A Multifaceted Approach to Reduce Blood Culture Contamination Rates
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Summary: Blood culture contamination has been a longstanding challenge in the clinical setting. False positive blood cultures may lead to increased clinical and financial burdens for patients. The goal of this project was to reduce and sustain blood culture contamination rates below the national benchmark (<3%). Our facility began a staggered interventional approach using education of staff along with direct draw method of blood culture collection, trial of new product (3.15% CHG/ 70% IPA) on both skin and tops of blood culture bottles for 1 month, 6-month period of original products, and final implementation of new product hospital-wide.

Experiment

- Quality improvement/ Quasi-experimental; Pre/post intervention design

- Three staggered interventions implemented.

  - "Direct draw" method & education- Changed blood culture collection process from straight needle & syringe to "direct draw" method to draw the blood directly into the bottles to eliminate unnecessary steps that could lead to contamination. Reeducated staff on proper blood culture collection including good aseptic technique to prevent skin contamination; included blood culture collection training to the new employee orientation for phlebotomists & ED nursing staff (December 2015).

  - A 30-day trial using 3.15% alcoholic chlorhexidine swabstick for skin antisepsis and device swab for blood culture bottle top cleaning by phlebotomists began (October 2016). ED staff and other nurses continued using old products for blood culture draws. Bottles drawn by phlebotomy using **Prevantics**® products were flagged with pink sticker identification system in order to compare old and new process in regard to contamination rates.

  - Upon completion of trial, the old process/old products resumed.

  - Hospital-wide implementation of **Prevantics** Swabstick for skin antisepsis and **Prevantics** Device Swab for blood culture bottle top disinfection initiated (June 2017).

Results

- Staff education and direct draw method: contamination rates fell to 3.15% for 2016, from 2015 rate of 3.77% but still exceeded national benchmark (<3%).

- Month-long trial evaluating **Prevantics** products: contamination rates fell to 2.63%.

- Upon completion of the trial, the original process was resumed: contamination rates increased, monthly rates over the 3% benchmark, with the highest month having a rate of 3.7%.

- The **Prevantics** Swabstick for skin antisepsis and **Prevantics** Device Swab for blood culture bottle top disinfection was fully implemented hospital-wide: Blood culture contamination rates immediately fell below the 3% national benchmark and have been sustained.

- In 2019, the annual hospital-wide blood culture contamination average was 2.4%.

- Rates have remained consistent in 2020, with a hospital wide average of 2.27%.

- The findings demonstrate how the use of a 3.15% alcoholic chlorhexidine product can significantly reduce blood culture contamination rates.
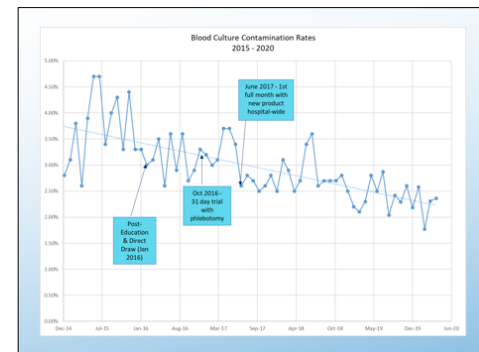
Limitations

- Single facility, with unknown sample size. Results may not be generalizable.

- Multiple interventions implemented during the study time period.

Joint Annual Meeting
VIRTUAL 2020

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BACKGROUND

- Blood cultures:
  - "Gold standard" for testing to diagnose blood stream infections.
  - Positive blood cultures help to diagnose life threatening infections such as endocarditis and sepsis.

- Blood culture contamination has been a longstanding challenge in the clinical setting.

- False positive blood cultures may lead to increased clinical and financial burdens for patients due to:
  - Prolonged hospital length of stay.
  - Unnecessary antibiotic use.

- The national benchmark set forth by the Clinical and Laboratory Standards Institute for blood culture contamination is less than 3% (Self et al.,2014).

- The goal of this project was to reduce and sustain blood culture contamination rates below the national benchmark.

- Several interventions/techniques have been shown to reduce blood culture contamination rates.

