

Middle East Forum on Quality & Safety in Healthcare **2023**

16-19 March, Doha

Healthcare Resilience in Extraordinary Times

Brought to you by:
Hamad Healthcare Quality Institute

I have no conflict of interest or disclosure in relation to this presentation.

Learning Objective

At the end of this session, participants will be able to understand how we successfully used an evidence based, multivariate calculator to reduce antibiotic use among term neonates admitted to the NICU

Reducing antibiotic use among Chorioamnionitis-exposed babies admitted to AWH NICU

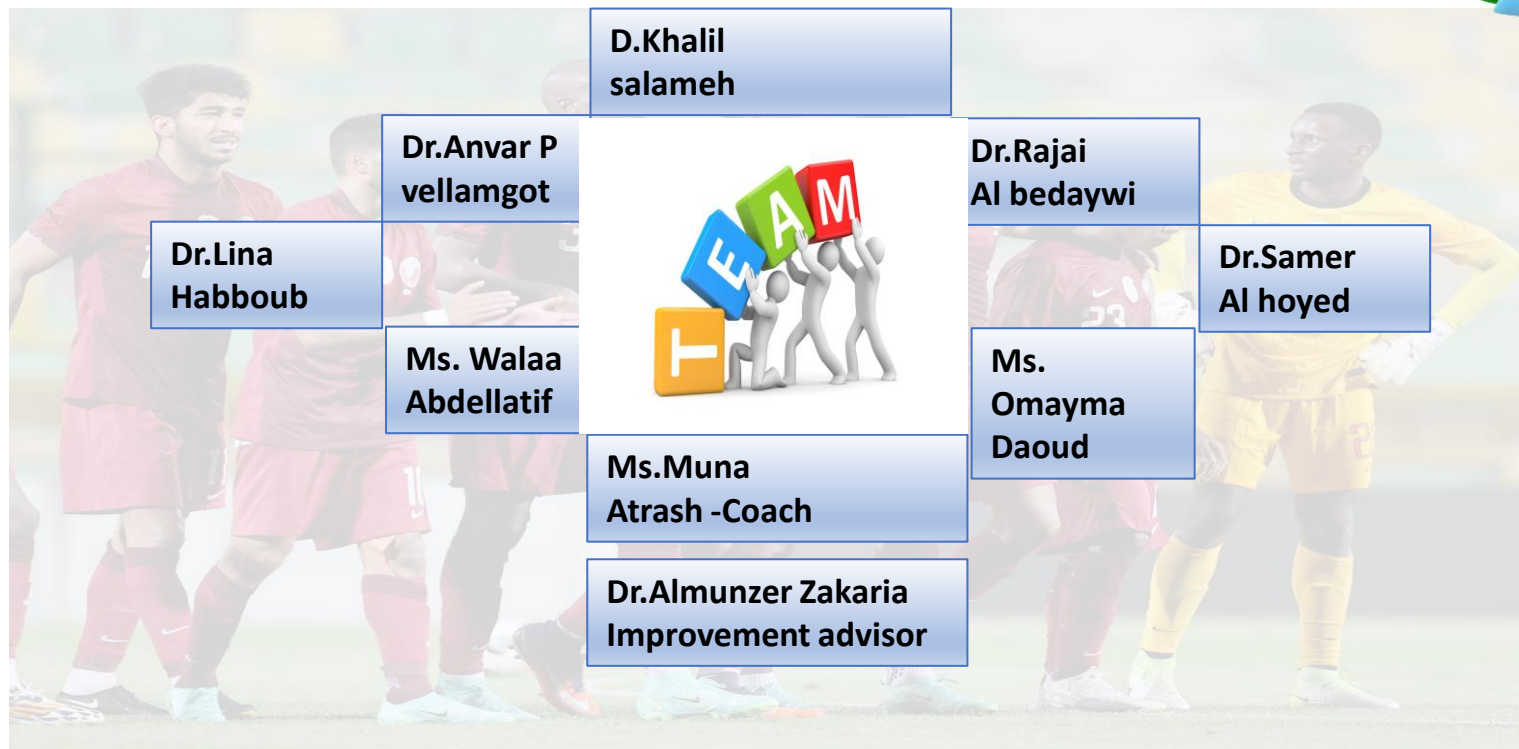


مستشفى الوكرة
Al Wakra Hospital

عضو في مؤسسة حمد الطبية
A Member of Hamad Medical Corporation



Dr. Anvar P Vellamgot
NICU - AWH



NICU – Al Wakrah Hospital

- Level 2B
- 30 beds
- 1200-1500 admissions annually
- Up to 95% are late preterm and term babies

Early Onset neonatal Sepsis (EOS)

Blood or CSF culture obtained within 72 hours after birth
growing a pathogenic bacterial species

Acquired from the mother peripartum

Mortality 3-5% among babies born at ≥ 35 weeks gestation

Puopolo et al 2018



Prematurity

Chorioamnionitis

Premature
rupture of
membranes

Lack of
intrapartum
antibiotics(if
indicated)

GBS carrier
state

EOS- Risk factors

Puopolo et al. 2018

Challenges in identifying babies at risk



EOS incidence and Empiric antibiotic use

“Despite the declining rate of EOS owing to widespread use of intrapartum antibiotic prophylaxis, early antibiotic use continues to be as high as 11% of all live births”

Mukhopadhyay et al. 2012

Early antibiotic use

**Prevent death and
neurodisability**

Stoll et al. 2011

Puopolo et al. 2018



**Risk of Wheeze,
Dysbiosis, Obesity,
Growth failure,
Separation from mother,
Lactation failure**

Uzan-Yulzari et al 2021

Reyman et al. 2022

Alm et al 2008

Chorioamnionitis (Intraamniotic infection/Triple I)

- Acute inflammation of placenta, cord and membranes, usually polymicrobial
- Affects up to 3.9% of all deliveries
- Critical risk factor for neonatal sepsis
- CDC and Committee on fetus and neonate (2014) recommended to start empirical antibiotics for all exposed neonates. AWH NICU followed this recommendation till 2019

Woodd et al 2019
Richard et al 2014

AWH NICU Early antibiotic use - audit 2019

Total admissions - 1164

Babies who received antibiotics – 543 (47%)

140 chorio-exposed babies received antibiotics, although only 2 positive blood cultures were reported.

