

2019

## Keeping Healthy “Chorio” Babies out of the NICU

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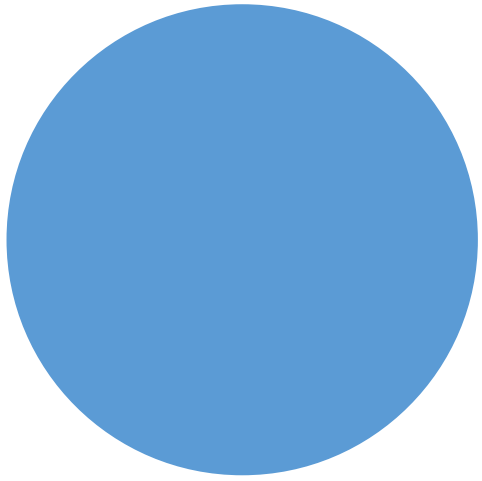
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Implementation of a QI project  
using the PDSA process:

Keeping Healthy  
“Chorio” Babies Out  
of the NICU

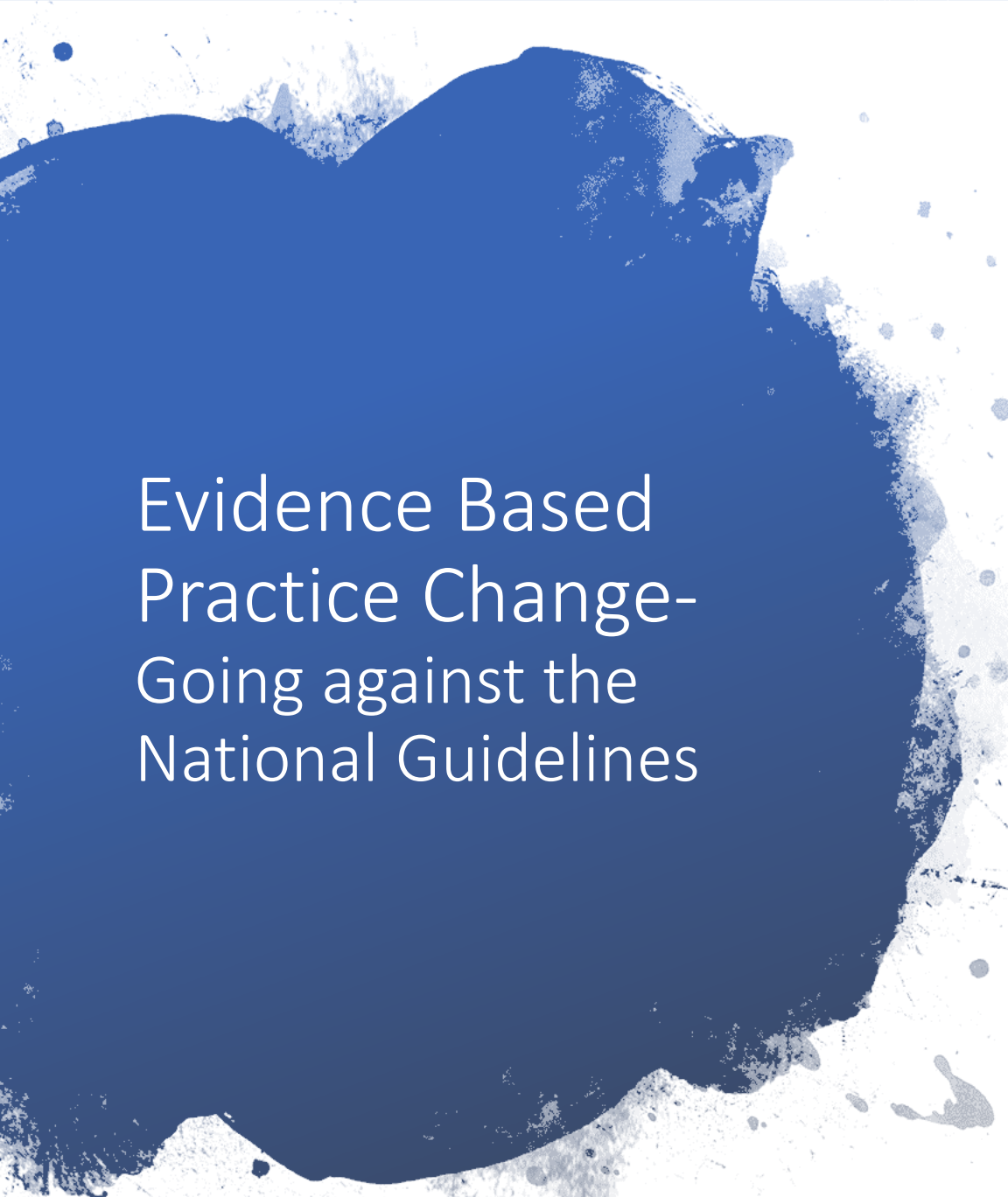


## Plan, Do, Study, Adjust- IHI Quality Improvement Process

- **PLAN:**
  - Background & Evidence
  - Barriers & Motivators
- **DO:**
  - Staff Education
  - Go Live
- **STUDY & ADJUST:**
  - Feedback & Data
  - Problem Prone & Lessons Learned



PLAN:  
Goals; Evidence; &  
Making it our Own



Evidence Based  
Practice Change-  
Going against the  
National Guidelines

- **Goals**

- Keep healthy babies with mothers
- Keep NICU open for sick babies

- **Barriers**

- AAP guidelines 2010

# Evidence & Making it our Own

- Kaiser
  - Created & tested EOS Calculator
  - Seamless organization
- Stanford
  - Academic/Teaching hospital
  - Special Care Nursery
- Sutter Medical Center Sac
  - Community hospital
  - Approx 40 OBs & 40 Pediatricians



