Associations Between Vascular Access Device Complications and Bloodstream Infections: An 18-Month Review at a Large Academic Hospital

by

Julie Allison Campbell

Bachelor of Public Health, University at Buffalo, 2020

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This essay is submitted

by

Julie Allison Campbell

on

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and approved by

Essay Advisor: Mohamed Yassin, MD-PhD, Clinical Assistant Professor, Department of Medicine, School of Medicine, University of Pittsburgh

Jeremy Martinson, DPhil, Assistant Professor, Infectious Diseases and Microbiology, Graduate School of Public Health, University of Pittsburgh

Heather Dixon, MSN, RN, CPHQ, CIC, Director, Quality, Safety and Patient Experience Patient Safety Officer, UPMC Mercy

Associations between vascular access device complications and bloodstream infections: An 18-month review at a large academic hospital

Julie Allison Campbell, MPH

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Abstract

Background: Hospital-associated infections (HAIs), used interchangeably with healthcare- acquired infections (HCAIs), are newly acquired infections that are contracted within a hospital environment or health care setting. These infections can occur as a result of complications with peripherally inserted central catheters (PICC), midline catheters (MC), or peripheral intravenous catheters (PIVs), all of which are vascular access devices required for the delivery of fluids, and medication therapies to hospitalized individuals. Identifying the factors associated with venous access device complications, positive blood culture outcomes and the emergence of healthcare-acquired infections is of clear public health significance. In this review, the electronic clinical data of patients experiencing concurrent vascular access device complications and bloodstream infections was analyzed to understand factors that need to be addressed to prevent or reduce incidence of future hospital associated infections.

Methods: Electronic medical records from platforms TheraDocTM, RISKMASTER and Cerner PowerChart were used to conduct a retrospective, review of clinical data over an 18-month time period from January 1, 2019 thru June 30, 2021. Findings helped to elucidate associations between vascular access device complications and bloodstream infections. Spreadsheet software and statistical software were used for analysis.

Results: Investigation of 1237 positive blood culture patient profiles and 905 IV line complication patient profiles revealed 55 patients that met the inclusion criteria of having concurrent IV line complications and positive blood culture outcomes within the 18-month study interval. Approximately 83% of patients reviewed had an infiltration vascular access device (VAD) complication, 10% had insertion site issues, and 5% had phlebitis. Infiltration outcomes were significantly associated with the peripheral intravenous line (PIV) access device, had the greatest harm score risk, and most frequent association with prevalent hospital-associated infection causative pathogens.

Conclusions: Our findings suggest that the majority of vascular access device complications and associated bloodstream infections result from peripheral intravascular (PIV) lines. Measures should be taken to increase mitigation efforts by focusing resources towards the development and implementation of PLABSI prevention bundles to help reduce and prevent the emergence of vascular access device related healthcare-associated infections.

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1.0 Hospital Associated Infections

Hospital-associated infections (HAIs), also referred to as healthcare-acquired Infections (HCAIs) and nosocomial infections, are newly acquired infections that are contracted within a hospital environment or health care setting. These infections usually manifest 48 hours after admission to the hospital or within 30 days of receiving healthcare.[1,2] Transmission and contraction can occur via healthcare workers, patients, hospital equipment, or interventional procedures like endotracheal intubation and vascular access device placement.

The National Healthcare Safety Network (NHSN), a surveillance division of the CDC, is the nation's largest HAI tracking and reporting system that provides an electronic resource to identify problem areas, measure progress of prevention efforts, and ultimately eliminate healthcare-associated infections.[3] Common types of hospital-associated infections (HAIs) outlined by the CDC include central line-associated bloodstream infections (CLABSI), catheter-associated urinary tract infections (CAUTI), ventilator-associated pneumonia (VAP), and surgical site infections (SSI).

In some cases, patients may come from outside facilities with existing healthcare-associated infections due to pre-established vascular access devices like peripherally inserted central catheters (PICCs), midline catheters (MCs), or be transported via ambulance where peripheral intravenous lines (PIVs) may have been placed. Therefore, determining the sources or factors directly contributing to infection presents challenges because regardless of when or where the patient acquired the infection, the hospital reporting the incident becomes medically and financially liable for the patient's condition.

1.1 Blood Stream Infections and Vascular Device Types: CLABSIs, MLABSIs and PLABSIs

Central line-associated bloodstream infections (CLABSI), are defined as a laboratory-confirmed bloodstream infection not related to an infection at another site that develops within 48 hours of a central line placement.[4] According to the CDC, this type of infection forms when pathogens (usually bacteria or viruses) enter the bloodstream through the central line. CLABSIs are serious, yet preventable infections that are difficult to treat and are associated with peripherally inserted central catheters known as PICC lines. An estimated 30,100 central line-associated bloodstream infections occur in intensive care units and wards of U.S. acute care facilities annually.[5]

Other vascular device-related bloodstream infections include midline catheter−associated bloodstream infections (MLABSIs), and peripheral line–associated bloodstream infections (PLABSIs) which in addition to CLABSIs, lead to prolonged hospital stays, increased health care costs and high mortality.[6] Employing proper aseptic technique, insertion techniques and management of these vascular access devices is integral to successful mitigation and prevention[7] of bloodstream infections.

1.1.1 Vascular Access Device Placement, Complications, and Harm Scale

Vascular access devices (VADs), are inserted into the body through a vein to enable the administration of fluids, blood products, medication and other therapies to the bloodstream.[8] Commonly used vascular access devices include the aforementioned peripherally inserted central

catheters, referred to as PICC lines, midline catheters or MCs and peripheral intravenous lines PIVs.

