Infection Prevention Considerations for Critical Care: Picking Up the Pandemic Pieces

Joan N. Hebden MS, RN, CIC, FAPIC, FSHEA
Infection Prevention Consultant
IPC Consulting Group LLC, Baltimore, MD.

PDI®
BE THE DIFFERENCE®

Disclosures

- Consultant for PDI, Inc.
- Cepheid speaker’s bureau
- Netflix IP consultant

PDI®
BE THE DIFFERENCE®

Objectives

- Identify the impact that COVID-19 has had on healthcare-associated infection (HAI) rates in the Intensive Care Unit (ICU).
- State the potential contributing factors to these increased HAI rates.
- Propose infection prevention interventions to mitigate the increased HAI rates.

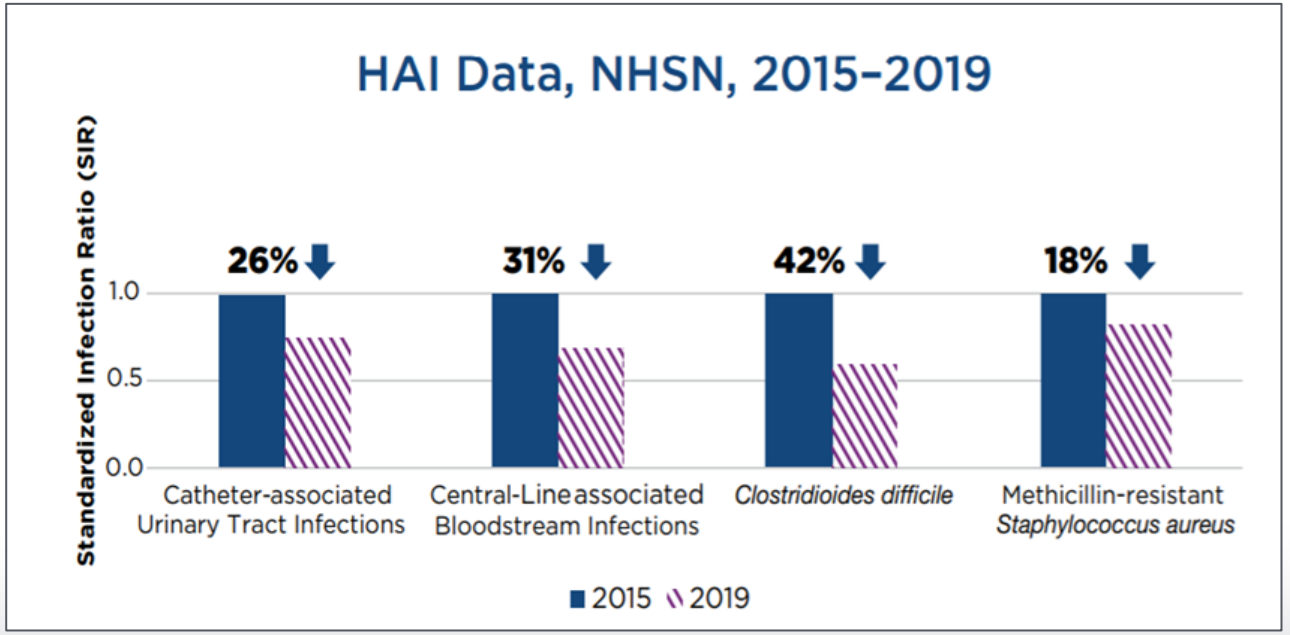
Mandated CMS reporting by IPs

Healthcare Facility HAI Reporting Requirements to CMS via NHSN--
Current or Proposed Requirements

CMS Reporting Program	HAI Event	Reporting Specifications	Reporting Start Date
Hospital Inpatient Quality Reporting (IQR) Program	CLABSI	Adult, Pediatric, and Neonatal ICUs	January 2011
	CAUTI	Adult and Pediatric ICUs	January 2012
	SSI: COLO	Inpatient COLO Procedures	January 2012
	SSI: HYST	Inpatient HYST Procedures	January 2012
	MRSA Bacteremia LabID Event	FacWideIN	January 2013
	C. difficile LabID Event	FacWideIN	January 2013
	Healthcare Personnel Influenza Vaccination	All Inpatient Healthcare Personnel	January 2013
	Medicare Beneficiary Number	All Medicare Patients Reported into NHSN	July 2014
	CLABSI	Adult & Pediatric Medical, Surgical, & Medical/Surgical Wards	January 2015
	CAUTI	Adult & Pediatric Medical, Surgical, & Medical/Surgical Wards	January 2015

https://www.cdc.gov/nhsn/pdfs/cms/cms-reporting-requirements.pdf

NHSN Surveillance: Great progress pre-pandemic



https://www.cdc.gov/nhsn/pdfs/NHSN-FactSheet-508.pdf

Objectives

- **Identify the impact that COVID-19 has had on healthcare-associated infection (HAI) rates in the Intensive Care Unit (ICU).**
- State the potential contributing factors to these increased HAI rates.
- Propose infection prevention interventions to mitigate the increased HAI rates.

