION 4:

### Evidence-based quality improvement for reducing of central line-associated bloodstream infections in a public sector neonatal intensive care unit

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**INTRODUCTION:** Central line-associated bloodstream infections (CLABSI) in the neonatal intensive care unit (NICU) contribute to increased morbidity, mortality, length of stay and healthcare cost. The use of central lines in critically-ill and premature neonates is unavoidable. Tygerberg Children's Hospital is a tertiary, university-affiliated public sector healthcare facility with a 124-bed neonatal service, including 12 NICU beds. The NICU introduced the Best Care Always quality improvement initiative in August 2012, to determine the baseline CLABSI rate and measure the impact of CLABSI bundle implementation. The programme included: staff education; implementation of bundled evidence-based best practices through standardised central line insertion/maintenance checklists; outcome and process surveillance; and feedback of results. The original (early implementation phase) central line insertion bundle included: hand hygiene; maximal barrier precautions; skin antisepsis; securement of lines with sterile dressings; and empowerment of staff to stop procedures if sterility was breached. The central line maintenance bundle included: daily review of line necessity; daily checks of the insertion site; aseptic changing of dressings when loose, soiled or wet; aseptic access of central line hubs; and scheduled sterile changes of infusion bags and lines. From August 2015 (the late implementation phase), secondary evidence-based strategies were added to the bundle, with the aim of further reducing the NICU's CLABSI rate.

**METHODS:** We conducted prospective CLABSI surveillance from 9 August 2012 until 31 July 2018, using the US Centres for Disease Control and Prevention guidelines. A NICU CLABSI register was used to determine the number of patients receiving central lines, total central lines inserted and central line days. Baseline CLABSI rates were determined during year one and calculated monthly thereafter. CLABSI surveillance data was classified according to five birth weight categories. In year four of the CLABSI programme (late implementation phase), additional strategies to combat microbial colonisation were incorporated: hydrophobic, bacteria-binding dressings on central line insertion sites; and cap protectors to disinfect needleless connectors on central line hubs. CLABSI rates were compared for the period prior to and after implementation of these additional evidence-based practices. Compliance evaluation and root cause analysis after CLABSI events was implemented to encourage quality improvement.

**RESULTS:** During the 6-year surveillance period, 2 184 central lines were inserted in 1 525 neonates with a total of 9 335 central line days. The baseline CLABSI rate was 6.74 per 1000 central line days. The CLABSI rate during the early implementation phase (years 2-3) was 5.99 versus 2.26 per 1000 central line days in the late implementation phase (years 4-6), after incorporation of two further evidence-based bundle elements. The lowest CLABSI rate (0.69 per 1000 central line days) and the

longest CLABSI-free interval (263 CLABSI-free days) were achieved in year 6 of the programme. CLABSI events occurred mostly in very low birth weight (34.1%) and extremely low birth weight (29.3%) neonates. Insertion bundle compliance rates exceeded 95%, but compliance with the maintenance bundle and completion of surveillance documents were considerably lower.

**CONCLUSION:** Despite challenges with infection outbreaks, staff shortages, high patient turnover and limited resources, an evidence-based approach to CLABSI prevention in a public sector NICU is feasible and effective. With the addition of further CLABSI prevention strategies, the NICU CLABSI rate was significantly reduced in years 4-6 of the programme. Continuous staff education, feedback, motivation and dedication are vital to sustain CLABSI surveillance and quality improvement.

**Will daily nursery rhyme reading by mothers improve maternal-infant interaction and neurodevelopment in preterm infants? a protocol for a quasi-experimental study.**

**Presenting Author: Jacomina Du Preez, University of Stellenbosch**

**INTRODUCTION:** Globally prematurity is a pressing health matter with 8-13% of infants born before 37 completed weeks. Thirty per cent of infants born prematurely suffers from a language developmental disorder. A fetus has substantial capacity for auditory learning and memory while in utero and can perceive and react to sensory information starting at approximately week 23-26 of life. Infants born prematurely miss out on a substantial period of intrauterine auditory stimulation. Infant development responds to the environment and the quality of care rendered by the primary caregiver. The maternal voice is a significant contributor to mother-infant attachment and live maternal voice exposure by reading or singing nursery rhymes books can offer a multisensory experience by enhancing smell, touch, sound and conversational turns, and may enhance infant-maternal interaction. The quality of General movements is a sensitive marker for cognitive and language outcomes in premature infants and the GMs at 3-5 months post-term age and their concurrent motor repertoire are associated with language outcomes in term infants born after uncomplicated pregnancies. It is currently unknown if daily live maternal voice exposure by reading nursery rhymes can enhance neurodevelopment and maternal-infant interaction. Study design

