UNIVERSITY OF BIRMINGHAM
University of Birmingham Research at Birmingham

Impact of neonatal sepsis calculator in West Midlands (UK)

van Hasselt, Tim J; McDermott, Helen; Surana, Pinki ; Eltahir, Rawia ; Macaskill, Laura ; Jain, Raunak ; McMullan, Nicola ; Slee, Samantha ; Jagga, Megha ; Naseem, Muhammed ; Alake, Oluwaseyi ; Cherry, Canada ; Miguras, Benjamin ; Ewer, Andrew

DOI:
10.1136/archdischild-2020-320862

License:
Creative Commons: Attribution-NonCommercial (CC BY-NC)

Document Version
Peer reviewed version

Citation for published version (Harvard):
van Hasselt, TJ, McDermott, H, Surana, P, Eltahir, R, Macaskill, L, Jain, R, McMullan, N, Slee, S, Jagga, M, Naseem, M, Alake, O, Cherry, C, Miguras, B & Ewer, A 2020, 'Impact of neonatal sepsis calculator in West Midlands (UK)', *Archives of disease in childhood. Fetal and neonatal edition*.
https://doi.org/10.1136/archdischild-2020-320862

Link to publication on Research at Birmingham portal

Publisher Rights Statement:
This document is the Author Accepted Manuscript version of a published work which appears in its final form in Archives of Disease in Childhood - Fetal and Neonatal Edition, copyright © Author(s) (or their employer(s)) 2020. No commercial re-use. The final Version of Record can be found at: http://dx.doi.org/10.1136/archdischild-2020-320862

General rights
Unless a licence is specified above, all rights (including copyright and moral rights) in this document are retained by the authors and/or the copyright holders. The express permission of the copyright holder must be obtained for any use of this material other than for purposes permitted by law.

•Users may freely distribute the URL that is used to identify this publication.
•Users may download and/or print one copy of the publication from the University of Birmingham research portal for the purpose of private study or non-commercial research.
•User may use extracts from the document in line with the concept of 'fair dealing' under the Copyright, Designs and Patents Act 1988 (?)
•Users may not further distribute the material nor use it for the purposes of commercial gain.

Where a licence is displayed above, please note the terms and conditions of the licence govern your use of this document.

When citing, please reference the published version.

Take down policy
While the University of Birmingham exercises care and attention in making items available there are rare occasions when an item has been uploaded in error or has been deemed to be commercially or otherwise sensitive.

If you believe that this is the case for this document, please contact UBIRA@lists.bham.ac.uk providing details and we will remove access to the work immediately and investigate.

Download date: 20. Mar. 2024

Archives of
Disease in Childhood

Impact of Neonatal Sepsis Calculator in West Midlands (UK)

Journal:	*Archives of Disease in Childhood*
Manuscript ID	fetalneonatal-2020-320862.R1
Article Type:	Letter
Date Submitted by the Author:	09-Nov-2020
Complete List of Authors:	van Hasselt, Tim; University Hospitals of North Midlands NHS Trust, Neonatal Intensive Care Unit McDermott, Helen; University Hospitals Birmingham NHS Foundation Trust, Birmingham Heartlands Hospital Neonatal Intensive Care Unit Surana, Pinki; University Hospitals Birmingham NHS Foundation Trust, Birmingham Heartlands Hospital Neonatal Intensive Care Unit Eltahir, Rawia; Shrewsbury and Telford Hospital NHS Trust Macaskill, Laura; Sandwell and West Birmingham Hospitals NHS Trust, City Hospital Neonatal Unit Jain, Raunak; University College London McMullan, Nicola; Dudley Group of Hospitals NHS Trust Slee, Samantha; University Hospitals of North Midlands NHS Trust Jagga, Megha; Birmingham Women's and Children's NHS Foundation Trust Naseem, Muhammed; University Hospitals Birmingham NHS Foundation Trust Alake, Oluwaseyi; Birmingham Women's and Children's NHS Foundation Trust Cherry, Canada; University Hospitals Birmingham NHS Foundation Trust Miguras, Benjamin; Royal Wolverhampton Hospitals NHS Trust Ewer, Andrew; Birmingham Women's and Children's NHS Foundation Trust, Birmingham Women's Hospital Neonatal Intensive Care Unit; University of Birmingham Institute of Metabolism and Systems Research
Keywords:	Neonatology, Microbiology

