Sepsis Risk Calculator: Reducing the use of antibiotics in neonates

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BACKGROUND

Early onset sepsis (EOS) is a life-threatening condition in neonates predominantly caused by group B streptococcus (GBS) and Gram negative bacteria. It requires prompt initiation of intravenous antibiotics (Table 1). Up to 10% of infants receive empiric antibiotics within 48 hours of life, however only 0.04% have positive blood culture[1]. Misdiagnosis and consequent unnecessary antibiotic use early in life increases risk of invasive fungal disease, necrotising enterocolitis, drug toxicities, and microbial resistance[1]. A validated Neonatal Early-Onset sepsis Risk Calculator (NEORC) (Figure 1) was implemented at the Royal Women's Hospital (RWH) for newborns ≥ 35 weeks to improve judicious prescribing of empiric antibiotics.

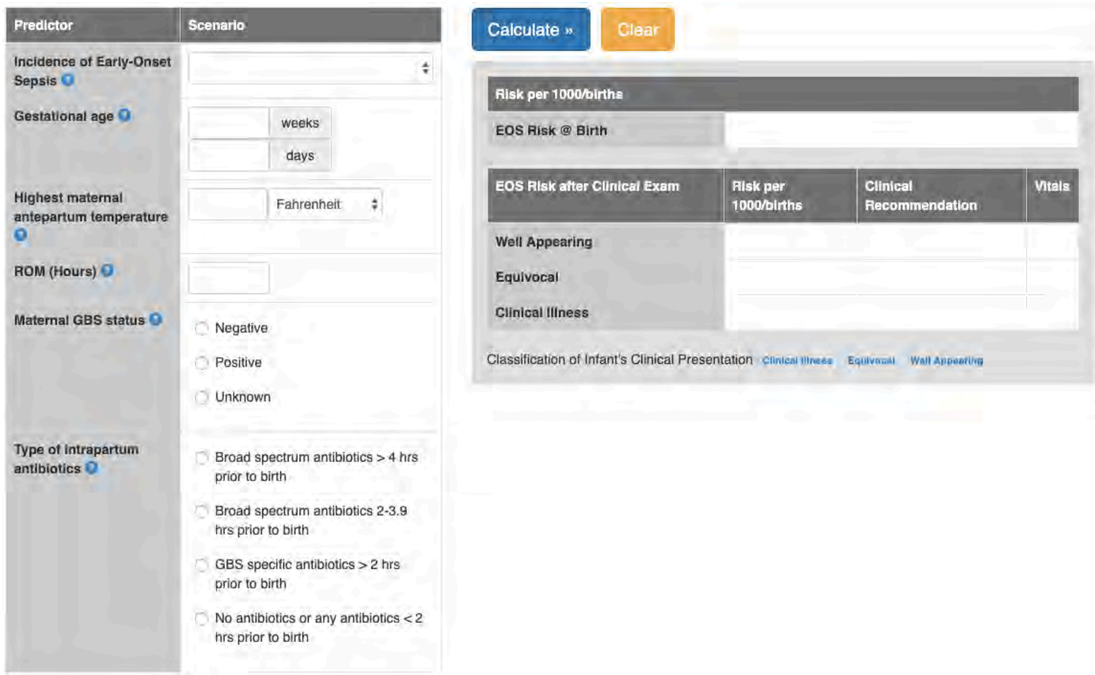

Figure 1: The Neonatal Early-Onset Risk Calculator, based on local probability of EOS, maternal risk factors, and infant clinical presentation

AIM

To evaluate the impact of the NEORC on the use of empiric antibiotics in neonates with suspected EOS.

METHOD

Medical records coded for sepsis were reviewed for infants born ≥ 35 weeks during both two months before and after NEORC implementation (Nov – Dec 2018 and Feb – Mar 2019). Infants transferred to other health services and those with incomplete or unavailable medical records were excluded. Demographic data, pathology results, EOS risk factors, antibiotic usage, and documented uses of NEORC were collected. Data was analysed descriptively, with p-values <0.05 used to denote significance.

Table 1. Empiric antibiotic regimen for EOS

Antibiotic	Benzylpenicillin	Gentamicin
Dose	60 mg/kg/dose	5 mg/kg/dose
Frequency	12 hourly	36 hourly

RESULTS

Table 2. Sample population and demographics

	Before (Nov 18 – Dec 18)	After (Feb 19 – Mar 19)
Total no. of infants born ≥ 35 weeks gestation at RWH	1203	1141
Total number of infants investigated for sepsis	113 (9.4%)	74 (6.5%)
Medical records available & reviewed	**90**	**52**
Maternal demographics		
GBS positive	11 (12.2%)	7 (13.5%)
Chorioamionitis	2 (2.2%)	1 (1.9%)
Fever in labour	8 (8.9%)	2 (3.8%)
Infant demographics		
Female/Male gender	18/20	12/29
Gestational age at birth (weeks), mean ± SD	39 ± 2.0	39 ± 1.6
Weight (g), mean ± SD	3288 ± 656.2	3364 ± 551.3

A significantly lower proportion of infants were investigated for suspected EOS among the total number of babies born in the post-implementation period than in the pre-implementation period (p=0.01) (Table 3). All treated infants had blood cultures performed within 48 hours of birth, though none were positive for growth in either group. There was no significant difference observed for antibiotic duration and frequency of antibiotic prescribing in the reviewed samples (p>0.05).

Table 3. Antibiotic use

	Before (Nov 18 – Dec 18) n = 90	After (Feb 19 – Mar 19) n = 52
Antibiotics given within 48 hours of life for suspected EOS	69 (76.7%)	41 (78.8%)
Duration of intravenous antibiotics benzylpenicillin & gentamicin (days) mean ± SD	3.1 ± 1.1	3.0 ± 1.2

DISCUSSION

Studies describing use of the EOS calculator in other infant populations reveal reductions in unnecessary antibiotic usage of approximately 70%[1]. This study demonstrates an overall reduction in the total number of infants investigated for sepsis, however with the number of medical records reviewed, it did not appear to show a reduction in antibiotic prescribing. This is likely due to small sample size. As such, limitations of this study include a substantial number of excluded infants due to unavailable or incomplete medical records.

CONCLUSION

NEORC is a novel support tool for clinical decision-making in the management of suspected EOS, reducing frequency of unnecessary investigation for early-onset sepsis. There is scope to further explore the calculator's influence on antibiotic prescribing using larger sample sizes.

REFERENCES

1. Warren S, Garcia M, Hankins C. Impact of neonatal early-onset sepsis calculator on antibiotic use within two tertiary healthcare centers. Journal of Perinatology. 2017;37:394.