

Improving the Evaluation and Management of Early Onset Sepsis in the Neonatal ICU (NICU) using QI Methodology

Anjali Anders, MD

BACKGROUND:

- Neonatal early onset sepsis (EOS) is an invasive bacterial infection of the blood or cerebrospinal fluid occurring in the first week of life.
- Signs of EOS are nonspecific and therefore difficult to diagnose clinically.
- EOS is associated with risks of significant morbidity and mortality.
- In an attempt to avoid missing a diagnosis of EOS, providers may obtain serial complete blood counts with differential (CBC) and C-reactive proteins (CRP) that are not sensitive or specific for a diagnosis of EOS, along with blood cultures.
- Antibiotics are frequently used during sepsis evaluation.
- There is evidence associating early antibiotic use with long-term adverse effects.
- The literature has shown that use of the Kaiser Permanente neonatal sepsis calculator can reduce antibiotic use and unnecessary sepsis evaluation.

METHODS:

- Baseline data from 2018 was collected from neonates ≥ 35 weeks gestational age (GA) at birth, inborn and admitted to the NICU with any concerns for sepsis (e.g., respiratory distress, hypothermia, hemodynamic instability, chorioamnionitis)
 - Sepsis calculator was not utilized during 2018
- SMART AIM to decrease overall antibiotic duration by 40% and unnecessary laboratory tests by 50% for infants ≥ 35 weeks GA admitted to the NICU for EOS evaluation within 6 months of initiation of sepsis calculator use along with education on sepsis evaluations and use of blood culture as the gold standard for determining if therapy is necessary.

RESULTS

- Preliminary results illustrate significant reduction in infant laboratory testing. CRPs obtained decreased from 91% to 31%.
- Number of CRPs/patient decreased from a mean of 2.15 to 0. Number of CBCs/patient decreased from a mean of 2.36 to 1.25.
- Significant reduction in duration of antibiotics used/patient from a mean of 103.5 hours to 48 hours (53% decrease in duration)
- Balancing measures include monitoring for any cases of sepsis that were missed by use of the sepsis calculator and readmission to our hospital within one week of discharge due to infection (both were 0).

Early onset sepsis calculator use has led to a significant reduction in antibiotic duration and unnecessary, painful and low value laboratory sampling.

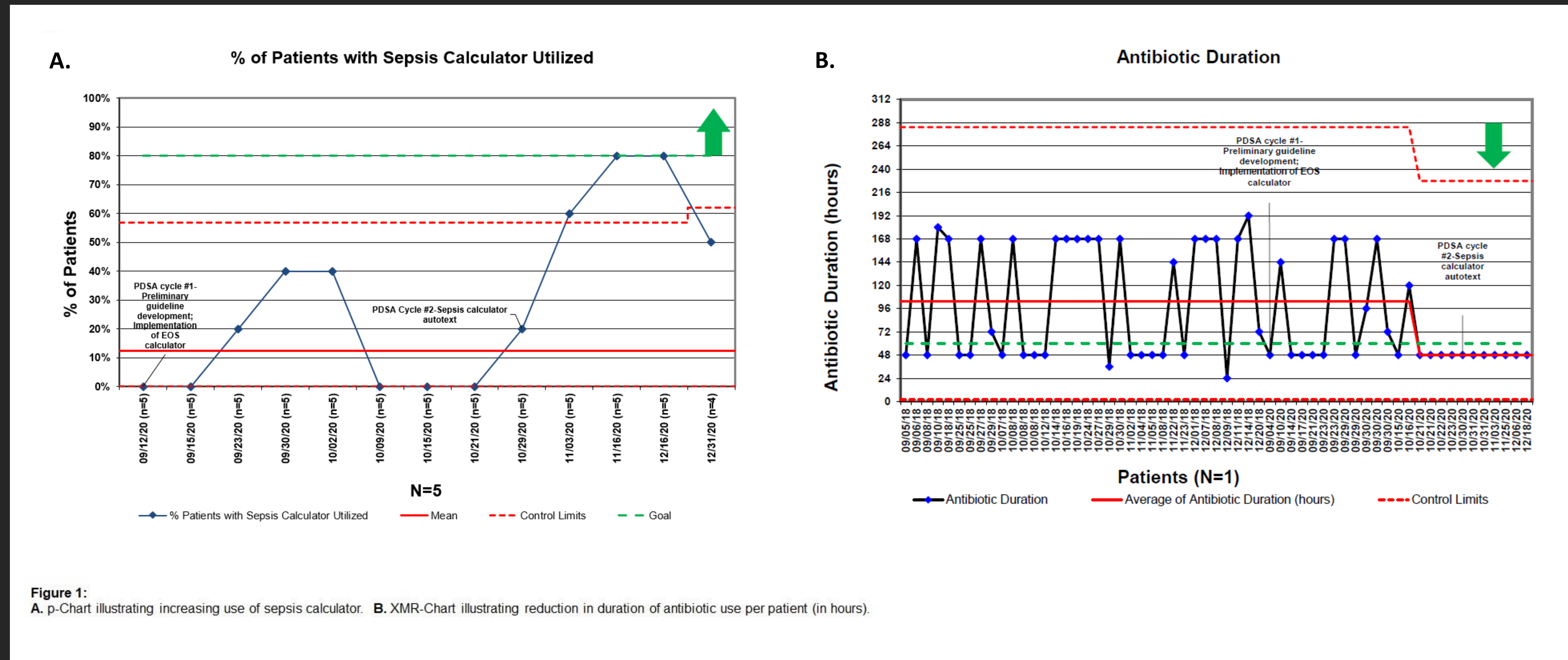


Figure 1: A. p-Chart illustrating increasing use of sepsis calculator. B. XMR-Chart illustrating reduction in duration of antibiotic use per patient (in hours).

