The OASCN Collaborative

(Optimizing Antibiotic Stewardship in California NICUs)

Learning Session #4:

"Contaminant prevention and NEC stewardship??"

April 15, 2021

1. Add your **NICU's name** to your zoom label
2. Send a chat message with your name and institution for attendance purposes
3. Please **keep yourself muted** unless you are speaking

Agenda

I. Intro

II. Didactic — Contaminant prevention –Linda Lefrak, RN MS

III. Case Presentation — Lalitha Venugopalan, MD

IV. Case Discussion

V. Conclusion, summary, next steps

Themes for the Day: "Contaminant prevention and NEC stewardship"

**We will try to prioritize discussion on this topic today

Zoom Reminders

1. Add your **NICU's name** to your zoom label
2. Send chat with your **name and institution** for attendance purposes
3. Please **stay muted** unless you are speaking
4. **Unmute** or **use the chat** to ask questions

1. Please send a private chat message to Janine Bergin for **technical assistance**

Blood Culture Best Practice

OASCN

Linda Lefrak, Neonatal CNS

Learning Session 4

4/15/21

Reducing Blood Culture Contamination

- Blood cultures play an important role in the diagnosis of infection
- Contamination is a common problem in the hospital setting
- Reported contamination rates are between 0.6%-12.5%
- The goal is to keep contamination rates under 3%
- *Patients with contaminated blood cultures often receive unnecessary antibiotics and additional tests leading to increased length of stay, cost and exposure to harm*

❖ *Clinical Practice Guideline, Synopsis Prevention of Blood Culture Contamination, Emergency Nurses Association, 2020.*

What is your Unit Practice Standard?

Table 1. Blood culture data

Source of culture (n=707)*	
In infants with central lines	
Central line only	5.0%
Peripheral only	25.0%
Central and peripheral	70.0%
In infants without central lines	
Venous	60.0%
Arterial	39.7%
Capillary	0.3%
Amount of blood drawn (n=715)*	
<0.5 cc	1.0%
0.5-1cc	82.0%
>1 cc	17.0%
Blood culture bottles (n=715)*	
Aerobic only	50.0%
Aerobic and anaerobic	46.0%
Don't know	4.0%
Reasons for anaerobic culture (n=667)*	
Routine	44.0%
Clinically indicated	42.0%
Don't know	14.0%

*: Number of respondents.

Table 2. Methods of antisepsis

Provider antisepsis methods (n=715)*	
Hand wash/rub	95.0%
Unsterile gloves	45.0%
Sterile gloves	41.0%
Face mask	6.0%
Unsterile gown	2.8%
Sterile gown	1.8%
Skin preparation methods (n=715)*	
Iodophor then alcohol	43.0%
Chlorhexidine preps	27.0%
Iodophor only	16.0%
Alcohol then iodophor	10.0%
Alcohol only	2.5%
Other	2.5%

*: Number of respondents.

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Clinical Practice Guideline: Synopsis Prevention of Blood Culture Contamination

CLINICAL QUESTION:

Which preanalytic variables related to peripheral venous blood specimen collection and transportation decrease blood culture contamination?