SCHOLARONE™
Manuscripts

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Confidential: For Review Only

Impact of Neonatal Sepsis Calculator in West Midlands (UK)

Corresponding author:

Dr Tim J van Hasselt

Email: t.vanhasselt@nhs.net

Address: Neonatal Unit
Royal Stoke University Hospital
Stoke-on-Trent
ST4 6QG

Tel: 01782 715444

Authors:

1. Tim J van Hasselt
   University Hospitals of North Midlands NHS Trust, Stoke-on-Trent, UK
2. Helen McDermott
   University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK
3. Pinki Surana
   University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK
4. Rawia Eltahir
   Shrewsbury and Telford Hospital NHS Trust, Shrewsbury, Shropshire , UK
5. Laura Macaskill
   Sandwell and West Birmingham Hospitals NHS Trust, Birmingham, UK
6. Raunak Jain
   University College London, London, UK
7. Nicola McMullan
   Dudley Group of Hospitals NHS Trust, Dudley, West Midlands, UK
8. Samantha Slee
   University Hospitals of North Midlands NHS Trust, Stoke-on-Trent, UK
9. Megha Jagga
   Birmingham Women's and Children's NHS Foundation Trust, Birmingham, UK
10. Muhammed Naseem
    University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK
11. Oluwaseyi Alake
    Birmingham Women's and Children's NHS Foundation Trust, Birmingham, UK
12. Canada Cherry
    University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK
13. Benjamin Miguras
    Royal Wolverhampton Hospitals NHS Trust, Wolverhampton, UK
14. Andrew K Ewer
    Birmingham Women's and Children's NHS Foundation Trust, Birmingham, UK

Keywords: Neonatal Sepsis ; Antibiotics

Word count: 500 words excluding title, figure, references

Confidential: For Review Only

Dear Editor,

The Kaiser Permanente Sepsis Risk Calculator (KP-SRC) was developed to predict early onset neonatal sepsis (EOS), using continuous variables (local EOS incidence rates, maternal factors, infant well-being) to guide decision making.[1]
KP-SRC has been adopted in Plymouth and Wales, reducing antibiotic use by up to 84%[2,3] compared with using National Institute of Clinical Excellence (NICE) guidelines. This may reduce antibiotic resistance, dysbiosis,[2] invasive procedures, and mother-baby separation, although some safety concerns have been raised.[4]

We performed a virtual application of the KP-SRC versus NICE guidance on postnatal antibiotic usage and length of stay, using anonymised clinical data collected prospectively across 11 neonatal units in the West Midlands, UK. The HRA confirmed ethical approval was not required.
All infants born ≥ 34 weeks gestation between 1st January 2020 and 29th February 2020 who were commenced on antibiotics for EOS and managed as per NICE guidelines were included. Those admitted to the neonatal unit prior to commencing antibiotics were excluded.
The KP-SRC was applied retrospectively, using two EOS incidence rates - 1/1000 and 2/1000 live births (West Midlands rate varies between 0.7-1.3/1000). KP-SRC recommendations were analysed against evidence of EOS.

Data from 626 infants were collected and 599 were included for analysis. (Figure 1)
KP-SRC would have led to antibiotic use in only 118 infants at an incidence of 2/1000 and 71 at 1/1000; a reduction of 80% and 88% respectively. If those recommended blood cultures only by KP-SRC were also treated, the reduction would be 49% and 72% respectively.
3/599 (0.5%) infants had positive blood cultures. One infant had GBS bacteraemia (CRP 28) and would have been recommended antibiotics using KP-SRC. Two infants had E. coli bacteraemia: one recommended observations by KP-SRC (CRP 37); the other recommended culture at 2/1000 and observations at 1/1000 (CRP 88). Due to persistent pyrexia, both would likely have commenced antibiotics subsequently under KP-SRC observations. All CSF cultures were negative.
27 (5%) infants had CRP levels >60, including one of the babies with E. coli bacteraemia; 7 (26%) infants with CRP >60 would be recommended observations only, even using KP-SRC at 2/1000.
No infants received mechanical ventilation or inotropes, and there were no deaths.
Current antibiotic use using NICE guidance led to a mean treatment length of 68.0 hours (median 48 hours). This could be reduced by up to 38% at 1/1000 and 35% at 2/1000 KP-SRC if only babies recommended antibiotics were treated, and all other babies observed for 36 hours. If babies recommended either antibiotics or culture were treated, then reductions would be 30% at 1/1000 and 18% at 2/1000.

