

# Enhancing Vascular Access Safety:

## The Role of Tissue Adhesives in Infection Prevention

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Infection Preventionist



### DISCLOSURES

Employee of  
Mercy Health System

Speakers Bureau  
HB Fuller Medical Adhesive Technologies

No off-label use will be discussed

### Understanding Implicit Bias



#### Attitudes that are unconscious and unintentional

Implicit bias refers to unconscious attitudes, beliefs, stereotypes, or prejudices that individuals may hold towards certain groups or individuals based on characteristics such as race, gender, age, or socioeconomic status. These biases are often unintentional and can influence our perceptions, decisions, and behaviors, even when we may consciously strive to be fair and impartial.



#### May be deeply ingrained and Subconscious

Implicit biases are formed through societal, cultural, and personal experiences, as well as the influence of media and upbringing. They can be deeply ingrained and operate at a subconscious level, impacting our interactions and decision-making processes.



CA 241



#### BARGAINING POWER OF BUYERS

What sets implicit biases apart from explicit biases is that individuals may not be consciously aware of holding them. These biases can persist despite an individual's genuinely held commitment to equality and fairness.



#### Self-reflect your views

Recognizing and addressing implicit biases is crucial in promoting inclusivity, fairness, and equity in various domains, including healthcare, education, and employment. It is important to engage in self-reflection, education, and dialogue to identify and challenge our implicit biases, as this can help foster more equitable treatment and decision-making.



#### Stride towards a more inclusive and equitable state

It's important to note that implicit biases can be countered through conscious efforts, such as increasing awareness, providing diverse perspectives, implementing unbiased policies and practices, and fostering empathy and understanding. By actively addressing implicit biases, we can strive towards a more inclusive and equitable society.

### OBJECTIVES

**Understand** vascular access device infections from an infection preventionist's perspective.

**Investigate** the characteristics and properties of tissue adhesives.

**Define** hospital-acquired conditions, including bacteremia and fungemia, associated with vascular access catheters.

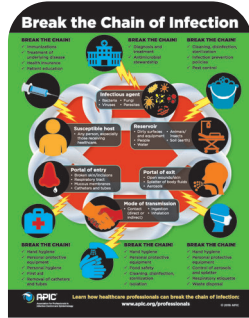
**Examine** the research, evidence, and guidelines on using cyanoacrylate (CA) tissue adhesive to prevent infections and reduce risks linked to vascular catheters.

**Identify** the common microorganisms responsible for infections related to peripheral vascular catheter (PIVC) devices.

## Breaking the Chain of Infection: What role do IPs play?



- ❖ Construction Projects and Planning
- ❖ Isolation Rooms
- ❖ Environmental Services
- ❖ Operating Room
- ❖ Sterile Processing
- ❖ High Level Disinfection
- ❖ Laundry
- ❖ Kitchen
- ❖ Unit Huddle
- ❖ Environment of Care
- ❖ Regulatory Tracer
- ❖ Hand Hygiene
- ❖ Exposures and Investigations
- ❖ Devices



[www.apic.org/professionals](http://www.apic.org/professionals)

## WHAT IS HOB?

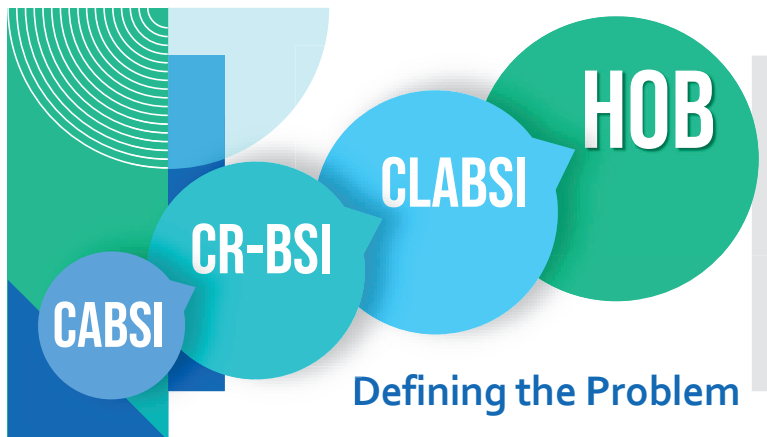
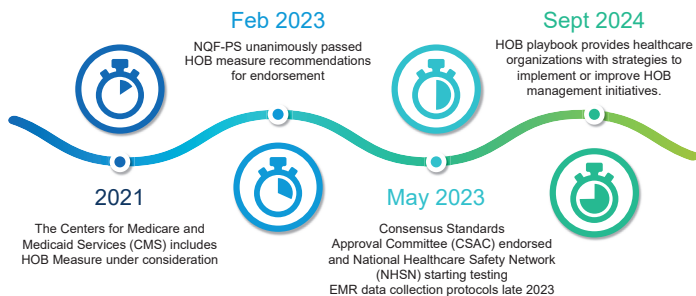
### Expanded healthcare-associated infection surveillance