Description of Decision Options/Interventions and the Level of Recommendation		
Standard Procedures	Divert the initial 1–2 ml of blood into a sterile receptacle when drawing blood culture specimens via peripheral venipuncture (Patton & Schmitt, 2010).	B
	Use a standard sterile process to draw blood cultures (Hall 2013 et al.; Qamruddin, et al., 2018; Self et al., 2013).	B
	Draw blood cultures from a dedicated peripheral venipuncture site, not an intravenous catheter (Baron et al., 2005; Mermel et al., 2009; Self et al., 2012; Snyder et al., 2012; Stohl et al., 2011).	B
	Use pre-assembled blood culture collection packs (Bamber et al., 2009; Dhillon et al., 2009; Madeo et al., 2005; Snyder et al., 2012; Thomas et al., 2011; Wilson et al., 2000).	C
Education	Provide education and training for personnel who collect blood cultures (Al-Hamad, et al., 2016; Bamber et al., 2009; Dhillon et al., 2009; Eskira et al., 2006; Harding & Bollinger, 2013; McLellan et al., 2008; Murillo et al., 2011; O'Connor, et al., 2016; Robertson et al., 2015; Roth et al., 2010; Tworek, 2008; Weddle et al., 2011; Youssef et al., 2012).	B
	Monitor contamination rates and provide performance feedback to personnel who draw blood cultures (Bekeris et al., 2005; Gibb et al., 1997; Harding & Bollinger, 2013; Mullan et al., 2018; Murillo et al., 2011; Robertson et al., 2015; Thomas et al., 2011; Tworek, 2008; Youssef et al., 2012).	B
Personnel	Establish a dedicated staff to draw blood cultures (Bekeris et al., 2005; Mermel et al., 2009; Mullan et al., 2018; Mtunthama et al., 2008; Roth et al., 2010; Schifman et al., 1998; Snyder et al., 2012; Tworek, 2008; Washer et al., 2013).	B
Skin Preparation	Allow the skin cleansing agent to air dry before venipuncture when drawing blood cultures (Baronet al., 2005; CLSI, 2007; Mermel et al., 2009).	A
	Use chlorhexidine alcohol to clean the skin before drawing blood cultures in patients over 2 months of age (Baron et al., 2005; Benjamin et al., 2011; Caldeira et al., 2011; CLSI, 2007; Madeo, 2008 et al.; Mermel et al., 2009; Story-Roller, et al., 2016; Tepus et al., 2008).	A
	Use products containing alcohol to cleanse the skin prior to collecting blood cultures (Baron et al., 2005; CLSI, 2007; McLellan et al., 2008; Mermel et al., 2009; Lium et al., 2016; Qamruddin et al., 2008; Schifman et al., 1998; Shahar et al., 1990; Snyder et al., 2012; Strand et al., 1993).	A
	Use alcohol to clean the skin before drawing blood cultures in children under 2 months of age (CLSI, 2007).	C
	Apply alcohol-containing solutions with 30 seconds of vigorous back and forth scrubbing. If povidone-iodine is used, it should be applied in concentric circles (Baron et al., 2005).	C

Standard Procedure/Personnel

- Divert the initial 1-2 ml of blood before drawing via a peripheral venipuncture-B

- Use of a standard sterile process to draw blood cultures-B
- Provide education and training for personnel who collect blood cultures-B

- Monitor contamination rates and provide performance feedback to personnel who draw blood cultures-B

Skin Preparation

- Use *products containing alcohol* to cleanse the skin prior to collecting blood cultures-A
- Use alcohol to clean the skin before drawing a blood culture in children under the age of 2 months-C
- Apply alcohol-containing solutions with *30 seconds of vigorous back and forth scrubbing*-C
- *Allow for drying* of the agent before venipuncture-A

Collection Packs/Bottle Prep

- Packs containing necessary supplies to draw blood cultures aseptically have been shown to decrease blood culture contamination in multiple studies-Dhillon et al, 2009, Madeo et al, 2005, Bamver et al, 2009.

- Introduction of collection packs with staff training and counseling if sample was contaminated *decreased contamination rates from 9.2-3.8%-Thomas, 2011.*

- Clinical Laboratory Standards Institute-*Recommends cleaning blood culture tops with 70% alcohol and allowing it to dry prior to inoculation*.

Specimen Diversion

- Microscopic skin fragments may contain bacteria that can enter the specimen during venipuncture, more common with large bore needles- Patton & Schmitt, 2010, Stohlet al, 2011.

- Diverting 1-2 ml of blood has been shown to decrease blood culture contamination in ED patients, inpatients and outpatients from 16-2.7% vs 1.4%, 1.78% vs 0.22%, 5% vs 2%-Patton & Schmitt, 2010, Rupp et al,2017, Zimmerman et al, 2020.

Specimen Collection from Intravenous Catheters

- Indwelling catheters become colonized with bacteria and may lead to positive blood culture results in the absence of actual bacteremia-Mermel, et al, 2009, Snyder et al, 2012.

- Single study in children found no difference in contamination rates in a PIV sample vs a freshly inserted IV catheter-Isaccman & Karasic, 1990.

- Should remain an option when IV access is limited in pediatrics, hematology oncology, and critical care. Snyder et al, 2012.

