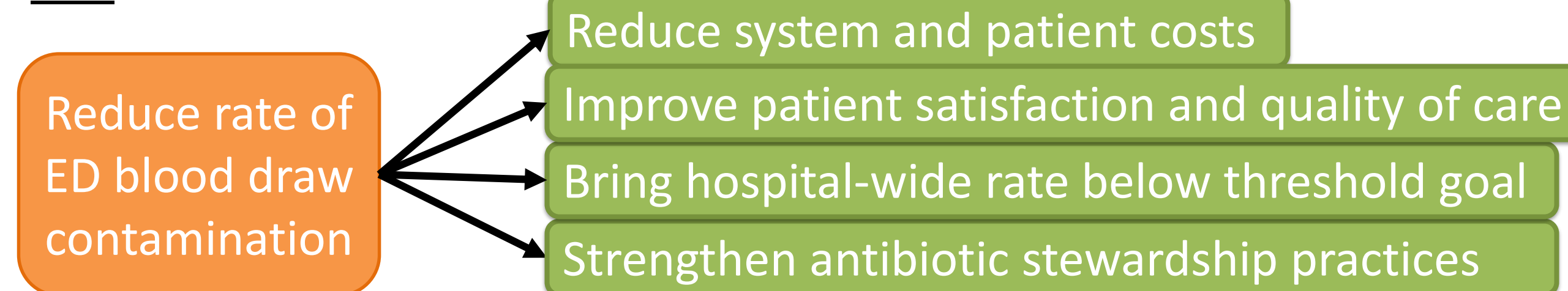


## Introduction and Aim

### Introduction

- Blood culture collection is an invasive procedure. Poor techniques can affect testing sensitivity and result in contamination. Blood culture contamination rates are used as a quality metric within hospital systems, due to:
  - ↑ patient length of stay
  - ↑ system costs for repeat cultures
  - ↑ Unnecessary antimicrobial therapy
  - ↓ Patient satisfaction due to culture re-collection
- A need for targeted improvement of VMC ED culture contamination rates was identified due to rates being consistently above the designated house-wide threshold of 2.5%. All other adult units remained consistently below 2.5% in 2017.

### Aim



Reduce the monthly rate of ED blood culture contamination by an absolute 2.0% (33% decrease) below their monthly mean (6.0%) by December 31st 2017.

## Methods

- Multiple targeted changes were made, holistically emphasizing education, materials, supplies, and data collection.
- The SMC Clean Collect® diversion system was considered for use, however, the less costly method of targeted re-education was chosen.
- Fishbone diagram and Plan-Do-Study-Act (PDSA) Cycle quality improvement tools used to systematically change existing processes.

### PDSA Cycles

- PDSA 1:** Mass re-education on blood draw techniques for all ED nurses, directed by VMC Nurse Education Specialists—April 2017.
- PDSA 2:** One-on-one re-education by designated Education Nurse Specialist utilizing new competency checklist, as needed for nurses responsible for contaminated draws—October 2017.
- PDSA 3:** 1) Redesigned blood draw cart to house all necessary supplies and instructional poster; 2) order of draw badge cards for staff; 3) compliance board with contamination rates linked to anonymous identifiers of responsible nurses. Implemented as part of ED Rapid Improvement Event—early November 2017.
- PDSA 4:** Increased frequency of contamination reports sent by lab staff to ED Nurse Specialist → weekly and monthly—late November 2017.