50 % of the mothers did not fulfil the criteria for clinical chorioamnionitis

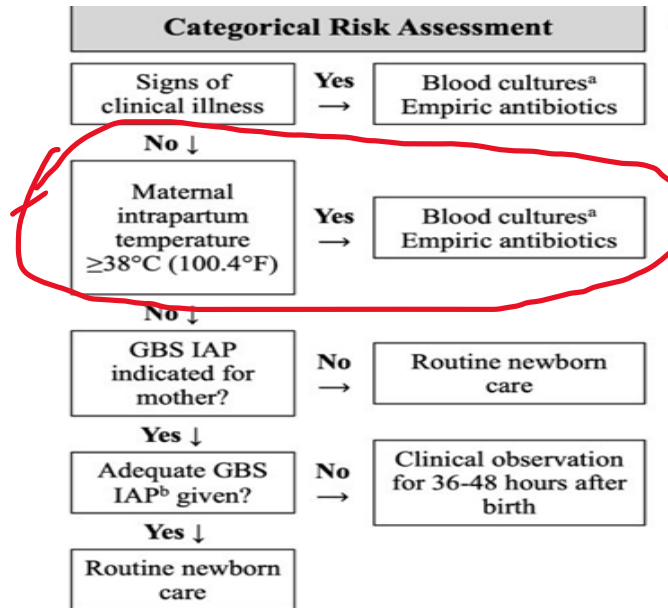
How to identify babies who really need empirical antibiotics and to save others?



Literature search – 3 Evidence Based Practices identified (All approved by AAP)

Richard et al 2014

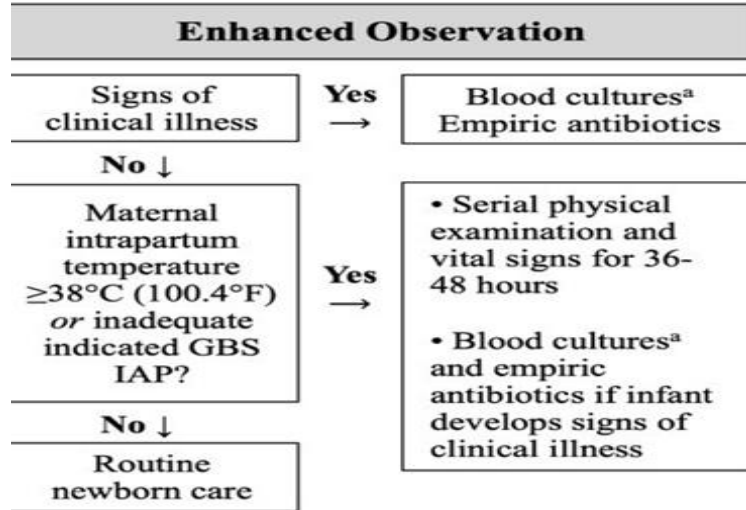
A.



- Different versions published since 1996.
- Clinical illness- Ill defined definition
- High empiric Abx use rate

B. The Enhanced observation approach

Cantoni et al. 2013

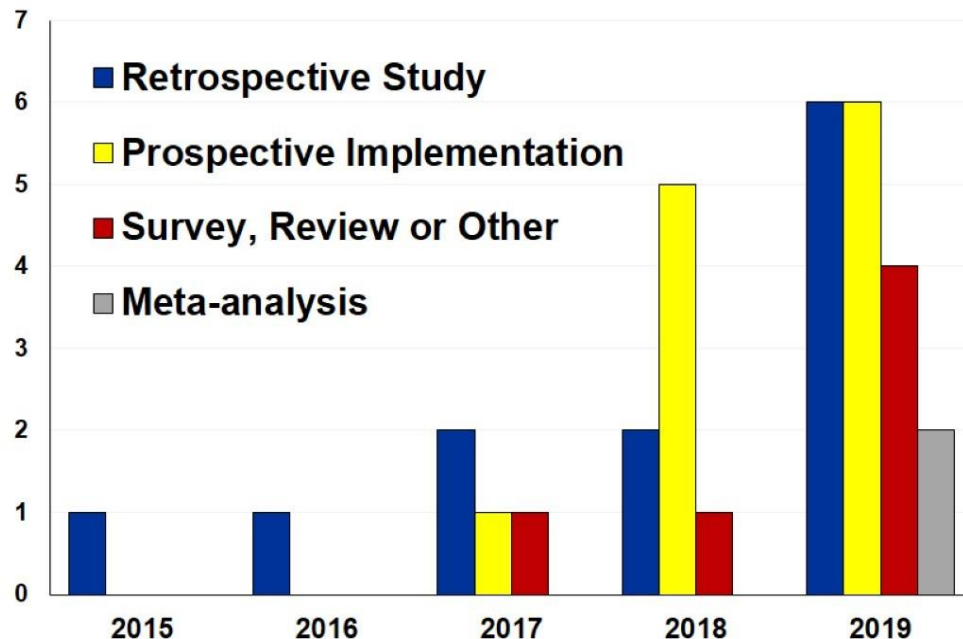


- Significant reduction in blood work ups and antibiotic use
- Needs structured, close observation and documentation.
- Not widely practiced

C. EOS Risk Calculator (EOSCAL)

- Multivariate model proposed by Kuzniewicz et al(2017)
- Strong evidence base
- Prospectively evaluated in over 600000 newborns

EOS Calculator Published Studies



- 16 different U.S. centers
- 7 international sites
- >40 publications including original research and commentaries

Support safety and efficacy

<https://neonatalespsiscalculator.kaiserpermanente.org/InfectionProbabilityCalculator.aspx>

Please enter details below.