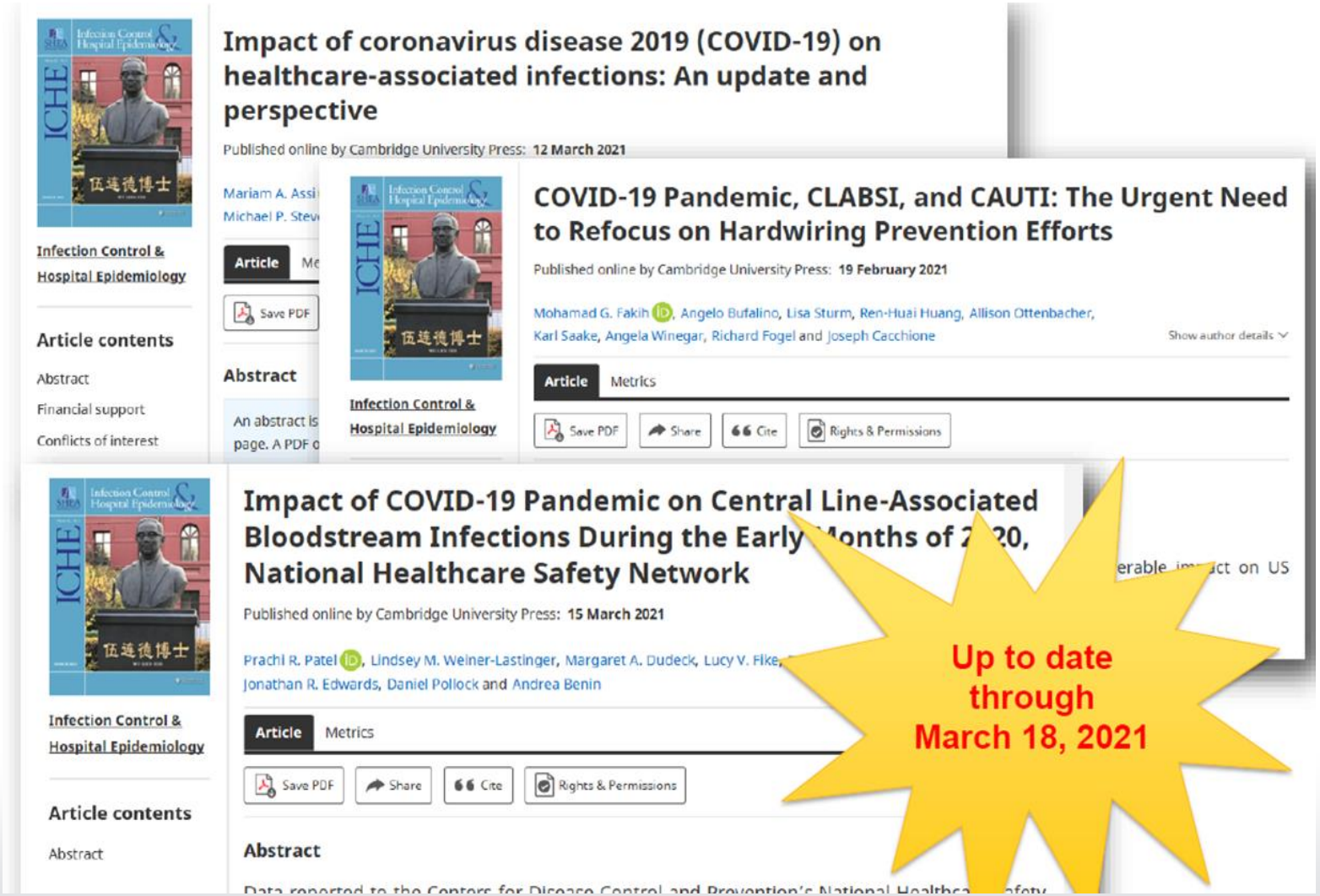
APIC Survey on HAI increases during the pandemic

- Conducted an online survey including 1,083 US infection preventionist members (October 22-November 5, 2020)
- Respondents asked about which HAIs had increased during the pandemic:
  - 27.8% noted CLABSIs had increased
  - 21.4% noted CAUTIs had increased

APIC Spreading knowledge. Preventing infection.
Association for Professionals in Infection Control and Epidemiology

https://apic.org/news/national-survey-shows-healthcare-facilities-implementing-ppe-crisis-standards-of-care/

COVID-19 Impact on HAIs



Pandemic Collateral Damage: CLABSIs

Coronavirus disease 2019 (COVID-19) pandemic, central-line–associated bloodstream infection (CLABSI), and catheter-associated urinary tract infection (CAUTI): The urgent need to refocus on hardwiring prevention efforts

Mohamad G. Fakih MD, MPH[1,2], Angelo Bufalino PhD[3], Lisa Sturm MPH[1], Ren-Huai Huang PhD[3], Allison Ottenbacher PhD[3], Karl Saake MPH[3], Angela Winegar PhD[3], Richard Fogel MD[1] and Joseph Cacchione MD[1]

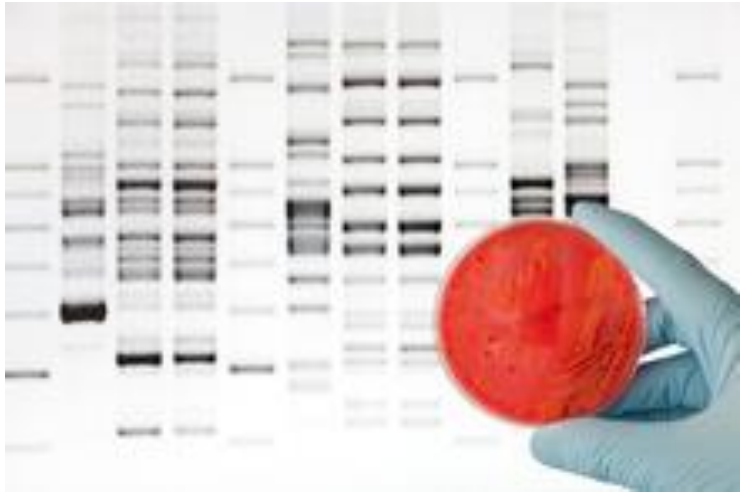
[1]Clinical & Network Services, Ascension Healthcare, St Louis, Missouri, [2]Wayne State University School of Medicine, Detroit, Michigan and [3]Ascension Data Science Institute, Ascension Healthcare, St Louis, Missouri