Lucile Packard  
Children's Hospital  
AT STANFORD



Sutter Health  
We Plus You





CROSSING THE  
QUALITY CHASM

A New Health System for the 21st Century

**STEEEP:**

IOM QI Goals-

*Safe,*

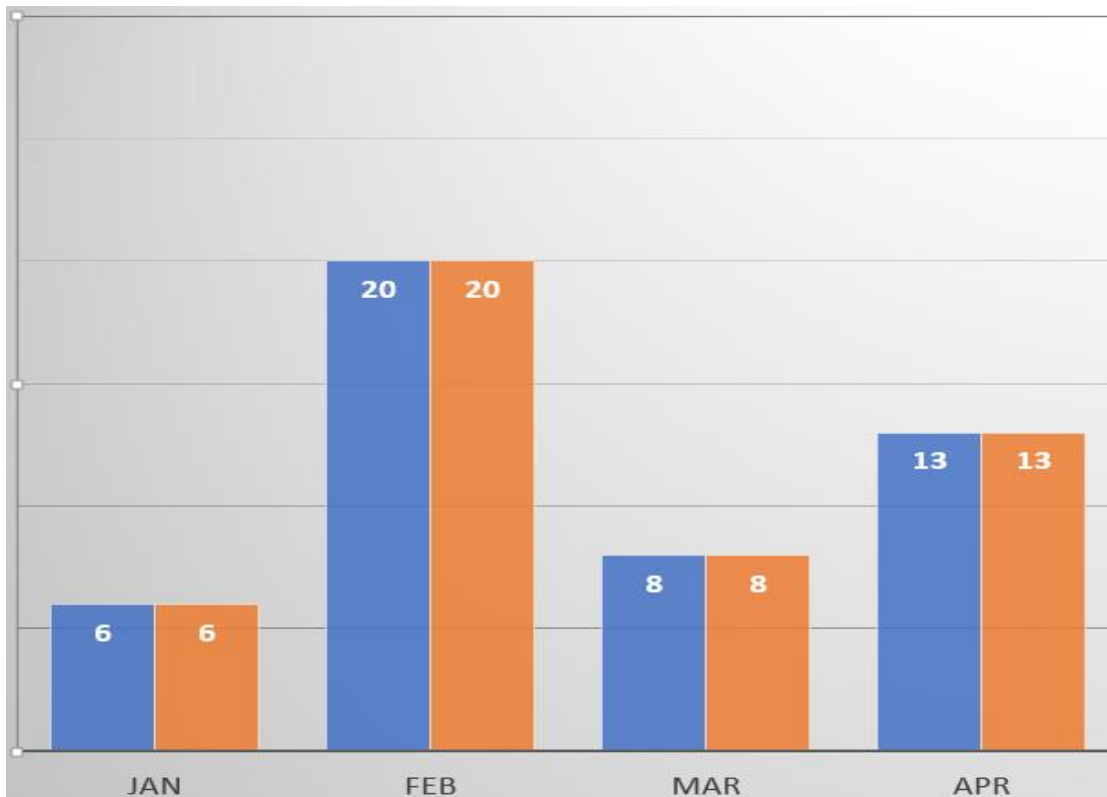
*Timely,*

*Effective,*

*Efficient,*

*Equitable &*

*Patient Centered*



■ chorio cases    ■ NICU admits

## Current Condition

- From Jan 2017 to April 2017
- Admission Rate to NICU for babies whose mothers were dx with chorio was 100%
- They received blood cultures then 48 hours of IV antibiotics
- This resulted in an economic cost of approximately \$\_\_\_\_\_.
- Our target is to reduce the rate to 50% by Sept 2017



# Measures



**Outcome:**



Admission Rate to NICU for chorio



**Process:**



Number of Intermediate Risk babies



Number of problem prone issues



**Balance:**



Negative newborn outcomes

# DO- Staff Education: Multiple Methods

**New**



**Same as Before**



# Revise Policy & New Clinical Exam TERMS-

## *Well Appearing*

- Newborn with no abnormal physiologic events

## ★ *Persistent Abnormal Physiologic Event-* ★

- newborn with a physiologic abnormality lasting longer than 60 minutes per the following criteria:
  - **Tachycardia (HR > 160)**
  - **Tachypnea (RR > 60)**
  - **Temperature instability**
    - ( $\geq 100.4^{\circ}\text{F}$  or  $< 97.5^{\circ}\text{F}$ )
  - **Respiratory distress**
    - **grunting, flaring, or retracting**
    - **not requiring supplemental O<sub>2</sub> to maintain O<sub>2</sub> sat >95%**

## *Equivocal Clinical Signs of EOS-*

- Newborn with a single persistent physiologic abnormality  $\geq 4$  hr; or
- Newborn with 2 or more persistent physiologic abnormalities lasting for  $\geq 2$  hrs

## *Clinical Signs of EOS*

- Persistent need for CPAP or mechanical ventilation (outside of the delivery room)
- Hemodynamic instability requiring vasoactive drugs
- Neonatal encephalopathy or Perinatal depression
  - Seizure
  - Apgar @ 5 minutes < 5
- Need for supplemental O<sub>2</sub>  $\geq 2$  hrs to maintain oxygen saturations > 90% (outside of the delivery room)

**NOTE: abnormality can be intermittent**

# 2Q 2017- Staff Education

## FAQs

- **When & Who screens the baby:**
  - All newborns for first 3 months
  - At risk babies after 3 months
  - ALS or TNT in first 2 hours of life
- **What happens when:**
  - Abnormal Vital Signs occur
  - ALS called to bedside for eval
- **Which babies go to Obs Nursery:**
  - Intermediate risk- with any abnormal VS
  - Low Risk- with persistent abnormal VS
- **When do they return to mom:**
  - When stable, i.e. 1 set of normal VS

## Vital Sign checks:

- Every 8 hours for:
    - **Term or Low EOS risk score**
  - Every 4 hours for:
    - **Late Preterm or Intermediate EOS risk score**
  - Every 30 to 60 minutes\*\* for:
    - **Abnormal VS until stable for 2 hour**
- \*\*Depends on severity and complexity of abnormal physiologic event**

## Abnormal Physiologic Event-

- Tachycardia (HR >160)
- Tachypnea (RR >60)
- Temperature Instability
  - $\geq 100.4$  or  $<97.5$  °F.
- Respiratory Distress