Hospital-onset bacteremia and fungemia (HOB) is any bloodstream infection in which bacterial or fungal pathogens are detected in a blood culture specimen collected **on day four or later** of hospital admission.

HOB includes bloodstream infections from all sources, **regardless of organism or device.**

It covers a **wider range of infections** than the traditional targets of infection prevention and control and quality measurement efforts over the past two decades e.g., CLABSIs, CAUTIs, and SSIs.

## It's time to protect **EVERY** vascular access catheter



## Why Measure HOB?



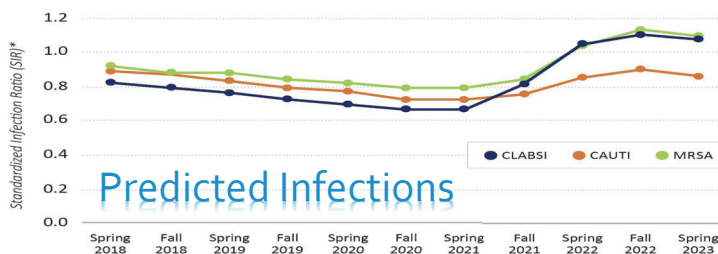
- Patients with HOB experienced
- longer stays (12.1–17.4 more days)
  - morbidity, mortality (>3.5-fold increased risk)
  - readmissions (relative risk, 1.28–1.41)
  - hospital costs (\$25,207–\$55,001 more per admission)

- Compared to the CLABSI measure, the HOB measure allows for more meaningful comparison between organizations;
- HOB and CLABSI rates are strongly associated but HOB occurs more frequently than CLABSIs.

- Current CLABSI classification captures only a small portion of HOB events.

(HOB Playbook, 2024)

## AVERAGE HEALTHCARE-ASSOCIATED INFECTIONS FROM HOSPITALS RECEIVING A LEAPFROG SAFETY GRADE



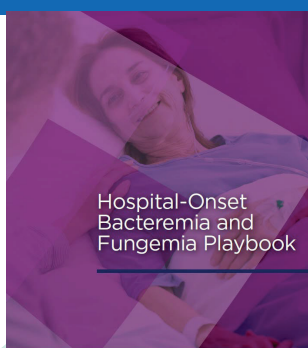
The standardized infection ratio (SIR) is used to measure HAIs by hospital. If the SIR is 1, then the number of actual infections is the same as the number of predicted infections. If the SIR is less than 1, then the number of actual infections is less than the number of predicted infections and if the SIR is more than 1, then the number of actual infections is more than the number of predicted infections.

\* Lower score indicates better performance



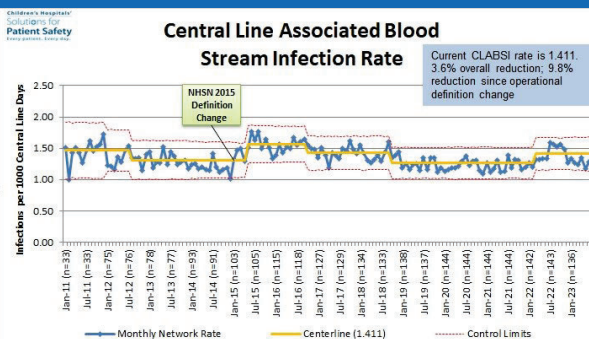
## What's the "Playbook"?