- Retrospective evaluation of 78 hospitals in a single healthcare system
  - Prior to the pandemic (Mar 2019 – Feb 2020) -12 months
  - During the pandemic (Mar-Aug 2020) – 6 months
- CLABSI rates increased by 51% during the 1st 6 months of the pandemic compared to the prior 12 months
  - Mainly observed in the ICUs where rates increased 71% with larger hospitals (>300 beds) most affected
- Average time to CLABSI from COVID-19 diagnosis = 18 days
- Patients with COVID-19 had > 5 times more CLABSIs than patients without COVID-19

Infection Control & Hospital Epidemiology (2021), 1–6

Pandemic Collateral Damage: CLABSIs

- Microbiology associated with CLABSIs
  - Gram-positive CLABSIs increased by 81%
  - Coagulase-negative Staphylococcus increased by 130%
  - Candida spp increased by 56.9%
- Contributing factors cited
  - Suboptimal blood culturing practice leading to contamination with skin commensal organisms
  - Broad spectrum antimicrobial pressure and prolonged use of central lines



Fakih M et al. Infection Control & Hospital Epidemiology (2021), 1–6

Pandemic Collateral Damage: CLABSIs

- Academic tertiary medical center in Detroit, MI
- Retrospective cohort study
- Time Period: Jan-May 2020 (COVID period cohort-included patients with/without COVID-19) versus Jan-May 2019 (pre-COVID cohort)
- Average monthly CLABSI rate increased to 1.7/1,000 central line-days (from 0.4/1,000 central line-days; represents a 325% increase; $P < 0.01$)
- Blood culture contamination rates 19% greater in COVID period cohort; were 3.2% in pre-cohort compared to 3.8% in COVID period cohort, $P < 0.01$

LeRose et al. Infec Control Hosp Epi Nov 20, 2020

Pandemic Collateral Damage: CLABSIs

- Analysis of NHSN data for CLABSI early in the COVID-19 pandemic in the United States
- All US hospitals who were voluntarily submitting CLABSI data. Data from 936 acute care hospitals were included
- Time Period: April-June 2020 vs. April-June 2019 (pre-COVID cohort)
- Findings:
  - 28% increase in national SIR (95% CI 20.0-33.6);from 0.68 in 2019 to 0.87 in 2020
  - ICUs had the greatest SIR increase: 39%, from 0.75 in 2019 to 1.04 in 2020
- Device utilization increased from 0.21 in 2019 to 0.23 in 2020
- CLABSI reporting dropped by 17% nationally for April-June 2020 (CMS exemption)

Patel PR et al. Infect Control Hosp Epidemiol; published online March 15, 2021.

Pandemic Collateral Damage: Catheter-associated UTI (CAUTI)- no evidence yet

Study Information	Rate/Baseline Rate	Comments
Study: Retrospective cohort study **Time Period:** Feb 1, 2020-Aug 31, 2020 (COVID period cohort) versus Jan 2018-Jan 2020 (pre-COVID cohort) **Setting:** Outram campus of the Singapore Health Services group (includes the 1,785 bed Singapore General Hospital + other specialist centers in same system)	(-) No significant change in CAUTI rate	• Increased compliance with CAUTI bundle noted
Study: Retrospective cohort study **Time Period:** March-August 2020 (COVID period cohort) versus March 2019-February 2020 (pre-COVID cohort) **Setting:** 78 hospitals from a single multi-state healthcare system (12 states represented) in the United States	(-) No significant change in CAUTI rate	• There were 817,267 urinary catheter-days (utilization 18.4%)

Stevens M. Impact of COVID-19 on HAI Prevention. SHEA 2021, April 14th

Pandemic Collateral Damage: Ventilator-associated pneumonia (VAP)

- Retrospective observational study in a single academic teaching hospital
  - 81 COVID-19 and 144 non-COVID-19 patients receiving invasive ventilation between March 15th and August 30th , 2020
- Patients with COVID-19 had a higher incidence of microbiologically confirmed VAP (39 (48%) COVID-19 patients compared to 19 (13%) patients without COVID-19)
- COVID-19 patients were significantly more likely to develop VAP than patients without COVID (Cox proportional hazard ratio 2.01 95% CI 1.14–3.54, p = 0.0015)
- Incidence density of 28/1000 ventilator days versus 13/1000 for patients without COVID (p = 0.009)
- Microbiology similar for COVID-19 patients compared to patients ventilated for other reasons

Maes *et al. Crit Care (2021) 25:25* https://doi.org/10.1186/s13054-021-03460-5

Objectives

- Identify the impact that COVID-19 has had on healthcare-associated infection (HAI) rates in the Intensive Care Unit (ICU).
- **State the potential contributing factors to these increased HAI rates.**
- Propose infection prevention interventions to mitigate the increased HAI rates.

Contributing Factors

- **High patient acuity of COVID-19 patients**
  - Longer length of hospitalization
  - Oxygenation required prone positioning
    - decreased visualization of the CL insertion site
    - third spacing of fluid compromised dressing integrity

- **Overall increase in the seriousness of general acutely ill patients** due to lack of care sought due to the pandemic

- **Patient surges and subsequent increases in patients needing ICU** care led to adjusted staffing to meet the demanding needs of these patients

- **Diagnostic imaging** to assess patient for secondary sources of infection was reduced

Contributing Factors

- **Nursing practice changes**
  - Moving medication pumps/dialysis machines into hallways: potential for tubing on the floor, increasing contamination risk
  - Reduction of time in patient's rooms impact on:
    - appropriate hand hygiene
    - tubing and vascular access site maintenance
    - disinfection of needleless access connectors prior to access of vascular devices
  - Universal decolonization including nasal and skin decolonization practices likely not performed due to priorities shifting

