# OASCN Collaborative: Antibiotic Stewardship Resources

August 29, 2023
12-1 pm Pacific

*The OASCN project was supported by the Agency for Healthcare Research and Quality (grant no. R18HS026168).*

# Agenda

| Time | Topic | Presenter |
|---|---|---|
| 12:00 | Welcome & Goals | Henry C. Lee, MD, MS |
| 12:05 | OASCN Overview & Results | Peter Mendel, PhD |
| 12:10 | OASCN Top 3 Lessons for Stewardship Improvement | Kurlen Payton, MD |
| 12:15 | OASCN Resource Bundle: Live Demo | Ken Zangwill, MD |
| 12:25 | OASCN Experiences: Highlights and Q&A with Participating Sites | Maria Fe Villosis, MD, FAAP<br>Sevini (Sina) Hallaian, MD<br>Kathy Weiss, MD<br>Kurlen Payton, MD (*Moderator*) |
| 12:55 | Wrap Up & Feedback Survey | Kurlen Payton, MD |

# Continuing Education (CE) Credit for RNs

Perinatal Advisory Council:
Leadership, Advocacy and Consultation

- CE credits have been approved for the **live attendance of today's session for RNs** (60 minutes of participation)
- The Perinatal Advisory Council: Leadership, Advocacy and Consultation (PAC/LAC) is an approved provider by the California Board of Registered Nursing Provider CEP 5862
- Please contact Courtney Breault (courtney@cpqcc.org) regarding any questions related to the RN-CE credits, grievances, or in order to request accommodations for disabilities

**STEP ONE**

**SIGN IN**

Please chat in your name to sign into today's session

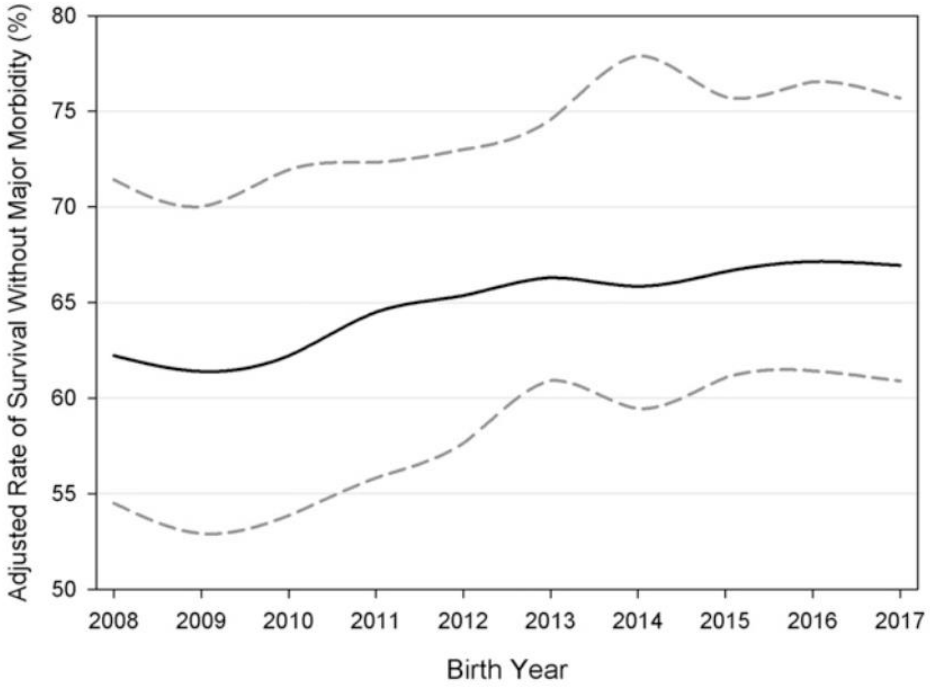
**STEP TWO**

**EVALUATION**

A QR code and link will be provided at the end of the live session

# Welcome & Goals

Henry C. Lee, MD, MS



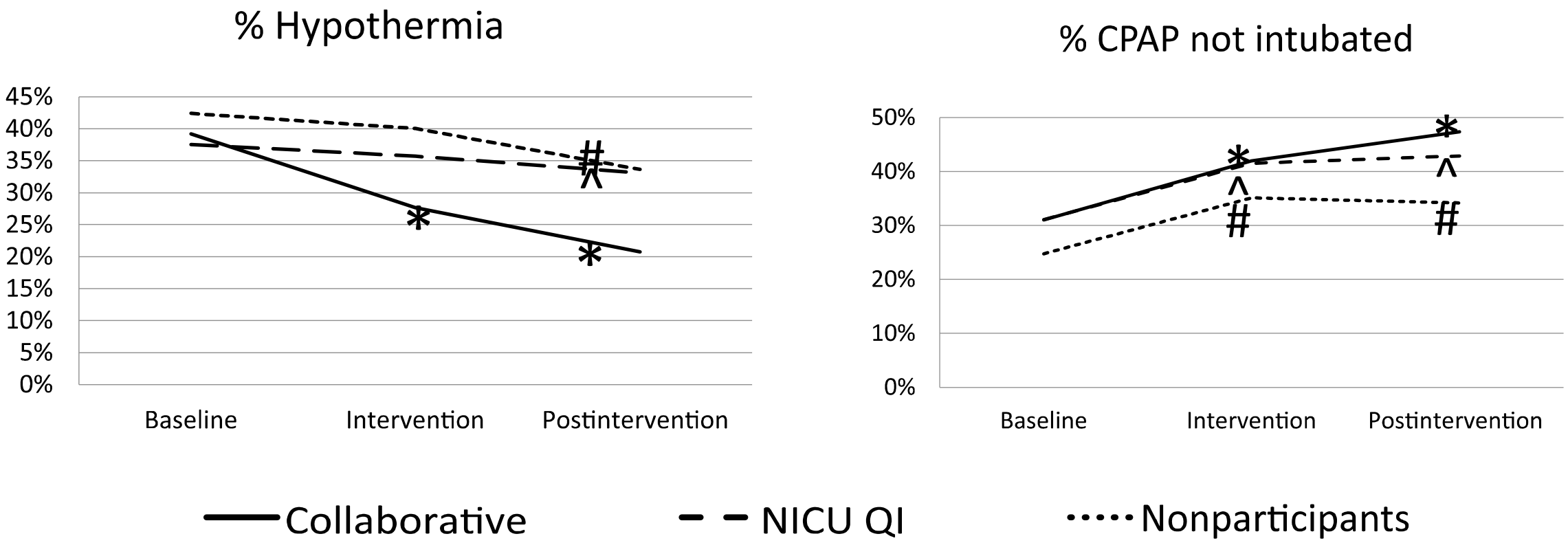

Survival without major morbidity among very low birth weight infants in California. Pediatrics 2020

**TABLE 3** Trends in Infant Morbidities Over Time (2008–2017)

| Morbidities | Birth y | | | | | | | | | | Percent Change, %[a] | Average Change per y, %[b] | *P* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | | | |
| 0 | 62.4 | 60.6 | 61.8 | 64.8 | 65.7 | 65.8 | 65.7 | 67.1 | 67.3 | 67.3 | 7.8 | 0.7 | <.001 |
| 1 | 20.7 | 22.2 | 22.5 | 22.1 | 21.7 | 21.0 | 21.9 | 20.9 | 21.1 | 20.1 | −2.9 | −0.1 | .13 |
| 2 | 11.4 | 11.3 | 11.3 | 9.4 | 9.4 | 9.4 | 9.0 | 9.0 | 8.7 | 9.3 | −18.4 | −0.3 | .002 |
| 3 | 4.3 | 4.4 | 3.5 | 2.8 | 2.6 | 3.1 | 2.7 | 2.5 | 2.3 | 2.6 | −40.0 | −0.2 | .002 |
| ≥4 | 1.2 | 1.5 | 1.0 | 0.9 | 0.7 | 0.8 | 0.7 | 0.5 | 0.6 | 0.7 | −41.7 | −0.1 | .004 |

[a] Absolute change from 2008 to 2017.

[b] Slope for average change per y as calculated by linear regression of rates of morbidities on birth year.




Implementation methods for delivery room management: a quality improvement study. Pediatrics 2014

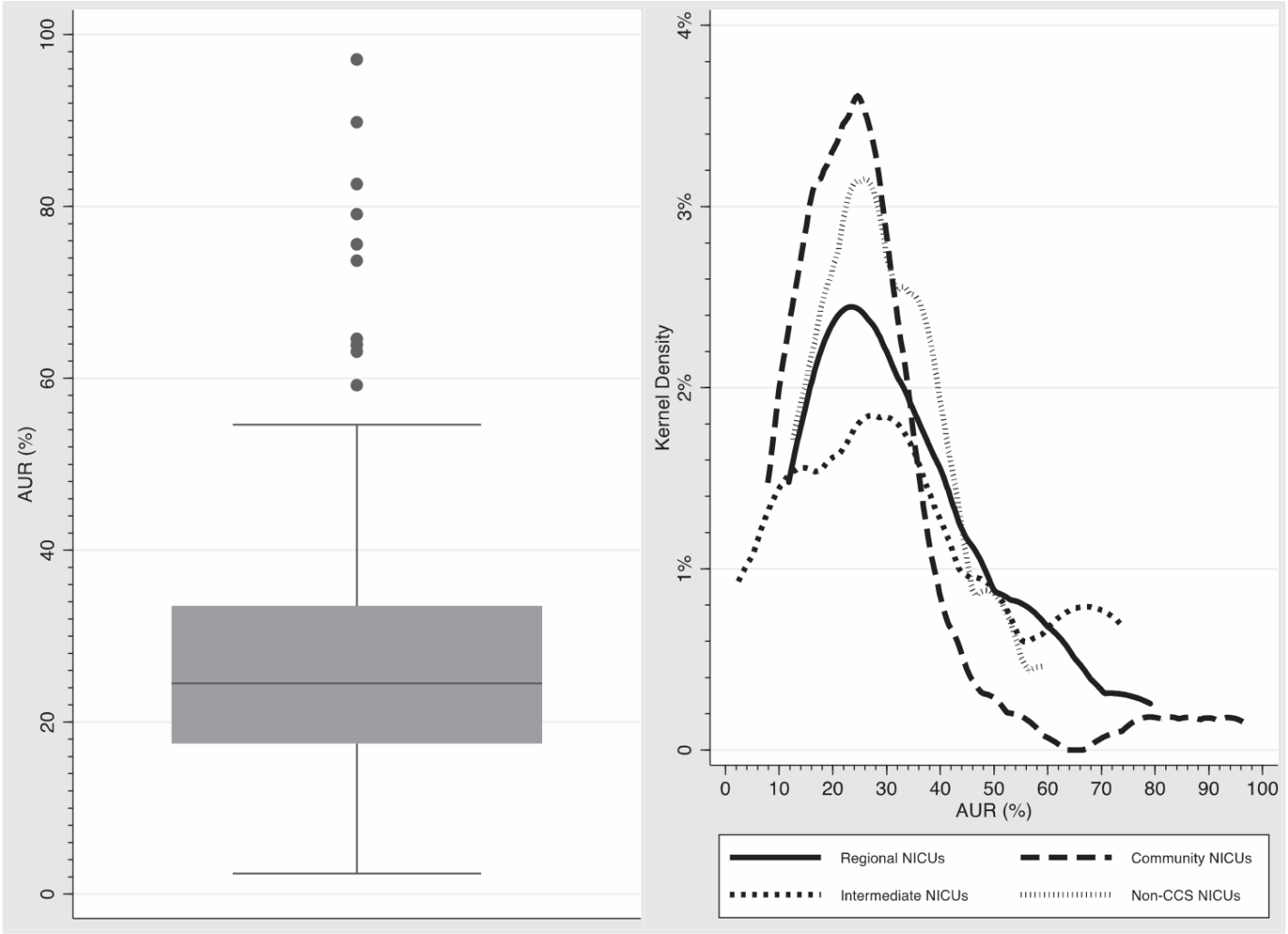



**FIGURE 1**

Range of AUR values and distribution of AUR values by level of care. Left, Interquartile range and median AUR across all NICUs; lines above or below the box extend further by 1.5 times the interquartile range; dots mark extreme outliers. Right, AUR stratified by NICU level of care. Kernel density is essentially a smoothed frequency distribution histogram.