# Who do we screen? Maternal Risk Factors

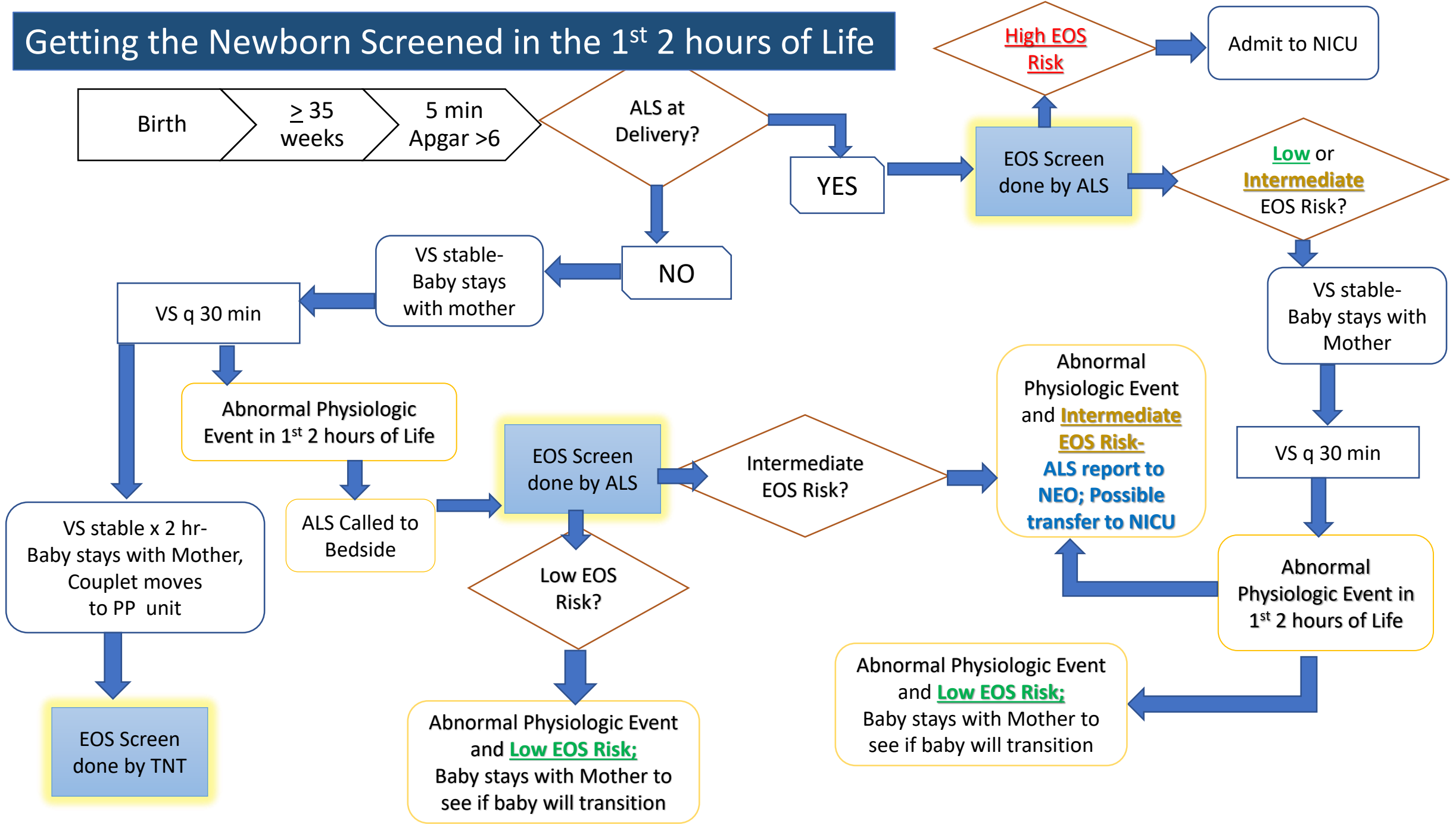
- **Gestational age**
  - (risk increased when  $< 37$  wks)
- **Maximum temperature in labor-**
  - (risk increased if maternal temperature in labor  $> 100.4$ )
- **Length of rupture of membranes**
  - (risk increased when  $\geq 12$  hrs)
- **GBS status-**
  - (risk increased if positive or unknown)
- **Use of antibiotics in labor**
  - (risk increased if GBS intrapartum prophylactic  $< 2$  hours)

If both GBS & Broad Spectrum antibiotics were used, only select item for BSA use

Predictor	Scenario
Incidence of Early-Onset Sepsis ?	0.5/1000 live births (CDC national) ▾
Gestational age ?	<input type="text"/> weeks <input type="text"/> days
Highest maternal antepartum temperature ?	<input type="text"/> Fahrenheit ▾
ROM (Hours) ?	<input type="text"/>
Maternal GBS status ?	<input type="radio"/> Negative <input type="radio"/> Positive <input type="radio"/> Unknown
Type of intrapartum antibiotics ?	<input type="radio"/> Broad spectrum antibiotics $> 4$ hrs prior to birth <input type="radio"/> Broad spectrum antibiotics 2-3.9 hrs prior to birth <input type="radio"/> GBS specific antibiotics $> 2$ hrs prior to birth <input type="radio"/> No antibiotics or any antibiotics $< 2$ hrs prior to birth

Duration in hours, to the nearest tenth.

# Getting the Newborn Screened in the 1<sup>st</sup> 2 hours of Life



.eos  
Smartphrase  
Screen shot  
example;  
Care Team note  
added by ALS  
or MNB Nursery  
nurse

Type:  Service:  Date of Service:  0954

Cosign Required

### EOS Screening and Plan of Care-

<https://neonatalesepsiscalculator.kaiserpermanente.org/>

**Gestational age:** 40w3d  
**Length of ROM:** 0h 21m; **GBS status:** Neg; **Maternal temp:** Temp (24hrs), Avg:98.2 °F (36.8 °C), Min:97.8 °F (36.6 °C), Max:98.3 °F (36.8 °C)

**Antibiotic use in labor:** Antibiotics prior to delivery?: None;

**Plan of Care:**  
The **Well Appearing** newborn with **Low or Intermediate** Early Onset Sepsis (EOS) risk score will receive **Vital Sign monitoring and Lab work per protocol**, and can remain in couplet care unless newborn exhibits equivocal or clinical signs/symptoms of EOS.

early-onset sepsis rate be calculated in an infant born  $\geq$  34 weeks gestation. The risk calculator produces the probability of early onset sepsis per 1000 babies by entering values for the specified maternal risk factors along with the infant's clinical presentation.