Peripherally inserted central catheters (PICCs) are inserted at the ante-cubital fossa (elbow pit) or in the upper arm, extending to the superior vena cava where the line terminates, remaining in place within the vein for days or weeks. PICC benefits include long-term use, ease of placement, safety, and cost-effectiveness compared with traditional central venous catheters (CVCs).[9,10,11,12] However, PICCs require X-ray guidance for lines to be placed and are associated with 2 major severe complications, including CLABSI and formation of a type of blood clot called deep venous thrombosis (DVT).[9,11,12]

Midline catheters (MCs) are also inserted at the anti-cubital fossa but extend only as far as the large peripheral vein in the arm where it terminates. MCs serve as an alternative to PICCs because X-Ray line-guided placement is not required, they are generally used for shorter durations, and the incidence of CLABSIs is reduced, however, MCs limitations include their inability to be used for chemotherapy administration, and association with higher risk for more non-life threatening complications like infection, pain, leaking and swelling. [9,10,13,14]

Peripheral intravenous lines (PIVs) are short flexible catheters that are commonly inserted into the small peripheral veins in the arms, hands or wrists. 60-90% of patients require peripheral intravenous lines during their hospital stay which offer insertion ease and are considered low risk for infection due to their short-term use duration.[15,16] However, PIV placements often fail due to blockage or dislodgement indicated by common signs including inflammation, tightness of the skin, and pain around the insertion site.[16,17]

Complications associated with vascular access devices include ***infiltration***, ***insertion site issues*** and ***phlebitis***. Infiltration occurs when fluids administered through the intravenous catheter

leak out of the vein into surrounding tissues. Several factors can contribute to infiltrations such as puncture of the vein wall by the catheter, blockages within the vein which cause fluids to back up and out of injection site, and vein fragility, an issue more common in elderly patients where veins cannot withstand the infusion therefore causing them leak.[17] Insertion site issues can vary in type and severity ranging from lack of access to a viable vein to extravasations, a type of infiltration that happens due to displacement of catheter causing leakage of necrosis causing drugs that can cause severe damage to surrounding tissues.[17] Phlebitis is an inflammation along the tract of a catheter or recently catheterized vein. Signs and symptoms include erythema, warmth, and pain or tenderness and can result from mechanical, chemical or infectious irritation at the cannula site.[17,18]

At UPMC Mercy, IV complication events are categorized using a letter-based harm score designation. The harm score range of A through I (**Appendix A**) is structured to reflect increasing severity with "A's" denoting unsafe conditions/potential adverse events and "I's" indicating events that contributed to or resulted in death. For this review, the vascular access complications yielded a score of either A, C, D, or E. Event letter designations and descriptions are as follows:

A – Circumstances could cause adverse events

C – Event reached individual but did not cause harm

D – Event required monitoring to confirm no harm

E – Temporary harm-required treatment or intervention

1.1.2 Bacteremia and Sepsis

Bloodstream infections, or bacteremia, are defined by the laboratory confirmed evidence of bacteria or fungus in the blood. These infections are considered healthcare-associated when a vascular access device like a PICC, MC or PIV was in place at the time of, or within 48 hours

before the infection onset.[19,20,21] There are 2 BSI classifications – primary, meaning that it did not result from an infection at another body site, and secondary, which is thought to be seeded from a site-specific infection at another body site.[7] Left untreated, bloodstream infections can develop into a life-threatening medical emergency called sepsis, a type of systemic blood poisoning that can rapidly lead to tissue damage, organ failure, and death.[22]

1.2 Prevalent HAI Causative Pathogens

Prevalent pathogens resulting in positive blood culture outcomes in this study (**Figure 3**) include the following:[23,24,25,26]

1. *Coagulase Negative Staph* (CoNS): A type of staphylococcal bacteria that are a common source of healthcare-associated bloodstream infections. There are more than 45 recognized species of coagulase-negative staphylococci with S. epidermidis being one of the most significant.

2. *Gram Negative Rods*: Gram-negative bacteria cause infections including pneumonia, bloodstream infections, wound or surgical site infections, and meningitis in healthcare settings.

3. *Gram Positive Cocci*: These bacteria that grow in chains (Staphylococcus), and clusters or pairs (Streptococcus), are classified by the blue color they turn in the staining method. Examples of gram positive infections that cause healthcare-associated bacteremia in hospitals include Staphylococcus aureus and multi-drug resistant methicillin-resistant Staphylococcus aureus (MRSA).

4. *Pseudomonas aeruginosa*: Pseudomonas infection is caused by strains of bacteria found widely in the environment; the most common type causing infections in humans is called Pseudomonas

aeruginosa. Serious Pseudomonas infections usually occur in those that are hospitalized and/or with weakened immune systems.

5. *Staphylococcus aureus*: A bacterium ubiquitous on the skin with 30% of people carrying it in their noses. Usually this bacterium is harmless, but sometimes Staphylococcus aureus causes infections. In healthcare settings, staph infections can be serious or fatal if they develop into bacteremia or sepsis when bacteria spread to the bloodstream.

6. *Staphylococcus aureus (MRSA)*: Methicillin-resistant Staphylococcus aureus is a bacterium that is resistant to certain antibiotics called beta-lactams. These antibiotics include methicillin and other more common antibiotics such as oxacillin, penicillin, and amoxicillin. In the community, most MRSA infections are skin infections. More severe or potentially life-threatening MRSA infections occur most frequently among patients in healthcare settings.

1.3 Public Health Significance

The US Center for Disease Control and Prevention (CDC) reports that nearly 1.7 million hospitalized patients annually acquire HCAIs while being treated for other health issues and that more than 98,000 patients (one in 17) die due to these.[2] Treating CLABSIs alone is especially problematic in contributing to the financial healthcare burden in the United States costing $2.7 billion a year according to the Centers for Disease Control and Prevention. Midline Catheters are increasingly being used as an alternative to PICC lines to prevent CLABSIs, however, midline catheters do not eliminate the risk of catheter-associated BSIs and unlike CLABSIs, surveillance and reporting of midline catheter–associated bloodstream infections (MLABSIs) are not required.[27] And in the United States, nearly 200 million peripheral intravenous (PIV) catheters are

used annually, but PIV-associated complications such as bloodstream infection are currently under evaluated.[6]

Surveillance, evaluation, and reporting is critical and of clear public health significance for the mitigation and prevention of the healthcare-associated infections and is of great interest for the Infection Control Department at UPMC Mercy. Identifying the factors associated with venous access device complications and bloodstream infections will enhance clinical processes for the Nursing staff and IV team by informing on interconnections between IV line types, common pathogens, and harm score taxonomy to improve IV line placement and follow up procedures. Physicians and Pharmacists will also be better informed to ensure that specific medications are administered using the correct vascular access device to help reduce complications and incidence of future hospital-associated infections.

