Submission Form Deadline: November 9, 2015

**Organization:** Sinai Hospital  
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**Solution Title:** Reducing Blood Culture Contamination in the Emergency Department

**Focus Area:** *(please check all that apply)*  
- ☑ Communication  
- ☑ Competency Assessment  
- ☑ Core Measure  
- ☑ Crisis Prevention  
- ☑ Culture  
- ☑ Diversity  
- ☑ Education  
- ☑ Emergency Department  
- ☑ Environment  
- ☑ Event Reporting  
- ☑ Falls  
- ☑ Hand Hygiene  
- ☑ Infection Prevention  
- ☑ Information Technology  
- ☑ ICU  
- ☑ Laboratory  
- ☑ Labor & Delivery  
- ☑ Lean Operations  
- ☑ Medical Equipment  
- ☑ Medication Safety  
- ☑ Patient Assessment  
- ☑ Patient Involvement  
- ☑ Pediatrics  
- ☑ Pressure Ulcer  
- ☑ Process Redesign  
- ☑ Surgical Services  
- ☑ Teamwork  
- ☑ Workforce  
- ☑ Other (please specify)

**Please indicate your interest in the following:**  
- ☑ Yes, the Maryland Patient Safety Center has permission to publish this Solution and place it on its public website.  
- ☑ We are interested in displaying a storyboard and participating in lunchtime presentations. (storyboards will be displayed on easels, and cannot be larger than 3 ft wide x 4 ft tall.)

Please complete the Submission and Application Form, including related tools and resources as attachments, and send to:  
lcatsos@marylandpatientsafety.org by November 9, 2015.

If you are unable to insert information, have any questions, or need further information, please contact:  
lcatsos@marylandpatientsafety.org
Organization: Sinai Hospital of Baltimore Maryland

Solution Title: Reducing the Blood Culture Contamination Rate in the Emergency Department

Focus Area: Emergency Department

Program or Project description, including goals:
Blood cultures are used to confirm bacteremia which is a significant cause of morbidity and mortality in hospitalized patients (Caldeira, David, & Sampaio, 2010). Blood cultures are drawn frequently in Emergency Departments (ED) for early identification of patients arriving with bacteremia. Blood culture contamination (BCC) during venipuncture has a significant negative impact for individual patients as well as the healthcare system as a whole. Contaminants may be introduced from patient skin, phlebotomist skin, airborne microorganisms, contaminated equipment, or laboratory procedures (Caldeira, David, & Sampaio, 2010). False-positive blood cultures expose the patient to potential harm and have been associated with incorrect diagnoses, unnecessary and inappropriate antibiotic therapy, adverse reactions, and increased susceptibility to infection from unnecessary antibiotic use, delays in appropriate antibiotic therapy, additional testing, and increased length of hospital stay (Snyder et al., 2012). A potential for hospital acquired infections may increase as a consequence from longer hospitalization. Bates, Goldman, and Lee (1991) found that BCC caused increased costs due to all of these factors and the increase was significantly greater than just the cost of the repeated test, adding an average of 4.5 hospital days and over $4,000 extra per patient. A more recent study put the additional cost of contamination at $8,720 per patient. (Gander 2009).

In 2013, over 66% of the total blood cultures performed at Sinai came from the Emergency Department (ED). The American Society of Microbiology recommends a BCC rate below 3% (Dunne, Nolte, & Wilson, 1997). Despite previous practice changes, Sinai ED’s average blood culture contamination rate was 5.6%.

Goal: < 3% contamination rate for blood cultures obtained in the Sinai ED setting.

Baseline Blood Culture Contamination Rate
Process:

The purpose of this project was to decrease contamination of blood cultures in the ED. The project was implemented in two phases by the ED Outcomes and Practice Committee. Phase I was implemented in July 2014 and involved one-on-one observation and re-education of the nurse phlebotomists as appropriate. Although there was significant improvement, the goal was not met. However, during the observation sessions, the team had often witnessed staff following the correct collection procedure. This encouraged the team to consider a process change and to research best practices for collection of blood cultures. Sinai uses the Rosswurm and Larabee (1999) “Model for Change to Evidence-Based Practice” to guide process changes. Phase II, which introduced the new process, was implemented in 2014, using this model.

Solution:

Phase I

Phase I included observation and re-education for nurses who had a contaminated specimen. When a contamination was reported, a member of the Outcomes and Practice Committee observed the next blood culture draw performed by the phlebotomist and provided real time education when needed. The observation sessions revealed multiple problematic areas: contaminated equipment, deviation from the current collection process and compliance with using the correct collection process. The sessions also frequently revealed that the nurse’s collection process was appropriate, even though contaminations had taken place.