## Outcomes

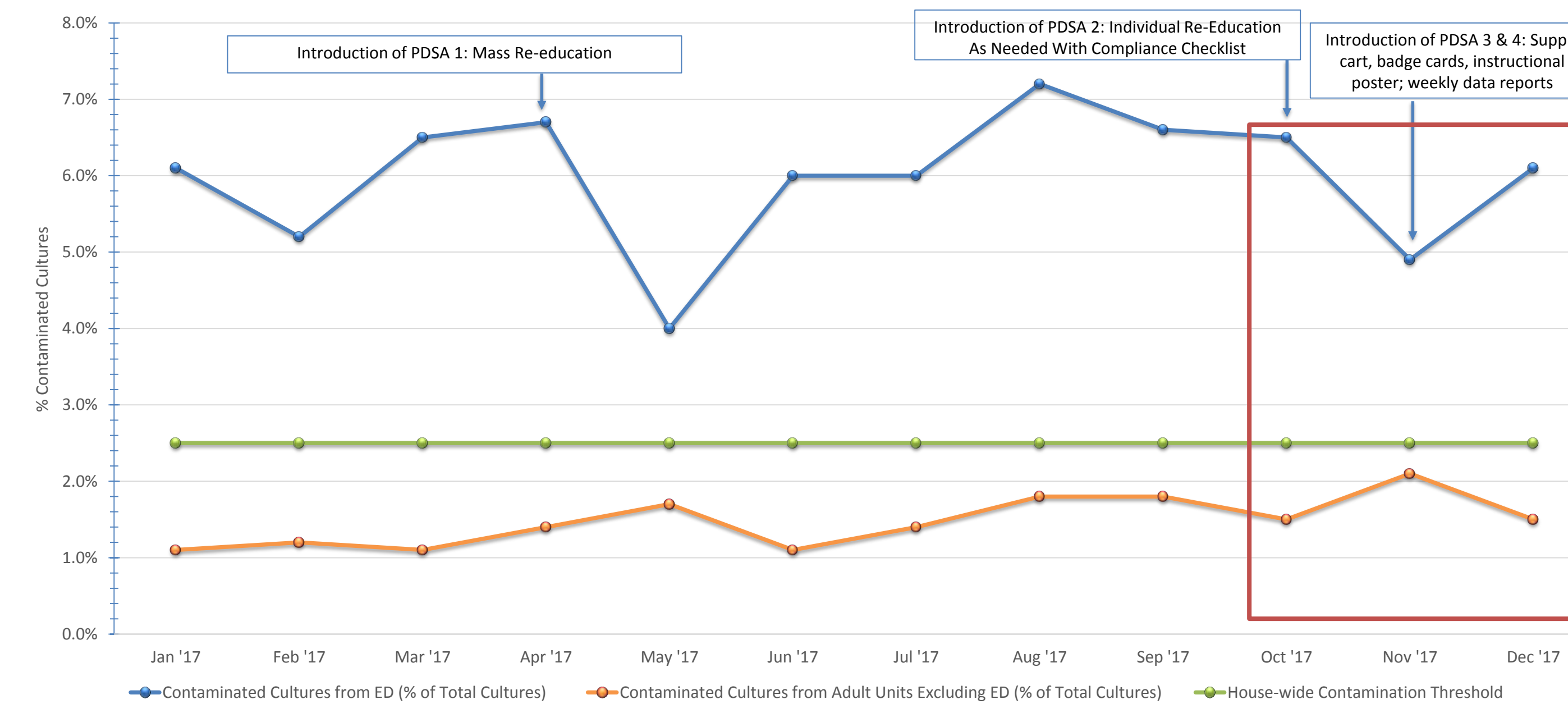


Figure 1. Monthly Blood Culture Contamination Rates from ED and Adult (excluding ED) Units at VMC (Jan-Dec 2017)