1.4 Essay Aims

The aim of this essay was to elucidate the connections between vascular access device complications such as infiltration, phlebitis, and insertion site issues and bloodstream infections. Electronic clinical data was retrospectively analyzed to gain an understanding of factors within the context of this review that may contribute to the emergence of healthcare-associated infections.

2.0 Methods

This retrospective review was conducted using the clinical data of 55 patients from electronic medical record sources TheraDoc™ Clinical Surveillance Software System, Riskmaster Incidences/Occurrences System, and Cerner PowerChart.

2.1 Retrospective Analysis

From January 1, 2019 through June 30, 2021, clinical data from electronic medical records were collected, analyzed, and combined from two different platforms: TheraDoc, which provided details about laboratory confirmed positive bloods culture results and patient demographic information, and Riskmaster, where specifics of healthcare-related adverse event data is reported. Inclusion criteria was met when both the exposure of a vascular access device complication and the outcome of a positive blood culture was reported for the same patient within this 18 month time frame.

2.2 Descriptive Statistics

Measures of frequency distribution were used to describe the relationships between complications associated with vascular access devices such as indicator (infiltration, phlebitis, insertion site issues), line type (PICC, CVC, MC, PIV), hospital unit, and harm score. Frequency was also used to determine pathogen prevalence and the vascular access devices they were most

associated with. Measures of central tendency were used to determine patient age distribution, median age, and mean age by harm score designation.

3.0 Results

During the 18-month study interval between January 2019 and June 2021, a total of 1237 positive blood culture patient profiles and 905 IV line complication patient profiles were analyzed and revealed 55 patients that met the inclusion criteria of having concurrent vascular access device complications and positive blood culture outcomes. Patient demographic was 49% male and 51% female ranging in age from 26 to 90 years with a median age of 62 years.

Of the vascular access device complications - infiltration, phlebitis, and insertion site issues as summarized in **Table 1**, the vast majority were infiltrations 46 (84%) with a harm score of D which is an event that required monitoring. But 9 of those cases required an intervention or some type of treatment and had a harm score of E (**Figure 1**). On average, younger patients experienced greater harm events and 5.5% of the study population with a mean age of 65 years had harm scores of A's, 21.8% with a mean age of 67 were C's, 56.4% with a mean age of 62 years were D's, and 16.4% with a mean age of 56 were E's (**Table 2**).

Table 1. Frequency distribution of vascular access device complication indicators

Outcome	Frequency	Relative Frequency	Percentage
Infiltration	46	0.836	84 (83.6)
Insertion Site Issue	6	0.109	11 (10.9)
Phlebitis	3	0.054	5 (5.45)
Totals	55	0.999	100

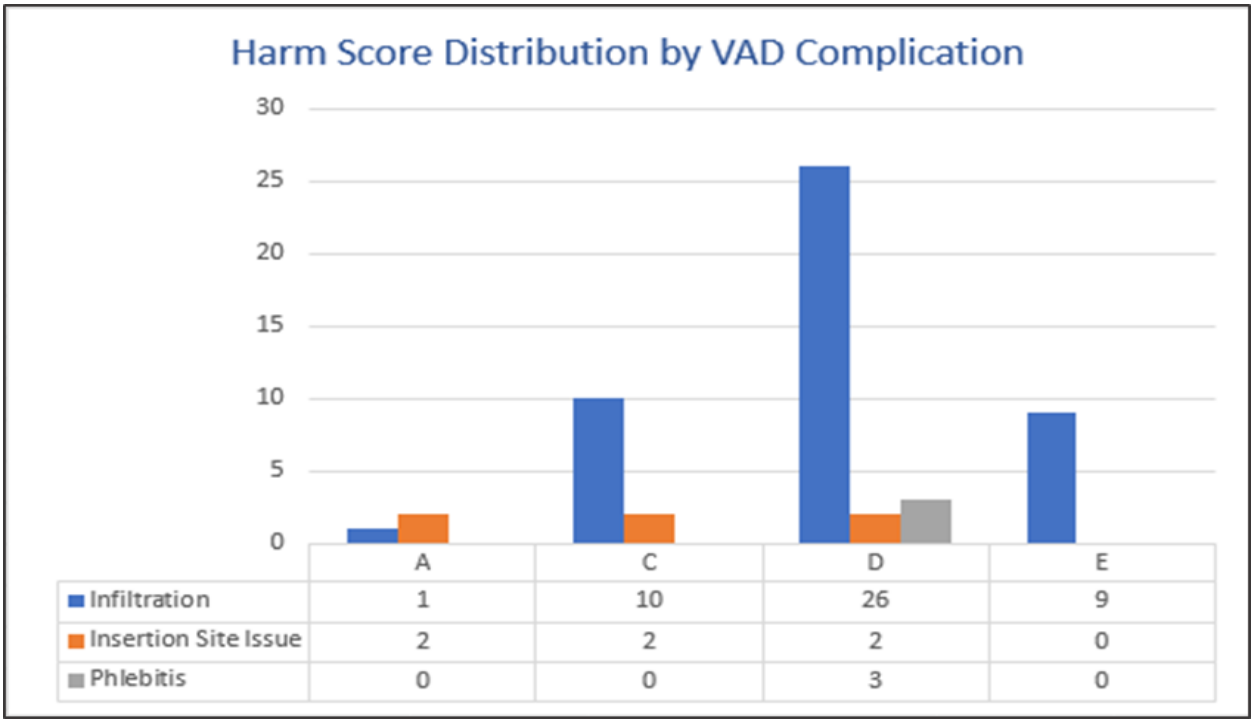


Figure 1. Harm score distribution based on vascular access device complications – inflitration, insertion site issues and phlebitis.