Predictor	Scenario
Incidence of Early-Onset Sepsis	
Gestational age	weeks days
Highest maternal antepartum temperature	Fahrenheit
ROM (Hours)	
Maternal GBS status	☐ Negative ☐ Positive ☐ Unknown
Type of Intrapartum antibiotics	☐ Broad spectrum antibiotics > 4 hrs prior to birth ☐ Broad spectrum antibiotics 2-3.9 hrs prior to birth ☐ GBS specific antibiotics > 2 hrs prior to birth ☐ No antibiotics or any antibiotics < 2 hrs prior to birth

Calculate »

Clear

Risk per 1000/births

EOS Risk @ Birth

EOS Risk after Clinical Exam

Risk per
1000/births

Clinical
Recommendation

Vitals

Well Appearing

Equivocal

Clinical Illness

Classification of Infant's Clinical Presentation [Clinical Illness](#) [Equivocal](#) [Well Appearing](#)

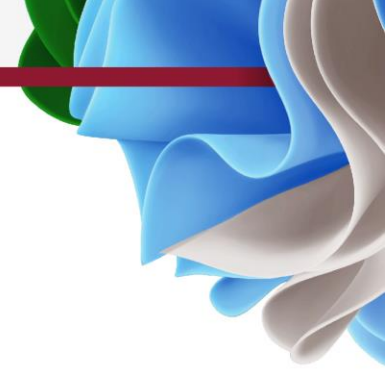
[Calculate »](#)[Clear](#)**Risk per 1000/births****EOS Risk @ Birth****0.39**

EOS Risk after Clinical Exam	Risk per 1000/births	Clinical Recommendation	Vitals
Well Appearing	0.16	No culture, no antibiotics	Routine Vitals
Equivocal	1.95	Blood culture	Vitals every 4 hours for 24 hours
Clinical Illness	8.20	Empiric antibiotics	Vitals per NICU

Classification of Infant's Clinical Presentation [Clinical Illness](#) [Equivocal](#) [Well Appearing](#)

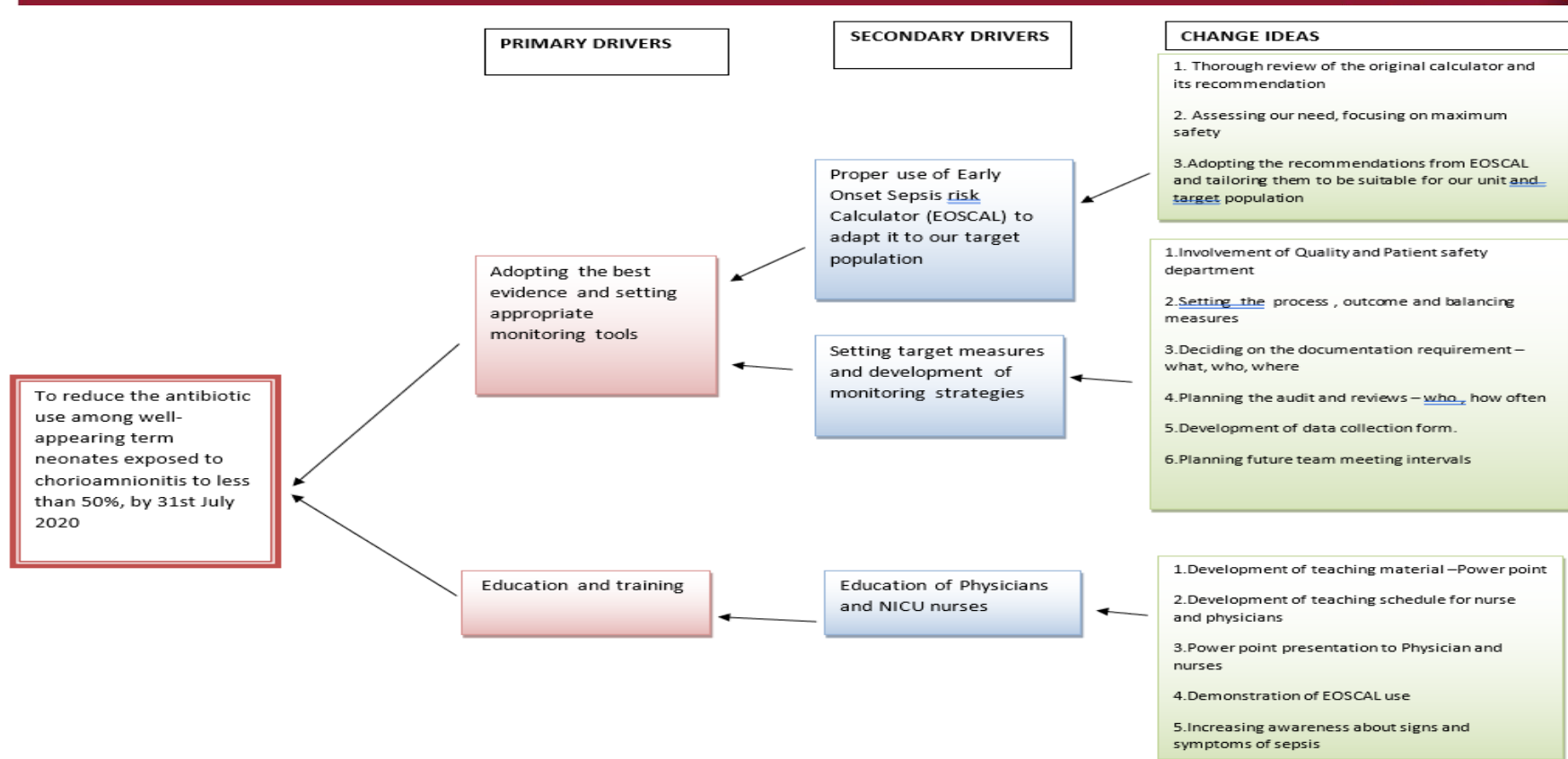
Classification of Infant's Clinical Presentation

Clinical Exam	Description
Clinical Illness	1. Persistent need for NCPAP / HFNC / mechanical ventilation (outside of the delivery room) 2. Hemodynamic instability requiring vasoactive drugs 3. Neonatal encephalopathy /Perinatal depression ▪ Seizure ▪ Apgar Score @ 5 minutes < 5 4. Need for supplemental O₂ ≥ 2 hours to maintain oxygen saturations > 90% (outside of the delivery room)
Equivocal	1. Persistent physiologic abnormality ≥ 4 hrs ▪ Tachycardia (HR ≥ 160) ▪ Tachypnea (RR ≥ 60) ▪ Temperature instability (≥ 100.4°F or < 97.5°F) ▪ Respiratory distress (grunting, flaring, or retracting) not requiring supplemental O₂ 2. Two or more physiologic abnormalities lasting for ≥ 2 hrs ▪ Tachycardia (HR ≥ 160) ▪ Tachypnea (RR ≥ 60) ▪ Temperature instability (≥ 100.4°F or < 97.5°F) ▪ Respiratory distress (grunting, flaring, or retracting) not requiring supplemental O₂ Note: abnormality can be intermittent
Well Appearing	No persistent physiologic abnormalities