- National Quality Forum
- Released September 30, 2024
- Provides healthcare organizations with guidance for HOB prevention programs
- VASs are PART of the HOB TEAM



qualityforum.org

## Central Line Associated Blood Stream Infection Rate



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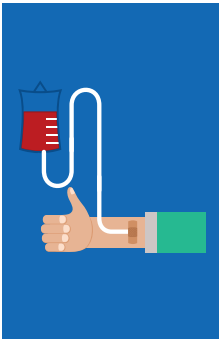
**CLABSIs**  
 Mortality 15–25%  
 Increased LOS 9.6–14.3 days  
 Attributable cost \$0.62 to \$2.68 Billion USD

VADs used in 90% of non-ICU patients

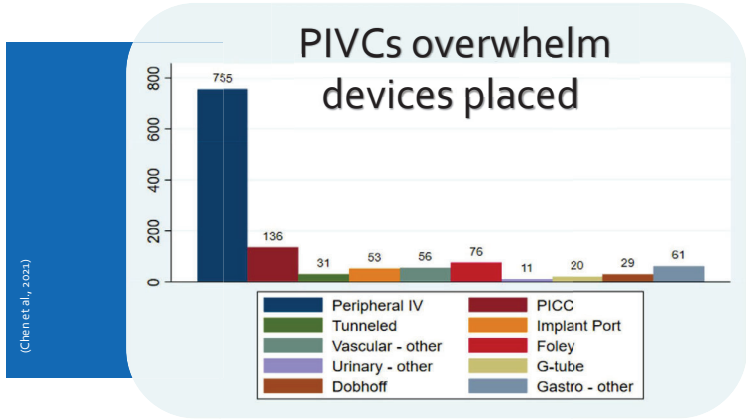
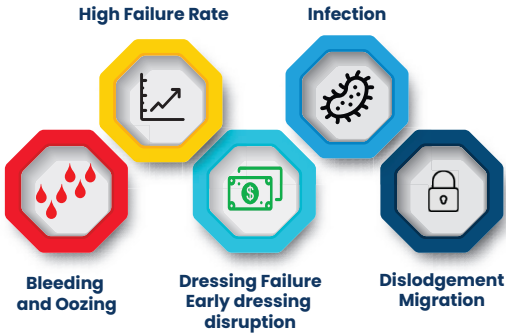
350 million PIVC Sold in the US **ANNUALLY**

8.5 million CVADs  
 10 million PICC  
 4 million Midline Sold in US **ANNUALLY**

(Chen et al., 2021; Garcia 2023; CDC 2011; Ray-Barruel & Alexander, 2023)



**Vascular Access Challenges**

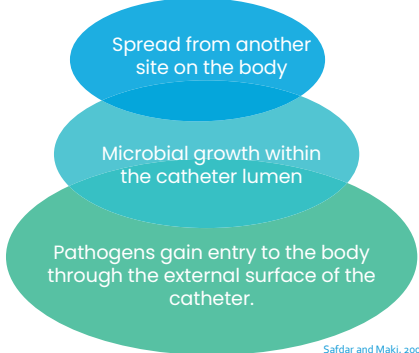


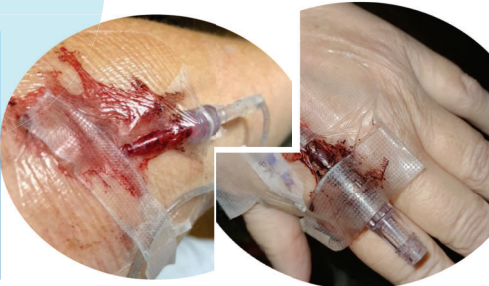
Other Sources

Intraluminal

Extraluminal

**How do VADs Become Infected?**





## PIVCs are an underrecognized source of *Staphylococcus aureus* BSI

Images courtesy of H. B. Fuller Medical Adhesive Technologies

### ORIGINAL ARTICLE

## Standards of Care for Peripheral Intravenous Catheters: Evidence-Based Expert Consensus

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 B. Braun Medical Inc, Balthasar, PA

**Highlights**

- The United States purchases an estimated 350 million PIVCs annually.
- PVC insertion is the most frequently performed invasive procedure in healthcare.
- There is multidisciplinary and multi-organizational collaboration.
- PVC insertion and maintenance is underrepresented in U.S. healthcare.
- There is a fundamental lack of awareness regarding associated risks.
- Patient knowledge and understanding accept substantial care.