Table 2. Harm score frequency distribution and event definition

Harm Scale	Frequency	Percentage	Harm Definition
A	3	5.5	Circumstances could cause adverse events
C	12	21.8	Event reached individual but did not cause harm
D	31	56.4	Event required monitoring to confirm no harm
E	9	16.4	Temporary harm-required treatment or intervention
Totals	55		

4 vascular access device types were assessed for their associations with harm (**Figure 2 and Table 3**) and with prevalent hospital-associated causative pathogens (**Figure 4**). 1 patient (1.8%) had a central venous catheter (CVC), 6 (10.9%) had midline-catheters (MCs), 3 (5.5%) had peripherally inserted central catheters (PICCs), and 44 patients (80%) had peripheral intravenous

lines (PIVs). One patient, accounting for 1.8% of the vascular access device/ harm association was determined to be “no access” following multiple failed intravenous insertion attempts.

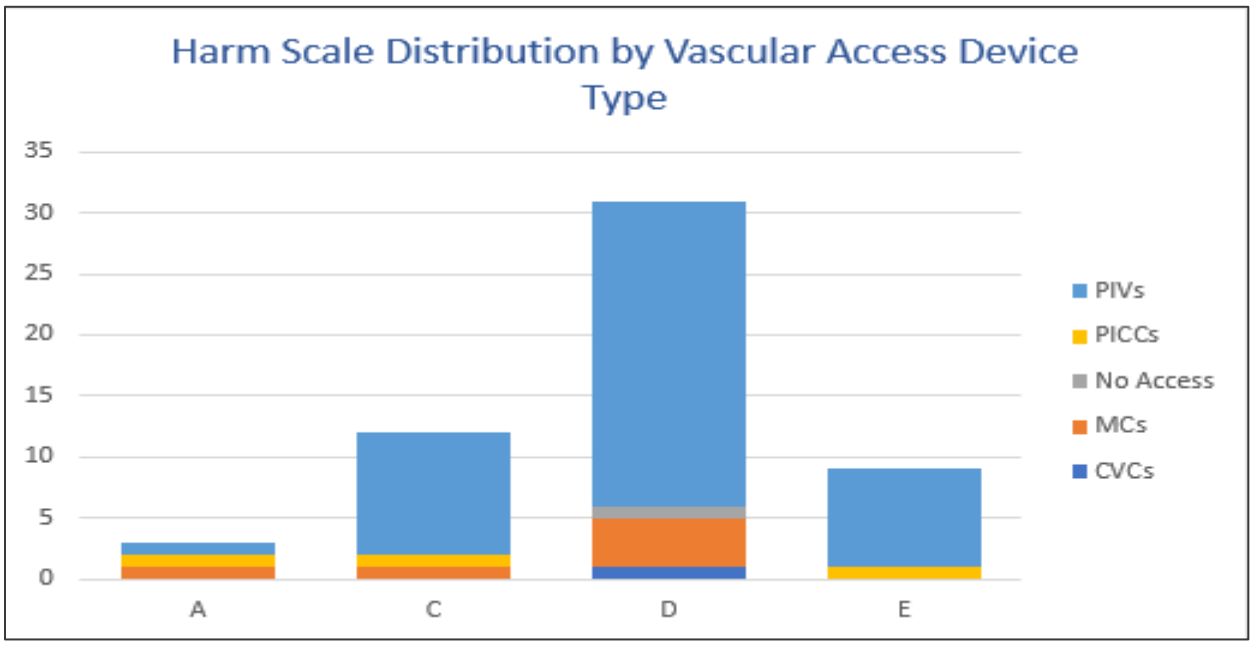


Figure 2. Features harm score distribution based on vascular access device type. PIVs are associated with greatest harm and CVCs are associated with least harm.

Table 3. Harm frequency based on vascular access device type

VAD Line Type	A	C	D	E
CVCs	0	0	1	0
MCs	1	1	4	0
No Access	0	0	1	0
PICCs	1	1	0	1
PIVs	1	10	25	8

In this review, the 6 prevalent healthcare-associated infection causative pathogens were identified. 20% were *Staphylococcus aureus*, 15% were *Methicillin-resistant Staphylococcus aureus*, 11% were *Gram negative rods*, 11% were *Gram positive cocci*, 5% were *Pseudomonas*

aeruginosa, and 5% were *Coagulase negative Staphylococci* (**Figure 3**). Bloodstream infection causing pathogens were found to be primarily associated with peripheral intravenous lines (PIVs)