Schulman. Neonatal intensive care unit antibiotic use. Pediatrics 2015

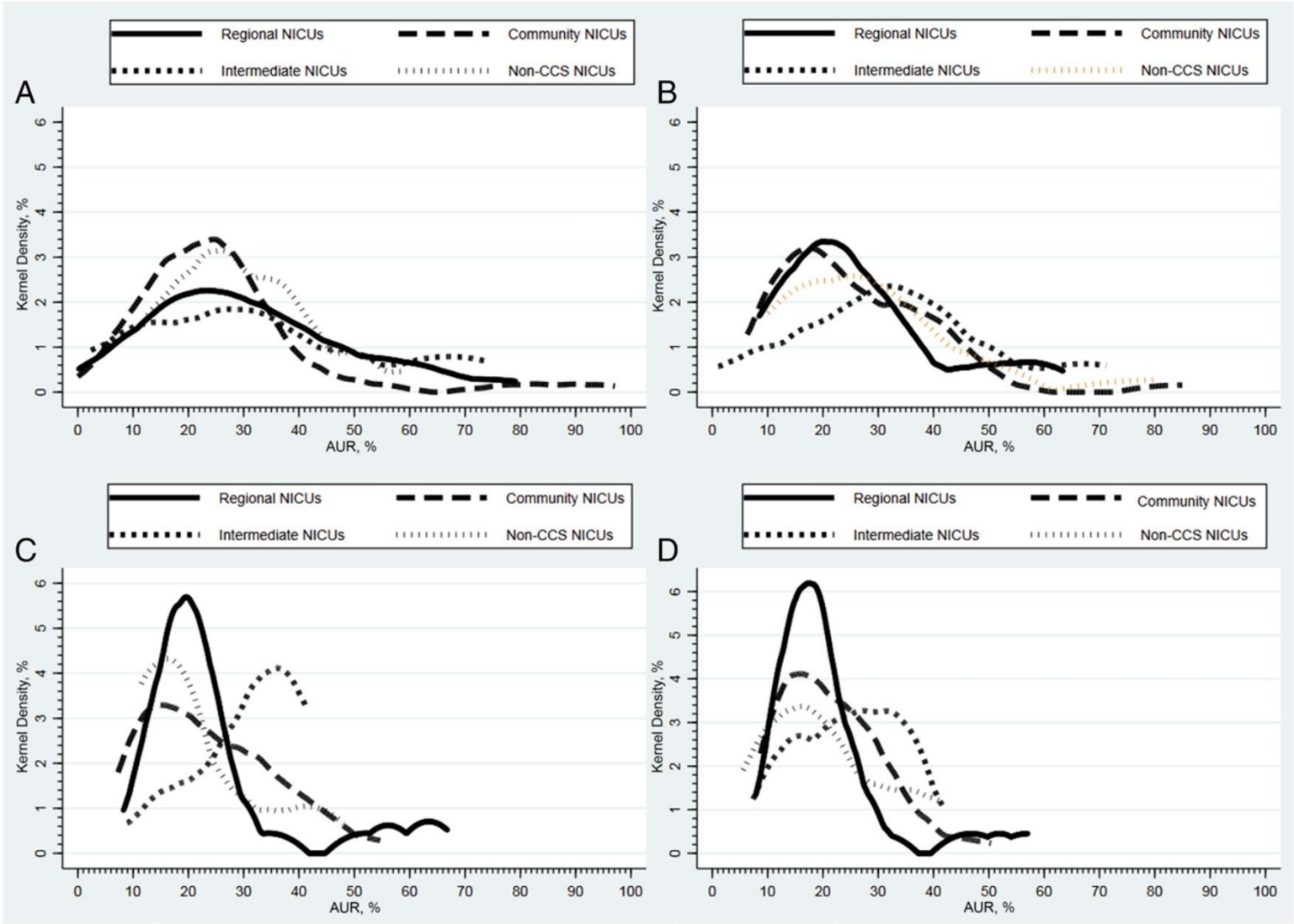
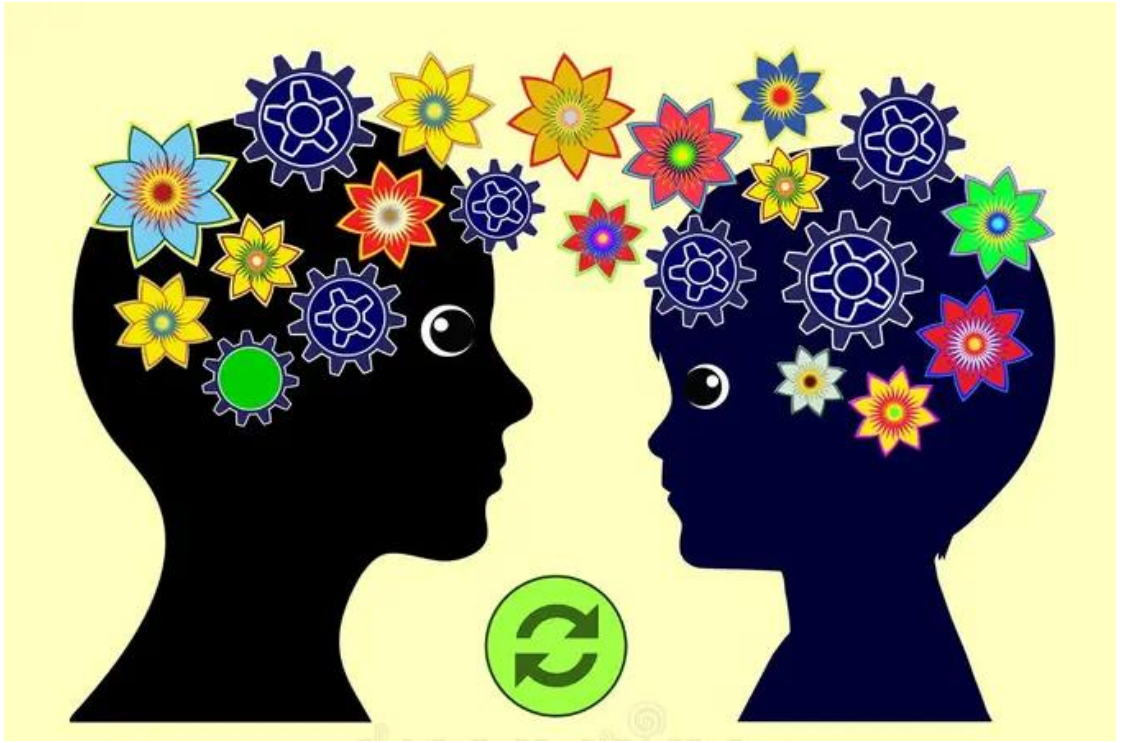



**FIGURE 2**

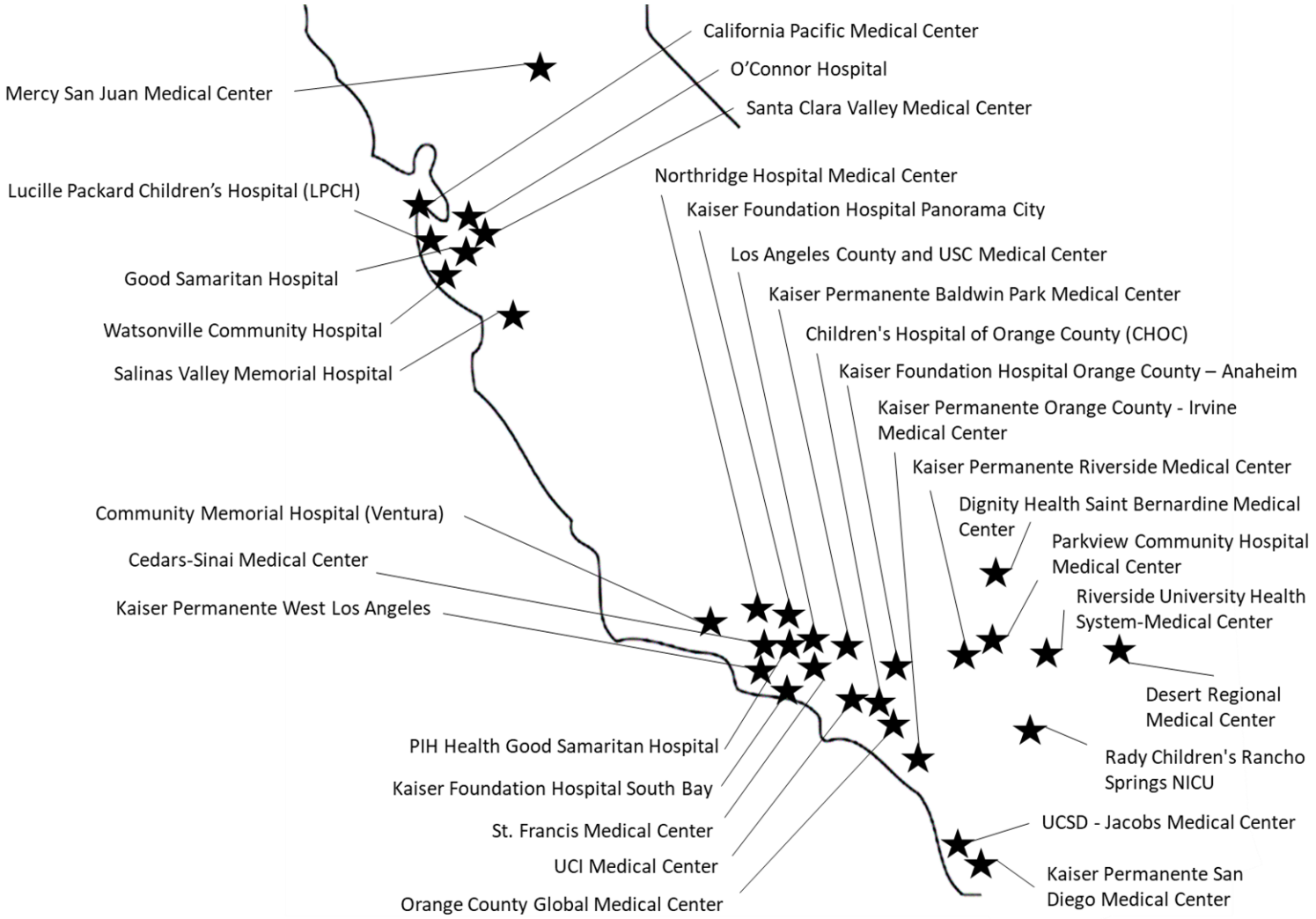
Distribution of AUR values by level of care for all NICUs from 2013 to 2016. The y-axis displays kernel density, which is essentially a smoothed frequency distribution histogram used to estimate the density of the distribution of values (the relative percent of NICUs at each admission rate value). A, 2013. B, 2014. C, 2015. D, 2016.

Schulman. Variations in antibiotic use. Pediatrics 2018

The Anatomical Lesson of Professor Pauw
by Andries Stock (Netherlands), 1616.



# OASCN – Who Participated?



# OASCN Faculty Panel, Learning Team, and Evaluation Team

The following team members comprised the OASCN Faculty Panel, Learning Team, and Evaluation Team in 2021-2023.

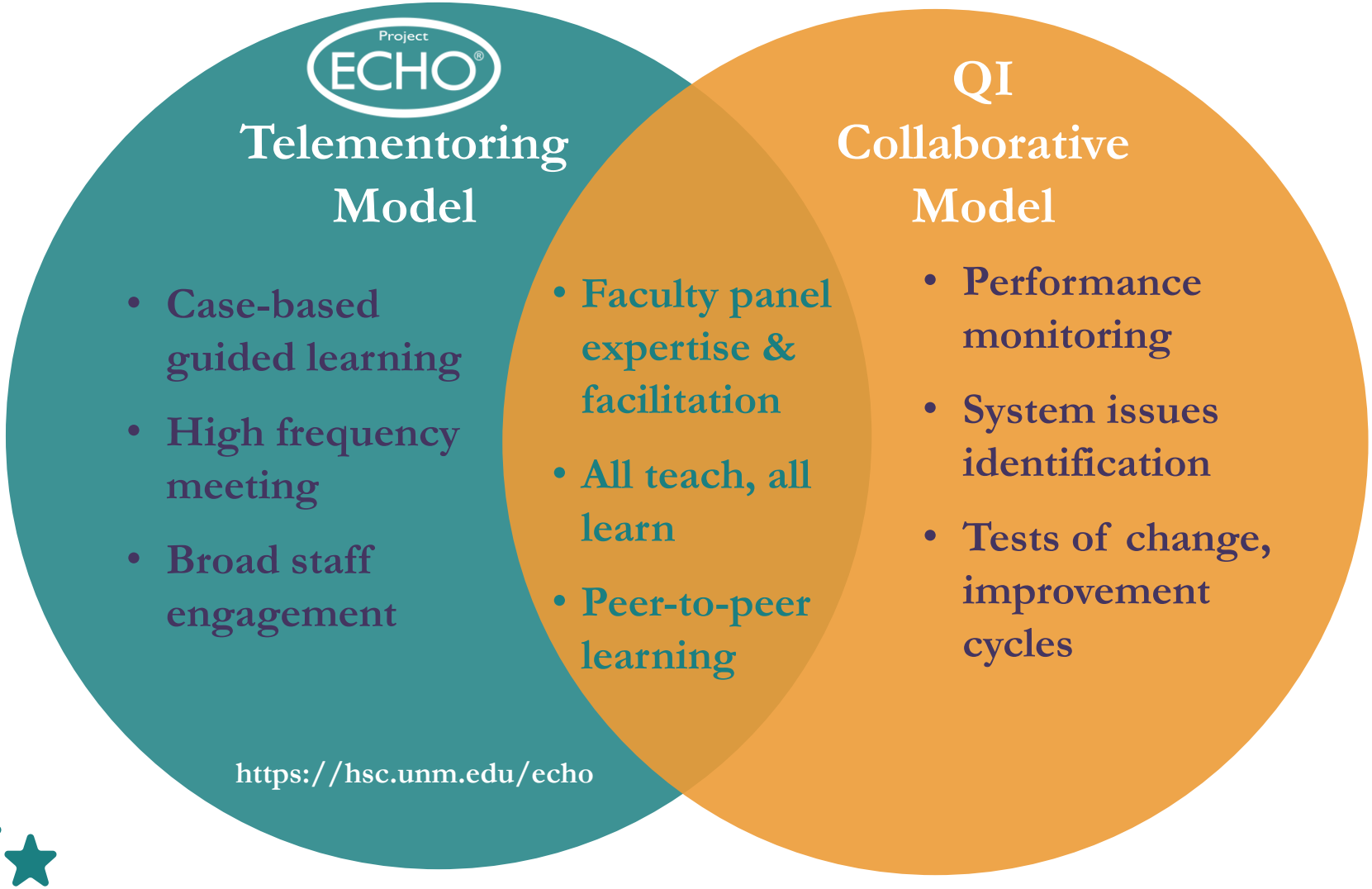
Alice Pong, MD, Rady Children's
Bill Benitz, MD, Stanford University
Courtney Armstrong, MPH, RAND Corporation
Cynthia Gong, PharmD, PhD, USC
Henry Lee, MD, MS, CPQCC
Irineo Cabreros, PhD, RAND Corporation
Jack Kroger, MSc, RAND Corporation
Janine Bohnert, BS, CPQCC
Jason Sauberan, PharmD, Rady Children's
Joseph Schulman, MD, MS, California Children's Services (CCS)
Ken Zangwill, MD, The Lundquist Institute at Harbor-UCLA Medical Center
Kristen Schaffer, MPH, CPQCC
Kurlen Payton, MD, Cedars-Sinai Medical Center
Lillian Sie, MPH, CPQCC
Linda Lefrak, MSN, RN, California Department of Public Health
Megan Schuler, PhD, RAND Corporation
Michael Bolaris, MD, Harbor-UCLA Medical Center
Nabeel Qureshi, MPH, RAND Corporation
Peter Mendel, PhD, RAND Corporation
Victor Wong, MD, Kaiser Permanente