- 
- The original researchers and AAP recommends EOSCAL as safe among all babies above 34 weeks, including those with chorioamnionitis background
 - Some experts have questioned the use in babies exposed to chorioamnionitis, as the baseline risk is high (Aghai et al. 2018) – and recommended to use a baseline risk of 4/1000 for calculation

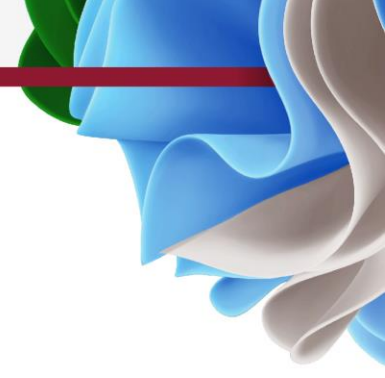
Multidisciplinary team – Brain storming





Objective

To decrease antibiotic use among well-appearing, term neonates exposed to chorioamnionitis to <50% by July 2020



Outcome measure

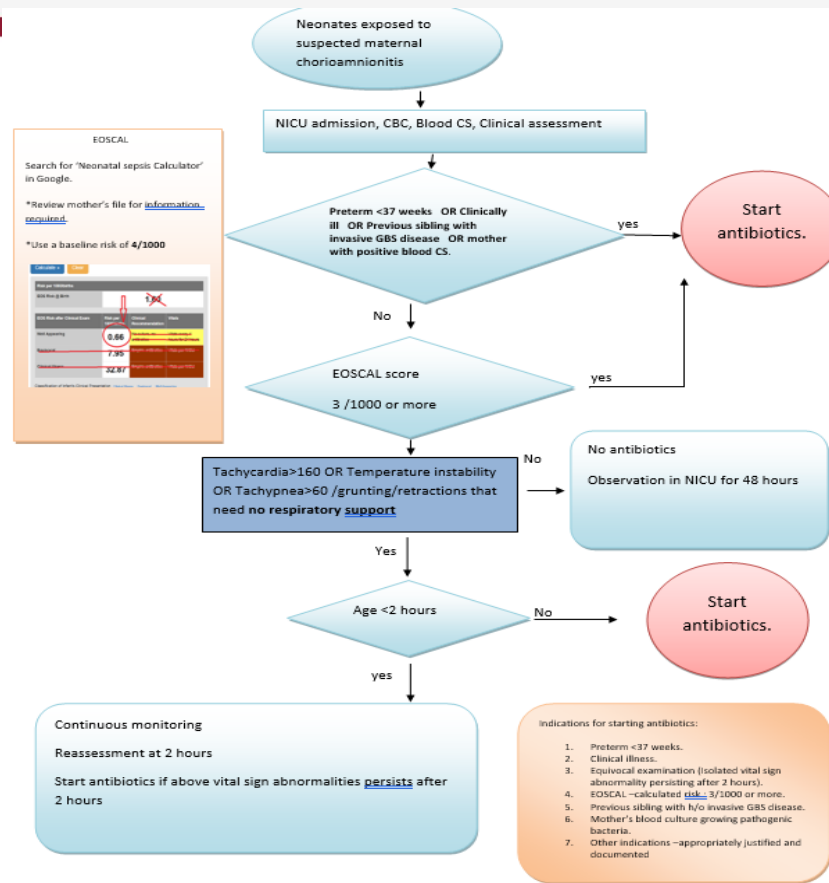
Antibiotic use rate among well-appearing, term babies exposed to chorioamnionitis, Goal <50%

Process measures

1. EOSCAL use rate among chorio-exposed, term, well-appearing babies , Goal 100%
2. EOSCAL calculation error rate , Goal 0%

Balancing measures

1. Percentage of untreated babies who developed confirmed sepsis during first week
2. Percentage of initially untreated babies who required antibiotics within 48 hours of age.



EOSCAL

Search for 'Neonatal sepsis Calculator' in Google.

*Review mother's file for [information required](#).

*Use a baseline risk of 4/1000

December 2019

مستشفى الوكرة
Al Wakra Hospital
مستشفى Hamad Medical Corporation

0 - 6 months 6 - 12 months more than 12 months

12. Project Implementation Facilities

☐ Across HMC	☐ Tertiary Hospital	☐ General Hospital	☐ Continuing Care	☐ Ambulance Service
☐ HGH	☐ AKH	☐ RH		
☐ WH	☐ AWH			
☐ HH	☐ CH			
☐ Others				

13. Stakeholder

Sponsor

Improvement (HHQI) Executive

Lead Improvement (LIP)

14. Challenges

In light of

15. Submission

Submitted by

Designation

Corporation No

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16. Approval Information 1/

Approved by

Designation

1/ Notes for Items 15 and 16 (This needs to be discussed between the improvement project team and the project/program sponsor. Timelines needs to be established to ensure that turnaround time are observed and