**METHODS AND ANALYSIS:** The study will be conducted within the Neonatal service of Tygerberg Hospital and will include some of the referral hospitals. Infants more than 750 grams but less than 1250 grams and 32 weeks gestational age will be enrolled. The study design is quasi-experimental with groups assigned every two months with a one-month washout period between groups. The methodological strategy will include 1. Screening for depression (PHQ-9) 2. Information on growth from nursing documents. 3. Measuring sound levels of maternal reading 4. Video recordings of General movements (GM's) at 12 to 16-weeks (5 minutes) 5. Video recording at 12 to 16-weeks post-term of maternal-infant interaction (5 minutes) 6. Griffith Infant Mental Development Scale at 12 to 16-weeks and 6 to 8-months post-term 7. Automated infant eye tracking and maternal and infant facial affect recognition at 6 to 8-months post-term 8. A maternal questionnaire after the study. The Department of Psychiatry and Physiotherapy of the University of Stellenbosch, the University of Reading (maternal-infant interaction) and the General Movement Trust collaborates in the study. The main regression parameters will be adjusted for possible confounders for the mother and infant characteristics. Mixed model repeated measures ANOVA will be conducted to compare control and

experimental groups over time. Interim data analysis will be done after the pilot study to inform the study number. The estimated study size is 200 patients in each group. The intervention group will receive nursery rhyme books in the first week of life and read daily to their infants for 15 minutes. The comparison groups will receive a book at completion of the trial. The study aims to optimize experience related auditory learning and enhance maternal-infant interaction.

**ETHICS AND DISSEMINATION:** The Ethical Committee for Clinical Research of the University of Stellenbosch approves the study protocol. Results will be published in international peer-reviewed journals and presented at relevant conferences. This research project will develop research relevant to (1) incidence of depression in our cohort (2) live auditory stimulation in premature infants and the effect on maternal-infant interaction and neurodevelopment (3) the use of the Motor Optimality Score as a proxy for later cognitive and language development in preterm infants.

### **Improving survival among preterm babies in a low limited setting ; 10 year experience nsambya hospital uganda**

**Presenting Author: Victoria Nakibuuka, Nsambya Hospital**

Co-Authors: Ritah Nazziwa (Nsambya Hospital), Catherine Nyagabyaki (Nsambya Hospital), Patrick Baigana (Nsambya Hospital), Robert Sebunya (Nsambya Hospital)

**BACKGROUND:** Surviving prematurity poses a great challenge in neonatal care in Uganda and Africa at Large and yet it remains the major cause of under-five mortality. Uganda is ranked 13th among the countries with high preterm birth deliveries worldwide. While many preterm babies survive in high-income countries, in low- and middle-income countries lack of adequate newborn care puts the lives of many preterm babies at risk. It is estimated that up to 2/3 of these deaths would be saved if secondary level interventions low cost interventions such as Kangaroo mother care (KMC), Use of antenatal steroids and Continuous positive air way Pressure, Early feeding with breast milk, use of Oxygen are scaled up.

**OBJECTIVES:** 1. To describe the changes in neonatal outcomes after implementation of secondary level interventions at Nsambya Hospital. 2. To explore the trends in case fatalities of prematurity from 2008 to 2018 after implementation of secondary level and tertiary level interventions

**METHODOLOGY:** Using perinatal death audits, gaps in care of preterms were identified and secondary and tertiary level interventions were implemented over a period of 10 years. The interventions included: Neonatal resuscitation, Kangaroo mother care, Use of continuous positive air way pressure, Use of surfactant, use of human milk only for feeding preterms, use of Bubble CPAP in the delivery room. Data on Case fatalities for prematurity, proportion of preterms with Necrotizing enterocolitis (NEC) and overall neonatal mortality was collected from 2008 to 2018. Comparisons were done before and after introduction of secondary levels interventions.

**RESULTS:** The case fatality rates of prematurity were 16.9% in 2008 compared to 6.8% (2018). The Survival Rates Improved for Extreme Preterms (< 1000 g) from 28% to 57%, Very low birth weight (1000 – 1499) from 80% to 95% and Late preterm 1500 to 2499 from 96 % to 100%. The proportion of babies dying due to NEC reduced from 10 to 0.

**CONCLUSION:** Implementation of phased secondary and tertiary level interventions is feasible and greatly improves survival of preterms in a low resource limited setting.

### **Surveillance for incidence and etiology of early-onset neonatal sepsis in soweto, south africa**

**Presenting Author:** Sithembiso Velaphi, Chris Hani Baragwanath Academic Hospital

Co-Authors: Firdose Nakwa (Chris Hani Baragwanath Academic Hospital), Shabir Madhi (Respiratory and Meningeal Pathogens Research Unit)

**Background:** Globally, over 400,000 neonatal deaths in 2015 were attributed to sepsis, however, the incidence and etiologies of these infections are largely unknown in low-middle income countries. We aimed to determine incidence and etiology of community-acquired early-onset (<72 hours age) sepsis (EOS) using culture and molecular diagnostics.