https://www.cpqcc.org/improvement/projects/OASCN

# OASCN Overview & Results

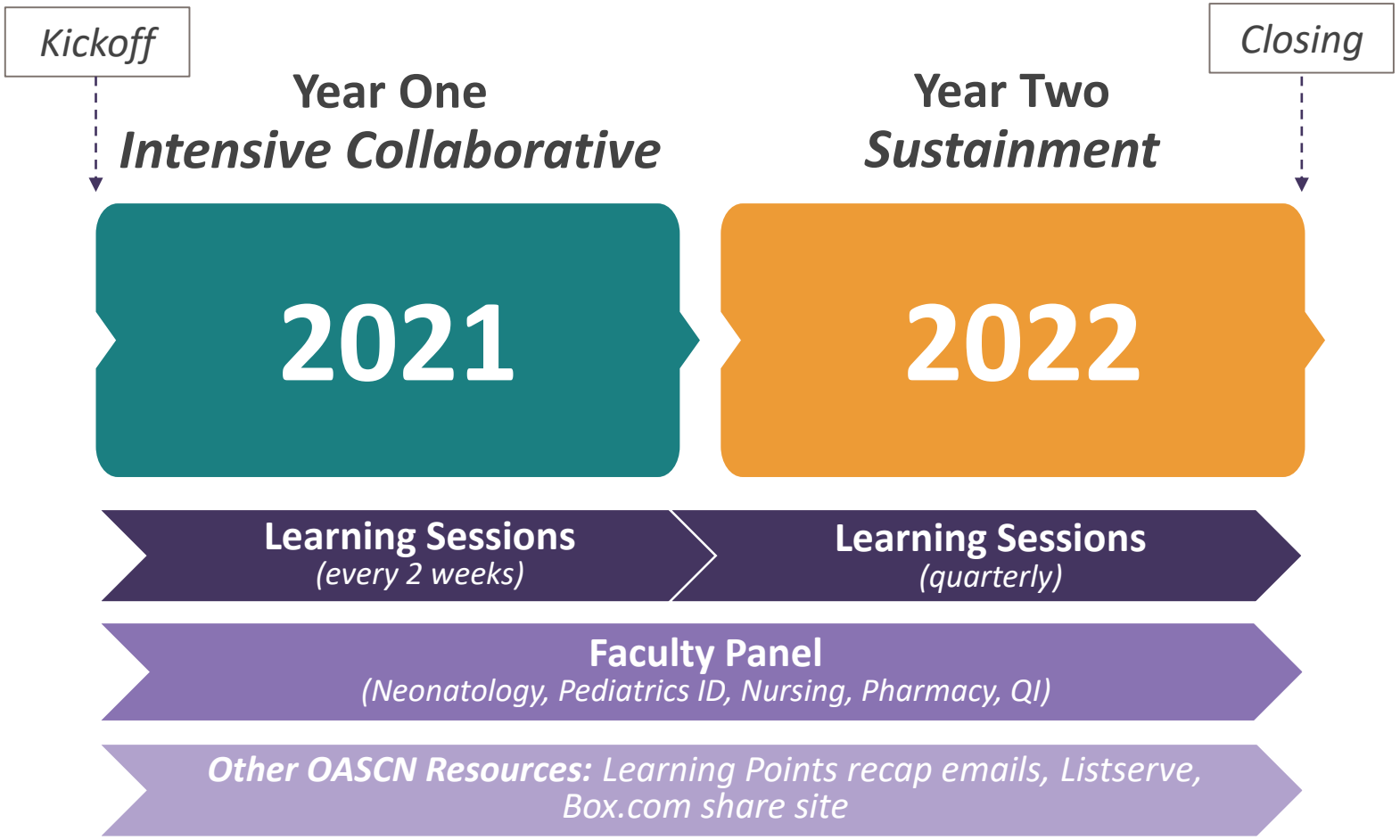
Peter Mendel, PhD

# The OASCN Collaborative: A "Blended" Design

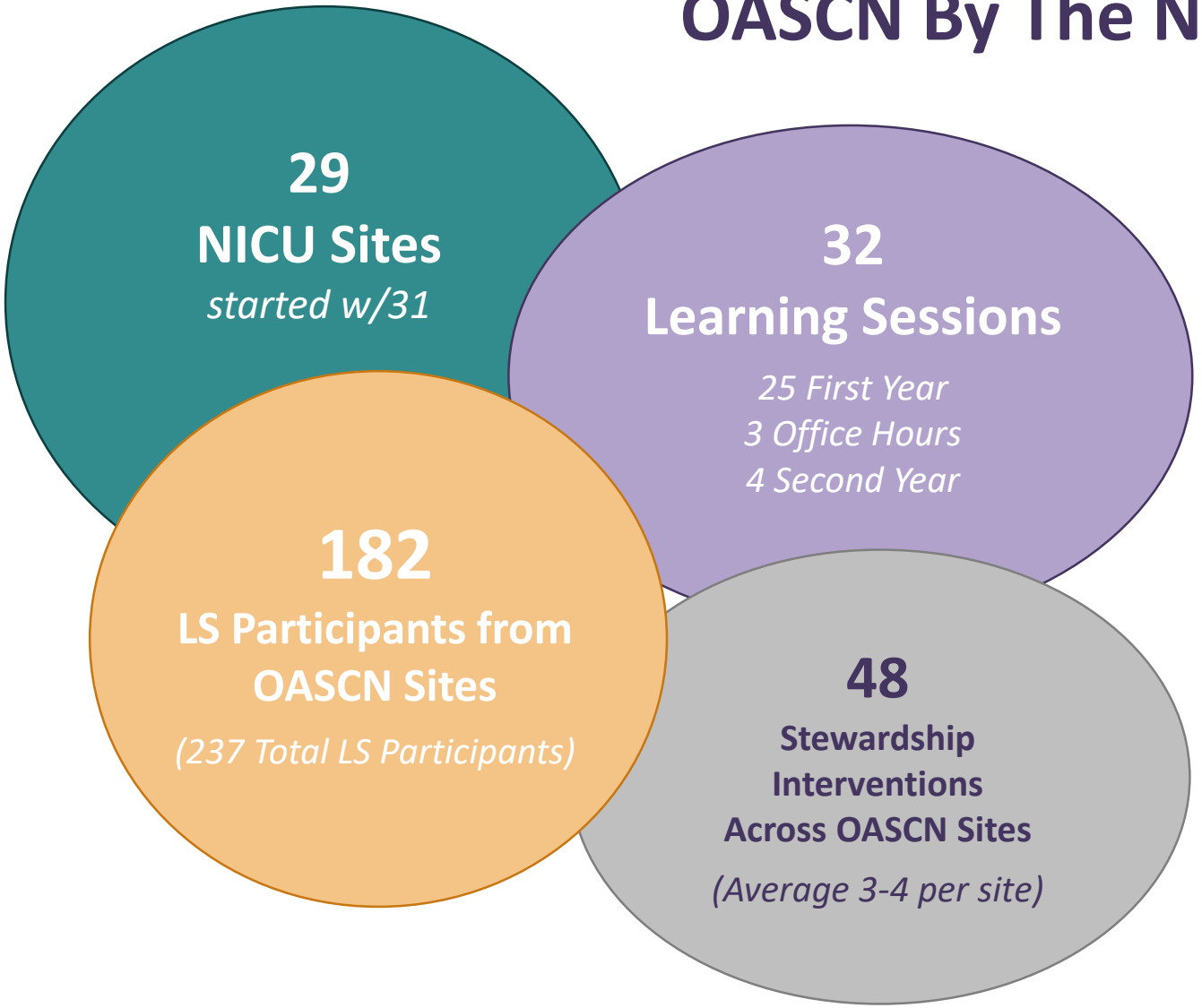



First antibiotic stewardship ECHO for NICUs!

# OASCN Timeline



# OASCN By The Numbers

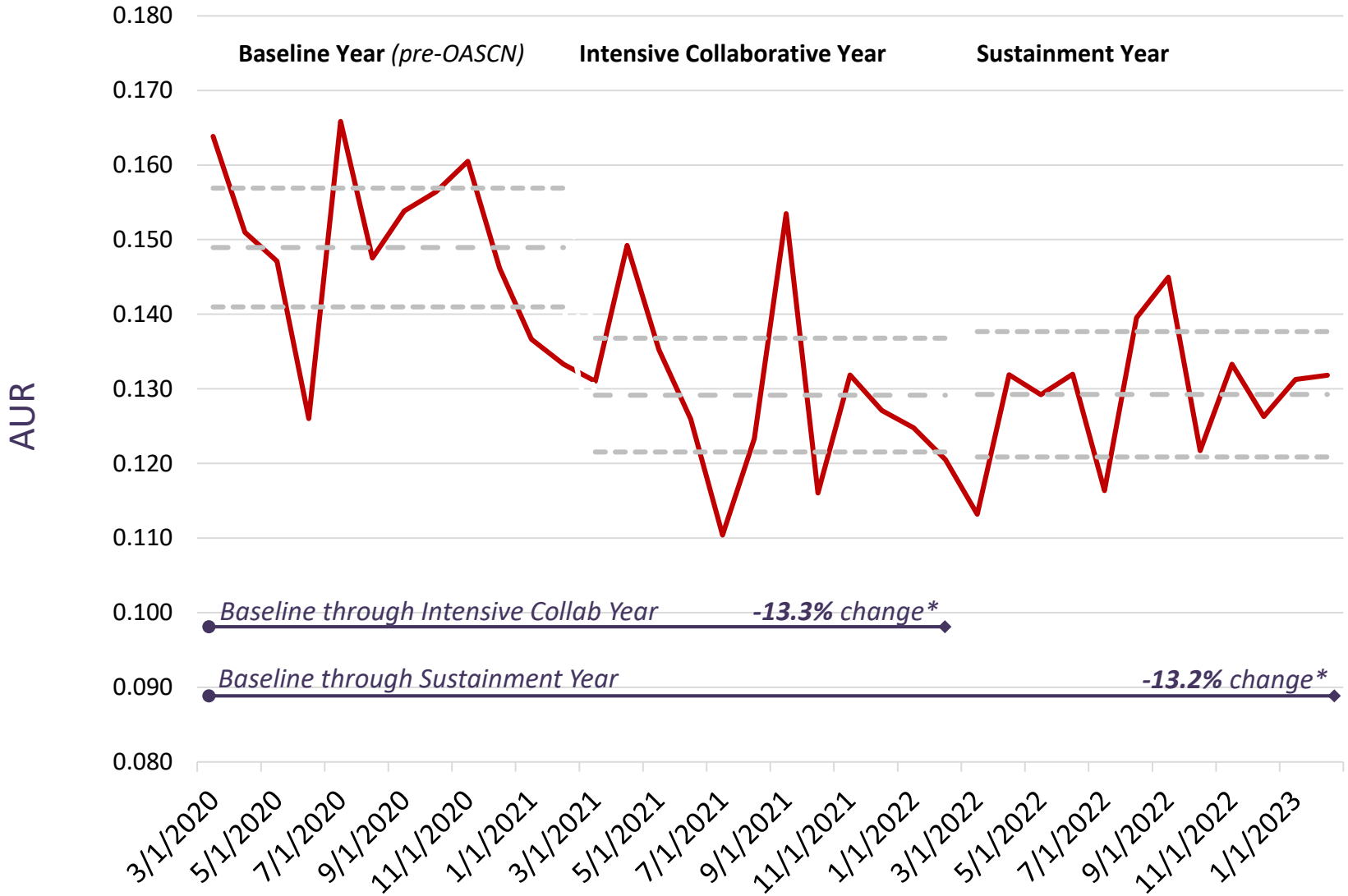



**60**
**Site Leader Interviews**
*(2 waves)*
***89*** *Site check-in calls*

**455**
**Prescriber Surveys**
*72% response rate (pre)*
*60% response rate (post)*

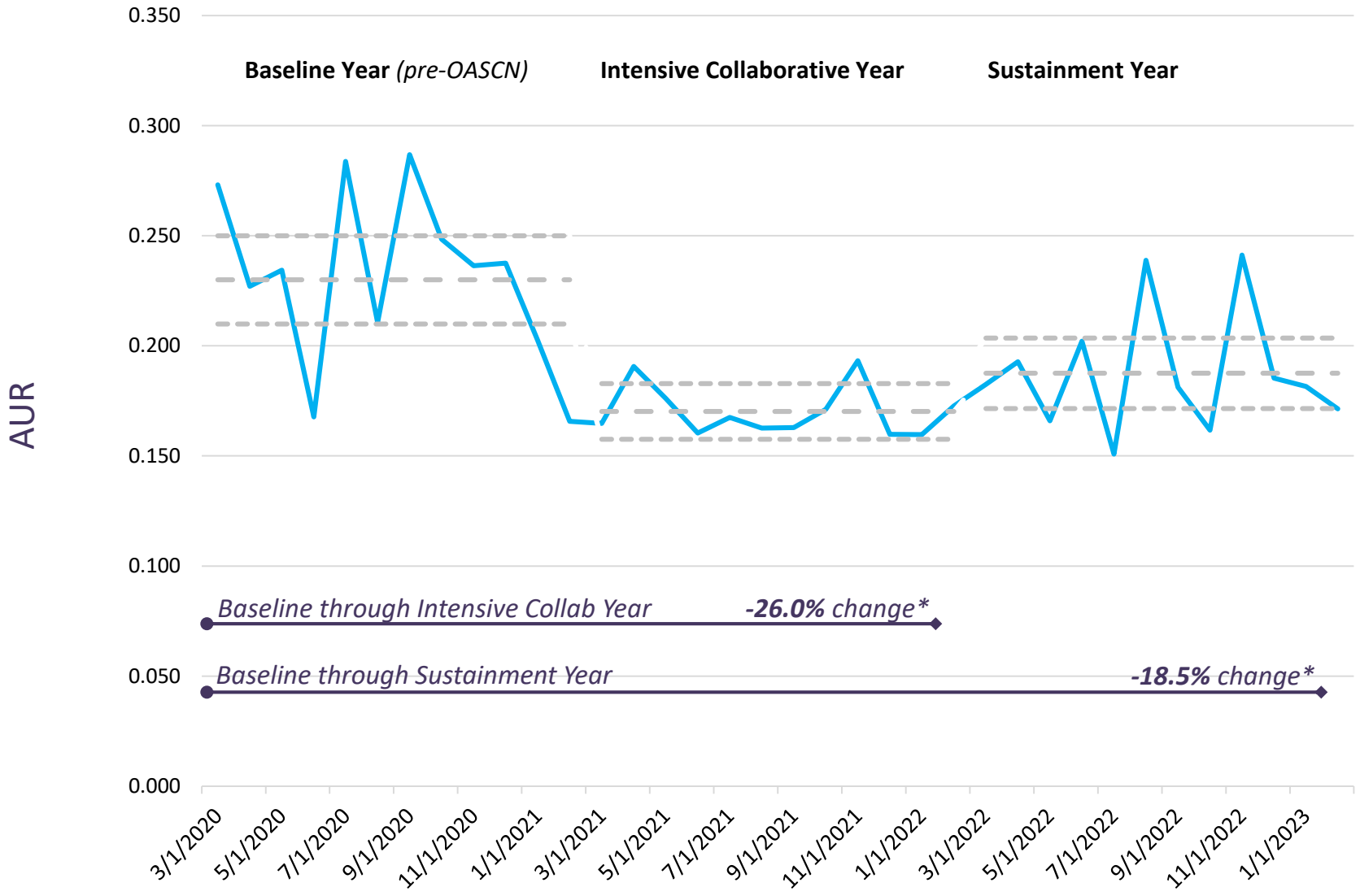
**845**
**Antibiotic Use (AUR) Data Points**
*349 total AUR*
*248 term AUR*
*248 preterm AUR*