## Vascular Access Evidence

Endorsed by 26 organizations

### Endorsing Organizations

- Alliance for Vascular Access Teaching and Research (AVATAR)
- American Academy of Emergency Nurse Practitioners (AAENP)
- American Association of Critical-Care Nurses (AACN)
- American Association of Nurse Anesthesiology (AANA)
- Association for Professionals in Infection Control and Epidemiology (APIC)
- Association for Safe Aseptic Practice (ASAP)
- Association for Vascular Access (AVA)
  - Beyond Acute Care Special Interest Group (BACSIG)
  - Canadian Vascular Access Association (CVAA)
- ECRI
- Emergency Nurses Association (ENA)
- Infection Nurses Society (INS)
- International Nosocomial Infection Control Consortium (INICC)
- Pediatric and Neonatal Special Interest Group (PediNeoSIG)
- Society for Healthcare Epidemiology of America (SHEA)
- Society of Nurse Scientists, Innovators, Entrepreneurs & Leaders (SONSIEL)

(Thompson J, Steinheiser MM, Hotchkiss JB, et al. 2024)



World Health Organization

Guidelines for the prevention of bloodstream infections and other infections associated with the use of intravascular catheters

Part 1: peripheral catheters



Guidelines for the prevention of BSI and other infections with the use of intravascular catheters

(World Health Organization, 2024)

## JAMA Pediatrics

### RCT: Effect of Novel Peripheral Intravenous Catheter Securement for Children to Prevent Catheter Failure

#### POPULATION

189 Males, 194 Females



Children in emergency departments (EDs) anticipated to require both a peripheral intravenous catheter (PIVC) and admission to hospital for >24 hours

Median age, 36 mo

#### INTERVENTION

402 Patients randomized

383 Patients analyzed



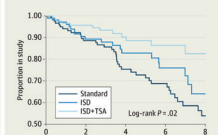
**134 Standard care**  
 Application of a bordered polyurethane dressing over the PIVC

**118 Integrated securement dressings (ISD)**  
 Application of an ISD with variable sizes over a PIVC

**131 ISD with tissue adhesive (TA)**  
 Use of TA at PIVC site and hub prior to integrated securement dressing

#### FINDINGS

PVC failure was lowest in ISD with TA group compared with ISD and standard care.



#### SETTINGS / LOCATIONS

2 regional hospitals in Queensland, Australia

#### PRIMARY OUTCOME

The primary outcome was PIVC failure, defined as unplanned PIVC removal where PIVC reinsertion was required

43 Of 134 patients had PIVC failure; IRR reference  
 24 Of 118 patients had PIVC failure; IRR, 0.80; 95% CI, 0.47-1.35  
 15 Of 131 patients had PIVC failure; IRR, 0.45; 95% CI, 0.23-0.84

Charters B, Foster K, Lawton B, et al. Effect of Novel peripheral intravenous catheter securement for children and catheter failure: a randomized clinical trial. JAMA Pediatr. Published online March 25, 2024. doi:10.1001/jamapediatrics.2024.0167

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**COMPLEXITY OF VASCULAR ACCESS**



**2-octyl cyanoacrylate (80%) butyl cyanoacrylate**

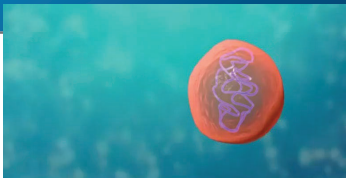
(Prince et al., 2017)

- Low water activity is a limiting factor for microbial survival
- Completely kills  $\geq 8$  log of bacteria after a 3-minute contact time
- Broad spectrum: Gram -, Gram +, Yeast, Fungi (including 3.47 log against *C. auris*)