Please enter details below:

Parameter	Scenario
Incidence of Early-Onset Sepsis	0.5 (0.000 to 0.010) (CDC culture)
Gestational age	40 (weeks) / 3 (days)
Highest maternal temperature	98.2 (Fahrenheit)
ROM (hours)	0.5
Maternal GBS status	<input checked="" type="radio"/> Negative <input type="radio"/> Positive <input type="radio"/> Unknown
Type of intrapartum antibiotics	<input checked="" type="checkbox"/> Broad spectrum antibiotics > 4 hrs prior to birth <input type="checkbox"/> Broad spectrum antibiotics 2-3 hrs prior to birth <input type="checkbox"/> GBS specific antibiotics > 2 hrs prior to birth <input type="checkbox"/> No antibiotics or any antibiotics < 2 hrs prior to birth

**Calculate** **Clear**

Risk per 1000babies			
<b>EOS Risk @ Birth</b>	<b>0.05</b>		
<b>EOS Risk after Clinical Exam</b>	<b>Risk per 1000babies</b>	<b>Clinical Recommendation</b>	<b>Notes</b>
Well Appearing	<b>0.02</b>	No culture, no antibiotics	Include Vitals
Expressed	<b>0.24</b>	No culture, no antibiotics	Observe Vitals
Clinical Signs	<b>1.01</b>	Strongly consider starting empiric antibiotics	Vitals per NICU

Classification of Infant's Clinical Presentation: [Well Appearing](#) [Observation](#) [Sepsis](#) [Well Appearing](#)

Contact Us! Send your e-mail at [PerinatalResearchUnit@kp.org](mailto:PerinatalResearchUnit@kp.org)

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## Newborn Clinical Exam-

- *Well Appearing*
- *Equivocal*
- *Clinical Illness*

MNB doesn't look at the numbers.  
**We only look at the color associated with the Well Appearing baby**

- **Low Risk- GREEN**
- **Intermediate Risk- YELLOW**
- **High Risk- RED**

Risk per 1000/births			
EOS Risk @ Birth			<b>0.52</b>
EOS Risk after Clinical Exam	Risk per 1000/births	Clinical Recommendation	Vitals
Well Appearing	<b>0.21</b>	No culture, no antibiotics	Routine Vitals
Equivocal	<b>2.58</b>	Blood culture	Vitals every 4 hours for 24 hours
Clinical Illness	<b>10.87</b>	Empiric antibiotics	Vitals per NICU

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

Case #1- Term; GBS negative, No Abx;  
 No maternal temp & ROM 8 hr-  
*Single Abnormal Physiologic Event- Screen- Low Risk*

Predictor	Scenario
Incidence of Early-Onset Sepsis ?	0.5/1000 live births (CDC nationa
Gestational age ?	39 weeks 2 days
Highest maternal antepartum temperature ?	98.3 Fahrenheit
ROM (Hours) ?	8.2
Maternal GBS status ?	<input checked="" type="radio"/> Negative <input type="radio"/> Positive <input type="radio"/> Unknown
Type of intrapartum antibiotics ?	<input type="radio"/> Broad spectrum antibiotics > 4 hrs prior to birth <input type="radio"/> Broad spectrum antibiotics 2-3.9 hrs prior to birth <input type="radio"/> GBS specific antibiotics > 2 hrs prior to birth <input checked="" type="radio"/> No antibiotics or any antibiotics < 2 hrs prior to birth

Calculate »

Clear

Risk per 1000/births			
EOS Risk @ Birth		<b>0.10</b>	
EOS Risk after Clinical Exam	Risk per 1000/births	Clinical Recommendation	Vitals
Well Appearing	<b>0.04</b>	No culture, no antibiotics	Routine Vitals
Equivocal	<b>0.49</b>	No culture, no antibiotics	Routine Vitals
Clinical Illness	<b>2.06</b>	Strongly consider starting empiric antibiotics	Vitals per NICU

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

**Persistent Abnormal Physiologic Event-  
 Still Low Risk**

Case #2- Term; Mom temp- 102.0;  
 ROM- 10 hr; GBS neg; Antibiotics > 4 hr (BSA)-  
*Well Appearing & LOW Risk- No Labs & Routine Care*

**Chorio?**

Predictor	Scenario
Incidence of Early-Onset Sepsis	0.5/1000 live births (CDC national) <input type="checkbox"/>
Gestational age	38 weeks
	0 days
Highest maternal antepartum temperature	102.0 Fahrenheit <input type="checkbox"/>
ROM (Hours)	10
Maternal GBS status	<input checked="" type="radio"/> Negative <input type="radio"/> Positive <input type="radio"/> Unknown
Type of intrapartum antibiotics	<input checked="" type="radio"/> Broad spectrum antibiotics > 4 hrs prior to birth <input type="radio"/> Broad spectrum antibiotics 2-3.9

Calculate » Clear

Risk per 1000/births			
EOS Risk @ Birth	<b>0.97</b>		
EOS Risk after Clinical Exam	Risk per 1000/births	Clinical Recommendation	Vitals
Well Appearing	<del>0.40</del>	No culture, no antibiotics	Routine Vitals
Equivocal	<del>2.10</del>	Empiric antibiotics	Vitals per NICU
Clinical Illness	<del>20.19</del>	Empiric antibiotics	Vitals per NICU

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

**Persistent Abnormal Physiologic Event-  
 Now High Risk?!?!**

Case #3- Late preterm; Mom Temp- 102.5;  
 ROM=12hr; GBS unk; Antibiotics 2 to 3.9 hr (BSA)  
*Well Appearing & INTERMEDIATE Risk- BC & VS q 4 hr*  
 (for 48 hours; not 24 hours)

**Chorio?**

Predictor	Scenario
Incidence of Early-Onset Sepsis	0.5/1000 live births (CDC national)
Gestational age	36 weeks
	0 days
Highest maternal antepartum temperature	102.5 Fahrenheit
ROM (Hours)	12
Maternal GBS status	<input checked="" type="radio"/> Negative
	<input type="radio"/> Positive
	<input type="radio"/> Unknown
Type of intrapartum antibiotics	<input type="radio"/> Broad spectrum antibiotics > 4 hrs prior to birth
	<input checked="" type="radio"/> Broad spectrum antibiotics 2-3.9 hrs prior to birth