# OASCN Mean Site AUR (Total)



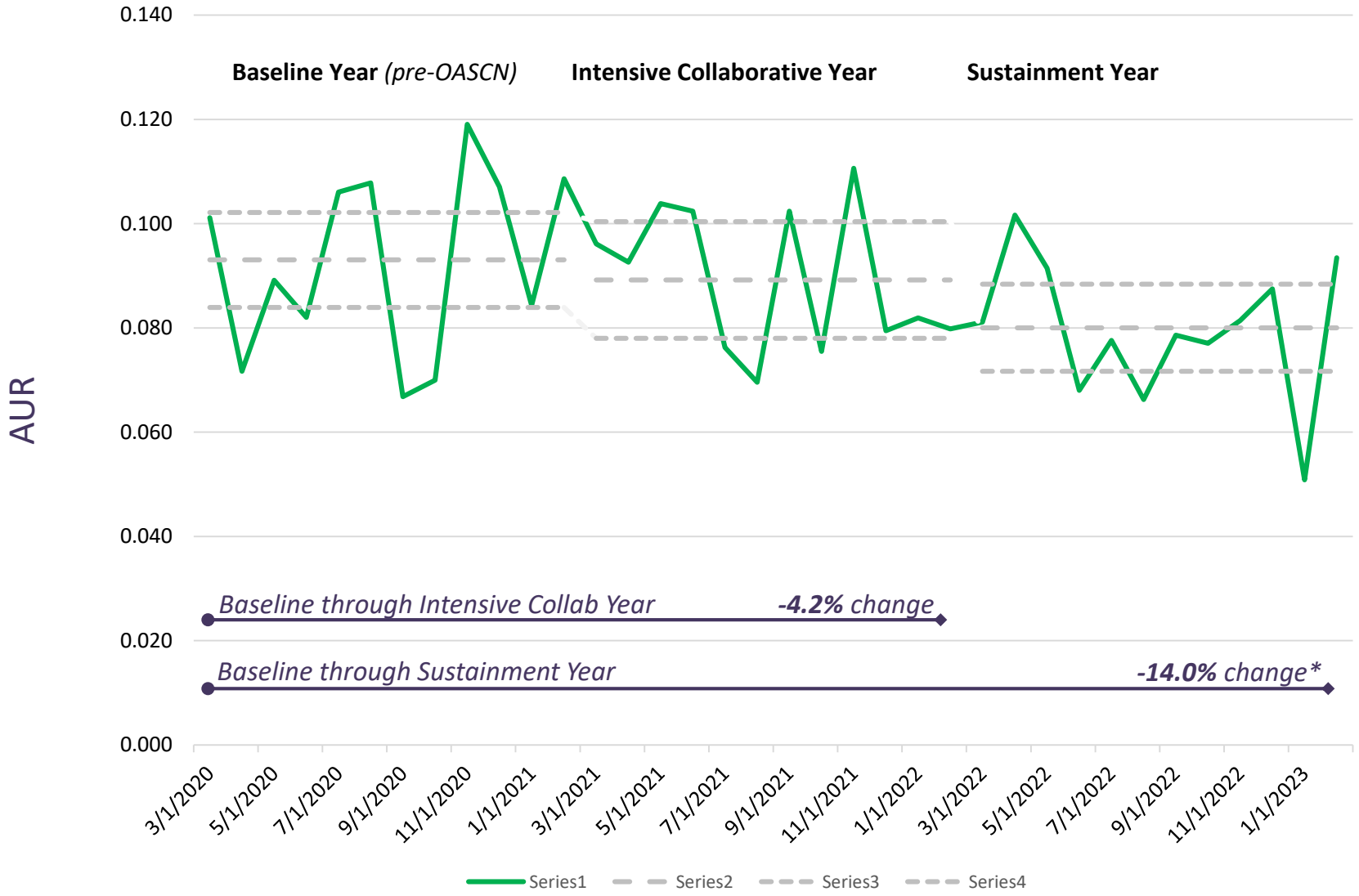

*Preliminary results. * $p < 0.05$*

# OASCN Mean Site AUR (Term)




*Term: ≥ 35 weeks gestational age. Preliminary results. * $p < 0.05$*

# OASCN Mean Site AUR (Preterm)

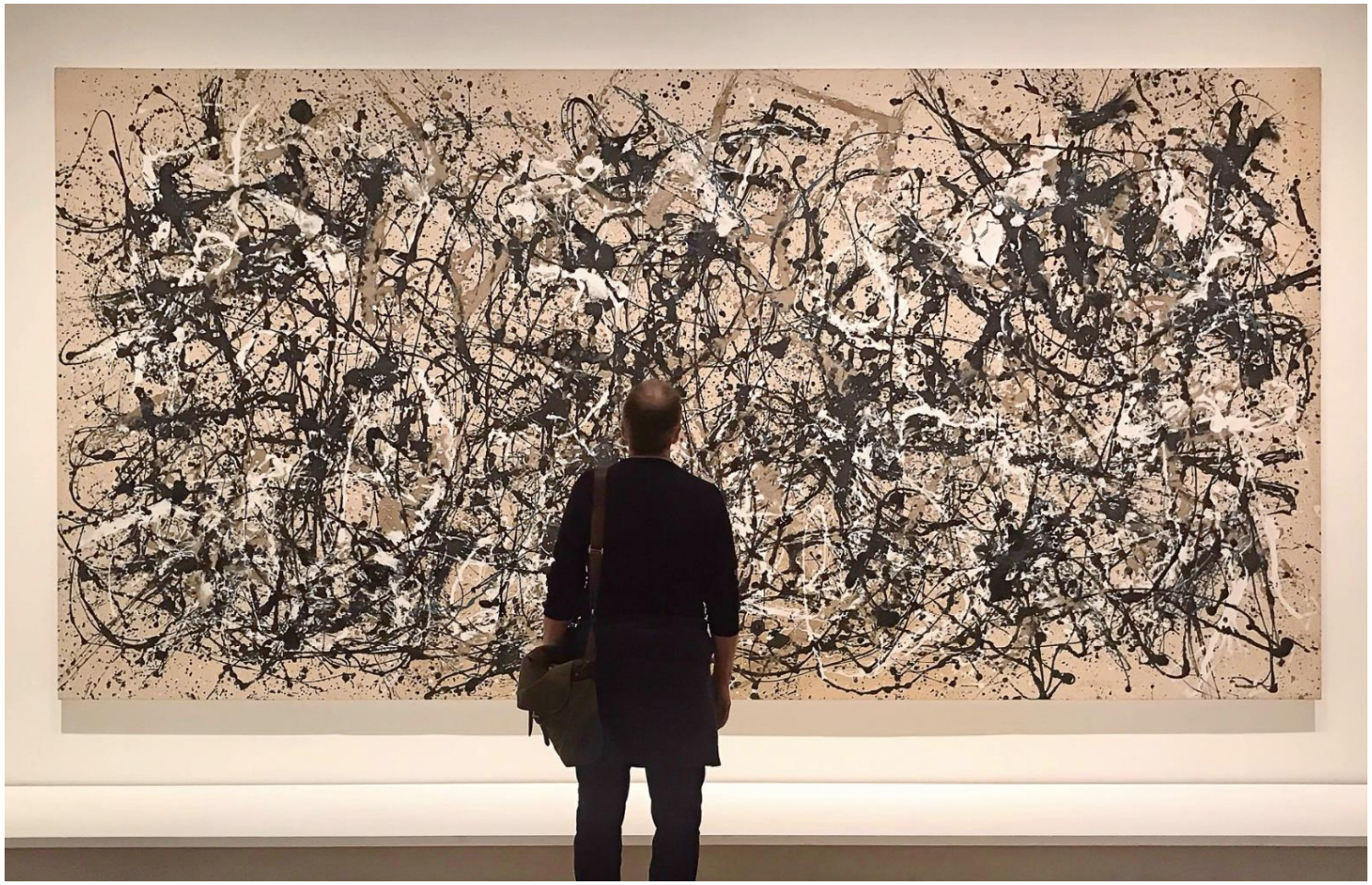



*Preterm: < 35 weeks gestational age. Preliminary results. * p < 0.05*

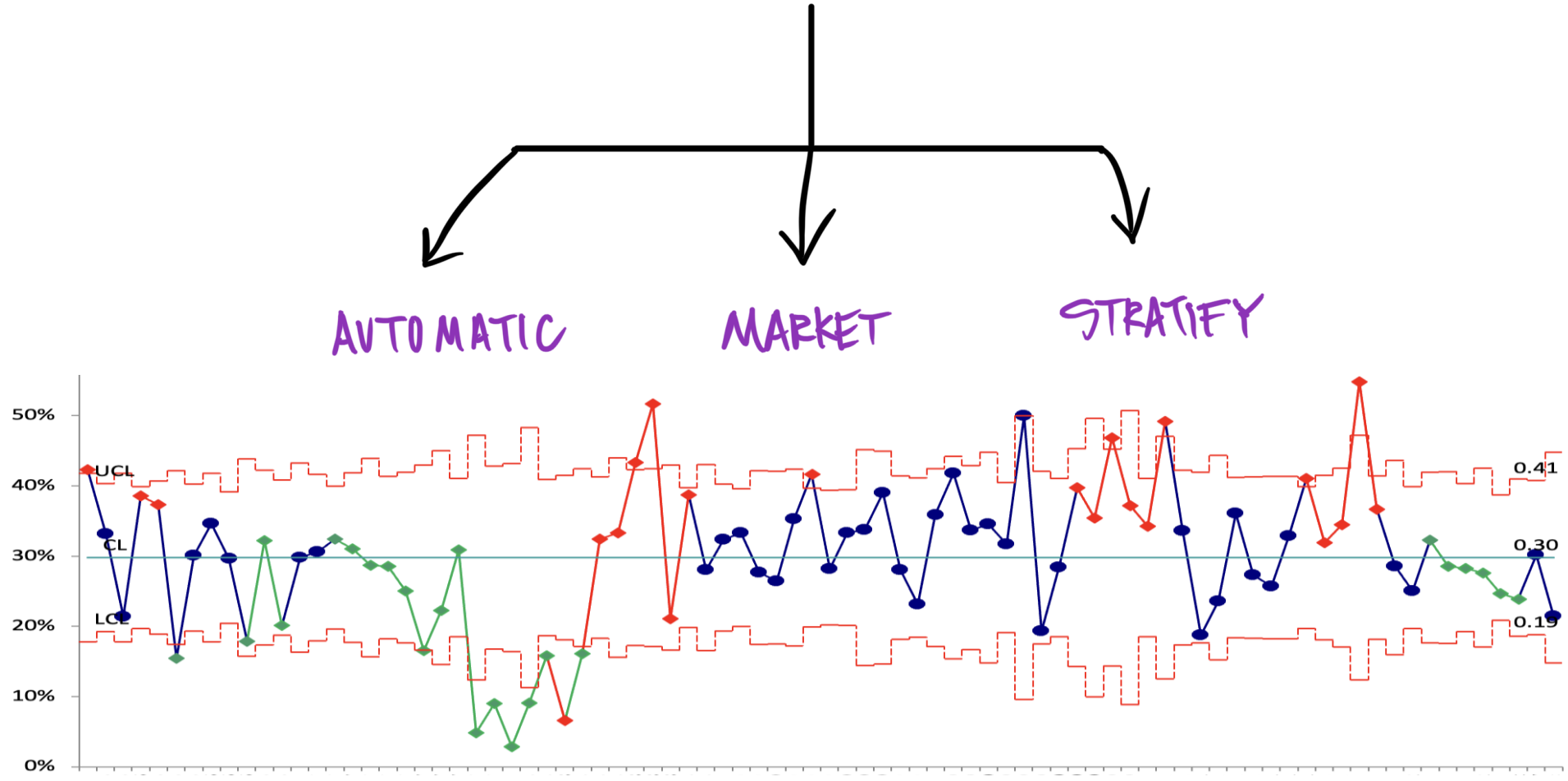
# OASCN Top 3 Lessons Stewardship Improvement