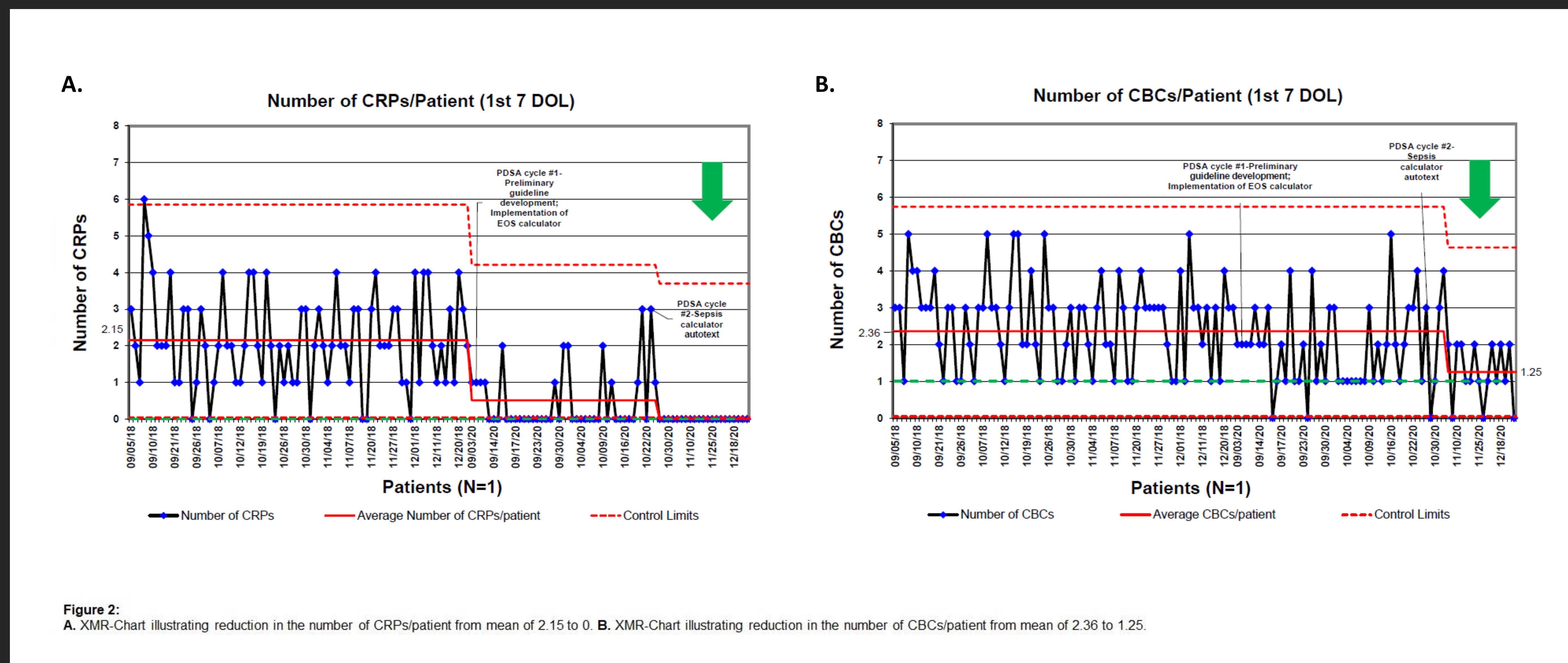


Figure 2: A. XMR-Chart illustrating reduction in the number of CRPs/patient from mean of 2.15 to 0. B. XMR-Chart illustrating reduction in the number of CBCs/patient from mean of 2.36 to 1.25.

Plan Do Study Act (PDSA cycles):

- 1st PDSA cycle**-included education on evidenced-based practices and neonatal sepsis calculator with consensus from NICU providers on commencing use of the calculator in decision making (preliminary guideline development included education on sensitivity and specificity of CBCs and CRPs for EOS)
 - Education was provided by Pediatric ID & NICU physicians and NNP; QI multidisciplinary team included Peds ID and NICU physicians, NICU nurse, NNP, and pharmacist
- 2nd PDSA cycle**-included incorporating use of the sepsis calculator into our documentation through autotext reminders, which significantly improved use of EOS calculator
- 3rd PDSA cycle**-ongoing PDSA cycle includes modifying the amount of blood obtained per blood culture bottle to improve recovery of organisms and increase confidence in culture results.
- Next steps**-include formal guideline development (4th PDSA cycle) on use of the EOS sepsis calculator, as upon data review there has been a variation in defining clinical appearance of infants (which affects the EOS adjusted risk)

Challenges:

- Due to the risks of morbidity and mortality associated with EOS, there remains a significant concern of missed diagnoses. This concern seems to be associated at times with prolonged use of antibiotics

Anjali P. Anders, MD,
 Kisha Linwood, NNP,
 and Amruta Padhye, MD

*Authors have no financial relationships to disclose