Calculate » Clear

Risk per 1000/births

EOS Risk @ Birth **4.46**

EOS Risk after Clinical Exam	Risk per 1000/births	Clinical Recommendation	Vitals
Well Appearing	[Redacted]	Blood culture	Vitals every 4 hours for 24 hours
Equivocal	[Redacted] 2	Empiric antibiotics	Vitals per NICU
Clinical Illness	[Redacted] 7	Empiric antibiotics	Vitals per NICU

**Persistent Abnormal Physiologic Event-  
 Now High Risk?!?!**

**HIGH Risk-  
Direct Admit  
to NICU**

Predictor	Scenario
Incidence of Early-Onset Sepsis	0.5/1000 live births (CDC national) <input type="text"/>
Gestational age	35 weeks
	0 days
Highest maternal antepartum temperature	102 Fahrenheit <input type="text"/>
ROM (Hours)	20
Maternal GBS status	<input type="radio"/> Negative <input checked="" type="radio"/> Positive <input type="radio"/> Unknown
Type of intrapartum antibiotics	<input type="radio"/> Broad spectrum antibiotics > 4 hrs prior to birth <input type="radio"/> Broad spectrum antibiotics 2-3.9 hrs prior to birth <input type="radio"/> GBS specific antibiotics > 2 hrs prior to birth <input checked="" type="radio"/> No antibiotics or any antibiotics < 2 hrs prior to birth

Calculate » Clear

Risk per 1000/births			
EOS Risk @ Birth		<b>35.78</b>	
EOS Risk after Clinical Exam	Risk per 1000/births	Clinical Recommendation	Vitals
Well Appearing	<b>14.99</b>	Empiric antibiotics	Vitals per NICU
Equivocal	<b>156.51</b>	Empiric antibiotics	Vitals per NICU
Clinical Illness	<b>440.31</b>	Empiric antibiotics	Vitals per NICU

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

# Combined Maternal Risk Factors and Newborn Exam create Risk Levels:

- **Low Risk- GREEN**
- **Intermediate Risk-  
YELLOW**

Low risk babies whose mother had a ***fever in labor*** will have a **T** on their green dots  
Intermediate risk babies who had a ***blood culture drawn*** will have a **+** on their yellow dots

A newborn exam card with a green dot in the top right corner. The card contains fields for Last Name, Date of Birth, Time of Birth, Weight (lbs, oz, gms), and Length (in, cm). Below these fields are checkboxes for Breast and Bottle. A white box with green text reads "GREEN VS every 8 hour". At the bottom, there is a green instruction: "When you're tired and want to sleep, put your baby in the crib back to sleep." and a blue rocking horse illustration.

A newborn exam card with a yellow dot in the top right corner. The card contains fields for Last Name, Date of Birth, Time of Birth, Weight (lbs, oz, gms), and Length (in, cm). Below these fields are checkboxes for Breast and Bottle. A white box with yellow text reads "YELLOW VS every 4 hours". At the bottom, there is a yellow instruction: "When you're tired and want to sleep, put your baby in the crib back to sleep." and a blue rocking horse illustration.

*Intermediate EOS Risk Baby*  
*“Guilty until proven innocent”*

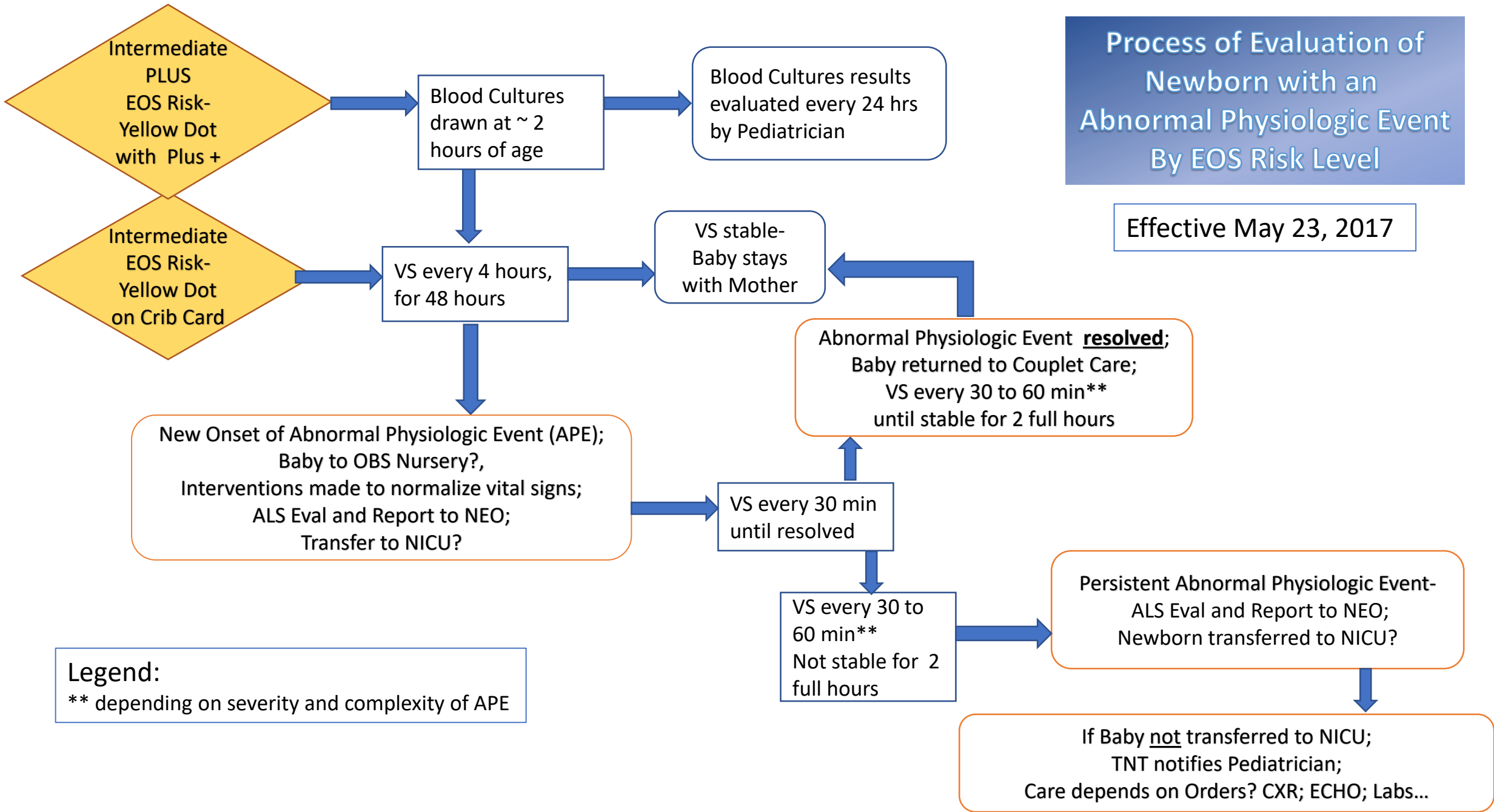
Criteria for Calling ALS to  
Evaluate the Baby