Areas for Discussion and Practice Improvement

1. Recommended site of draw
   - Should a venipuncture be the standard?
   - When should a vascular device be used? Time and volume concerns?

2. Skin Prep
   - Does delayed bathing may increase skin colonization and need for additional cleansing?
   - Since friction and alcohol may lead to skin injury should agent contact time be increased?

3. Standard Procedure and Competency
   - Can Unit Specific Procedure address all unique elements in the NICU?
   - Should a two-person draw be recommended to reduce risk of contamination for a venipuncture ?
   - Should all units require a competency and annual review?

4. What are your questions?

OASCN Case ID #: P106
(To be provided by OASCN coordinator)

Optimizing Antimicrobial Stewardship in California NICUs (OASCN)

Patient Case Presentation Form

Please complete this form and email to jmbergin@stanford.edu

Do not include any Protected Health Information (PHI) in this form. Click here for definition.

Date: 4/15/2021	**Presenter Name**: Lalitha Venugopalan

Check One	_X__ New Patient Presentation ___ Follow-up from Previous Patient Presentation

Brief clinical summary: 26 week GA 793g female delivered by C/S due to maternal pre-eclampsia and intubated for respiratory distress. Extubated to NAVA the next day. Infant received TPN and advanced on feeds, but developed several episodes of feeding intolerance. Feedings were held and blood cultures/KUBs obtained; short course of antibiotics thereafter. Clinical exams were subsequently reassuring, and feeds resumed. On DOL 23, baby developed abdominal distension and sepsis workup was repeated. On DOL 24, there was an area of erythema and induration with central punctate yellow spot on the left leg (previous IV site) for which the baby was started on vancomycin and gentamicin. Blood culture (+) for CONS in 21hrs. Repeat blood culture (-). Two days later, baby developed multiple apnea/desaturations, was intubated and placed on an oscillator. Abdominal X ray showed pneumatosis. Emergency laparotomy with enterotomy showed evidence of NEC. Baby continued to worsen requiring aggressive fluid resuscitation with blood products and vasopressors during the next 24 hours. Flagyl was added to provide anaerobic coverage; switched to Zosyn later. Second laparotomy performed on DOL 28 revealed NEC totalis. Care was withdrawn.

Pertinent labs:
Day 23 WBC: 11.6 (B4/S34/L42/M17), Hct 39, plt 300K; CRP 0.9
Day 26: WBC: 18.5 (B3/S19/L65/M9), Hct 33, plts 176K
Day 26: CSF WBC: 3, RBC 225, glu 60, prot 145
Day 27: WBC: 5.0 (B30/S20/L43/M6); Hct 41, plt: 54K; CRP 0.5

Day 23: blood Cx coagulase negative staph (CONS)
Day 25: blood Cx (-)
Day 26: CSF Cx (-)

Imaging:
DOL 23: Abd Xray unremarkable
DOL 26: Abd Xray pneumatosis ++

Current antibiotics:	**Other recent antibiotics**:
Vancomycin/gentamicin/zosyn	Flagyl