- **CMS waivered HAI reporting requirements** (June 2020)
  - increased demands that COVID-19 placed on infection preventionists
  - reduced attention to HAI surveillance made it difficult to recognize increased HAI rates

Sociobehavioral Factors

Surging CLABSI Rates

- **Observed increases in CLABSI rates in US hospitals during the early phases of the COVID-19 pandemic**

- **Potential Sociobehavioral Factors Underpinning Observation**
  - Changed movement
    - Minimizing interaction with patients to minimize exposure, conserve PPE
    - Changed approaches to caring for patients that put lines at risk (prone positioning)
    - Reduction in vigilance-promoting safety interactions (line rounds)
  - Changed attitudes
    - Competing priorities – navigation and balancing of risks
    - Exhaustion, burnout, emotional overwhelm
  - Changed resources
    - Workload increases
    - Staffing shortages, transient staff

Szymczak J. Human Behavior in Response to a Pandemic: Implications for HAIs and AMR. SHEA 2021 April 14th

Objectives

- Identify the impact that COVID-19 has had on healthcare-associated infection (HAI) rates in the Intensive Care Unit (ICU).
- State the potential contributing factors to these increased HAI rates.
- **Propose infection prevention interventions to mitigate the increased HAI rates.**

Back to the Basics: Adherence to HAI prevention bundles

- Retrospective cohort study
- Outram campus of the Singapore Health Services group (includes the 1,785 bed Singapore General Hospital + other specialist centers in same system)
- Feb 1, 2020-Aug 31, 2020 (COVID period cohort) versus Jan 2018-Jan 2020 (pre-COVID cohort)
- COVID period cohort with 0.20 incidents/1,000 device days (down from 0.83/1,000 device days; IRR = 0.24,95% CI: 0.07-0.57, $P < 0.05$)
- Prior experience with SARS in 2003 led to early adoption of aggressive infection prevention bundles including universal masking, adequate PPE access
- Increased CLABSI bundle adherence noted

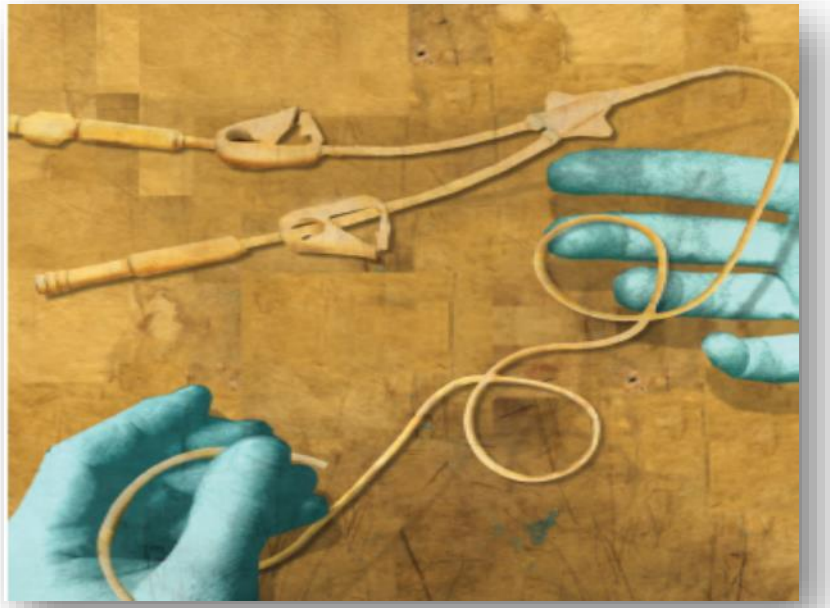
Wee et al. Am J of Infection Control Nov 4, 2020

Back to the Basics

- Resume prospective surveillance for HAIs
- Re-initiate real-time root cause analyses of HAIs
- Monitor process metrics of prevention bundles: insertion technique, catheter and line maintenance, “line rounds” to discontinue unnecessary catheters
- Ensure that decolonization strategies are being adhered to

Strategies to Prevent HAIs: SHEA Compendium - CLABSI

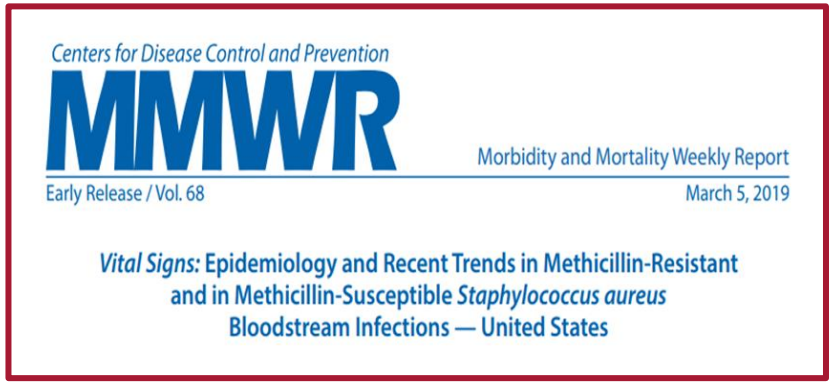
- Use maximal barrier precautions
- Bathe intensive care unit (ICU) patients >2 months of age with chlorhexidine preparation on a daily basis
- Use ultrasound guidance for internal jugular catheter insertion
- Ensure appropriate nurse-to-patient ratio in ICUs



Yokoe D et al. A Compendium of Strategies to Prevent HAIs in Acute Care Hospitals: 2014 Updates. ICHE(35)S2; S89 - S107