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Timeline

Initial education/awareness completed by 31st Jan 2020

Project commenced on 2nd Feb 2020

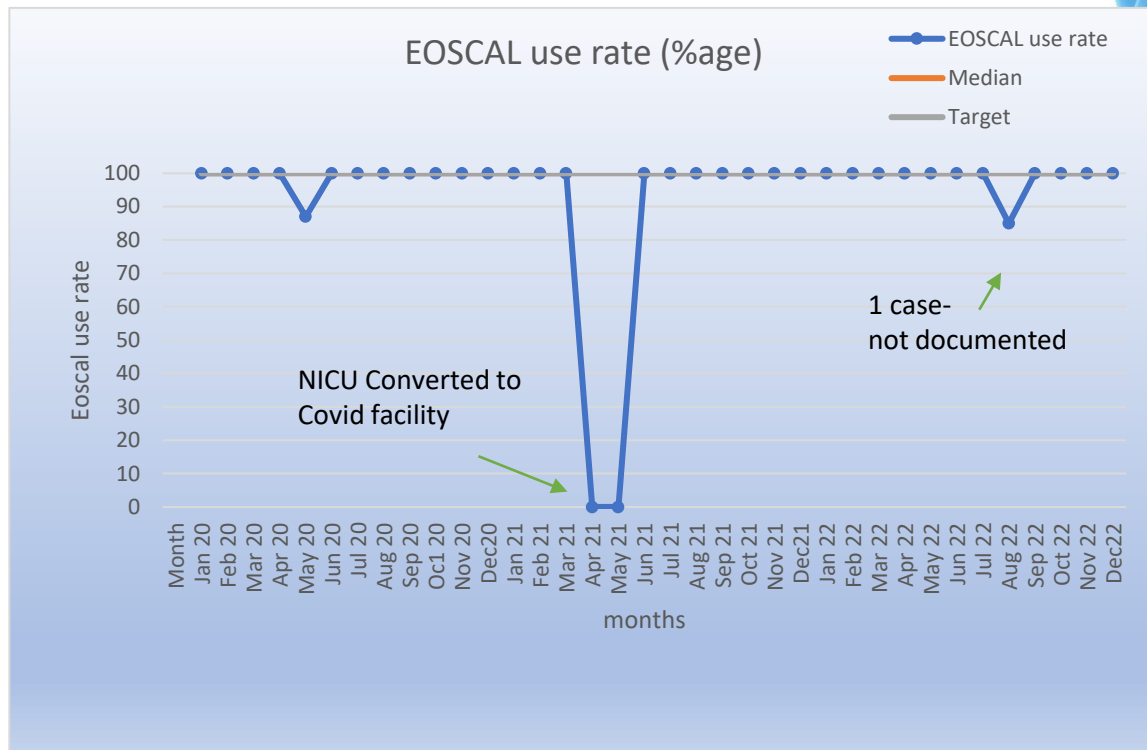
February : Pilot period

Initial project period – 6 months till July 2020

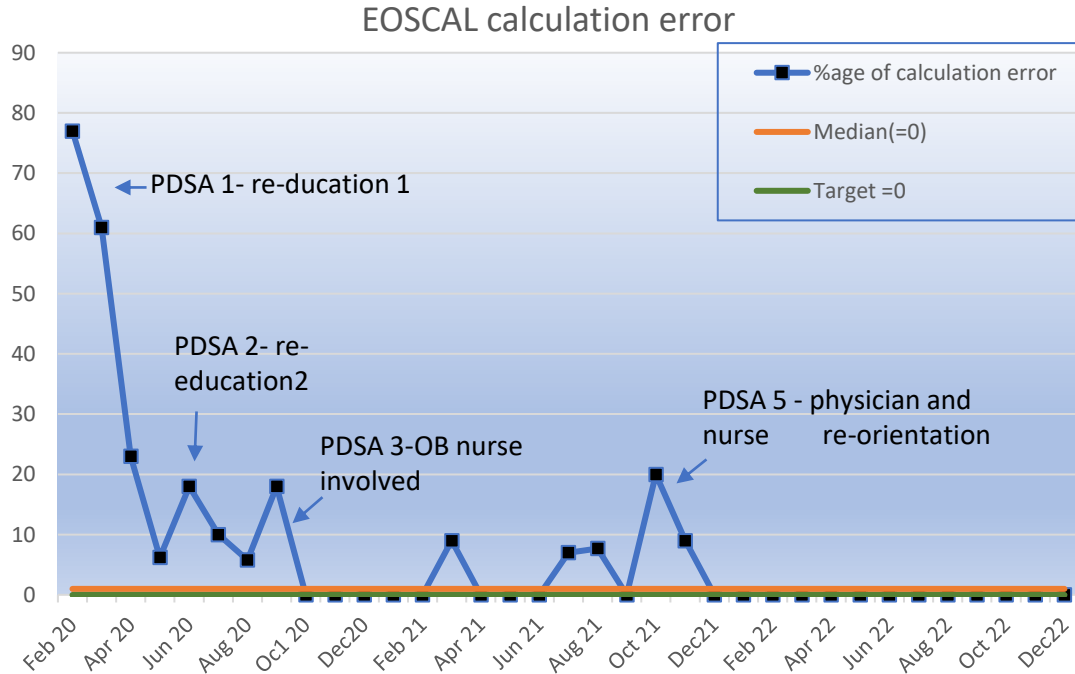
Extended till Dec 2022 (3 years) – as the balancing measure (confirmed sepsis) is rare, serious and needs longer monitoring)

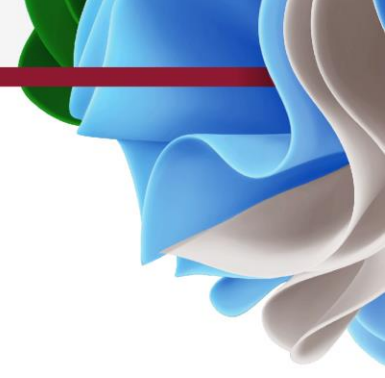
Data

Process measure 1



Process measure 2





PDSA 1 and 2

Physician re-education

One-to-one sessions

PDSA 3

Suspected chorioamnionitis – Maternal information

(To be completed by the admitting LR/OT nurse)