*Water diffusion from microbe cell into CA causes cell lysis and death*

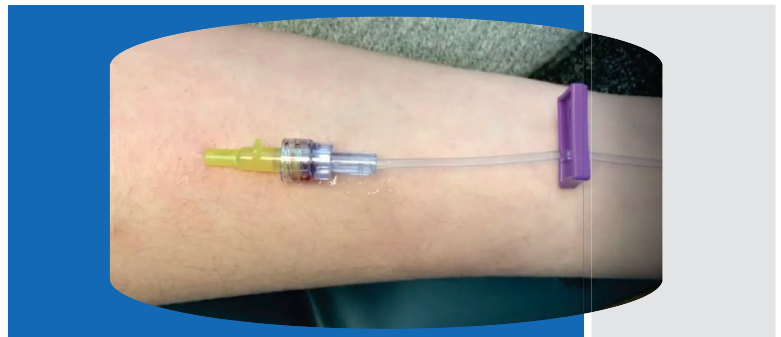
**CHG mechanism of action**

- ✓ Rapidly disrupts the cell membrane
- ✓ Broad-spectrum, Gram +, Gram -, nonspore-forming bacteria, yeast, and selective lipid envelope viruses, including HIV
- ✓ Bacteriostatic (inhibits) and Bactericidal (kills)
- ✓ Can protect against biofilm development
- ✓ Log reduction 4-6 (may vary by product)



Edmiston et al., 2013

**PIVC Sealed and Secured with Tissue Adhesive**



Video courtesy of HB Fuller Medical Adhesive Technologies

## Radial Artery Catheters

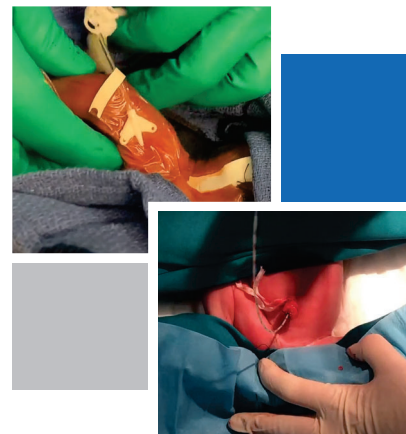
- Frequent use in critical care: pressor titration, laboratory testing, ventilation
- Care and management are often "trivialized" and lack attention like PIVCs, though evidence of infection risk suggests they should be treated like CVC
- Location (near flexion) and wrist restraints add to complications

(Imbrisco et al., 2022; Barros et al., 2021)

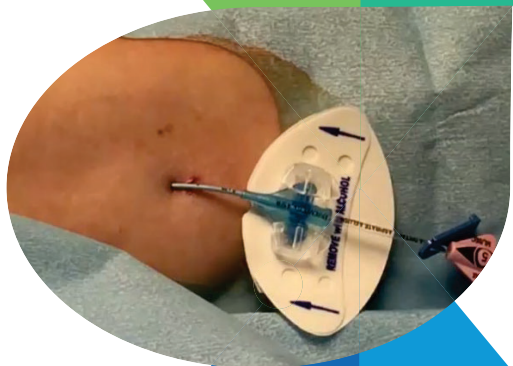


## NICU Umbilical, PICC, PIVC

(D'Andrea et al., 2023)



## Tissue Adhesive Securement Insertion Site Sealed



VIDEO COURTESY OF HB FULLER MEDICAL ADHESIVE TECHNOLOGIES





**Mercy Hospital  
Springfield, MO USA**

Level 1 Trauma Center  
Burn Center  
Pediatric ED  
St. Jude Affiliate Clinic

Region's longest-serving  
health care provider since 1891

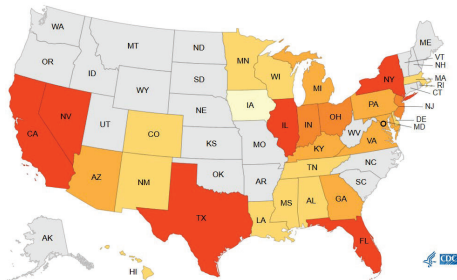
Health system serves patients and  
families across Arkansas, Kansas,  
Louisiana, Mississippi, Missouri,  
Oklahoma and Texas



|   |   |   |
|---|---|---|
| <b>914 Beds</b><br>Inpatient Care             | <b>7,411 Co-workers</b><br>Hospital Based           | <b>62,439 Visits</b><br>Emergency Room    |
| <b>226 Locations</b><br>Clinic and Outpatient | <b>453 Physicians</b><br>Mercy Clinic               | <b>3,057 Births</b><br>Maternity Services |
| <b>30,417 Discharges</b><br>Acute Inpatient   | <b>36,286 Surgeries</b><br>Inpatient and Outpatient |   |