Decolonization to prevent *S. aureus* BSI

- **Core Strategy**: Pursue a strategy to reduce carriage of *S. aureus* among all patients admitted to intensive care units (ICUs) including:
  - Apply intranasal mupirocin twice a day to each nare for 5 days in conjunction with daily chlorhexidine bathing for duration of ICU admission
  - Intranasal iodophor could be considered as an alternative to intranasal mupirocin
  - For more information see: Universal ICU Decolonization: An Enhanced Protocol. Agency for Healthcare Research and Quality (AHRQ)external icon.
- **Supplemental Strategy**: Pursue a strategy to reduce carriage of *S. aureus* for patients hospitalized with CVCs or midline catheters outside the ICU
  - Apply intranasal mupirocin twice a day to each nare for 5 days in conjunction with daily chlorhexidine bathing while CVC or midline catheter is present
  - Intranasal iodophor could be considered as an alternative to intranasal mupirocin



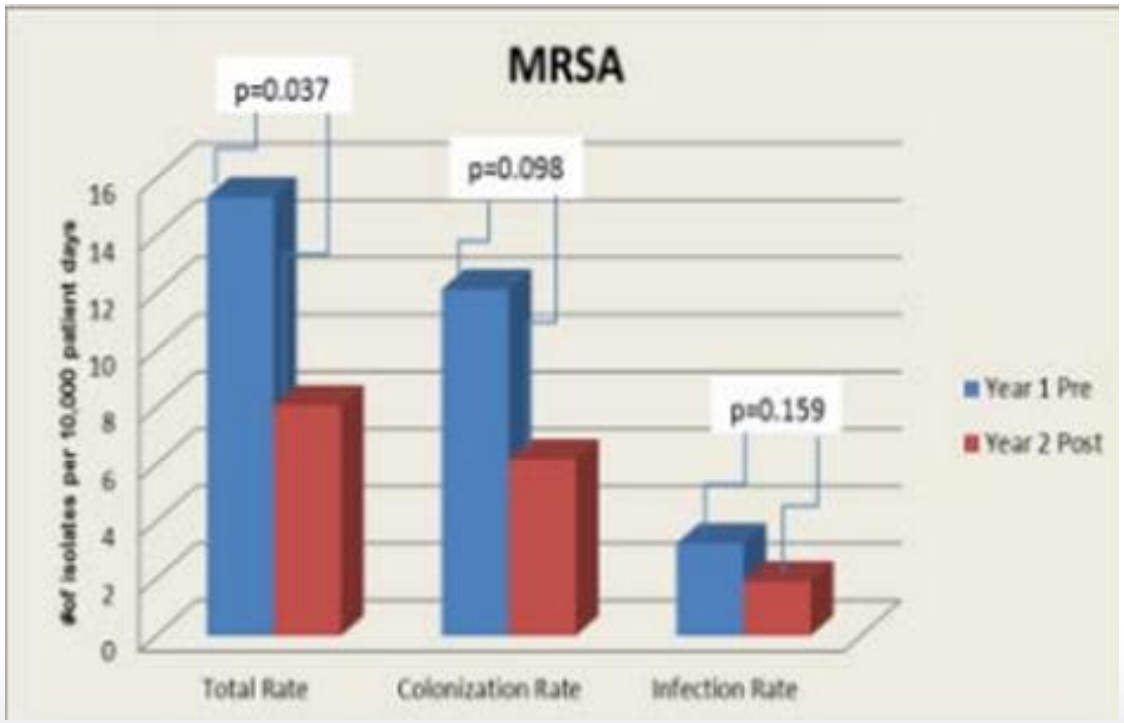
The Effect of Universal Decolonization on MRSA and CRE Acquisition in Adult ICUs: A Pre and Post Intervention Analysis

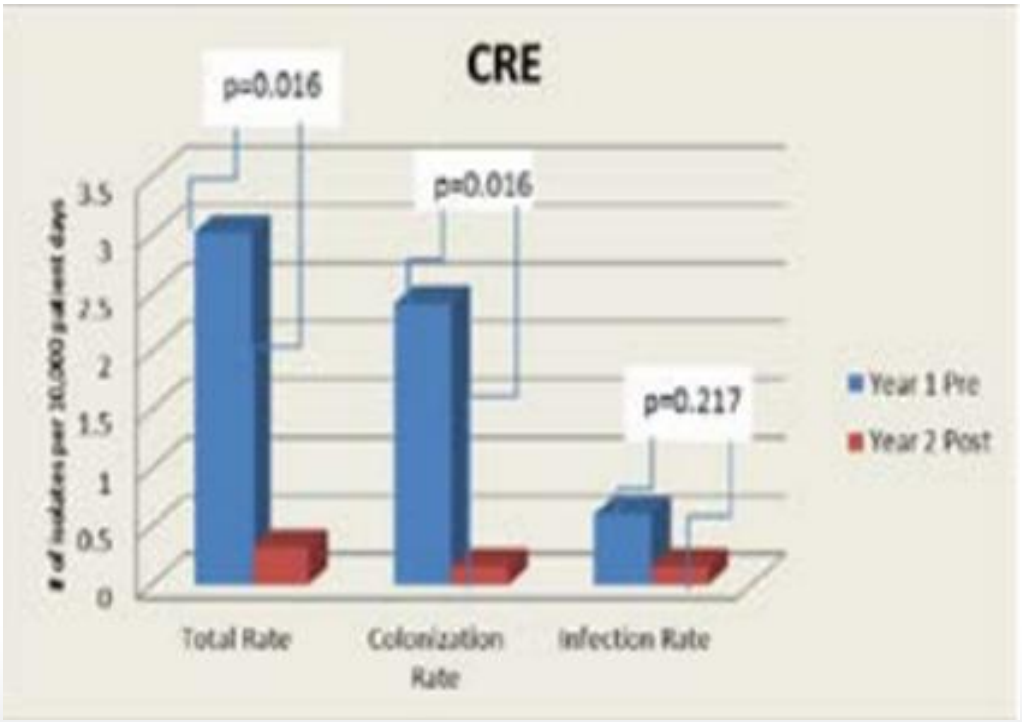
- **Background:**
  - Contact precautions for MRSA discontinued
  - Simultaneously implemented universal decolonization using a onetime application of nasal PVP-I and daily 2% CHG applied via a pre-impregnated wipe in adult ICUs.
  - Admission and weekly screening for MRSA and MDR-GNs including CRE
- **Objective:** Determine the effect of this intervention on MRSA and CRE acquisition in adult ICUs.
- **Results:**
  - For MRSA alone, the acquisition rate fell 51% (16.02 vs. 7.92; p= 0.037), the colonization rate fell 51% (12.75 vs. 6.24; p=0.098) and the infection rate fell 44% (3.28 vs. 1.85; p=0.159).
  - For CRE alone, the acquisition rate fell 90% (3.11 vs. 0.31; p= 0.016), the colonization rate fell 94% (2.51 vs. 0.16; p= 0.016) and the infection rate fell 75% (0.60 vs. 0.15; p=0.217).
  - A total of 11 hospital acquired MRSA or CRE infections were estimated to have been prevented (8 MRSA and 3 CRE).