- Laboratory Services provided bi-weekly BCC reports. The reports included the identification number of the RN (phlebotomist) who had drawn the culture.
- An ED Clinical Leader reviewed the report for accuracy and notified the RN of the contamination.
- A member of the Outcome and Practice Committee observed the nurse drawing the next blood culture and provided education as appropriate.

Phase II

Based on results of Phase I, the ED Outcomes and Practice Committee, which is made up of ED bedside nurses, performed a literature review and also a survey of area hospitals to identify processes that would provide best results in this environment. The ED process was revised and taught to all ED nurses. The policy was changed to reflect the revisions. The new process added the use of sterile gloves and a sterile vacutainer. The nurses now leave the alcohol swabs in place after wiping the tops of the collection bottles in preparation for use. The site is prepped twice by using two choraseptic sponges for 30 seconds each, consecutively. The use of a face mask is recommended but optional. During the same time, a new report for BCC trending was created that contained more detail than previous reports. The new report enabled trending by individual. By trending individuals, the Committee was able to identify the nurses and provide immediate feedback. For every blood culture contamination, the individual was informed within
two weeks of the draw. Individualized trending reports were sent to all nurses, with nurses identified through their employee identification numbers. This allowed them to not only see their own results, but to see how their results correlated with the rest of the department.

- The Outcomes and Practice Committee researched best practices for collecting blood cultures.
- ED changed the blood culture collection process/policy based on best evidence.
- A competency validation tool was created.
- Blood culture collection was added to the mandatory, annual, one-on-one, return-demonstration competency assessment.
- Detailed electronic data was maintained regarding the blood culture contamination including the name of the nurse, date and time that education was provided, total number of contaminations per nurse and per unit, and the contamination rate.
- Trending reports were posted and visible for staff to view. The reports included the total number of blood cultures drawn, the number of contaminates the unit had, and the BCC rate.

**Measureable Outcomes:**

Prior to this project, the baseline BCC rate was 5.6%. During Phase I, the contamination rate decreased to 3.4%. This was a marked improvement; however it remained above the goal. During Phase II, the average contamination rate was 2.2%, which represents a 3.4% decrease and meets the goal. From January 2015 thru September 2015, the ED obtained over 4,395 blood cultures and had a contamination rate of 2.2%. The goal has been met consistently over the past three quarters.

![ER-7 Quarterly BCC Rate](chart.png)

Quarterly Blood Culture Contamination Rate 2014-2015
The decrease in contaminated specimens represents an improvement in quality care and safety for nearly 150 patients. Using a conservative estimated cost of $6,500 per false positive blood culture, this project also saved close to one million dollars in healthcare costs, in less than a year.

**Sustainability:**
The initiatives have proven to be successful. Our results have been sustainable over the last three quarters of 2015. The new process was added to the orientation checklist and the ED annual competency assessment to ensure ongoing education and correct practice. The ED Outcomes and Practice Committee presented their practice change to the organization’s Outcomes Committee. Due to the ED’s success, the organization has since changed the house-wide blood culture collection process and policy. Monitoring and education are ongoing: The Outcomes and Practice Committee continues to follow trends and complete staff observations to identify any factors that could lead to elevated rates. Research is continuing to search for other best-practice processes that may enhance our current process. One such discovery that may potentially be used after more investigation is a device that automatically wastes the first milliliter of blood drawn. These types of options will be further explored.

**Role of collaboration and Leadership:**
The implementation process included an interdisciplinary and collaborative effort between Laboratory Services, ED Leadership and bedside nurse members of the unit’s Outcomes and Practice committee. The team members for the BCC initiative included the ED Director, the ED Clinical Information Systems Coordinator, ED Clinical Leaders, the ED Outcomes and Practice Committee, Laboratory Services, and the Vice President of Clinical Services. Preliminary reports are generated from Laboratory Services. ED Clinical Leaders complete chart reviews. Specific information regarding blood cultures drawn, contamination rate and the individual RN phlebotomist is maintained electronically. Blood culture reports are sent electronically to all ED RN’s, Clinical Leaders and the ED Director. Follow-up is completed by members of the ED Outcomes and Practice Committee. Monthly reports are generated by the ED Clinical Information Systems Coordinator and submitted to the ED Director as well as to the Vice President of Clinical Services. The ED Director and the Clinical Leaders provide one-on-one, positive feedback and reinforcement to staff.

**Innovation attributes:**
Since 2011, it was apparent that our blood culture contamination rate was high. The ED Clinical Director encouraged and fostered the ED Outcomes and Practice Committee to research and implement changes to improve the contamination rate. The unique attributes were the involvement, dedication, commitment and success of a collaborative team. The impact of this project not only had a positive effect on the patient and the cost of healthcare; it created enthusiasm among the nurses on the unit. Nurses have expressed interest and are eager to be a member of future projects that would improve outcomes.

**Related tools and resources:**
References:


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