- Our facility began a staggered interventional approach using:

  Education to Staff and implementation of direct draw method
  ↓
  Trial of new product with 3.15% alcoholic chlorhexidine
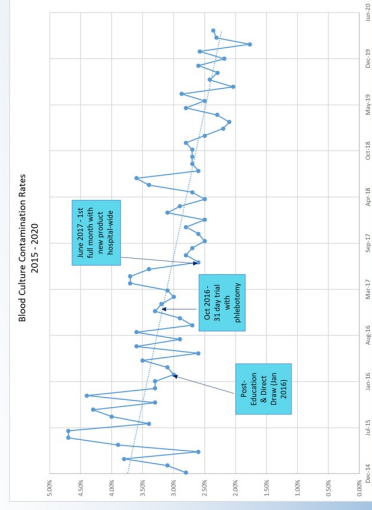 ↓
  Implementation of 3.15% alcoholic chlorhexidine

METHODS

- **December, 2015: "Direct draw" method & education**
  - Changed blood culture collection process to "direct draw" method. "Direct draw" method— collector uses a butterfly needle & blood culture adapter to draw the blood directly into the bottles. This evidence based method helps eliminate unnecessary steps that could lead to contamination. It also helps increase the best volume of sample in the blood culture bottles. Previous method used— straight needle & syringe to draw blood, along with a transfer device to add the sample to the blood culture bottles.
  - Trained staff on the "direct draw" method. Simultaneously reeducated everyone on proper blood culture collection including good aseptic technique to prevent skin contamination. Blood culture collection training was also added to the new employee orientation for phlebotomists & ED nursing staff.

- **October, 2016: Trial for new products for skin antisepsis product & blood culture bottle top cleaning**
  - Conducted a 30-day trial with a new skin antisepsis product & blood culture bottle top cleaning using products with 3.15% alcoholic chlorhexidine— swab stick (for skin antisepsis) & prep pad (for blood culture bottle tops).
  - All previous skin cleaning products were removed from use for the phlebotomists, including those who worked in the ED, and replaced with the new products. Remaining ED staff, which included nurses, nursing assistants, & patient care techs, continued using the old products.
  - Phlebotomists labeled all blood culture bottles that were collected using the new products with pink dot stickers. This allowed for microbiology staff to document & compare blood cultures done with new vs old products during the trial period.
  - Results of the trial were significant enough that the decision was made to switch to the new products. However, the previous products were in use for six months before the changeover was complete, in which blood culture contamination rates increased again.

- **Ongoing Monitoring**
  - At the end of each month, the number of contaminated blood cultures for each staff member was tallied.
  - Phlebotomists received emailed report cards with their number of contaminated blood cultures, & the phlebotomy supervisor followed up with staff who had more than two contaminated cultures in a month. This follow-up included additional direct observations and training sessions as deemed necessary.
  - As additional reporting capabilities became available in early 2019, phlebotomy report cards also showed an individual's total number of blood cultures collected, the number of contaminated cultures, & the percent contamination rate. This allowed follow-up to be directed more towards those who had an overall higher contamination rate.

RESULTS

- December, 2015, staff education was introduced followed by the implementation of the direct draw method to help reduce contamination.
  - Contamination rates fell to 3.15% for 2016, from the annual baseline of 3.77% in 2015 but still exceeded the national benchmark (<3%)

- October of 2016, a month-long trial was conducted to evaluate a new skin & blood culture bottle top antisepsis product. These new products contain 3.15% alcoholic chlorhexidine.
  - During this trial, contamination rates fell even further- to 2.63%.
  - Upon completion of the trial, the original process was resumed, and an immediate increase in contamination rates occurred.
  - Monthly rates were over the 3% benchmark, with the highest month having a rate of 3.7%

- June 2017, the 3.15% alcoholic chlorhexidine skin & blood culture bottle top antisepsis was fully implemented hospital-wide.
  - Blood culture contamination rates immediately fell below the 3% national benchmark, & have been sustained.
  - In 2019, the annual hospital-wide blood culture contamination average was 2.4%.
  - Rates have remained consistent in 2020, with a hospital wide average of 2.27%.

Blood Culture Contamination Rates
2015 - 2020

June 2017 - 1st full month with new product hospital-wide

Oct 2016 31 day trial with phlebotomy

Post-Education & Direct Draw (Jan 2016)

CONCLUSIONS

- Research into the various techniques for reducing blood culture contamination may be necessary to determine the best evidence-based method for each facility.

- Multiple methods may need to be adopted and revised continually to achieve optimal results.

- Our findings demonstrate how the use of a 3.15% alcoholic chlorhexidine product can significantly reduce blood culture contamination rates.

- Using a quality improvement approach to reduce blood culture contamination rates is attainable with continuous staff education, emphasis on a standardized collection process and newer antisepsis products.

- Using a multifaceted approach to reduce blood culture contamination rates, we have improved patient care by avoiding unnecessary antibiotic use and increase length of stay due to false positive blood cultures.