- Jason Moss, DO; Kulwinder Sekhon, MPH; Lovisa Olafsdottir, MD; David S. Burgess, PharmD, FCCP, FIDP; Aric Schadler, MS; Derek Forster, MD University of Kentucky College of Medicine; UK Healthcare; University of Kentucky College of Pharmacy; Lexington, KY. Poster SHEA conference 2018.

The Effect of Universal Decolonization on MRSA and CRE Acquisition in Adult ICUs: A Pre and Post Intervention Analysis

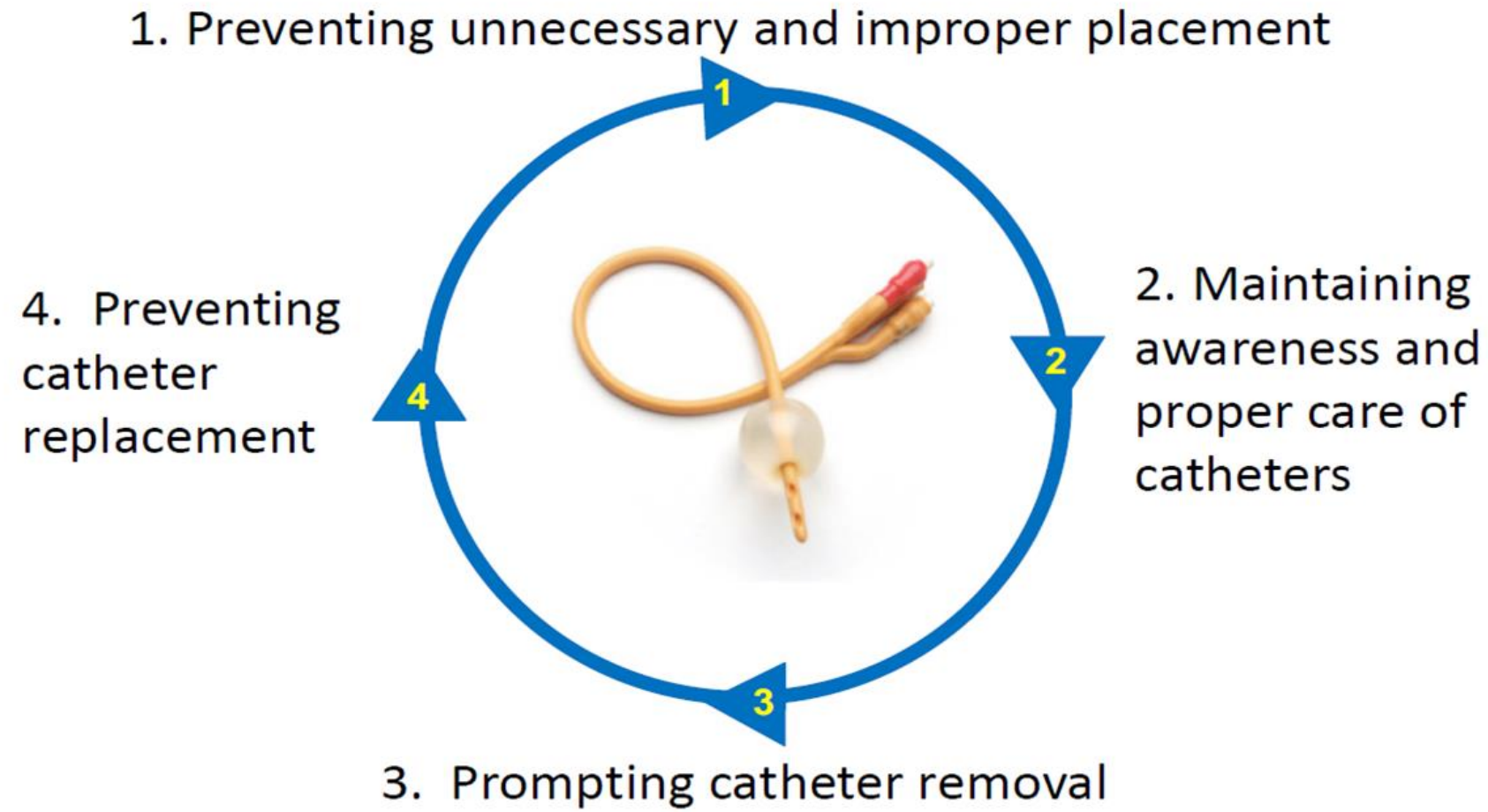
- **Conclusion:** Universal chlorhexidine bathing combined with the discontinuation of contact precautions for MRSA was associated with a significant reduction in the number of hospital acquired MRSA and CRE colonizations and infections.