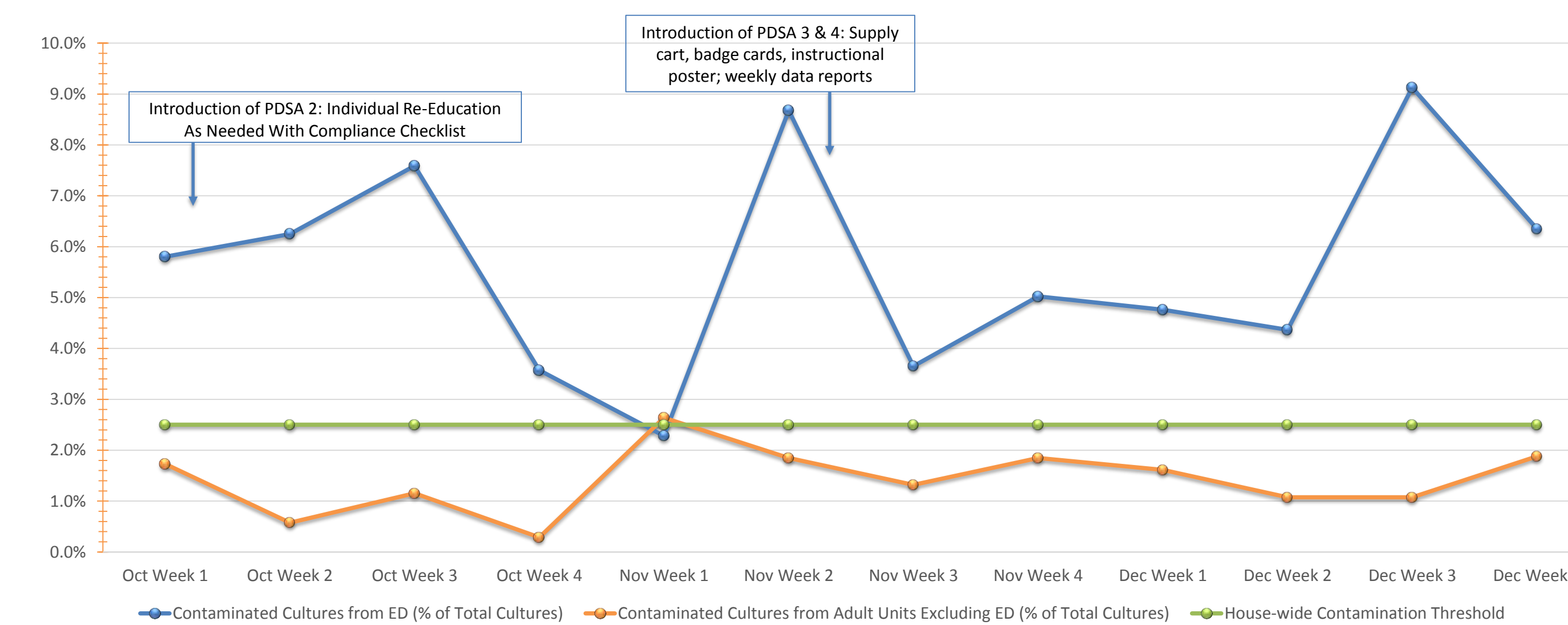


Figure 2. Weekly Blood Culture Contamination Rates from ED and Adult (excluding ED) Units at VMC (Oct-Dec 2017)

**Method of Validation:** E-Explanation, M-Demonstration, S-Simulation, CBI-Chart Review, T-Written Post-Test

**Performance Behaviors**

Review policy L1-11 Blood Cultures: Specimen Collection in Blood Culture Bottles	Circle Validation Method
Review policy VPS-C519 for Blood Sampling from Central Vascular Access	E RD S CRT
Review MD order	E RD S CRT
Assembles supplies needed for Blood Culture Acquisition:	E RD S CRT
<ul style="list-style-type: none"> <li>Chlorhexidine gluconate (CHG)</li> <li>Alcohol wipes (70%)</li> <li>Syringes: 2-10cc syringes with butterfly needle appropriate for the patient.</li> <li>Butterfly with special vacuainer hub for adult blood culture bottles.</li> <li>A set of blood culture bottles.</li> </ul>	E RD S CRT
Identifies correct amount of sample per patient population:	E RD S CRT
<ul style="list-style-type: none"> <li>Adults and pediatric patients ≥ 13kg and/or ≥ 2 years of age:                             <ul style="list-style-type: none"> <li>The specimen volume for the adult bottles is ten (10) mL each bottle.</li> <li>The absolute minimum in each bottle is four (4) mL of blood.</li> </ul> </li> <li>Pediatric patients &lt; 13kg and/or &lt; 2 years of age and neonates:                             <ul style="list-style-type: none"> <li>The specimen volume for pediatric bottles is four (4) mL.</li> <li>The minimum volumes are 1 mL and 0.5 mL, respectively.</li> </ul> </li> <li>Verbalizes to not place 1 mL or 0.5 mL in an adult bottle for a pediatric patient.</li> </ul>	E RD S CRT
Demonstrates Correct Process for Inoculation of Blood Culture Bottles (as appropriate per unit):	E RD S CRT
<ul style="list-style-type: none"> <li>If using a butterfly set with special vacuainer hub for direct draw: Inoculate the aerobic (blue) bottle first, then the anaerobic (purple) bottle.</li> <li>If using a syringe and butterfly set: Change the needle to a new sterile needle first. Inoculate the aerobic (blue) bottle first, then the anaerobic (purple) bottle.</li> </ul>	E RD S CRT
Signature of Trainer Validating Competency	Date: _____

**Site and Bottle Preparation**

- Break the Chlorhexidine (CHG) cap by pinching the wings and pressing against the site to saturate the sponge.
- Use a 30 second back and forth friction to cover as large an area as possible (2 inches in diameter).
- Do not blot or blow on the site.
- Wipe each blood culture bottle's rubber septum with a new alcohol wipe and allow to dry (at least 30 seconds) before inoculation.