# Process of Evaluation of Newborn with an Abnormal Physiologic Event By EOS Risk Level

Effective May 23, 2017



**Legend:**  
\*\* depending on severity and complexity of APE

Predictor	Scenario
Incidence of Early-Onset Sepsis	0.5/1000 live births (CDC nationa
Gestational age	36 weeks 0 days
Highest maternal antepartum temperature	100.2 Fahrenheit
ROM (Hours)	24
Maternal GBS status	<input type="radio"/> Negative <input checked="" type="radio"/> Positive <input type="radio"/> Unknown
Type of intrapartum antibiotics	<input type="radio"/> Broad spectrum antibiotics > 4 hrs prior to birth <input type="radio"/> Broad spectrum antibiotics 2-3.9 hrs prior to birth <input checked="" type="radio"/> GBS specific antibiotics > 2 hrs prior to birth <input type="radio"/> No antibiotics or any antibiotics < 2 hrs prior to birth

Calculate » Clear

**Risk per 1000/births**

EOS Risk @ Birth **1.46**

EOS Risk after Clinical Exam	Risk per 1000/births	Clinical Recommendation	Vitals
Well Appearing	<b>0.60</b>	No culture, no antibiotics	Vitals every 4 hours for 24 hours
Equivocal	<b>7.26</b>	Empiric antibiotics	Vitals per NICU
Clinical Illness	<b>30.06</b>	Empiric antibiotics	Vitals per NICU

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

*Case #1- Late preterm; GBS+ but treated >2 hr; Low maternal temp (100.2) & ROM 24 hr- Intermediate Risk VS every 4 hours, Single Abnormal Physiologic Event- Low Temp= 97.4° F*

- Baby to Obs Nursery.
- Interventions made to re-warm baby
- ALS called to Eval, Report to Neo;
- Not transferred to NICU.
- 30 min later, Temp= 97.9, but RR= 68.
- ALS to bedside for eval, Report to Neo.
- Transfer to NICU

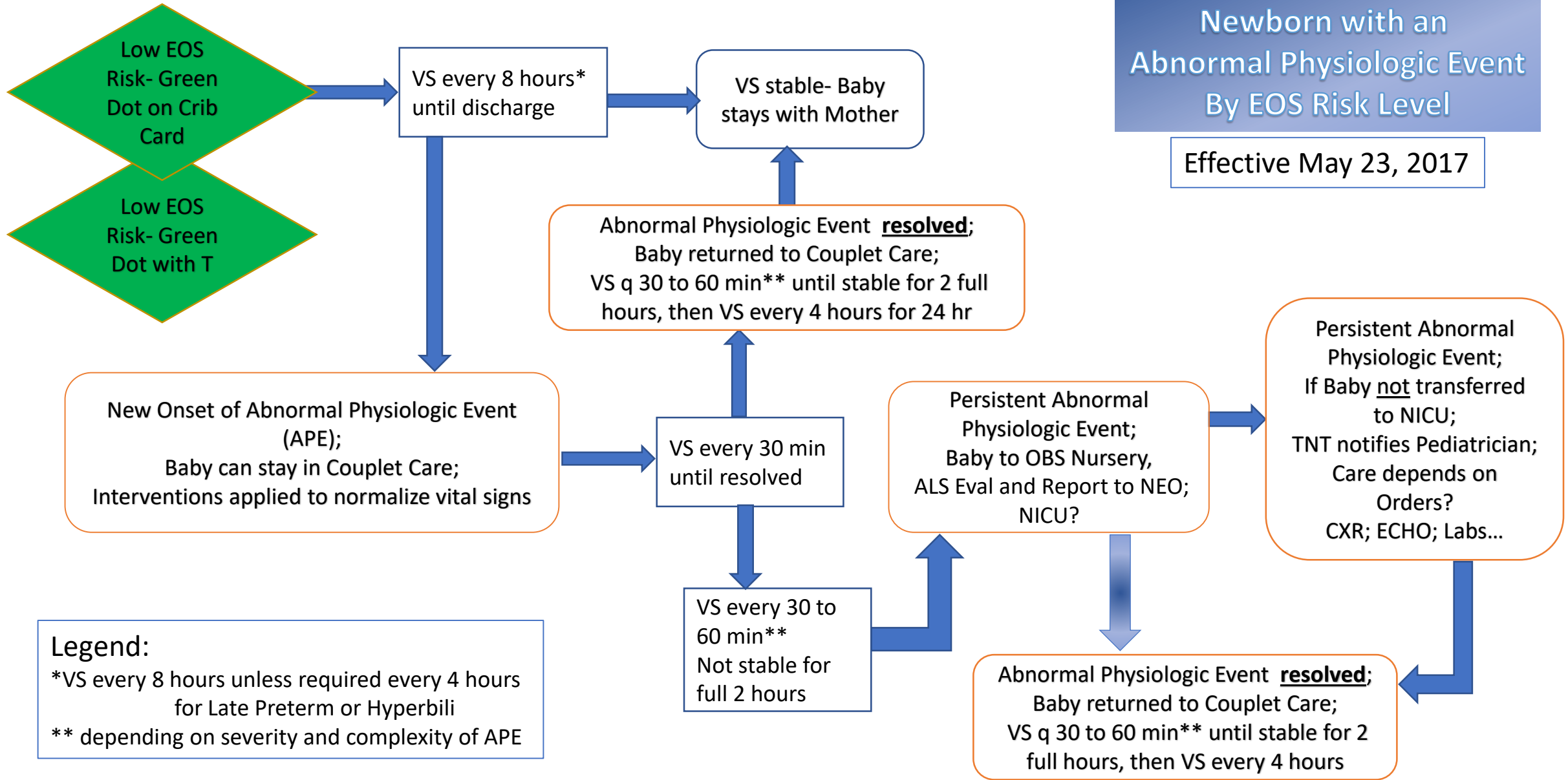
*Low EOS Risk Baby –  
“Innocent until proven Guilty”*