Jason Moss, DO; Kulwinder Sekhon, MPH; Lovisa Olafsdottir, MD; David S. Burgess, PharmD, FCCP, FIDP; Aric Schadler, MS; Derek Forster, MD University of Kentucky College of Medicine; UK Healthcare; University of Kentucky College of Pharmacy; Lexington, KY. Poster SHEA conference 2018.

Strategies to Prevent HAIs: SHEA Compendium - CAUTI



Meddings J and Saint S. Clin Infect Dis 2011;52:1291

Strategies to Prevent HAIs: SHEA Compendium - VAP

⇩ **Possible** (evidence from observational studies alone or inconsistent RCT data)

↓ **Probable** (evidence from RCTs and / or meta-analyses)

	Duration of Ventilation	Pneumonia	Atelectasis	ARDS	Fluid Overload
Minimize sedation	↓	⇩	⇩		
Paired SATs and SBTs	↓	⇩		⇩	
Early Mobility	↓	⇩	⇩		
Low tidal volume ventilation	⇩	↓	↓	↓	
Conservative fluid management	↓	⇩		⇩	↓
Conservative transfusion thresholds	⇩	↓		↓	↓

Klompas M. Am J Resp Crit Care Med 2015:192:1420

Scrubbing the Hub: CHG/Alcohol vs. Alcohol caps vs. Alcohol swabs

Brief Report

Needleless connector decontamination for prevention of central venous access device infection: A pilot randomized controlled trial

Pilot randomized controlled trial (180 patients) of needleless connector decontamination. Central line-associated bloodstream infection occurred in 2% (1/61) of 70% isopropyl alcohol (IPA) wipe, 2% (1/59) of 70% IPA cap, and zero (0/58) infections in 2% chlorhexidine gluconate in 70% IPA wipe patients. Larger definitive trials are feasible and needed.

Rickard et al. AJIC 49(2);269–273 Published online: July 28, 2020

What the Nursing Staff Didn't Know…

- **Reducing blood culture contamination rates: A systematic approach to improving quality of care**
- Formation of a system-wide interdisciplinary group – nursing, IP and lab – to develop 3 evidence-based nursing protocols for blood culture collection: from CVC, from new PIV, with peripheral blood draw.
- Lessons learned: **lack of knowledge** regarding
  - Proper use of CHG for skin prep
  - Need to disinfect bottle tops
  - Removal and change of needleless connector
  - Scrub the hub of CVC

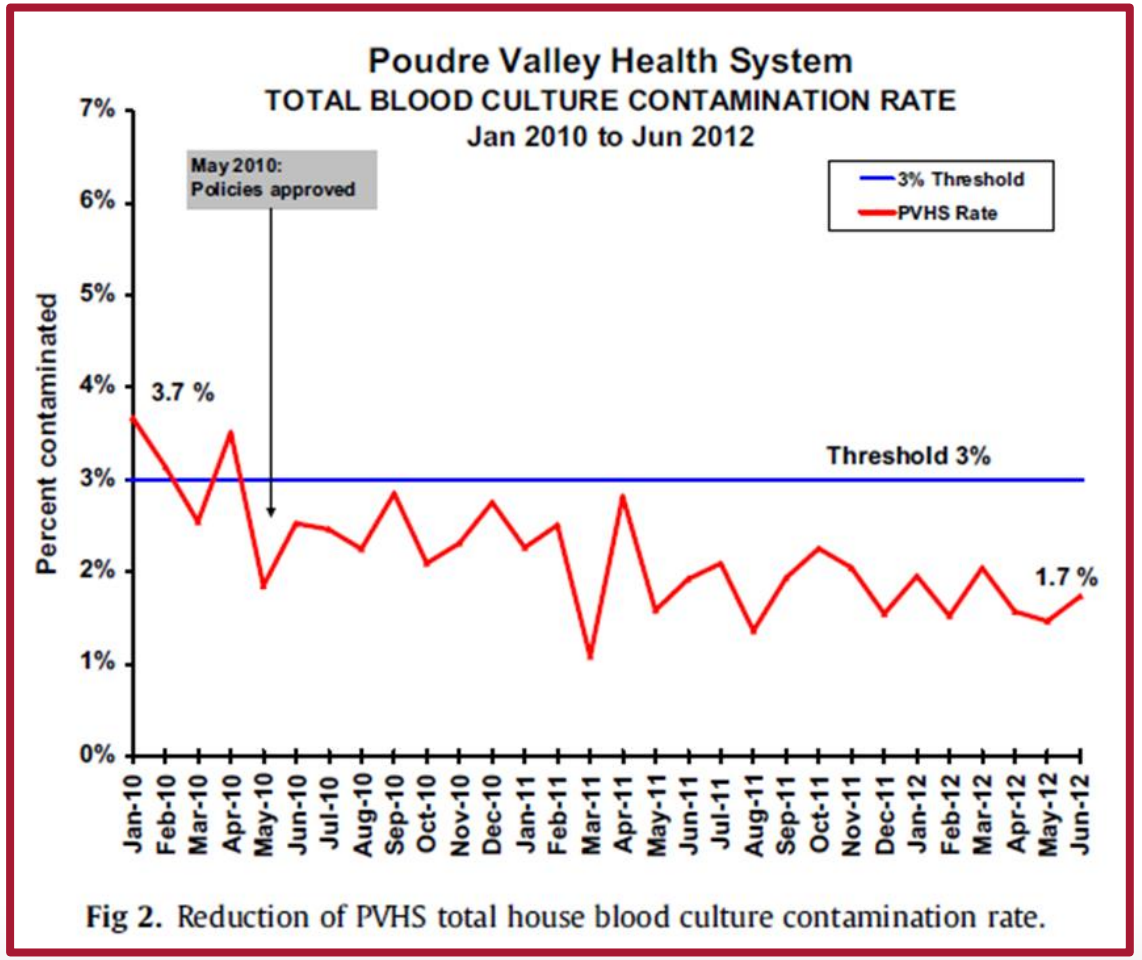


Fig 2. Reduction of PVHS total house blood culture contamination rate.