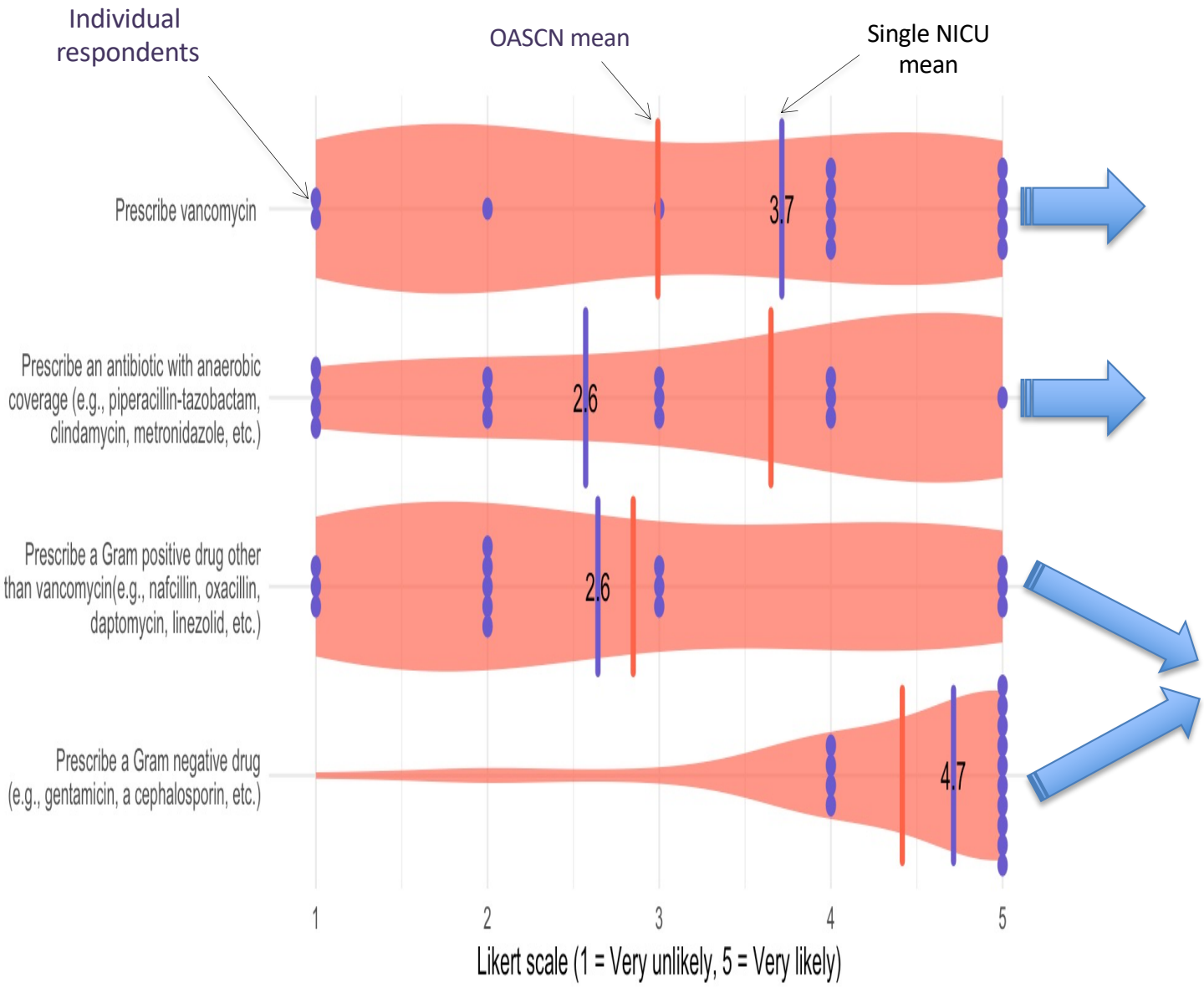
What are your specific question(s) you'd like to discuss with the group? *(Please keep this to 3-4 questions at most)*

1) What could be the cause for NEC? Is it CONS?
2) Since baby was already on vanc & gent, could it have caused alteration of intestinal microbiome and caused NEC?
3) Is the antibiotic combo vanc/gent/zosyn appropriate on this case?
4) Could anything have altered the clinical course? Would you have performed these labs? Any others?

When we receive your case, we will email you a confidential patient ID number (OASCN Case ID) to use when identifying the patient during the OASCN Learning Session.

PLEASE NOTE that Project ECHO® case consultations do not create or otherwise establish a provider-patient relationship between any OASCN clinician and any patient whose case is being presented in a Project ECHO setting.

OASCN vignette results and evidence based best stewardship practice



Vancomycin for empiric NEC treatment?

Benefit of anaerobic coverage?

What is the "middle ground" for first line empiric NEC treatment?

Conclusions: “NEC antibiotic stewardship?”

1. Empiric vancomycin use for NEC/LOS should be avoided

1. Reducing duration of EOS empiric treatment can help reduce NEC risk, thus may help reduce AUR.

2. Some recommendations consider narrow coverage with ampicillin and gentamicin reasonable coverage for empiric treatment of mild to moderate NEC

Next Steps

Complete **LS#4 evaluation**

First step in getting consensus on NEC treatment?

Identify your **opportunities** for improvement

What does your **baseline data** tell you?

What's your **PDSA #1** plan?

We will be sending out FAQ soon