Kurlen Payton, MD

# What lessons can we pass on?



# # 1 **Measure** Antibiotic Use Effectively



# # 2 Engage Everyone with Vignettes

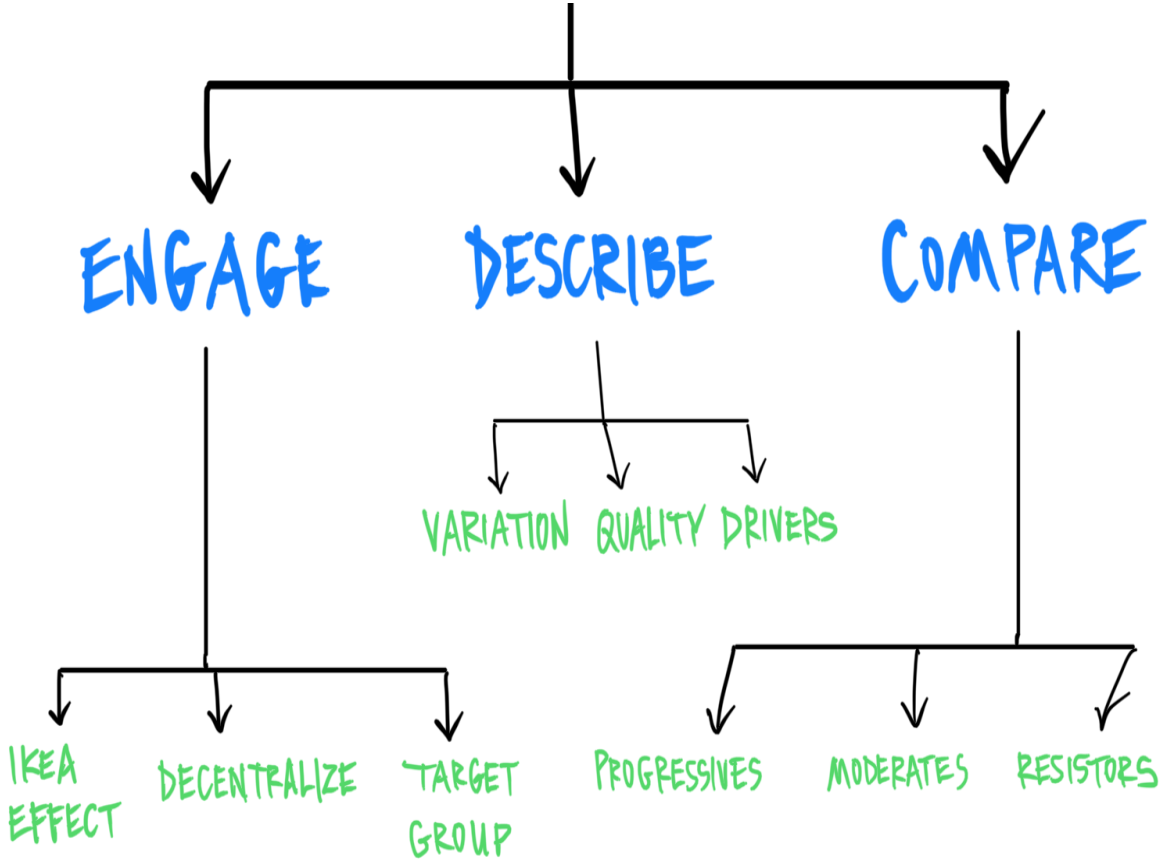




*Photo Credit: Jesus Renedo*

# Vignettes Engage, Describe, Compare

Case:

Well appearing newborn with risk factors

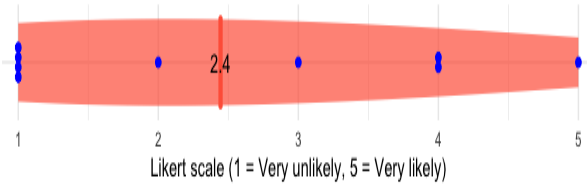
| Pre-OASCN Vignettes | | Post-OASCN Vignettes |
|---|---|---|
| 1/2 | **Order CRP?** | 1/3 |
| CRP 18 mg/L<br>1/4 | **Start Abx?** | ~ 1/10 |
| CRP 56 mg/L<br>2/3 | **Start Abx?** | 1/2 |

# Poll your colleagues with this vignette

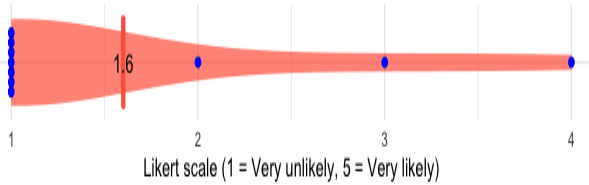
Case:

Well appearing newborn with risk factors

**Pre-OASCN Vignettes**

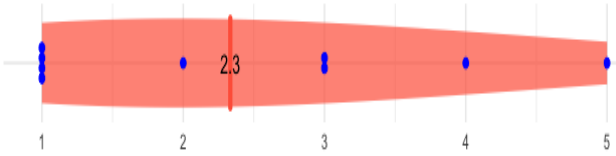



**Post-OASCN Vignettes**

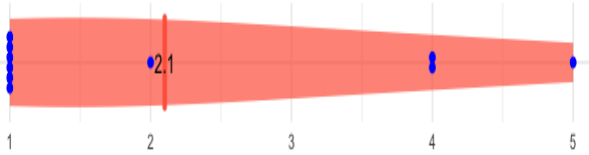



# 1
Order CRP?

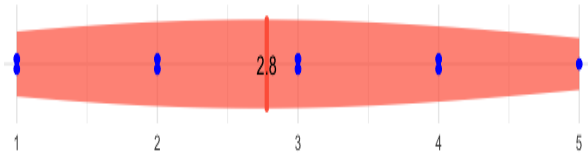
CRP 18 mg/L



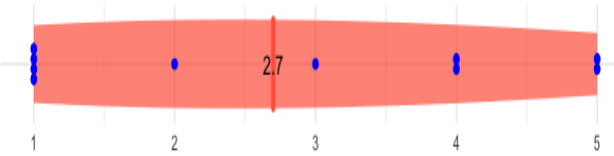

# 2
Start Abx?



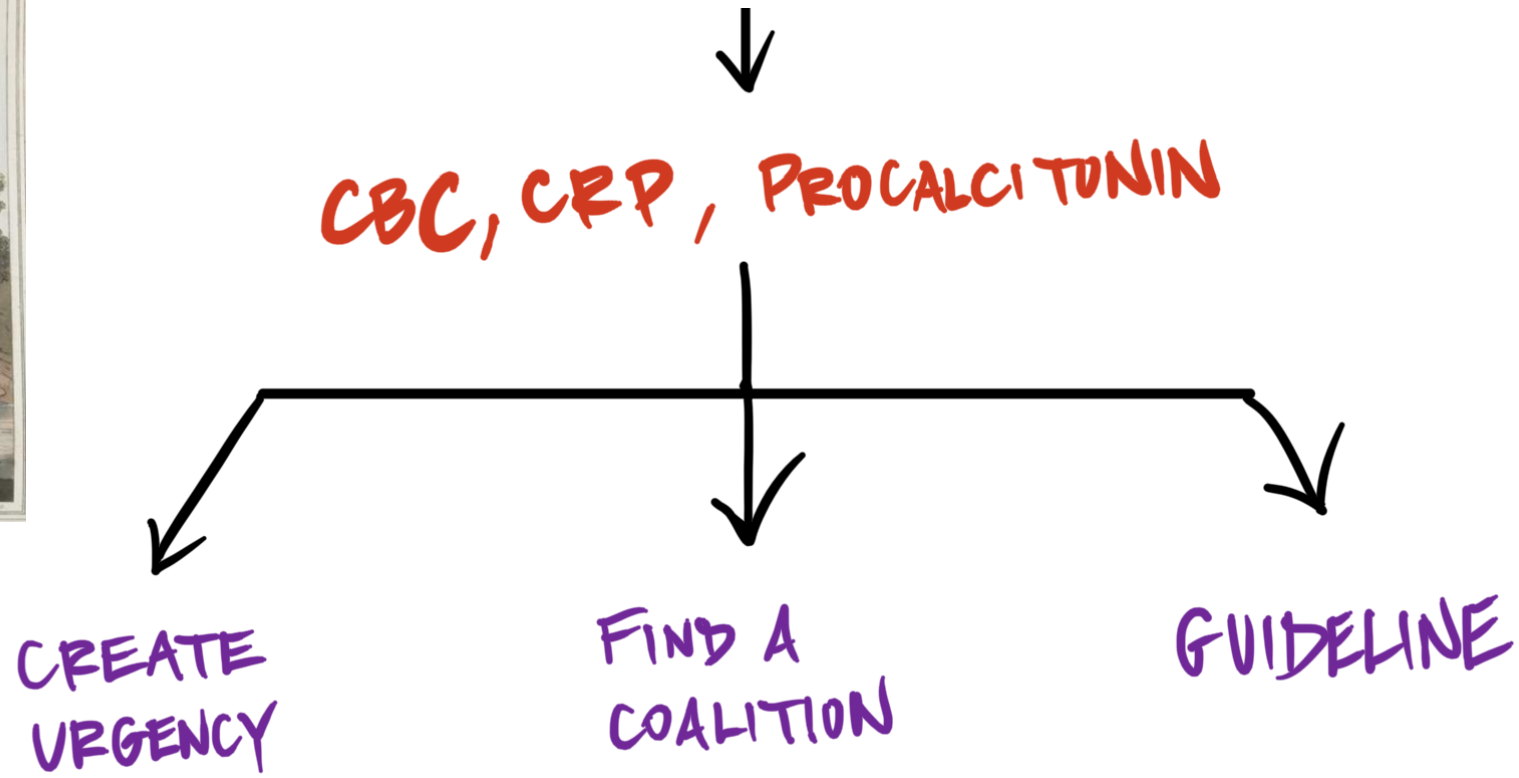

CRP 56 mg/L




# 3
Start Abx?

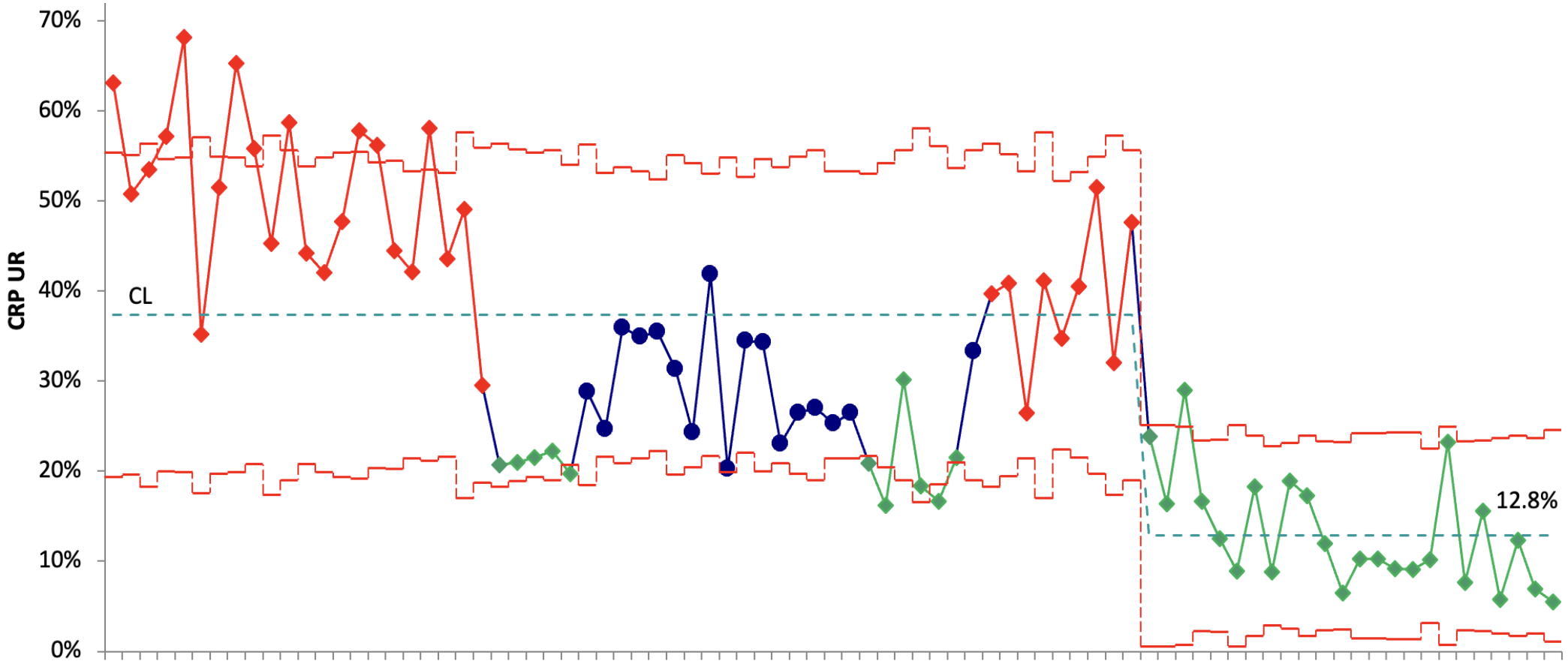


# # 3 De-implement old practices




Burton et al. Theory and practical guidance for effective de-implementation of practices across health and care services: a realist synthesis. Southampton (UK): NIHR Journals Library; 2021 Feb. PMID: 33555774.

# De-implementing CRP for EOS evaluations

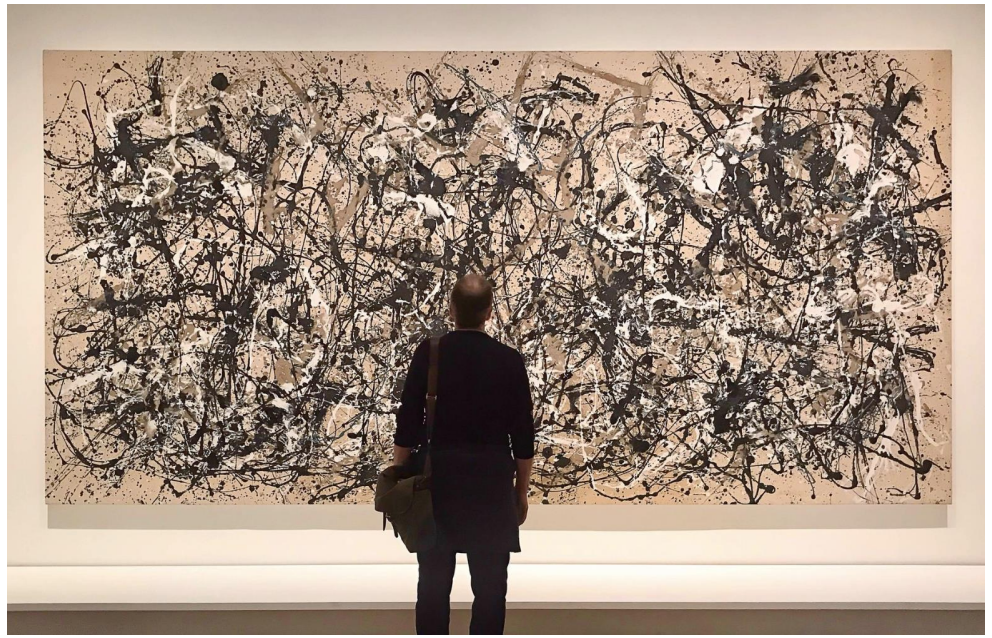


# Top 3 OASCN Lessons for Stewardship Improvement

**M**easure effectively

**E**ngage everybody - vignettes

**D**e-implement old practices



Data and QI Tools for Stewardship (16 minutes):
https://www.youtube.com/watch?v=RS5oFJmUtRI

Inflammatory markers for EOS and LOS (14 minutes):
https://www.youtube.com/watch?v=v82319mqrz0