Mother – sticker

Date and time of delivery 18/10/2022 06:30 hr

Gestational age : 39 weeks 2 days

GBS status : - Positive / Negative / Unknown

Duration of rupture of membranes - 14 hours

Peak maternal temperature (before delivery): 38.2°C

Date and time of first dose of IV antibiotics before delivery

Pen G

Ceftriaxone 18/10/2022 05:15

Metronidazole

Ampicillin

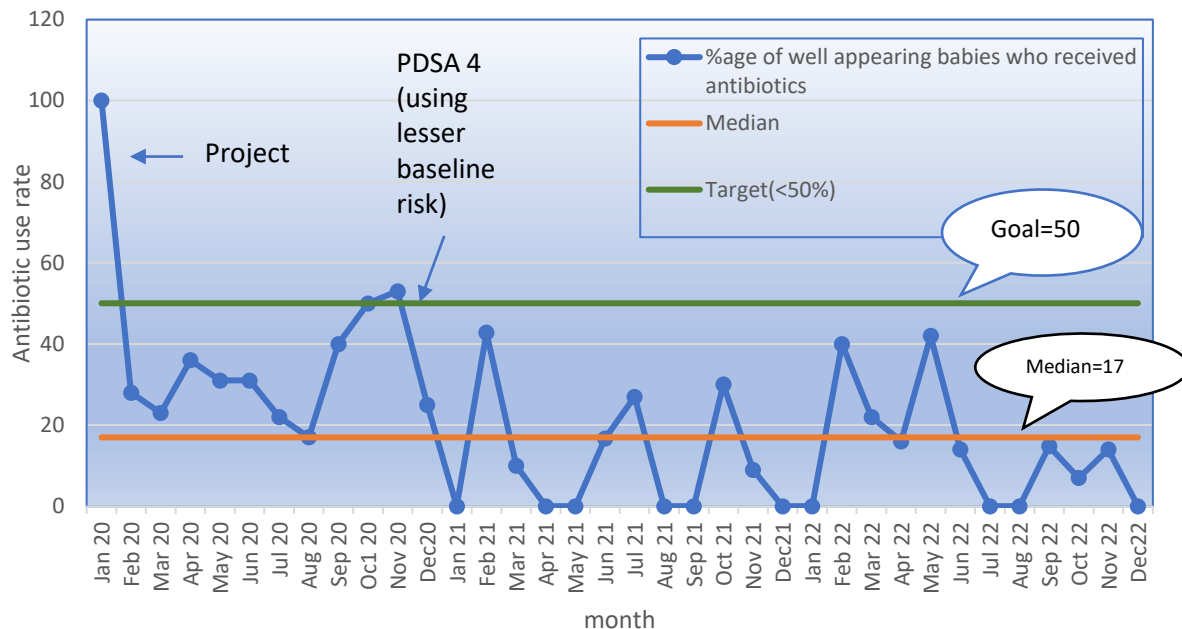
Other (specify)

Calculation error

- During first 2 months, 2 babies received antibiotic due to calculation error alone
- None of the babies were denied antibiotics due to calculation error alone

Outcome measure

Antibiotic use rate among chorio-exposed, term well babies



Data from - then ongoing research project in AW NICU Jan 2016 to Nov 2020

	Total babies with suspected maternal chorioamnionitis N = 593	Preterm babies N =40	Symptomatic term babies N =110	Asymptomatic term babies N =443
Positive Blood culture	5	2	3	0

There were no reported cases of confirmed sepsis among term, well babies affected by chorioamnionitis. In PDSA4, we used a baseline risk of 2/1000 instead of 4/1000.

Vellamgot AP, Salameh K, Habboub LHM, Pattuvalappil R, Elkabir NA, Siam YS, Khatib H. Suspected clinical chorioamnionitis with peak intrapartum temperature <38°C: the prevalence of confirmed chorioamnionitis and short term neonatal outcome. BMC Pediatr. 2022 Apr 11;22(1):197. doi: 10.1186/s12887-022-03239-9. PMID: 35410259; PMCID: PMC8996607.

PDSA 4

(Nov 2020)

Using lower base line risk for calculation – 2/1000 instead of 4/1000

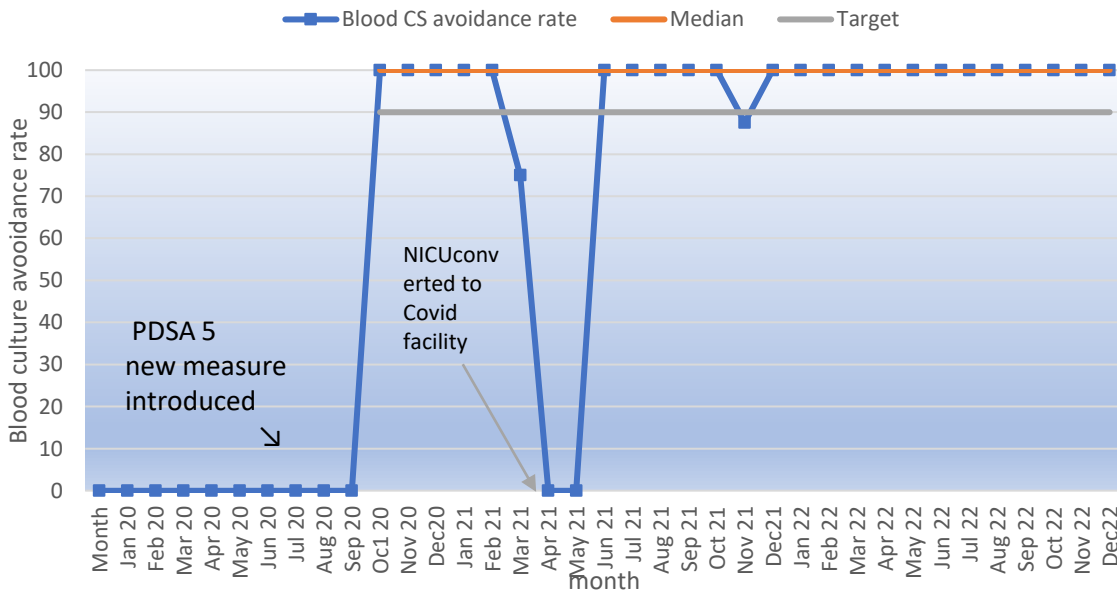
PDSA 5

(Nov 2020)