**Sample Collection**

- Per Policy: Inoculate aerobic (blue) bottle first, then anaerobic (purple) bottle.
- 10 mL per bottle in for adults per policy.
- 0.5 mL to 4 mL blood for pediatric (butterfly) culture bottle.
- Blood cultures should be collected when starting an IV or via butterfly. Do NOT collect Blood Cultures from an EMS IV or aspirated blood receiving catheter.

**Time of Draw**

- Location of site.
- How site was prepared.
- How sample was obtained (via IV site, butterfly, etc.).
- How patient tolerated procedure.
- How staff collecting sample.

**Labeling on bottle**

- Date and time of specimen collection.
- Initials and employee number of collector.
- Collection site.
- HL # 2 set.

**Other tips**

- The Chlorhexidine Prep sponge is a one-time use. Do not wipe your glove with the Prep sponge then place on patient or reuse when ONE USES, ONE TIME.
- Do not separate the site unless the gloved finger has been prepped with a prep, fresh time appears.
- Do not sand on site or with other specimens that are on site.

**Order of Draw:**

**Vacucliner**

- Citrate (lt. blue)
- SST (gold)
- red
- Heparin (green)
- PST (lt. green)
- EDTA (lav)
- Sodium Fluoride (gray)

**Syringe or Butterfly-Winged Injection Set**

- Blood Culture Bottles
- Citrate (lt. blue)
- SST (gold)
- red
- Heparin (green)
- PST (lt. green)
- EDTA (lav)
- Sodium Fluoride (gray)

**ORDER OF DRAW after blood cultures**

Figure 3. A) Blood culture acquisition competency checklist for one-on-one re-education; B) Instructional poster at redesigned blood draw cart and tube locations; C) Compliance board with contamination rates and deidentified list of ED nurses with contaminated draws; D) Distributed badge cards instructing order of draw.

## Discussion

### Discussion and Goals

- From January to October 2017, the average ED contamination rate was 6.0%.
- PDSA cycles 1 and 2, both education initiatives, resulted in an immediate sharp decline in rates followed by a slight rise in subsequent months.
  - A challenge with PDSA 1 and 2 was sustaining education after loss of educators and hiring of new staff.
  - This challenge provided an opportunity for further drill-downs and a need to brainstorm education reinforcement strategies.
- PDSA cycle 3 resulted in the most significant absolute drop (1.7%; 26% relative drop) in contamination rates observed from October to November.
  - This indicates that tangible material aids may have more longevity of usefulness for sustainable impact.

PDSA Cycle	Date	Action Taken	Measured Outcomes (Absolute % change)
1	April	Mass re-education	Apr to May= ↓2.7% Apr to Jun&Jul= ↓0.7%
2	Oct	1-on-1 re-education, competency checklist	Oct to Nov= ↓1.6% Oct to Dec= ↓0.4%
3	Nov (Wk 2)	Supply cart, badge cards, compliance board	Nov Wk 2 to 3= ↓5.0% Nov Wk 2 to 4= ↓3.7%
4	Nov (Wk 4)	Increased frequency of report delivery	Nov Wk 4 to Dec Wk 1= ↓0.2% Nov Wk 4 to Dec Wk 2= ↓0.6% Nov Wk 4 to Dec Wk 3= ↑4.1% Nov Wk 4 to Dec Wk 4= ↑1.3%

## Conclusion and Goals

- The aim to reduce monthly ED blood culture contamination rates to 2.0% below the monthly mean was not achieved. However, rates declined at points coinciding with PDSA cycles.
- As PDSA cycles occurred in rapid succession, it may help to expand the period of time in between cycles to allow staff to adjust.
- Thus, changes made ultimately showed immediate improvements in contamination rates, but varying levels of long-term success.
- Future goals will include further assessment to identify/finetune methods to sustain implemented changes.

## Acknowledgements and Contact

We would like to acknowledge Kamilah Williams, PhD, for her involvement in education efforts associated with this project.

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