[Mercy Hospital Springfield Quick Facts | Mercy](#)

*Candida auris*  
Clinical cases  
by state in  
2022



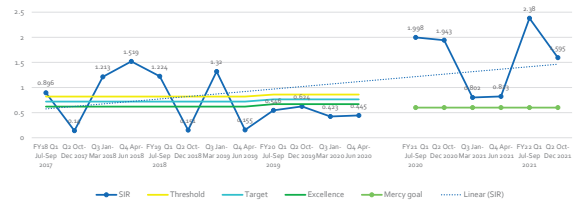
**Legend**

From January 1 to December 31, 2022, the most recent full year of data reported, there were 2,377 clinical cases. There were an additional 5,754 screening cases not shown on the map.

- 0 clinical cases and at least 1 screening case
- 1 to 10
- 11 to 50
- 51 to 100
- 101 to 500
- 501 to 1000
- 1001 or more

[Tracking C. auris | Candida auris \(C. auris\) | CDC](#)

**Central line Bloodstream Associated Infection (CLABSI) ICU and CMS Select Wards  
Mercy Springfield**



| Springfield CLABSI | Q1 | Q2 | Q3 | Q4 | Total | SIR   |
|--------------------|----|----|----|----|-------|-------|
| FY18               | 6  | 1  | 10 | 11 | 28    | 0.955 |
| FY19               | 8  | 1  | 9  | 1  | 19    | 0.719 |
| FY20               | 3  | 3  | 2  | 2  | 10    | 0.512 |
| FY21               | 8  | 9  | 4  | 4  | 25    | 1.299 |
| FY22               | 11 | 7  |    |    | 18    | 1.997 |

**FY19 July-Mar 2018 Intervention Period; Jan-June 2019 Performance Period**

CMS select wards=adult/pediatric medical, surgical, med-surg  
Data Source: NHSN CMS Reports new 2015 baseline (BS2)

# Leader Audit Compliance Results

| Nursing Leader Audits Goal = 95%                                   | Jan N=250 | Feb N=408 | Mar N=630 | April N=673 |
|--|-----------|-----------|-----------|-------------|
| Line does not meet criteria  | 2         | 2         | 4         | 3           |
| WDL - Clean, dry and intact  | 99%       | 99.50%    | 99%       | 99%         |
| WDL except - soiled  | 1         | 0         | 0         | 2           |
| WDL except - loose   | 0         | 2         | 1         | 2           |
| Dressing dated (within 7 days) Peds Excluded starting Mar          | 41%       | 49%       | 97%       | 93%         |
| IV Tubing dated  | 59%       | 51%       | 98%       | 96%         |
| Curores caps present on all lumens                                 | 63%       | 56%       | 99%       | 97%         |
| Has IV tubing been changed and documented per policy?              | 95%       | 95%       | 95%       | 92%         |
| Have needleless connectors been changed and documented per policy? | 94%       | 92%       | 94%       | 90%         |

Shared with permission from Mercy

## COLLABORATION IS ESSENTIAL!

We learned about a glue specific to vascular access in Spring 2021.

June of 2021, trialed on PICC lines and Midlines in our medical ICU

November 2021, in-service education and product roll-out on all adult inpatient IV access