# Learning Points – The Fabulous Thirteen

| # | |
|---|---|
| 1 | *Stop antibiotic by 36-48 hrs unless clear evidence of site-specific infection. Actively flesh out DDx.* |
| 2 | *KP calculator lessens antibiotic use. Serial clinical examination is important, esp in the first 24hrs.* |
| 3 | *Biomarkers have very low PPV for EOS. Not a required part of sepsis evaluation.* |
| 4 | *Blood cultures have high NPV if >1cc obtained. Think hard before treating viridans streptococcus and coag (-) staph in EOS.* |
| 5 | *For selected low risk preterms: no antibiotics (EOS).* |
| 6 | *Quality stewardship study showed no harm in treating pneumonia for 5d, assuming good clinical course.* |
| 7 | *Double gram negative coverage for EOS (or LOS) is unnecessary.* |
| 8 | *Empiric antibiotic for NEC should not exceed 5-7d. Avoid vancomycin. Anaerobic coverage only if perforation likely.* |
| 9 | *Don't' forget to use nasal bact/viral PCR test in sick babies.* |
| 10 | *PDSAs, QI data, and A3 reports very useful. Small scale improvements can overcome resistance to change.* |
| 11 | *Minimize unnecessary syphilis therapy by calling health dept (more data) and considering serofast state.* |
| 12 | *Ampho can be used if thrombocytopenic. Fluconazole also good first line drug (if very little C. krusei & C. glabrata).* |
| 13 | *Urine culture should be sent to lab/refrigerated ASAP; if >1-2hrs @ room temperature, may be falsely positive.* |

Total of 47 learning points from OASCN Year 1

# OASCN Resources Demo

Ken Zangwill, MD

# OASCN Resource Bundle

- OASCN resources are available on the CPQCC website
- The landing page has a list of topic areas and supplemental resources (e.g. learning points, references, timeline)
- Each topic area brings you to a page with relevant:
  - Didactics (learning session recordings and slides)
  - Learning Points (key points from learning sessions)
  - References (NICU stewardship-related publications)

www.cpqcc.org/resources/OASCN-resource-bundle

# For More Info

## OASCN Resource Bundle

Includes links to each topic area, OASCN didactic slides, videos, learning points, and references

www.cpqcc.org/improvement/projects/OASCN

## Project Overview

Includes the OASCN Timeline, Top Ten OASCN Learning Points, OASCN by the Numbers, list of participating NICUs, and relevant publications

www.cpqcc.org/resources/OASCN-resource-bundle

# OASCN Experiences: Highlights and Q&A with Participating Sites

Moderated by Kurlen Payton, MD

# Maria Fe Villosis, MD, FAAP

*Chief of Neonatology, KP Panorama City & Woodland Hills Medical Center*
*NICU Medical Director, KP Panorama City*

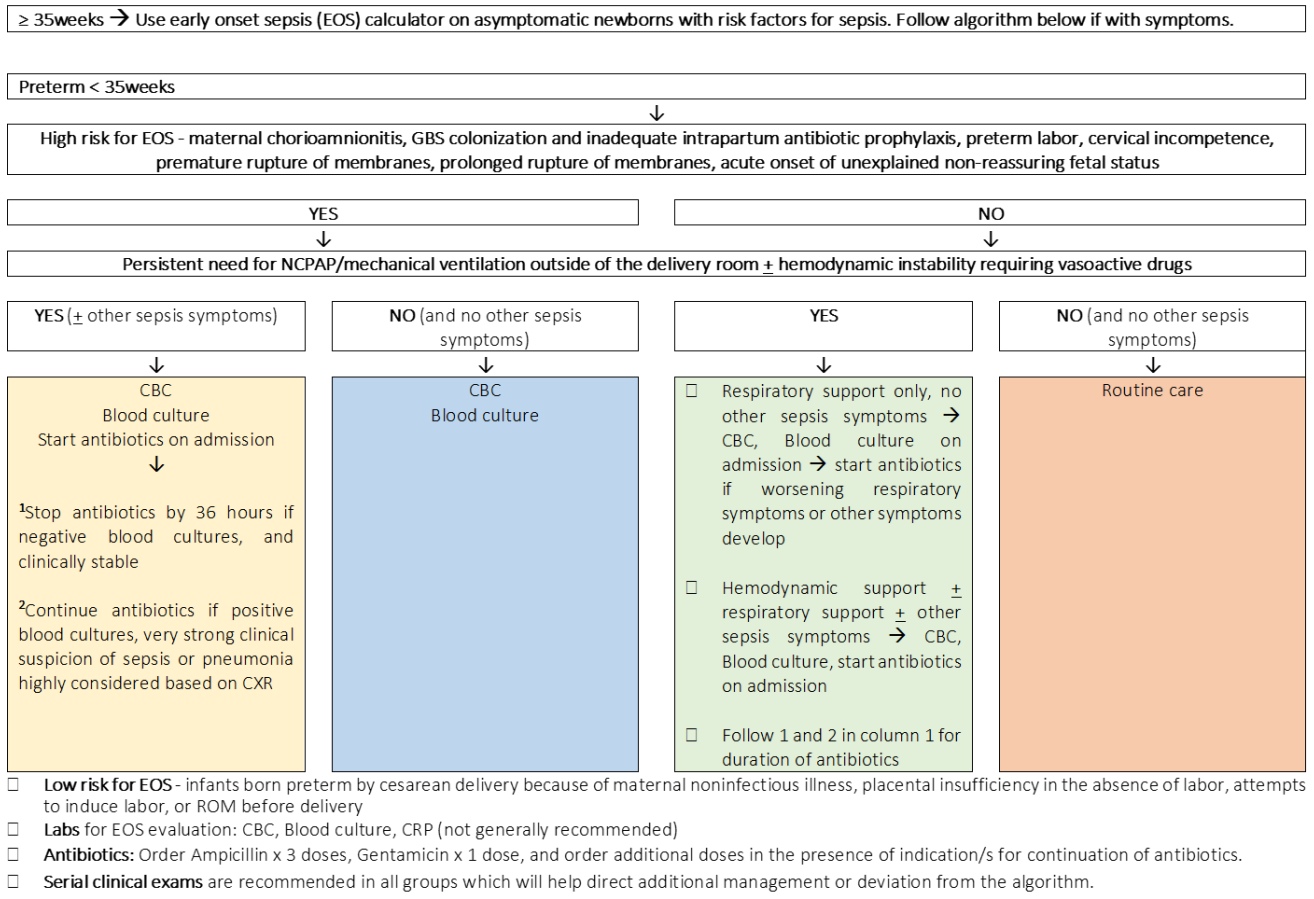
maria-fe.b.villosis@kp.org

# What were your top 1-2 successes during OASCN?

- Stop antibiotics at 36-hrs with negative blood cultures
- Compliance to antibiotic stewardship algorithm / guideline

# What new tools / guidelines did your team create as part of your participation in OASCN?

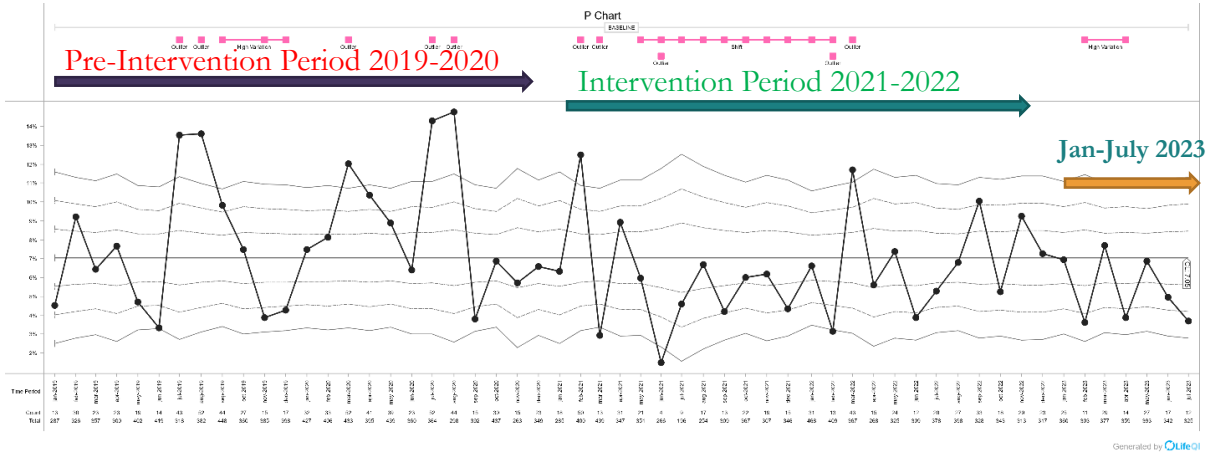
- KP-PC Antibiotic Stewardship Algorithm



# Have you been able to sustain improvements? YES

**Total AUR Pre-Intervention Period 2019-2020: 8%** **Total AUR Intervention Period 2019-2020 (OASCN): 6.4%**

**Total AUR Jan-July 2023: 5.5%** **Neonatal Antibiotic Exposure (NAE):** decrease by 47% from 6% (2019) to 3.2% (Jan-July 2023)




# Top 1-3 lessons for others?

- Adopt evidence-based practice through education, learnings, teamwork and collaboration.
- Change mindset for better patient care through QI process.

# Sevini (Sina) Hallaian, MD

*Assistant Professor*

*Cedars-Sinai Medical Center*

sevini.hallaian@cshs.org

# What were your top 1-2 successes during OASCN?

- Developing a stratified approach to the antibiotic utilization rate (AUR) metric
- Reducing AUR in both term and preterm infants by >20% in the first week of life

# What new tools/guidelines did your team create as part of your participation in OASCN?

## Cedars-Sinai NICU Early Onset Sepsis Guideline for Infants ≥ 35 Weeks

**Goals:**

1. To provide timely antibiotic treatment of early onset sepsis while minimizing unwarranted antibiotic exposure.
2. To encourage nursing involvement in serial physical exams.
3. To limit variability in antibiotic duration.

**Diagnostic Workup**

- ✓ Labs: Blood culture (minimum 1ml), CBC+d, Glucose, Gas
  - ➢ CRP and I:T ratio are neither sensitive nor specific for EOS and should not be routinely ordered.
  - ➢ Consider using Neonatal Early Onset Sepsis Calculator (incidence = 0.6/1000)
- ✓ Serial assessments by MD, NNP and nursing through 6HOL (see Table to right)

**Treatment**

- ✓ Ampicillin & Gentamicin
  - ➢ Use Ceftazidime if renal impairment or suspect meningitis
  - ➢ Use Acyclovir for suspected HSV
- ✓ Duration (from first negative blood culture):
  - Culture negative and stable: 36-48 hours
  - Culture Negative Sepsis: 5 days
  - UTI, Pneumonia: 7 days
  - Gram-Positive Sepsis: 10 days
  - Gram-Negative Sepsis, GBS, or Gram-Positive Meningitis: 14 days
  - Gram-Negative Meningitis: 21 days
- ✓ Consult Pediatric Infectious Disease if culture positive and/or clinical deterioration
- ✓ Antibiotics should be discontinued by 36-48h unless there is clear evidence of infection

| |
|---|
| RR ≥70 bpm or<br>Apnea x10 sec or<br>FiO2 ≥5% from admission |
| Temp ≤36°C or ≥38°C |
| HR >160 bpm (during rest) or <80 bpm |
| Poor perfusion/color or<br>MAP < Gestational Age |
| Lethargic or Irritable |
| Critical Lab Values Including:<br>• Glucose ≤40 or ≥150 mg/dl<br>• pH ≤7.15, pCO2 ≥60 or BE ≥ -10<br>• Polys, Absolute (ANC) ≤1.5 (x 1000/UL)<br>• Platelets ≤100 (x1000/UL) |

## Cedars-Sinai Medical Center Early-Onset Sepsis Guideline for Infants <35 Weeks Gestation

Aim: To reduce antibiotic exposure among preterm infants by using delivery characteristics to determine antibiotic use

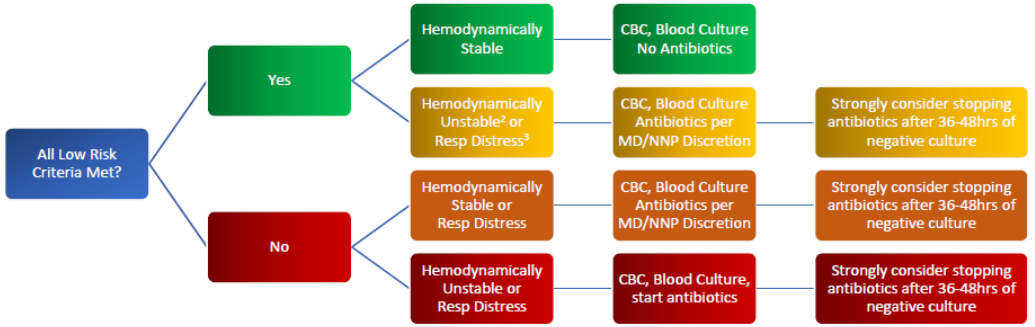
*Guidelines are meant to provide evidence-based criteria to aid in decision-making. As with all guidelines, care provided on a case-by-case basis per MD/NNP discretion is encouraged.*