As reported by others, we conclude that implementation of KP-SRC could reduce antibiotic exposure in 49-88% of infants with a reduction in hospital stay by 18-38%.

Confidential: For Review Only

However, a small group of infants initially recommended observations by KP-SRC, can have high CRP or bacteraemia. Therefore, emphasis on close observation, early recognition of deterioration and timely escalation is vitally important.

Further research is required to examine the safety of KP-SRC in the UK setting.

Acknowledgements

We are grateful to the West Midlands Operational Delivery Network, all the trusts, consultants, doctors and ANNPs who have contributed to and supported this project.

References

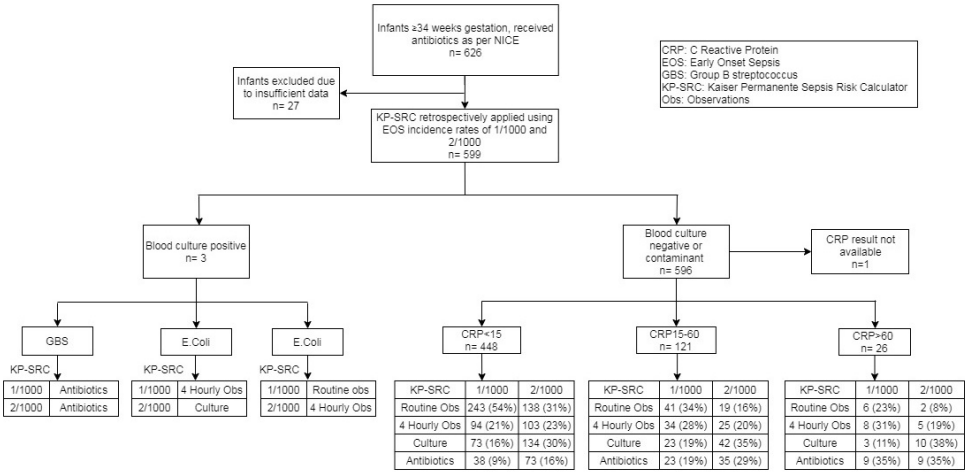
1. Kuzniewicz MW, Puopolo KM, Fischer A, et al. A quantitative, Risk-Based approach to the management of neonatal early-onset sepsis. JAMA Pediatr 2017;171:365–71

2. Goel N, Shrestha S, Smith R, et al. Screening for early onset neonatal sepsis: NICE guidance-based practice versus projected application of the Kaiser Permanente sepsis risk calculator in the UK population. Arch Dis Child Fetal Neonatal Ed 2020;105:118-22.

3. Eason J, Ward H, Danko O, et al. Early-onset sepsis: can we screen fewer babies safely? Archives of Disease in Childhood. Published Online First: 02 November 2019. doi: 10.1136/archdischild-2019-317047

4. Pettinger KJ, Mayers K, McKechnie L, et al. Sensitivity of the Kaiser Permanente early-onset sepsis calculator: A systematic review and meta-analysis. EClinicalMedicine. 2019 Dec 22;19:100227.

Confidential: For Review Only



KP-SRC	1/1000	2/1000
Routine Obs	243 (54%)	138 (31%)
4 Hourly Obs	94 (21%)	103 (23%)
Culture	73 (16%)	134 (30%)
Antibiotics	38 (9%)	73 (16%)

KP-SRC	1/1000	2/1000
Routine Obs	41 (34%)	19 (16%)
4 Hourly Obs	34 (28%)	25 (20%)
Culture	23 (19%)	42 (35%)
Antibiotics	23 (19%)	35 (29%)

KP-SRC	1/1000	2/1000
Routine Obs	6 (23%)	2 (8%)
4 Hourly Obs	8 (31%)	5 (19%)
Culture	3 (11%)	10 (38%)
Antibiotics	9 (35%)	9 (35%)

Figure 1: Retrospective Virtual Application of KP-SRC to Infants Receiving Antibiotics as per NICE EOS guidelines

238x121mm (120 x 120 DPI)