## HOW TISSUE ADHESIVE CAME TO MERCY SPRINGFIELD

## Bundle Elements: Quality Care Rounding

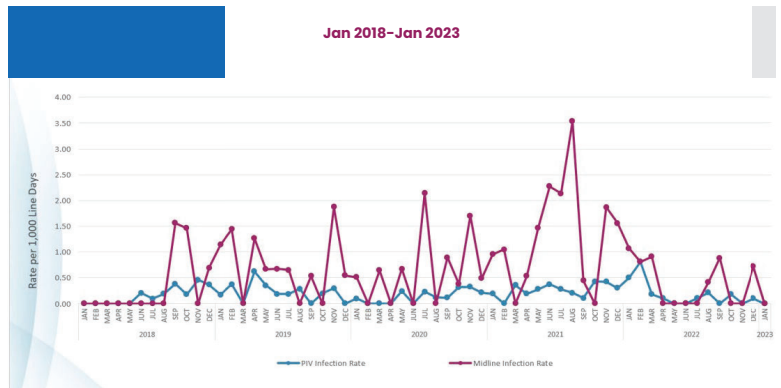
- Continued to monitor bundle elements, blood culture contamination rates, line utilization, daily bathing, etc.
- Initiated printed K Cards in ICUs
- Health System interventions:
  - Updated insertion and maintenance guidelines
  - Standardized CL insertion kits
  - Insertion education/expectations for providers
- Still struggled with line infections

Shared with permission from Mercy

| Mercy<br>ICU Leader Quality Care Rounding K-Card |   |                   |
|--|---|-------------------|
| Date:  | Pt #:   | Unit: 3E 4E 6A 7H |
| <b>YES</b>                                       | <b>Central Line (CL) Care</b>   | <b>NO</b>         |
|  | Daily review of line necessity completed <ul style="list-style-type: none"> <li>HO</li> <li>hemodynamic pressure monitoring</li> <li>Long term abx</li> <li>Medically Unstable</li> <li>Multiple infusions/med incompatibility</li> <li>Poor venous access</li> <li>Rapid fluid resuscitation</li> <li>TIN/Chemol/vasoact</li> <li>Does not meet criteria (obtain order and remove ASAP if no longer needed)</li> </ul>   |                   |
|  | CL dressing is low on the neck or on the chest and tubing is turned downward  |                   |
|  | CL dressing is intact with insertion site and hub covered (clean, dry, not peeling back, not reinforced)  |                   |
|  | CL dressing is dated within past 7 days (dressing changes due every Thursday and as needed when soiled or loose)  |                   |
|  | The CL is not inserted to the hub of the line (to allow CHG disc to be placed correctly)  |                   |
|  | CHG disc is present and applied correctly (placed around the line and directly on skin)   |                   |
|  | Patient has received daily CHG bath   |                   |
|  | <b>Reminders and Observation opportunities:</b> <ul style="list-style-type: none"> <li>Perform hand hygiene and apply clean gloves prior to handling CL</li> <li>Scrub the hub for 15 secs and allow to dry prior to each access</li> <li>Appropriate flush orders placed for each line and each lumen</li> <li>Tubing (including needleless connectors) changes due every Sunday, Thursday and as needed per specific medication or with visible blood or debris. *Document in EHR</li> <li>... caps present on each port/hub when not in use</li> </ul> |                   |

## Bloodstream Infections Related to PIVCs

Jan 2018 - Jan 2023



## TA pays for itself in dressing change reduction

Dressing change reductions demonstrated in the published literature: 45% to 57%

50% reduction w/TA



### Eliminate Other Products

Engineered securement  
Hemostatic Products  
Antimicrobial disk or gel



### Reduce Catheter Replacements

93% Reduction in catheter migration



### Reduce Catheter Dislodgement

75% Reduction in catheter dislodgement



### Infection Prevention

Reduced risk for Infection

(Kleidon et al., 2017; Ullman et al., 2017; Webber et al., 2020)

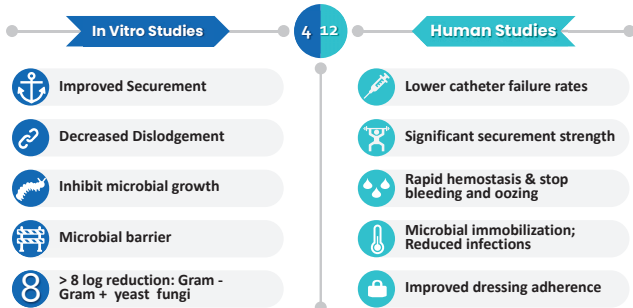
Scan for NQF Playbook and Presentation References



End of CE content

Questions

## SYSTEMATIC REVIEW OF LITERATURE



(Zhang et al., 2022; Bull et al., 2018; Rickard et al., 2018; Bhende et al., 2002; Waller 2019; Timsit et al., 2022)