Criteria for Calling ALS to  
Evaluate the Baby



# Process of Evaluation of Newborn with an Abnormal Physiologic Event By EOS Risk Level

Effective May 23, 2017



**Legend:**  
 \*VS every 8 hours unless required every 4 hours for Late Preterm or Hyperbili  
 \*\* depending on severity and complexity of APE

Predictor	Scenario
Incidence of Early-Onset Sepsis	0.5/1000 live births (CDC nationa
Gestational age	36 weeks 0 days
Highest maternal antepartum temperature	99.5 Fahrenheit
ROM (Hours)	10
Maternal GBS status	<input type="radio"/> Negative <input checked="" type="radio"/> Positive <input type="radio"/> Unknown
Type of intrapartum antibiotics	<input type="radio"/> Broad spectrum antibiotics > 4 hrs prior to birth <input type="radio"/> Broad spectrum antibiotics 2-3.9 hrs prior to birth <input checked="" type="radio"/> GBS specific antibiotics > 2 hrs prior to birth <input type="radio"/> No antibiotics or any antibiotics < 2 hrs prior to birth

Calculate » Clear

Risk per 1000/births			
EOS Risk @ Birth	<b>0.55</b>		
EOS Risk after Clinical Exam	Risk per 1000/births	Clinical Recommendation	Vitals
Well Appearing	<b>0.23</b>	No culture, no antibiotics	Routine Vitals
Equivocal	<b>2.74</b>	Blood culture	Vitals every 4 hours for 24 hours
Clinical Illness	<b>11.52</b>	Empiric antibiotics	Vitals per NICU

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

*Case #2- Late preterm; GBS+ but treated >2 hr; Low maternal temp & ROM 10 hr- Low Risk VS every 8 hours, Single Abnormal Physiologic Event- RR= 78*

- Persistent Abnormal Physiologic Event-
  - RR= 78, interventions made,
  - then 30 min RR= 68,
  - To Obs Nursery- ALS Eval, Report to NEO;
  - Not transferred to NICU.
- 
- 30 min later, RR= 58, return to Mom.
  - Primary RN check VS every 30 to 60 min until 2 full hours of stable VS.





# Study & Adjust

**First 3 Month Overview &  
September 2017 Policy Revisions**

# Problem Prone Areas



Needing to be conservative to prevent a bad outcome

Increase in the number of phone calls to ALS to evaluate babies



Newborns with Low EOS Risk who have tachypnea for more than 4 hours

Every 30 min vital signs for ..... Hours!!  
Not sustainable.



How to classify a newborn who has abnormal VS for > 4 hours

Initial "Well Appearing" newborn who was Low EOS Risk, but who is now ....





## 3 Month Overview

- ***Numerous cases of healthy appearing newborns who:***
  - Did not have to be separated from his/her mother
  - Did not have to have lab work done
  - Did not have to have antibiotics



## Policy Revisions

- Screen fewer babies
  - about 20%
- Simple process
  - when abnormal VS occur
- Increase tachypnea threshold to
  - Greater than 70 bpm
  - for 1st 4 hrs of life
- Reduce frequency of VS ✓ to hourly,
  - when VS are abnormal



## Screen Fewer Babies

- Only screen newborns with ↑ risk factors
  - Late preterm ~5%
  - Temp in labor ~5%
  - ROM > 12 hr ~10%
  - GBS pos /unk ~10%
  - Use of antibiotics in labor ~5%
  - 70 to 80% will NOT be screened

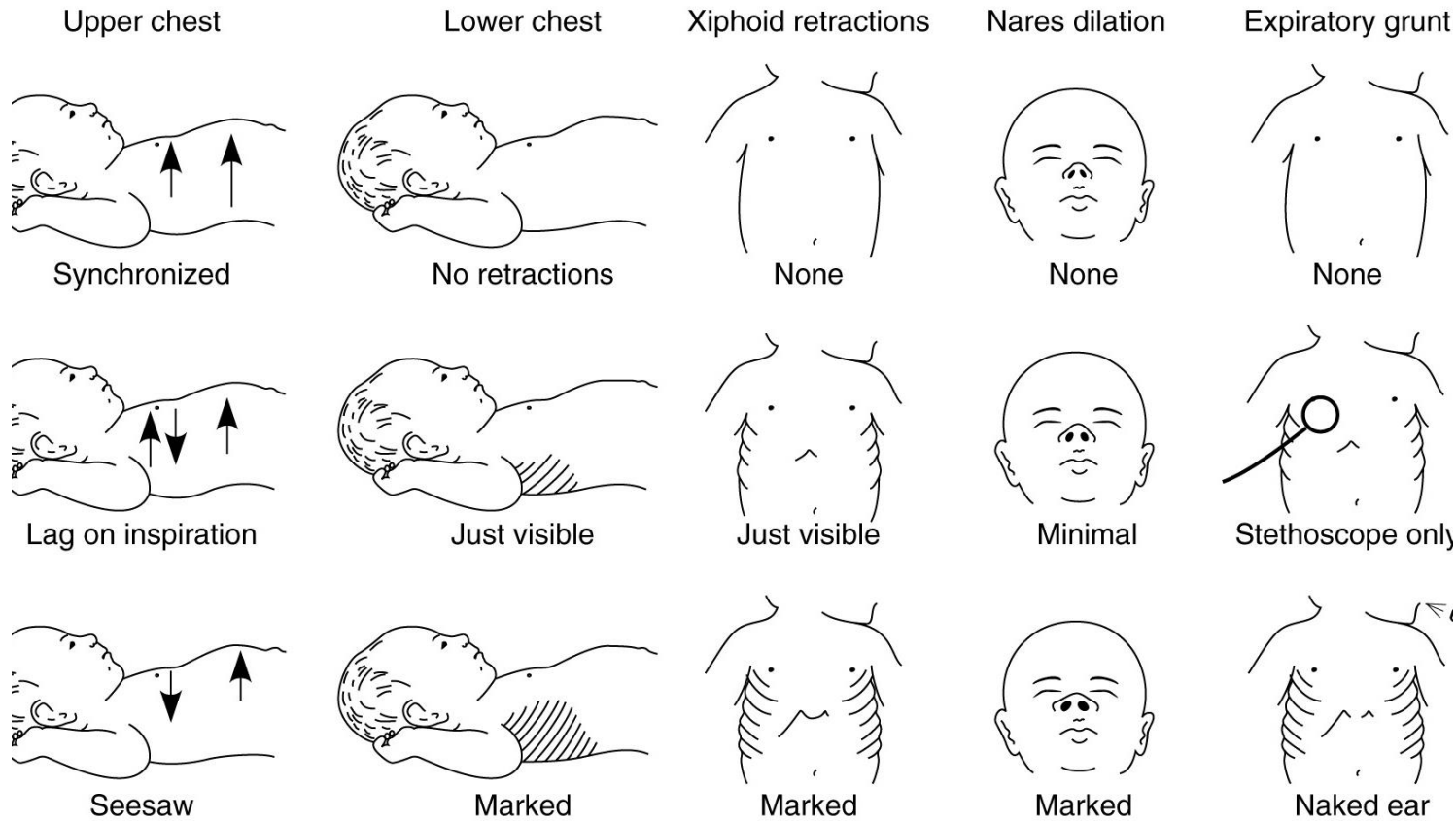
Simplified Process:  
When persistent abnormal  
physiologic event occurs-