**Low Risk Criteria:**

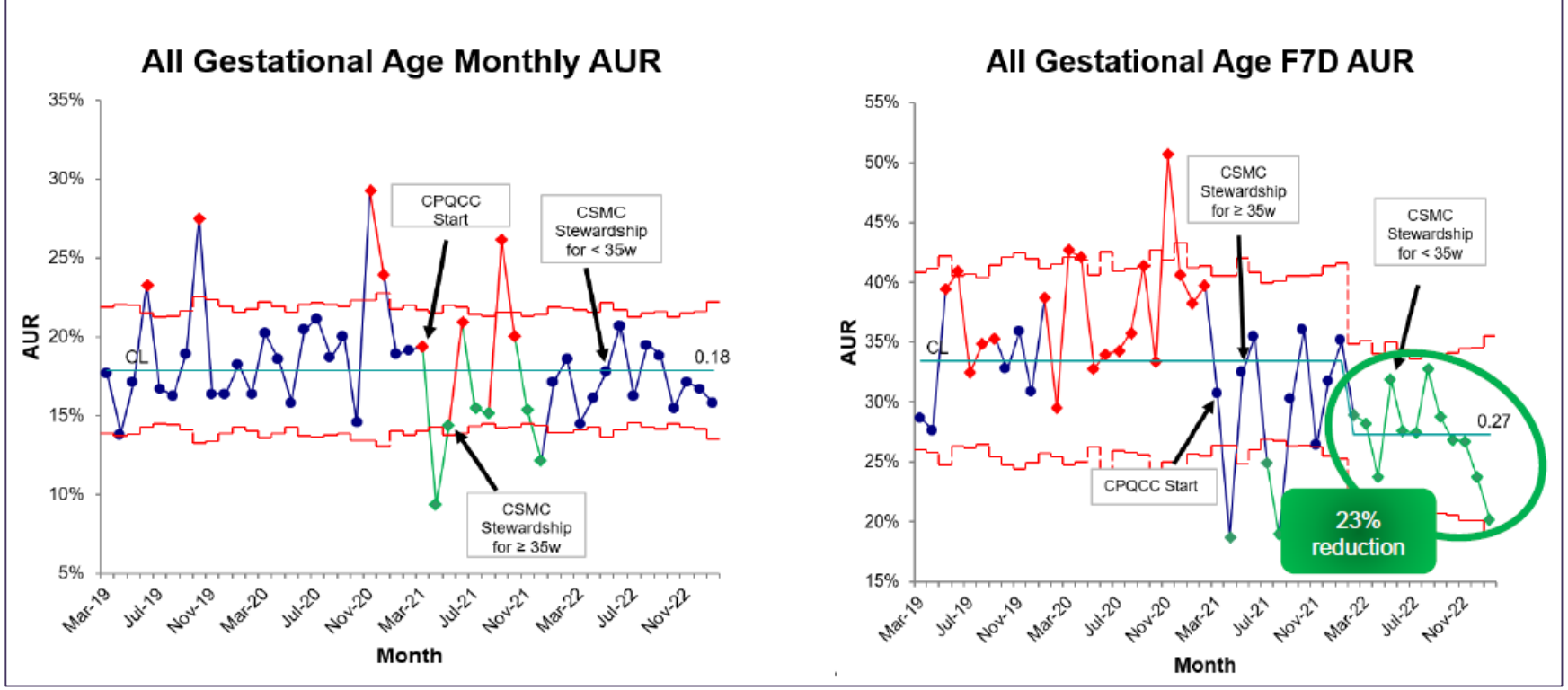
- ✓ Delivery for maternal indication
- ✓ Delivery by cesarean section
- ✓ Rupture of membranes at delivery
- ✓ Absent preterm labor
- ✓ Absence of intraamniotic infection or maternal fever
- ✓ Absence of Category III fetal tracings
- ✓ GBS negative, GBS unknown with rupture at delivery, or GBS unknown/positive with adequate treatment[1]

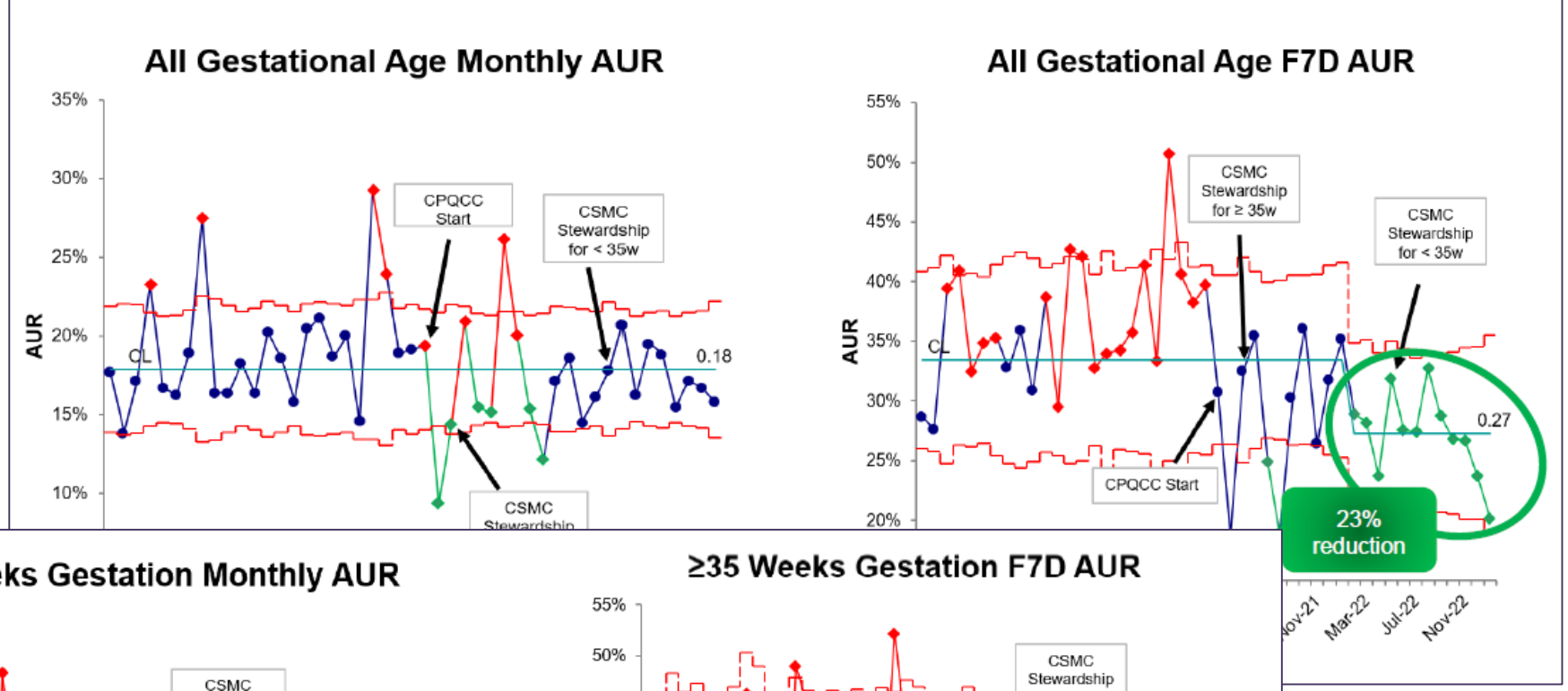
1. **Adequate intrapartum antibiotic prophylaxis** is defined as at least one dose of Penicillin, Ampicillin or Cefazolin ≥ 4 hours prior to delivery.
2. **Hemodynamically unstable** is defined as hypotension necessitating the use of vasopressors.
3. **Respiratory distress** is defined as supplemental oxygen, CPAP or mechanical ventilation for >1 hour after birth. In an otherwise *low-risk stable* infant, this is not an indication for initiating antibiotics.

- ➢ **Neutropenia, leukopenia and/or thrombocytopenia** in an otherwise *low-risk stable* infant alone is not an indication for initiating antibiotics.
- ➢ **CRP** is neither sensitive nor specific for diagnosing EOS and its use is discouraged. **Bands and IT** have a low likelihood ratio for diagnosis of EOS.
- ➢ MD/NNPs should **reassess infant's status daily** to determine need for continued antibiotics rather than commit to prolonged antibiotic courses in the first 48 hours.
- ➢ Initial antibiotic choice should include **Ampicillin & Gentamicin**. Broadening of antibiotics for worsening clinical status is per MD/NNP discretion.
- ➢ 5 days of antibiotics is the recommended duration for **culture-negative sepsis**.

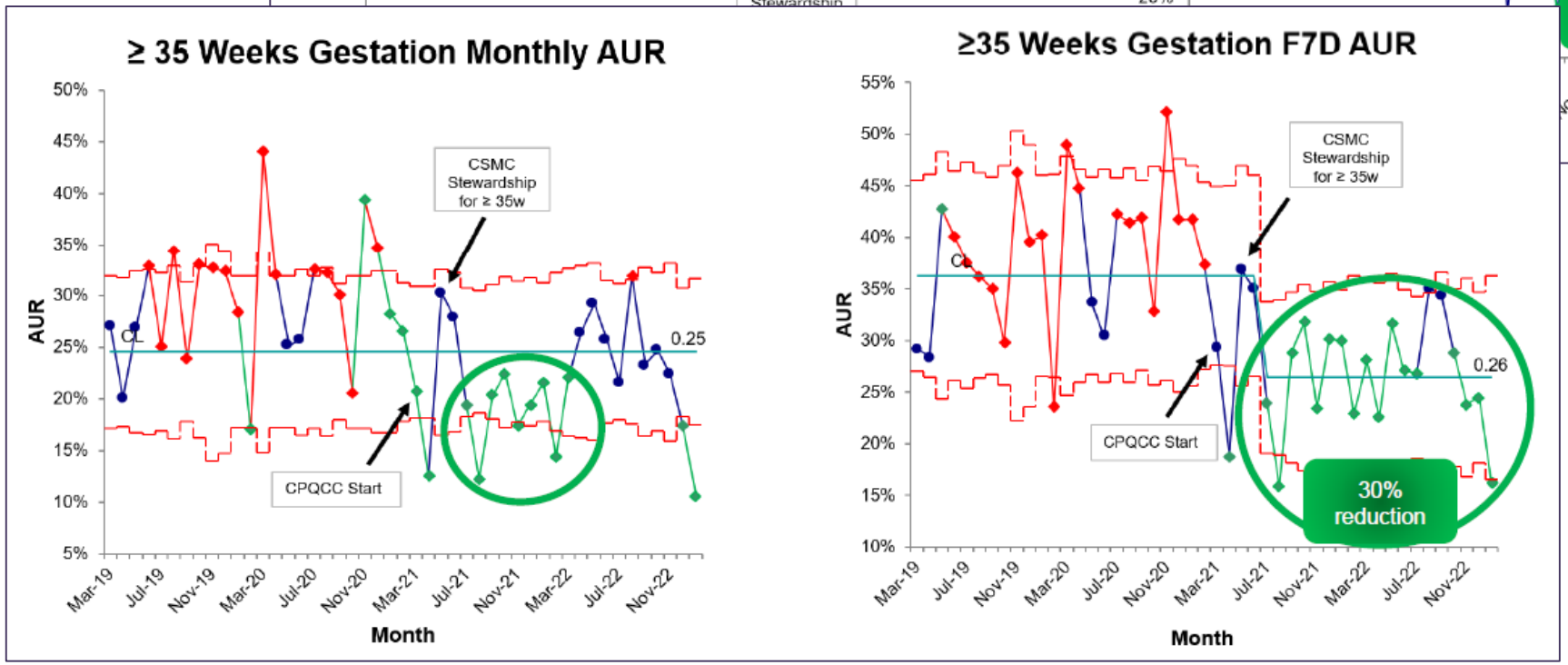



**Additional tools: case vignettes, 36-hour time outs, updated note templates, nursing rounds**


All Gestational Age Monthly AUR
AUR
35%
30%
25%
20%
15%
10%
5%
CL
0.18
CPQCC Start
CSMC Stewardship for < 35w
CSMC Stewardship for ≥ 35w
Mar-19
Jul-19
Nov-19
Mar-20
Jul-20
Nov-20
Mar-21
Jul-21
Nov-21
Mar-22
Jul-22
Nov-22
Month
All Gestational Age F7D AUR
AUR
55%
50%
45%
40%
35%
30%
25%
20%
15%
CL
0.27
CSMC Stewardship for ≥ 35w
CSMC Stewardship for < 35w
CPQCC Start
23% reduction
Mar-19
Jul-19
Nov-19
Mar-20
Jul-20
Nov-20
Mar-21
Jul-21
Nov-21
Mar-22
Jul-22
Nov-22
Month

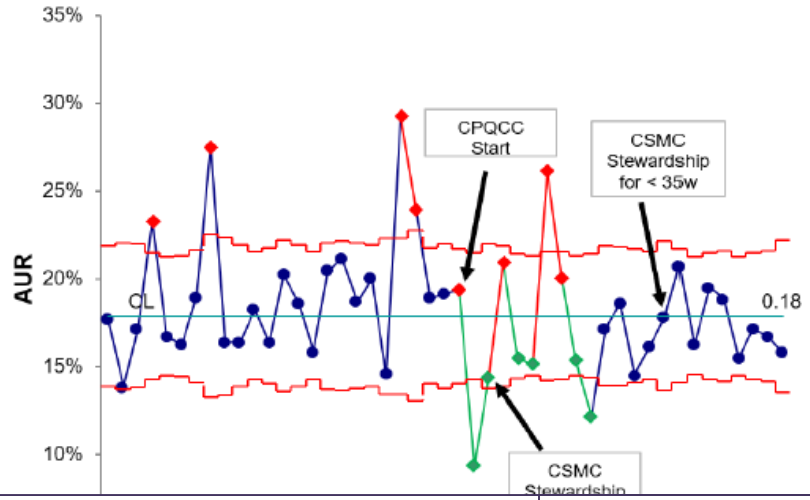

All Gestational Age Monthly AUR
AUR
CL
0.18
CPQCC Start
CSMC Stewardship for < 35w
CSMC Stewardship


All Gestational Age F7D AUR
AUR
CL
0.27
CSMC Stewardship for ≥ 35w
CSMC Stewardship for < 35w
CPQCC Start
23% reduction
Nov-21
Mar-22
Jul-22
Nov-22

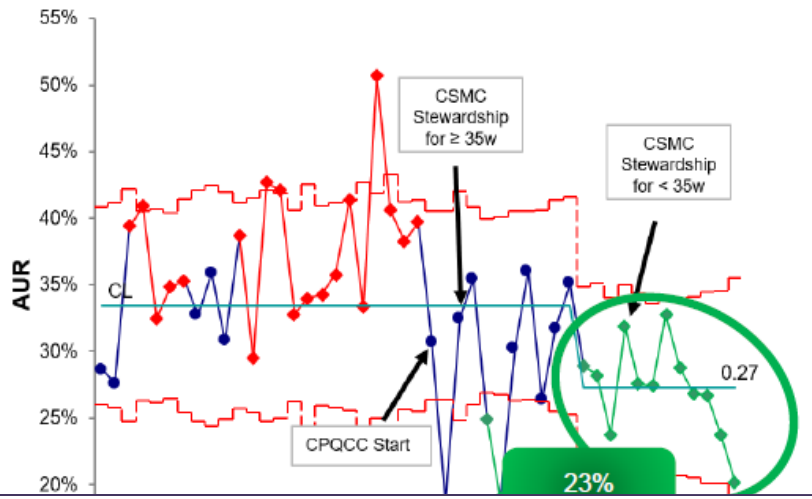

≥ 35 Weeks Gestation Monthly AUR
AUR
CL
0.25
CSMC Stewardship for ≥ 35w
CPQCC Start
Month