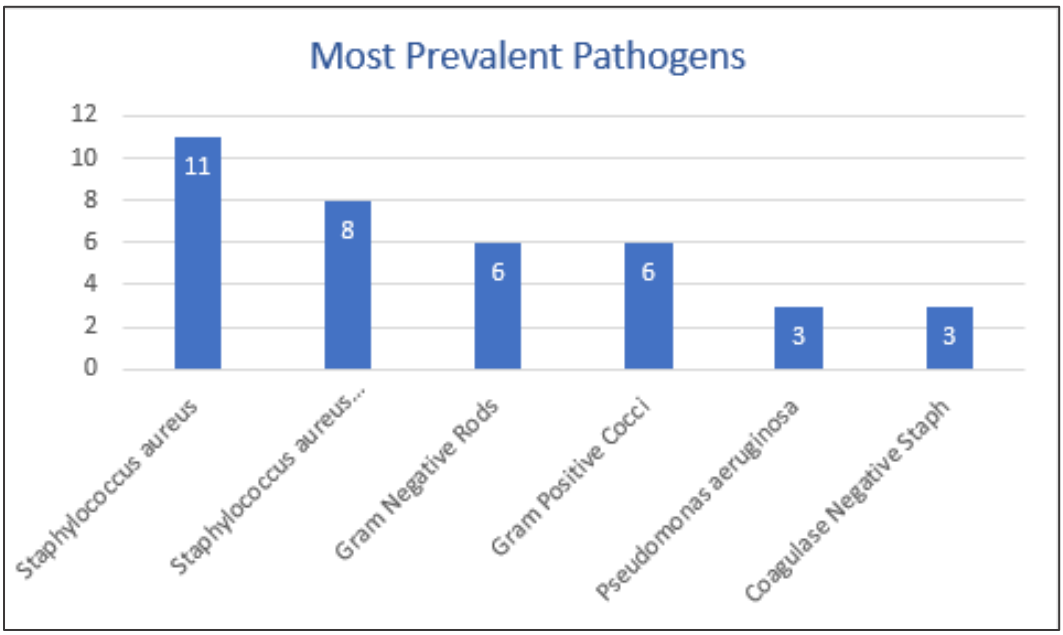


Figure 3. Features the 6 most prevalent healthcare-associated infection causative pathogens in patients with vascular access device complications.

and midline catheters (MCs) with *Staphylococcus aureus*, *Methicillin-resistant Staphylococcus aureus*, *Gram negative rods*, and *Gram positive cocci* occurring most frequently (**Figure 4**).

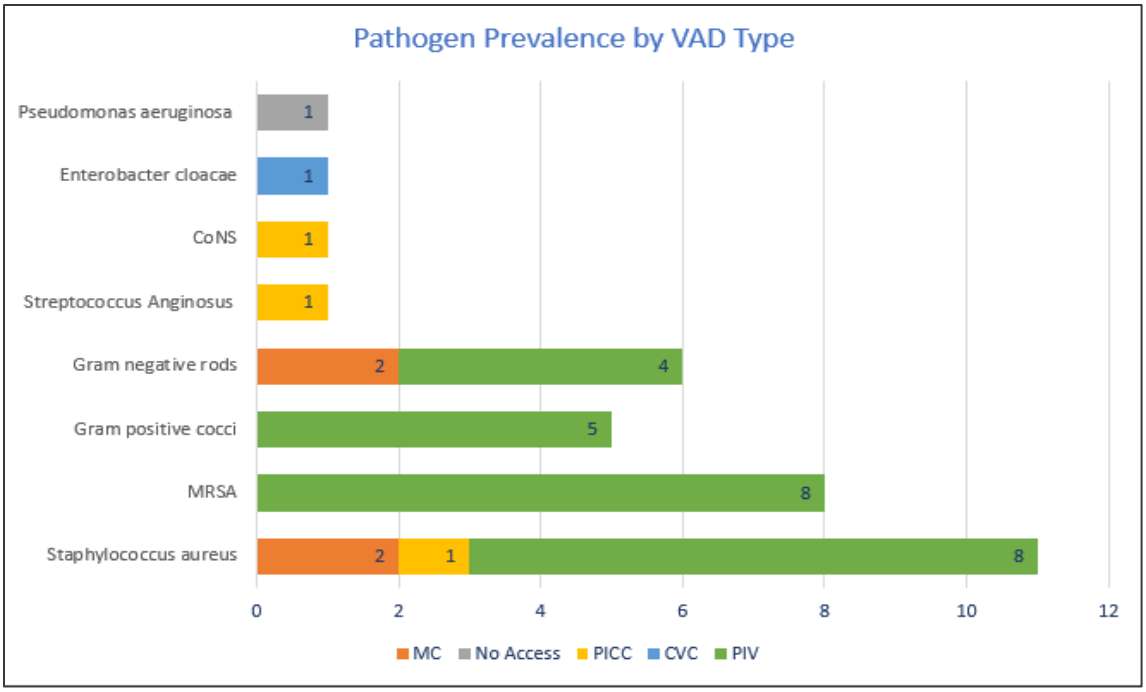


Figure 4. Reflects prevalence of bloodstream infection causing pathogens and associated vascular access devices - central venous catheters (CVCs), peripherally inserted central catheters (PICCs), midline catheters (MCs) and peripheral intravenous lines (PIVs).

4.0 Discussion

When reviewing the factors that contribute to vascular access line complications and bloodstream infections, findings suggest notable differences between central venous catheters (CVCs), peripherally inserted central catheters (PICCs) and midline catheters (MCs) in comparison to peripheral intravenous lines (PIVs). Despite having one case designated an E, the majority of minor harm event designations of A and C were mainly attributed to MC lines with 2 cases, PICC lines with 2 cases, and PIV lines with 11 cases (**Table 3**). However, significantly more cases, 33, with D and E harm score designations were associated with peripherally inserted intravenous lines (PIVs).

Peripheral intravenous lines (PIVs), were also more associated with the most prevalent healthcare-associated infection causative pathogens *Staphylococcus aureus*, *Methicillin-resistant Staphylococcus aureus*, *Gram negative rods*, and *Gram positive cocci* than all other vascular access device types combined (**Figure 4**). These results are consistent with results from other studies such as Zhang et al where the bacteria most frequently isolated from peripheral intravenous lines include Zhang et al. *Staphylococcus aureus, Gram negative rods,* and *Coagulase Negative Staph* (CoNS)[30] which is one of the 6 prevalent pathogen findings in this review (**Figure 3**).