Added new outcome measure – avoiding antibiotics for babies with EOSCAL < 1

Outcome measure 2

Percentage of eligible babies for whom blood Cs was not done

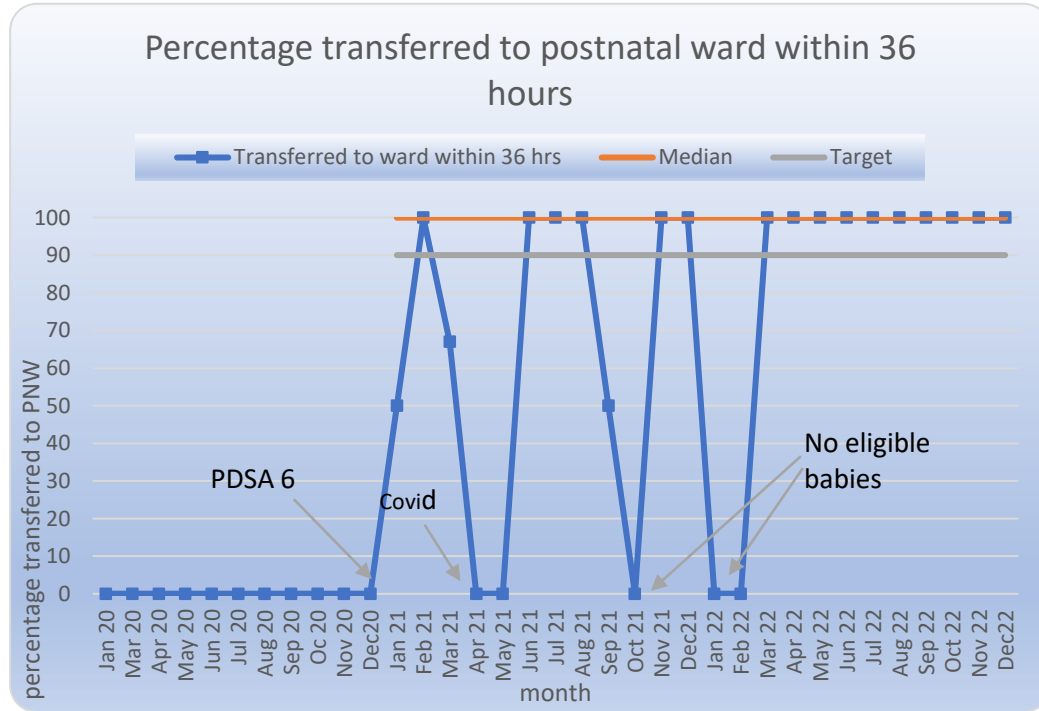


PDSA 6 (Outcome measure 3)

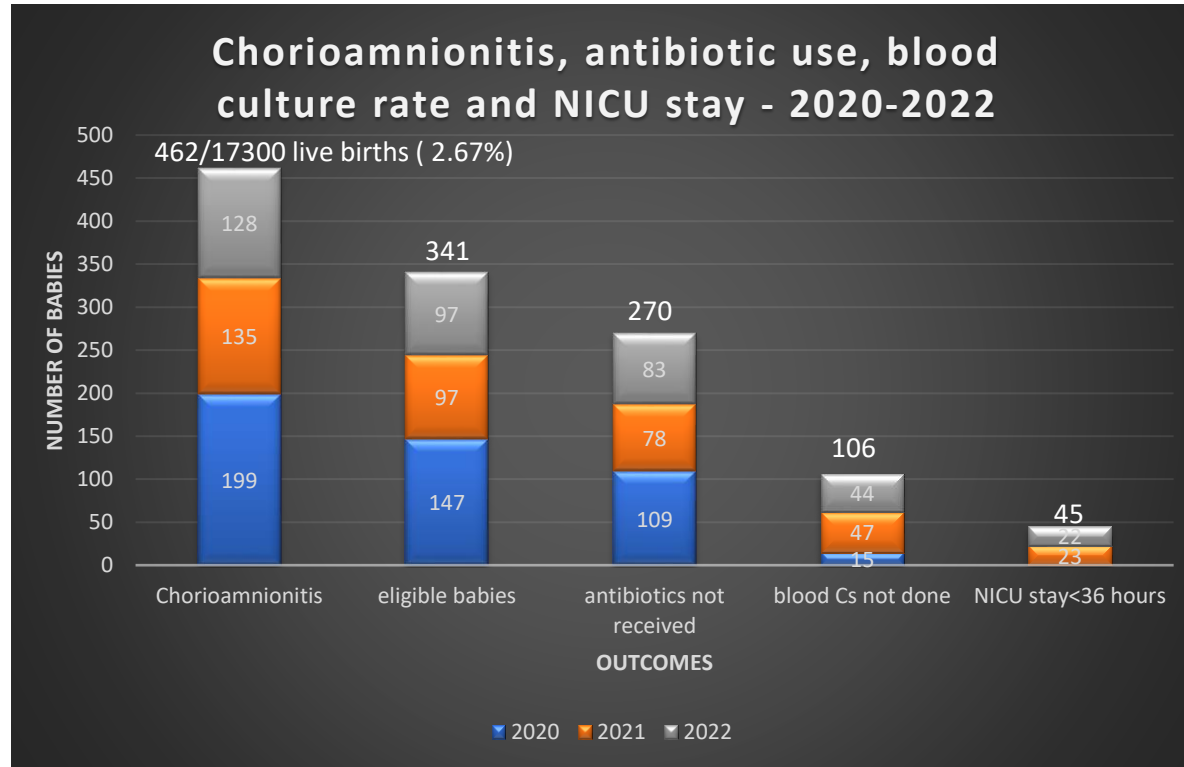
Transferring low risk babies (asymptomatic babies with EOSCAL <1) to postnatal ward within 24-36 hours

Babies were eligible if the mother stayed in the PN ward for at least 48 hours (e.g. LSCS)

