IMPROVING BLOOD CULTURE SAMPLE VOLUME IN AN EMERGENCY DEPARTMENT: A QUALITY IMPROVEMENT PROJECT

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Introduction

- Bloodstream infection (BSI) can result in morbidity and mortality. Proper assessment include the collection of blood culture samples for accurate diagnosis and management.
- Inadequate volume of blood culture samples can lead to harmful effects to patient care

Background & Significance

- Sampling and patient conditions are two of the most critical factors affecting volume and samples collected.
- Errors in clinical interpretation can result from false positive samples which can significantly impact patient outcome.
- False positives can result in unnecessary use of antimicrobial therapy, additional testing resulting in increase hospital stay and costs.
- An increase in hospital stay by 5.4 days and potential increase in cost of treatment by $7502 has been reported.

Aims & Objectives

- Implement evidence-based guidelines by the Clinical Laboratory Standards Institute on blood culture sample volumes

  - Conduct a retrospective chart review on patients requiring blood culture sample collection to improve collection practices by identifying gaps in current practice

  - Utilize data from the Computerized Patient Record System (CPRS) to determine potential causes before and after implementation of recommended guidelines by auditing the charts for a period of six weeks

  - enhance skills and knowledge of optimal amount of blood required for the detection of microorganisms in the blood among Emergency Department room Nurses to improve blood culture sampling to ensure adequate blood volume to improve the accuracy of blood culture results

Methodology

- **Design:** Quality improvement project utilizing a retrospective chart review of pre and post intervention
- **Setting:** 19-bed Emergency Department at a Veterans Administration Hospital
- **Population:** Veterans over age 18 and ED nurses
- Compliance rate: 78%-Goal: 100%
- **Pre-implementation:**
- Retrospective chart review: 114 patients
- Staff observation: collection of 80 vials from 20 patients
- Laboratory collaboration with ED for marking of all BC bottles
- Education of 27 nurses
- Post-Implementation chart review: 130 patients

Results

	Pre		Post		Total		
	n	%	n	%	n	%	p-value
Female	8	7.02%	4	3.04%	12	4.99%	
Male	106	92.98%	126	96.94%	232	95.01%	
Adequate Vial Volume	39	34.22%	102	77.83%	141	57.51%	0.0002
Pathogen Isolated	15	13.16%	9	6.92%	24	9.79%	0.1066
Vial held Vertical	4	20.00%	15	75.00%	19	47.50%	0.0015
Vial held Horizontal	16	80.00%	5	25.00%	21	52.50%	
Butterfly Used	2	10.00%	3	15.00%	5	12.50%	1.00
IV Kit Used	18	90.00%	17	85.00%	35	87.50%	
Vial Wiped	16	80.00%	14	70.00%	30	75.00%	0.7150
Collection site prepped	2	10.00%	20	100%	22	55%	
SIRS	12	10.00%	20	15%	30	12.5%	

	Pre		Post		Total	
	n	%	n	%	n	%
Staph Aureus	9	25%	4	19.04%	13	22.0%
Staph Coagulase Negative	12	33.3%	5	23.8%	17	28.5%
Klebsiella Pneumonia	3	8.33%	3	14.2%	6	11.2%
Escherichia Coli	2	5.5%	2	9.5%	4	7.5%
Enterobacter Aerogenes	2	5.5%	1	4.7%	3	5.1%
Micrococcus * (Contaminant)	1	2.78%	0	0	1	1.39%
Bacillus *(Contaminant)	1	2.78%	0	0	1	1.39%
Alpha Strep	1	2.78%	1	4.7%	2	3.74%
Acinetobacter	1	2.78%	2	9.5%	3	6.14%
Serratia Marcescens	1	2.78%	2	9.5%	3	6.14%
Staphylococcus Epidermidis	1	2.78%	1	4.7%	2	3.74%
Staphylococcus Salivarius	1	2.78%	0	0	1	1.39%
Staphylococcous Hominis	1	2.78%	0	0	1	1.39%
Peptostreptococcus Sp	1	2.78%	0	0	1	1.39%
Strep Pneumonia	1	2.78%	0	0	1	1.39%

Implications

Clinical Practice:

- Standardize the process with marking BC bottles and improve process of collection to ensure accuracy of results based on current evidence-based recommendations.
- Practice guidelines updated and available for newer nurses on best practice to blood culture collection.
- Explore early nurse notification of inadequate samples by laboratory

Research

- Initiate quality improvement monitoring of new process to maintain best practice.
- Project finding important for policy improvement and subsequent research

- **Interprofessional Collaboration**
- Laboratory and Emergency Department to monitor marking of bottles

- **Financial Impact**
- Potential for cost saving related to a decrease in the number of suboptimal cultures requiring recollection

- **Education**
- Enhance nurses' knowledge on best practices to help ensure appropriate steps to overcoming blood culture sample insufficiency
- Yearly unit-based in-service recommended to maintain consistent knowledge
- Return demonstration depicting proper collection process

Discussion

- Findings showed an increase in amount of blood culture sample volume and appropriate positioning of vials.
- Reduction in contaminate pathogens from 5.2% to 0% lending to the accuracy and potential provider confidence
- Education alone did not impact outcome as expected
- Use of butterfly allows easier access of vials to be held vertically, however may result in additional phlebotomy attempts
- Explore early nurse notification of inadequate volume

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Contact information