4.1 CLABSI Prevention Bundles

Patients in this review with PICC lines were associated with experiencing the least harm overall, and less distribution of bloodstream infection causing pathogens. This is likely because of UPMC Mercy's employment of CLABSI prevention bundles (**Appendix B**). One recent study showed that implementation of evidence-based CLABSI prevention bundles and process monitoring by direct observation led to significant and subsequently sustained improvement in reducing CLABSI rates.[28]

The CLABSI bundle consists of evidence-based practices that have been combined and implemented together to provide best strategy guidelines and tools for consistent bloodstream infection prevention, central line care and maintenance, and blood collection and medication administration.[28] Best practice measures for the central line insertion aspect of CLABSI bundles focuses on hand hygiene before, during, and following patient contact and line placement, steps for skin preparation to establish a sterile injection site, correct use of personal protective equipment (PPE) and maintaining aseptic technique, and guidelines for selecting the optimal catheter insertion site such as the subclavian or internal jugular veins for infection prevention purposes.[28]

Then, there is the central line maintenance aspect which also emphasizes hand hygiene, but at specific moments including prior to patient contact, before preforming any aseptic procedure, and after body-fluid exposure, touching the patient, or touching patient surroundings. Central line maintenance also calls attention to the importance daily catheter assessment during rounds to determine catheter necessity or catheter removal and addresses techniques for accessing and changing needleless connectors and tubing which can vary by institution or organizational policy.[28]

4.1.1 Addressing PLABSIs with a CLABSI Bundle Approach

It could be recommended that this bundled approach may prove successful for the prevention of peripheral line–associated bloodstream infections (PLABSIs). Surveillance, reporting, research and standardization of practices has resulted in a significant reduction in central line-associated bloodstream infections (CLABSIs), however, the research concerning peripheral intravenous line related bloodstream infections lack standardization in clinical practice.[29] Zhang et al reported that the categories of risk factors for peripheral IV infection were catheter related, healthcare related, and dressing related and there were four possible pathways of infection: 1. migration of microbes down the catheter tract, 2. via the catheter hub, 3. by bacteria circulating in the bloodstream (existing infection), or 4. from contaminated infusate.[30]

Each of the aformetiond risk factors and mechanisms for infection with the exception of pre-existing infections, could have connections to components of human error in healthcare settings. An example of this could occur via the first infection pathway; migration of microbes down the catheter track, which could be linked to inadequate hand hygiene or insertion site sterilization both of which minimize the potential of skin organism introduction into the catheter and are particular practices where infection mitigation efforts should be focused using an approach similar to that of CLABSI bundles.

I had the opportunity to shadow the phlebotomy and the IV team and based on my observations, it became apparent that peripherally inserted line (PIVs) sites had the greatest potential for infection despite generally being considered lower risk for infection than central lines. For the IV team, the process for placing a PICC line used assistive equipment and was time consuming with protocol that involved multiple consecutive steps that were followed with each patient to ensure consistency, safety, and aseptic technique whereas with the phlebotomy team, the

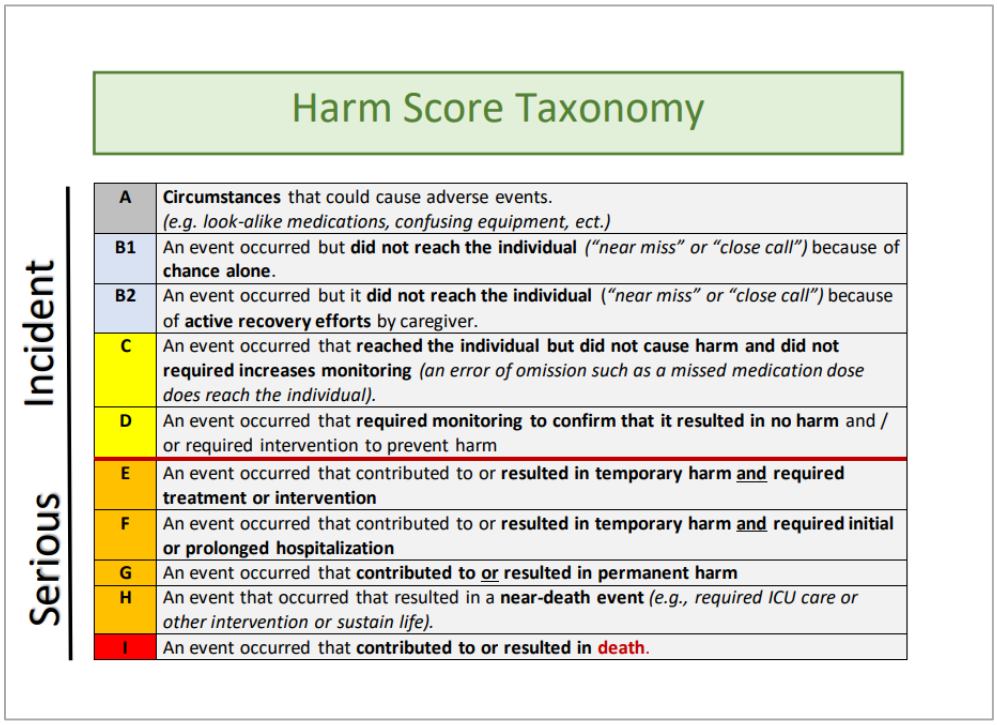
process for peripheral line insertion was quick and not as regulated or regimented with variations in execution based on the phlebotomist placing the line. PIV use is much more frequent, therefore attributing responsibility for a larger number of infections in comparison to PICCs, MCs and CVCs. This warrants the application of control measures to all types of vascular access devices [31] and towards the development and implementation of PLABSI prevention bundles to reduce the emergence of peripheral line-associated bloodstream infections in healthcare settings.

5.0 Conclusion

This retrospective review highlights that the majority of vascular access device complications which resulted in a greater measure of patient harm and associated bloodstream infections within the affected population result from peripheral intravascular (PIV) line use. Also described and of critical public health importance is the lack of surveillance, evaluation, and reporting of complications involving peripherally inserted lines. And with associations between PIVs and prevalent bloodstream infection causative pathogens and increased incidence of harm score events that required monitoring / interventions to prevent harm or resulted in temporary harm that required intervention or treatment, the need for preventative measures becomes evident.