Outcome measure 3

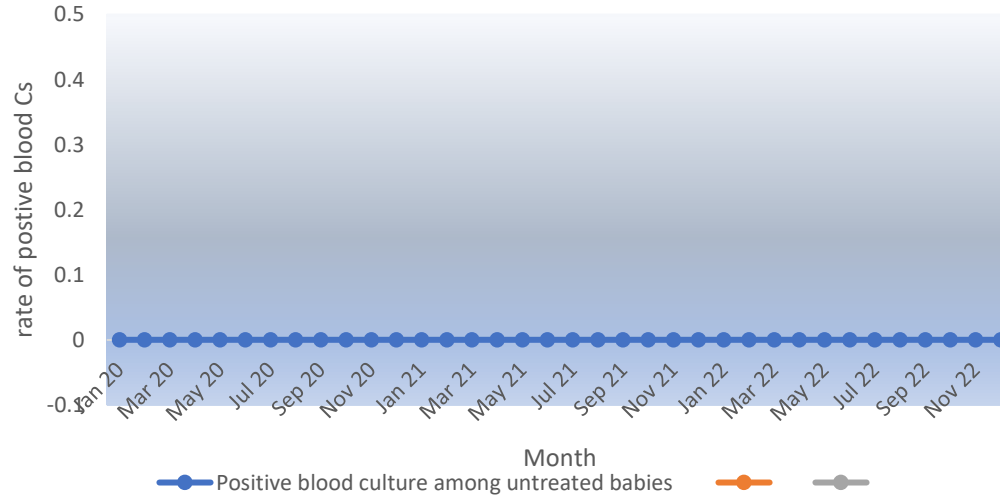


Overall outcome data

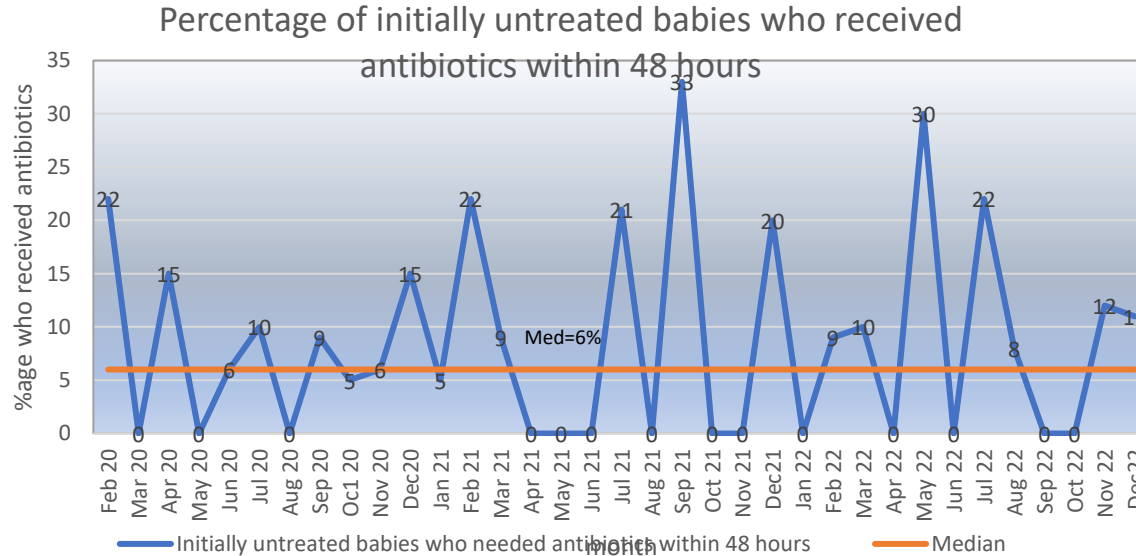


Balancing measure – Rate of confirmed sepsis among untreated babies

Rate of positive blood Cs among untreated babies during first week

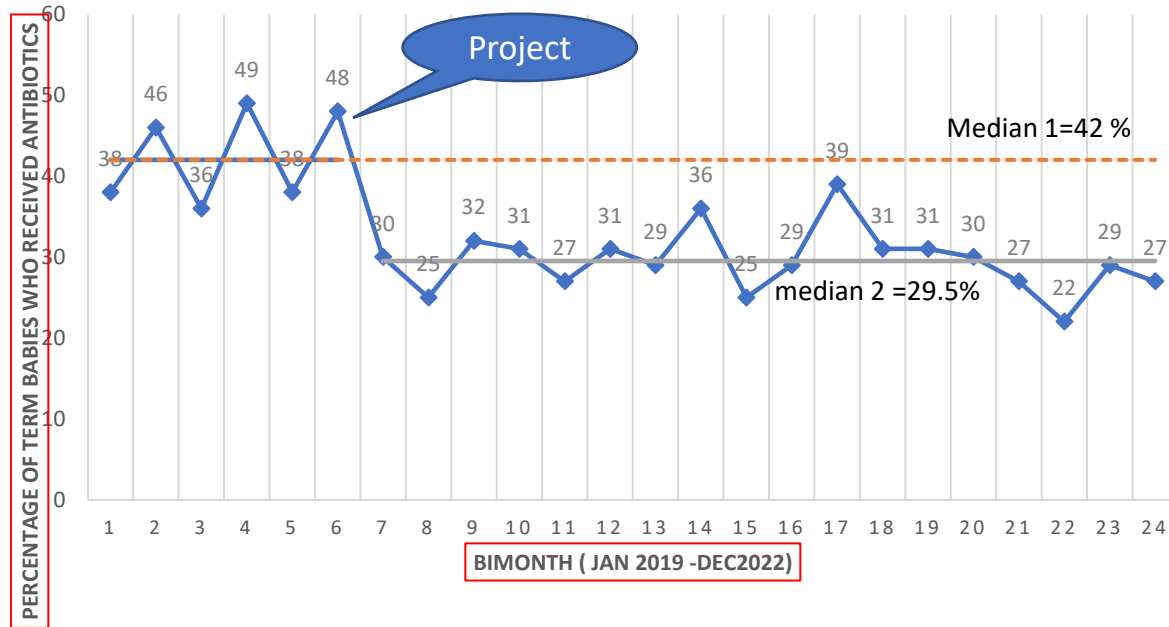


Percentage of initially well-appearing babies who later required antibiotics within 48 hours



- Mean age of starting antibiotics – 3.5 hours
- Positive blood CS – Nil
- Needed antibiotics for >2 days : 1 %

IMPACT ON OVERALL ANTIBIOTIC USE AMONG TERM BABIES (2019-2022)



Key messages

- Careful use of the EOSCAL safely and effectively reduced antibiotic use, blood culture rate and length of stay among term babies admitted to NICU
- Positively impacted on cost, safety and patient flow.



- Avoiding NICU admissions among low-risk babies (score <1)
- This would reduce around 50 NICU admissions annually
- Challenge : inadequate observation facility and expertise in the postnatal wards.

Scale Up and Spread



Projected outcome for 4 HMC hospitals

Assuming 26000 deliveries annually, adoption of this project would:

- Avoid antibiotic use among 520 (2%) neonates
- Avoid blood investigation for 260 (1%) neonates



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10. Vellamgot AP, Salameh K, Habboub LHM, Pattuvalappil R, Elkabir NA, Siam YS, Khatib H. Suspected clinical chorioamnionitis with peak intrapartum temperature $<38^{\circ}\text{C}$: the prevalence of confirmed chorioamnionitis and short term neonatal outcome. *BMC Pediatr*. 2022 Apr 11;22(1):197. doi: 10.1186/s12887-022-03239-9. PMID: 35410259; PMCID: PMC8996607
11. Wood S, Montoya-Aguirre M, Pi L, Calvert C, Rehman AM, Chou D, Campbell OMR. Incidence of maternal peripartum infection: a systematic review and meta-analysis. *PLoS Med*. 2019 Dec 10;16(12):e1002984. doi: 10.1371/journal.pmed.1002984

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