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- **Those that are screened**
  - **will be followed by Neonatologists**
- **Those newborns who are not screened**
  - **will be followed by their Primary Provider**







Increase tachypnea threshold to  $> 70$   
for 1st 4 hours of life

- Fewer cases of abnormal VS
- Newborn will declare himself by 1 of the following:
  - continue tachypnea after 1st 4 hours
  - developing respiratory distress
  - $\uparrow$  RR  $> 70$  bpm



## ***WHEN VS ARE ABNORMAL***

**REDUCE FREQUENCY OF VS  
RE-CHECKS**

**TO EVERY 60 MIN**

**EXCEPT FOR  
LATE PRETERM INFANTS**

# EOS /Chorio Babies QI Project Outcomes:

## Pre-Implementation

- For the first 4<sub>3/4</sub> months of 2017,
- 64 cases of Chorio,
- all **64** babies admitted to the **NICU (100%)**

Jan 1<sup>st</sup> to May 22<sup>nd</sup>

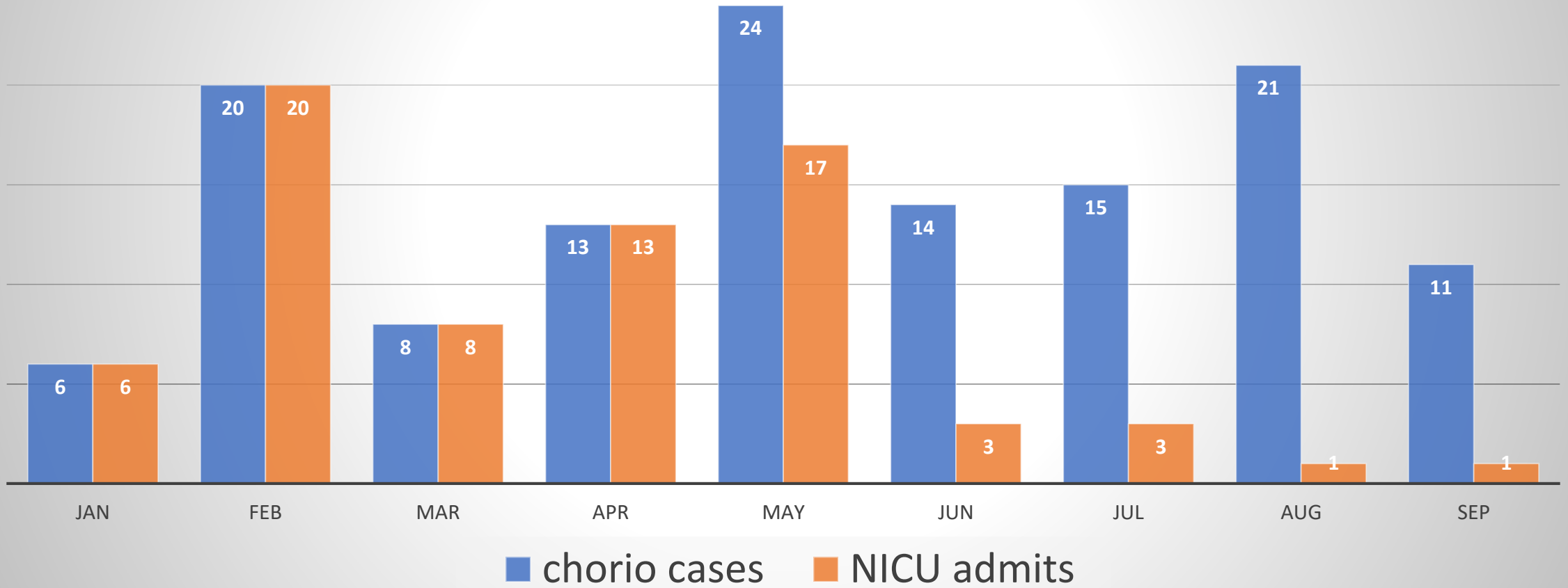
## Post-Implementation

- For the first 4<sub>1/4</sub> months after new process
- 68 cases of Chorio,
- only **8** babies were admitted to the **NICU (11.7%)**
- **Significant ↓ in NICU admissions**
- **No adverse outcomes**

May 23<sup>rd</sup> to Sept 30<sup>th</sup>



## Pre & Post Neonatal EOS Risk Screening





## Meeting our Goals:

- Number of critically ill newborns turned away:
  - 2013- 14
  - 2014- 32
  - 2015- 109
  - 2016- 42
  - **2017- 14**
    - **9 post implementation**

Evidence-  
Based  
Literature  
Sources

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