**Methods:** This was a prospective observational study, in which we conducted a surveillance for pathogens using a combination of blood culture and a polymerase chain reaction (PCR)-based test. Blood culture was performed on all neonates with suspected EOS. Among the subset fulfilling criteria for protocol-defined EOS, blood and nasopharyngeal (NP) respiratory swabs were tested by quantitative real-time reverse-transcriptase PCR using a Taqman Array Card (TAC) with 15 bacterial and 12 viral targets. Blood and NP samples from 312 healthy newborns were also tested by TAC to estimate background positivity rates. We used variant latent-class methods to attribute etiologies and calculate pathogen-specific proportions and incidence rates.

**RESULTS:** We enrolled 2,624 neonates with suspected EOS and from these 1,231 newborns met criteria for protocol-defined EOS (incidence- 39.3/1,000 live-births). Using the partially latent-class modelling, only 26.7% cases with protocol-defined EOS had attributable etiology, and the largest pathogen proportion were *Ureaplasma* spp. (5.4%; 95%CI: 3.6–8.0) and group B *Streptococcus* (GBS) (4.8%; 95%CI: 4.1–5.8), and no etiology was attributable for 73.3% of cases. Blood cultures were positive in 99/1,231 (8.0%) with protocol-defined EOS (incidence- 3.2/1,000 live-births). Leading pathogens on blood culture included GBS (35%) and viridans streptococci (24%). *Ureaplasma* spp. was the most common organism identified on TAC among cases with protocol-defined EOS.

**CONCLUSION:** Using a combination of blood culture and a PCR-based test the common pathogens isolated in neonates with sepsis were *Ureaplasma* spp. and GBS. Despite documenting higher rates of protocol-defined EOS and using a combination of tests, the etiology for EOS remains elusive.

### **The trajectory of general movements from birth until 12-14 weeks corrected age in preterm infants born before 33 weeks' gestation and weighing less than 1500g: a descriptive study**

**Presenting Author:** Jacomina Du Preez, University of Stellenbosch

Co-Authors: Reze van Zyl (University of Stellenbosch), Marlette Burger (University of Stellenbosch)

**BACKGROUND:** Premature infants are a high-risk group for developing neurological deficits such as cerebral palsy (CP). Tygerberg hospital is the biggest neonatal service in the Western Cape. A reliable screening method is essential to identify high-risk infants for timely intervention and effective

resource allocation. Prof. Heinz Prechtl and his co-workers introduced a quick, inexpensive, non-invasive method with high predictive validity for the early detection of those premature infants at risk for later developmental deficits. This method, called general movements (GMs), is based on the assessment of spontaneous movement patterns in young infants. GMs are assessed at different time-points: during preterm up to term corrected age and again during period of fidgety movements (FMs) at 9-16 weeks post-term). Normal GMs at term corrected age is associated with a normal neurological outcome and an increase in Intelligence Quotient (IQ) of 13 points. The quality of FMs is a sensitive marker for cognitive, language and motor outcomes in premature infants. There is limited information available describing the trajectory of GMs in high-risk premature infants.

**OBJECTIVE:** To describe the trajectory of GMs from birth till 12-14 weeks corrected age and determine the association of known perinatal risk factors on such a trajectory in very low birth weight and extremely low birth weight infants admitted to the neonatal care of TCH, Cape Town, South Africa.

**METHODOLOGY:** A longitudinal, prospective cohort study with repeated measures was conducted using Prechtl's method of the qualitative assessment of GMs at the following four key time periods: birth to 34 weeks postmenstrual age (PMA), 34 weeks PMA to term age, term age and 12-14 weeks corrected age. Detailed perinatal data of infants were collected. Results were analyzed using STATA version 14, IBM SPSS and a logistic regression model to determine the association between perinatal factors and GM outcomes.

**RESULTS:** The study sample consisted of 119 infants with a birth mean weight of 1048.2g and a mean gestational age of 26.7 weeks. Of 300 GM assessments done, 157 were preterm assessments, 55 at term age and 88 at 12-14 weeks corrected age. At birth to 34 weeks PMA, 96% of GMs were abnormal and 4% normal. At 34 weeks PMA to term, 89% of GMs were abnormal and 11% normal. All GMs were abnormal at term age. At 12-14 weeks corrected age, 7% of GMs were abnormal and 93% normal. On univariable analysis, lower birth weight ( $p=0.043$ ), lower gestational age ( $p=0.017$ ), intraventricular hemorrhage (IVH) grade IV ( $p<0.001$ ) and time ( $p<0.001$ ) were associated with abnormal GMs. Birth weight ( $p=0.046$ ) and time since birth (PMA in weeks) ( $p<0.001$ ) were the only variables inversely associated with GMs on multivariable analysis.

**CONCLUSION:** The results of this study indicated that GMs are predominantly abnormal prior to term age with a significant decrease in abnormality at 12-14 weeks corrected age. Resources should not be allocated to preterm GM assessments but towards assessing GMs in the period of Fidgety Movements. Lower birth weight and lower PMA (time since birth) were associated with increased odds for abnormal GMs. Longitudinal follow-up and long-term neurodevelopmental outcomes of this cohort is essential before implementing the use of FMs as a screening test for follow-up.