The development and implementation of peripheral line-associated bloodstream infection (PLABSI) prevention bundles would serve as an evidence-based resource that provides peripheral intravenous line-specific practices. This PLABSI best strategy guide would assist as an educational tool that promotes consistency in critical practices while informing clinicians of significant factors related to mechanisms of bloodstream infection. Details of the PLABSI protocol would include but is not limited to hand hygiene, correct PPE use, and conditions necessary for maintaining asepsis during PIV placement. Adapting this approach could help further reduce and prevent the emergence of healthcare-associated infections related to vascular access devices.

Appendix A Harm Score Taxonomy

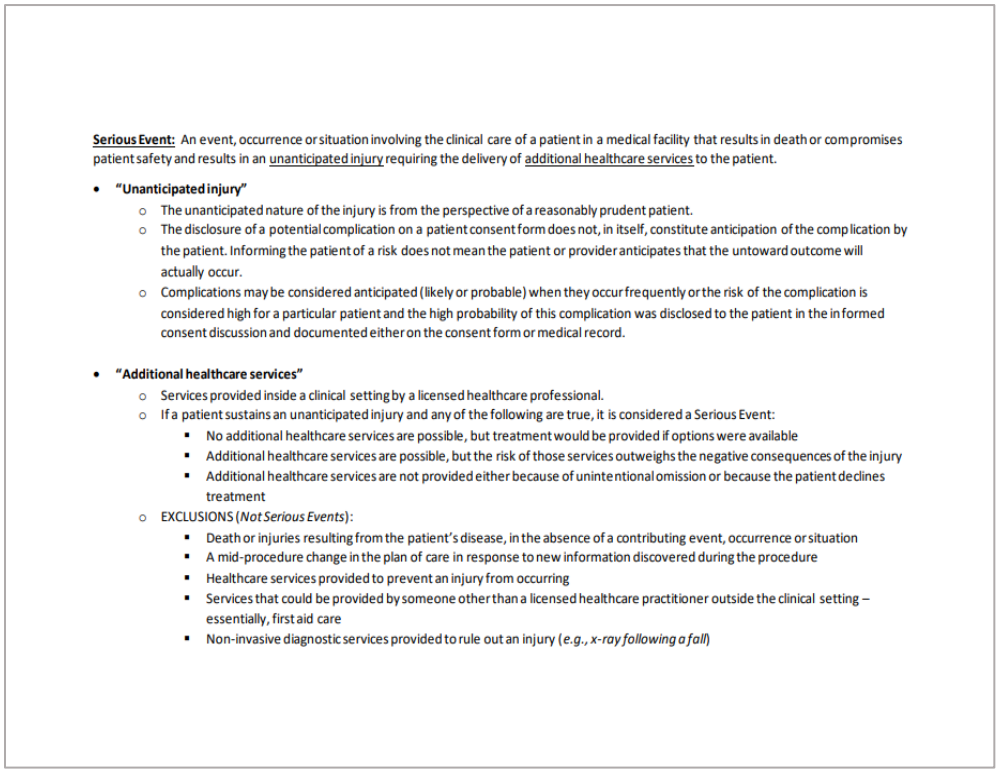


Harm Score Taxonomy

Incident	A	**Circumstances** that could cause adverse events. *(e.g. look-alike medications, confusing equipment, ect.)*
Incident	B1	An event occurred but **did not reach the individual** *("near miss" or "close call")* because of **chance alone**.
Incident	B2	An event occurred but it **did not reach the individual** *("near miss" or "close call")* because of **active recovery efforts** by caregiver.
Incident	C	An event occurred that **reached the individual but did not cause harm and did not required increases monitoring** *(an error of omission such as a missed medication dose does reach the individual).*
Incident	D	An event occurred that **required monitoring to confirm that it resulted in no harm** and / or required intervention to prevent harm
Serious	E	An event occurred that contributed to or **resulted in temporary harm and required treatment or intervention**
Serious	F	An event occurred that contributed to or **resulted in temporary harm and required initial or prolonged hospitalization**
Serious	G	An event occurred that **contributed to or resulted in permanent harm**
Serious	H	An event that occurred that resulted in a **near-death event** *(e.g., required ICU care or other intervention or sustain life).*
Serious	I	An event occurred that **contributed to or resulted in death.**