≥35 Weeks Gestation F7D AUR
AUR
CL
0.26
CSMC Stewardship for ≥ 35w
CPQCC Start
30% reduction
Month

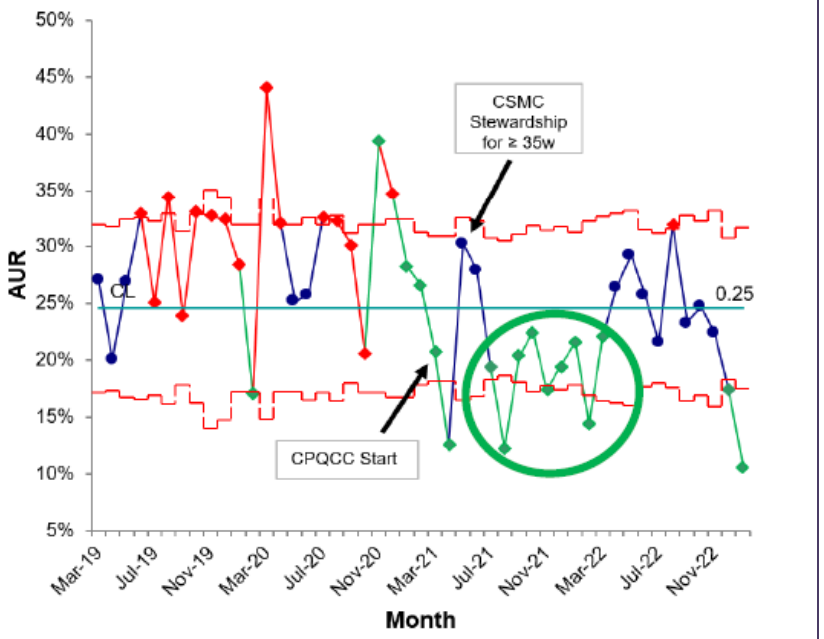
## All Gestational Age Monthly AUR



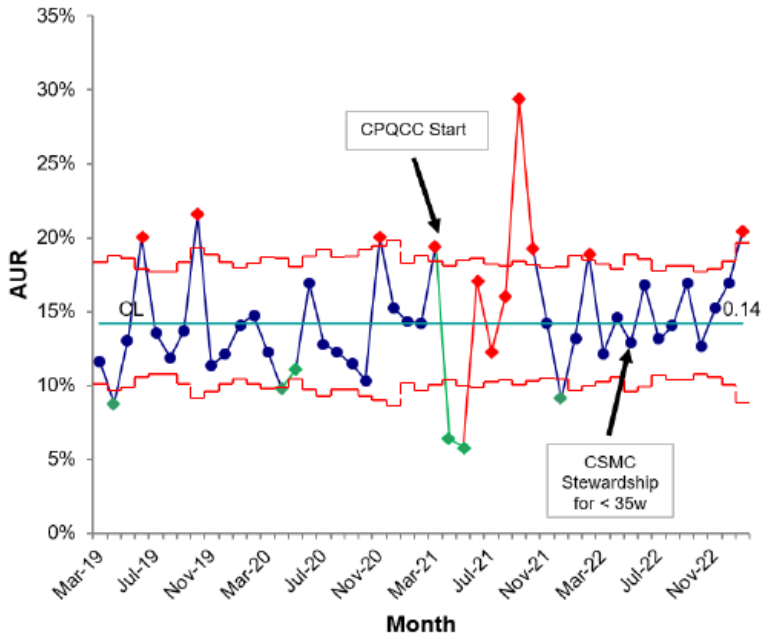

## All Gestational Age F7D AUR



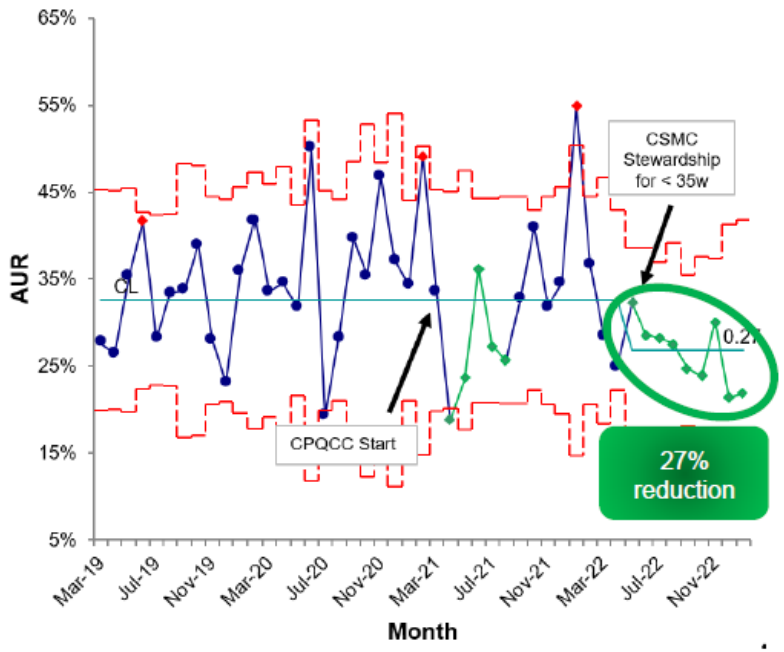

## ≥ 35 Weeks Gestation Monthly AUR




## < 35 Week Gestation Monthly AUR




## <35 Week Gestation F7D AUR



- **Have you been able to sustain improvements?**
  - Yes, sustained improvement through July 2023
  - Work recently accepted into Journal of Perinatology

- **Top 1-3 lessons for others?**
  - Unstratified metrics may overlook improvements and NICUs should consider stratifying AUR by gestational age and/or by first week of life
  - Separate processes for antibiotic stewardship of preterm and term babies should strongly be considered

# Kathy Weiss, MD

*Associate Professor Neonatology*
*Rady Children's Rancho Springs*

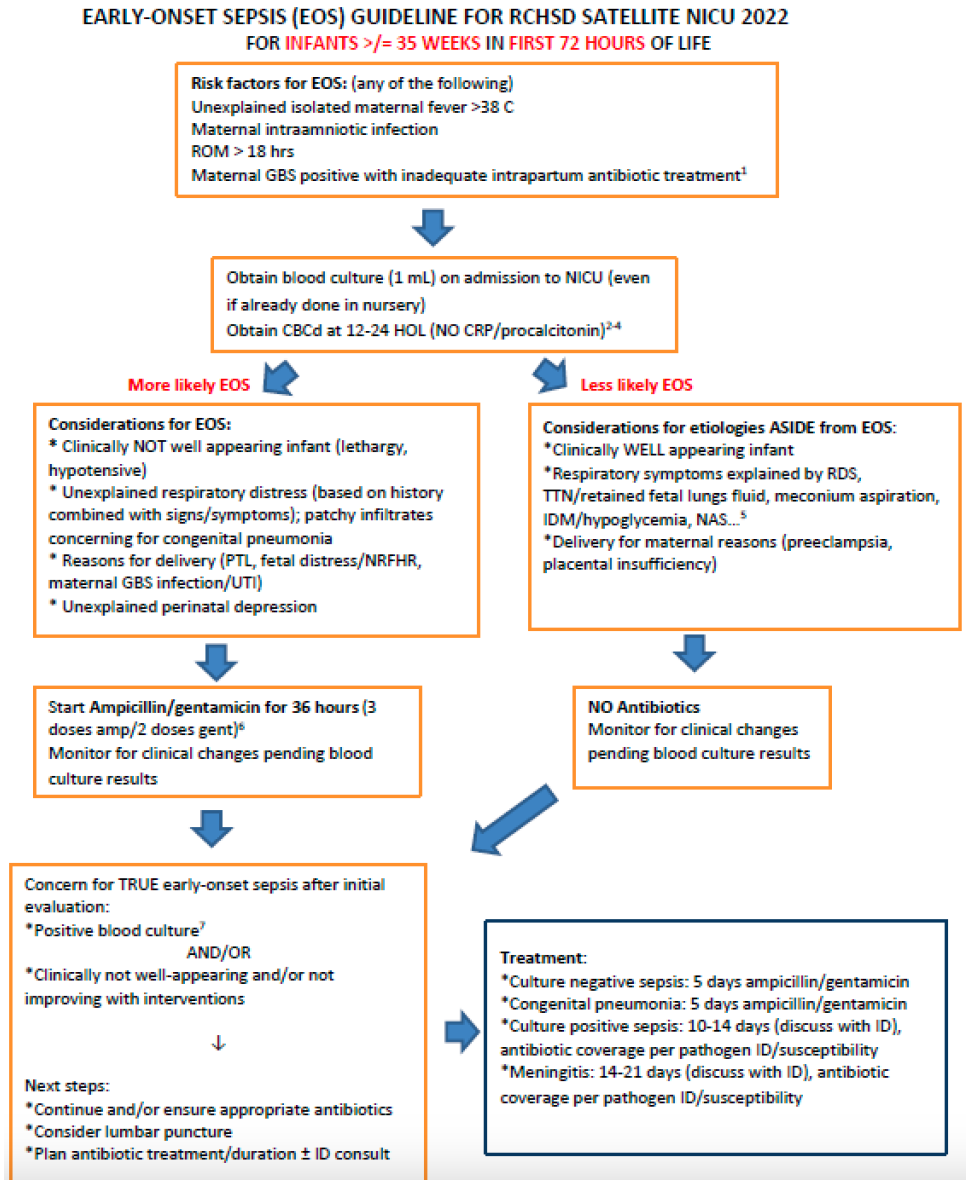
kweiss2@rchsd.org

# What were your top 1-2 successes during OASCN?

- Creation of early-onset sepsis guideline
- Optimizing blood culture

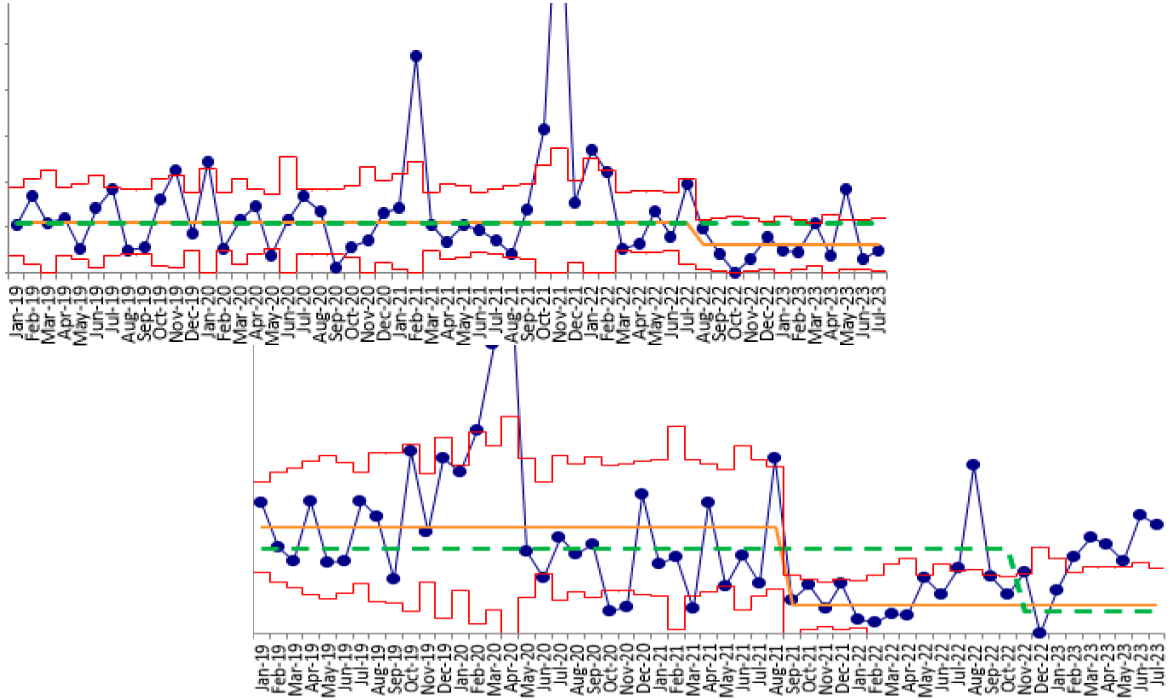
# What new tools/guidelines did your team create as part of your participation in OASCN?

- 36 hour rule out
- 5 day culture negative sepsis treatment
- Rule in the diagnosis (NOT rule out sepsis)
- Blood culture 1mL



## Have you been able to sustain improvements?

- Yes and no



## Top 1-3 lessons for others?

- There are various ways to implement antibiotic stewardship based on your NICU size and staff
- Focus on blood culture and clinical status
- What you do is less important than how carefully you pay attention to the consequences (Dr. Benitz)

# Submitted Questions

| |
|---|
| Ampicillin & Gentamicin versus Ampicillin & Cefitaxime for empirical treatment of EOS in a newborn |
| EOS stopping at 36hrs of ABX<br>Length of antibiotic therapy if culture negative |
| Ideal way to collect culture, and what is better: venous or arterial? |
| Sustainability is difficult for any QI project. How has monitoring continued for AUR for participating units or your own unit? |
| Trends in practice: Who is responsible for assessing & utilizing the sepsis calculator in the NICU & Mother/Baby unit? |
| What adaptive challenges have you identified in implementing antibiotic policy in the NICU? |
| Will there be data shared with stakeholders regarding outcomes of this bundle? |
| Will we learn about how to implement specific protocols that will lead to improved antibiotic stewardship? |

# Wrap Up & Feedback Survey

Kurlen Payton, MD

# Evaluation of Today's Session

- Please fill out an evaluation of today's session
- We'd like to hear feedback from all of you
- **For those requesting RN-CE credit, an evaluation is due by September 5**
- The Perinatal Advisory Council: Leadership, Advocacy and Consultation (PAC/LAC) is an approved provider by the California Board of Registered Nursing Provider CEP 5862
- Please contact Courtney Breault (courtney@cpqcc.org) with any questions related to the RN-CE credits, grievances, or in order to request accommodations for disabilities

Scan the QR code or click on the link provided in the chat to submit an evaluation of today's session. *Required for RN-CE credit.*

# Thank you!