Appendix A. 1 of 2 Harm Score Taxonomy

http://patientsafety.pa.gov/ADVISORIES/Documents/Tool%20PDFs/201503_taxonomy.pdf



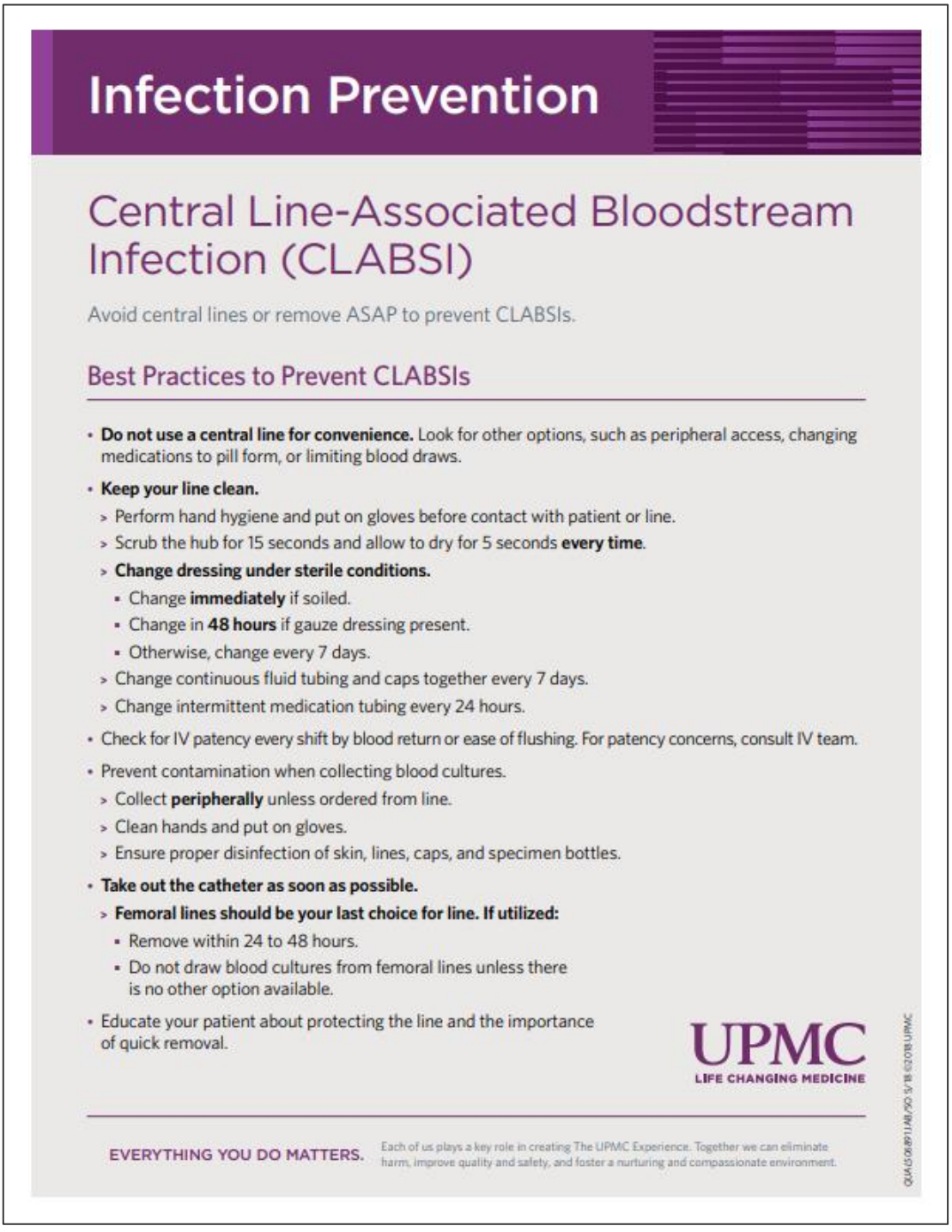
Serious Event: An event, occurrence or situation involving the clinical care of a patient in a medical facility that results in death or compromises patient safety and results in an unanticipated injury requiring the delivery of additional healthcare services to the patient.

- **"Unanticipated injury"**
  - The unanticipated nature of the injury is from the perspective of a reasonably prudent patient.
  - The disclosure of a potential complication on a patient consent form does not, in itself, constitute anticipation of the complication by the patient. Informing the patient of a risk does not mean the patient or provider anticipates that the untoward outcome will actually occur.
  - Complications may be considered anticipated (likely or probable) when they occur frequently or the risk of the complication is considered high for a particular patient and the high probability of this complication was disclosed to the patient in the informed consent discussion and documented either on the consent form or medical record.

- **"Additional healthcare services"**
  - Services provided inside a clinical setting by a licensed healthcare professional.
  - If a patient sustains an unanticipated injury and any of the following are true, it is considered a Serious Event:
    - No additional healthcare services are possible, but treatment would be provided if options were available
    - Additional healthcare services are possible, but the risk of those services outweighs the negative consequences of the injury
    - Additional healthcare services are not provided either because of unintentional omission or because the patient declines treatment
  - EXCLUSIONS (*Not Serious Events*):
    - Death or injuries resulting from the patient's disease, in the absence of a contributing event, occurrence or situation
    - A mid-procedure change in the plan of care in response to new information discovered during the procedure
    - Healthcare services provided to prevent an injury from occurring
    - Services that could be provided by someone other than a licensed healthcare practitioner outside the clinical setting – essentially, first aid care
    - Non-invasive diagnostic services provided to rule out an injury (*e.g., x-ray following a fall*)

Appendix A. 2 of 2 Harm Score Taxonomy

Appendix B UPMC CLABSI Fact Sheet



Infection Prevention

Central Line-Associated Bloodstream Infection (CLABSI)

Avoid central lines or remove ASAP to prevent CLABSIs.

Best Practices to Prevent CLABSIs

- **Do not use a central line for convenience.** Look for other options, such as peripheral access, changing medications to pill form, or limiting blood draws.
- **Keep your line clean.**
  - Perform hand hygiene and put on gloves before contact with patient or line.
  - Scrub the hub for 15 seconds and allow to dry for 5 seconds **every time**.
  - **Change dressing under sterile conditions.**
    - Change **immediately** if soiled.
    - Change in **48 hours** if gauze dressing present.
    - Otherwise, change every 7 days.
  - Change continuous fluid tubing and caps together every 7 days.
  - Change intermittent medication tubing every 24 hours.
- Check for IV patency every shift by blood return or ease of flushing. For patency concerns, consult IV team.
- Prevent contamination when collecting blood cultures.
  - Collect **peripherally** unless ordered from line.
  - Clean hands and put on gloves.
  - Ensure proper disinfection of skin, lines, caps, and specimen bottles.
- **Take out the catheter as soon as possible.**
  - **Femoral lines should be your last choice for line. If utilized:**
    - Remove within 24 to 48 hours.
    - Do not draw blood cultures from femoral lines unless there is no other option available.
- Educate your patient about protecting the line and the importance of quick removal.

UPMC
LIFE CHANGING MEDICINE

EVERYTHING YOU DO MATTERS. Each of us plays a key role in creating The UPMC Experience. Together we can eliminate harm, improve quality and safety, and foster a nurturing and compassionate environment.

Appendix B: This fact sheet serves as a best practice strategy guide to assist in CLABSI reduction

Bibliography

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