Hopkins K, et al. Am J Infect Control 2013;41:1272-4

Reducing blood culture contamination rate in the emergency department with a quality improvement intervention

Objective: describe the implementation and effectiveness of a quality improvement (QI) intervention for reducing BC contamination in an ED of a 207-bed teaching hospital

Research design: Pre-post quasi-experimental retrospective study

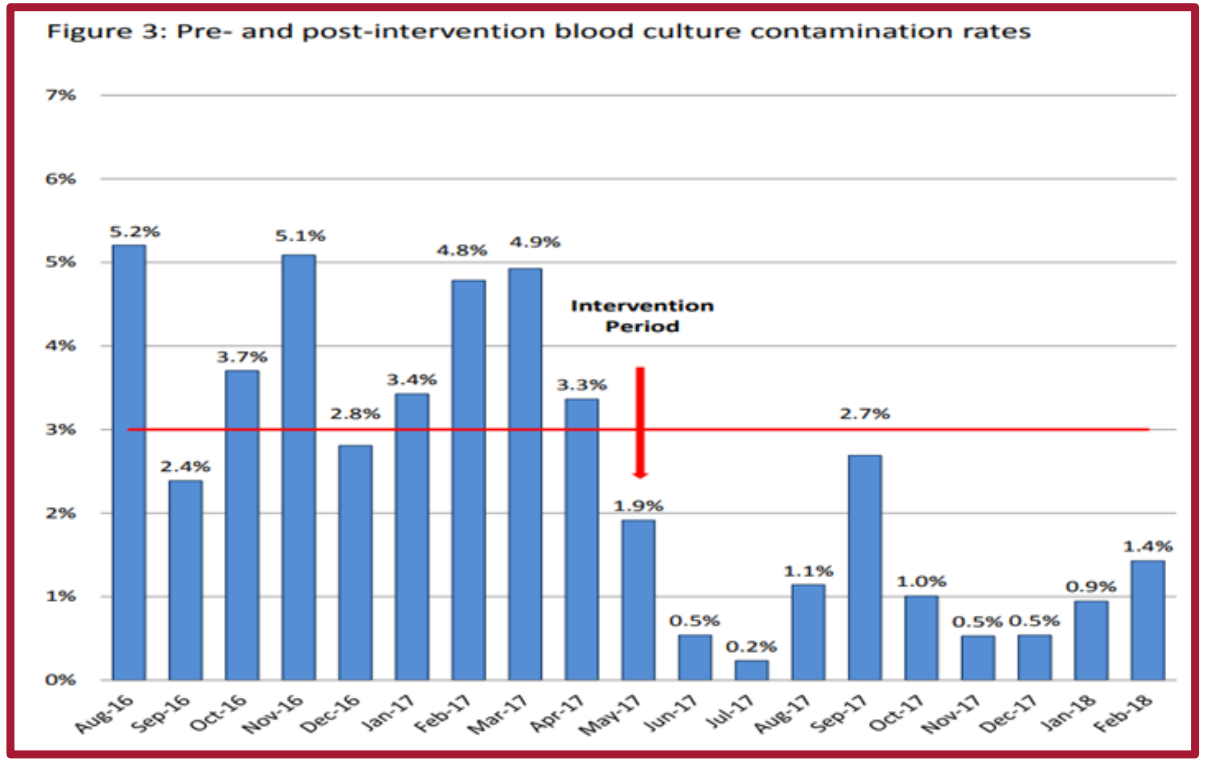
Intervention: a dedicated team of lead nurses and paramedics was trained by our lead phlebotomist to perform all BC draws in the ED with hands-on training sessions; ID MD and IP provided educational material to trainees; pre-assembled kit

Ann Marie Keegan, BSN, RN, CIC, Claudiu Georgescu, MD, Nancy Maenle, EMT, Heather Byrd, MLS (ASCP), Deanna Montanaro, RN, Constance Stec, BS, H(ASCP), and Geehan Suleyman, MD University of Toledo Medical Center, Toledo, OH. Poster SHEA conference 2018.

Reducing blood culture contamination rate in the emergency department with a quality improvement intervention

Results: During the baseline 9-month period, 157 of 3977 (3.95%) cultures were contaminated, compared to 35 of 3478 (1.01%) during the 9-month intervention period ($p < 0.0001$)

Conclusions: Dedicating a group of trained lead nurses and paramedics to perform all BC draws and standardizing the collection process resulted in a sustained reduction in ED contamination rates



Ann Marie Keegan, BSN, RN, CIC, Claudiu Georgescu, MD, Nancy Maenle, EMT, Heather Byrd, MLS (ASCP), Deanna Montanaro, RN, Constance Stec, BS, H(ASCP), and Geehan Suleyman, MD University of Toledo Medical Center, Toledo, OH. Poster SHEA conference 2018.

Summary

The COVID-19 pandemic shifted the priorities of IPs resulting in delayed surveillance and evaluation of HAIs resulting in increased rates, particularly for CLABSIs.

Contributing factors were multifactorial; debriefing with clinical staff about potential reasons for increased HAIs and discussing strategies to mitigate risk is recommended.

Refocusing attention back to the basics e.g. hand hygiene, HAI prevention bundle monitoring and prospective surveillance is a must for IPs in collaboration with the clinical staff.

Thank you

Joan N. Hebden MS, RN, CIC, FAPIC, FSHEA
Infection Prevention Consultant
IPC Consulting Group LLC, Baltimore, MD.

PDI®
BE THE DIFFERENCE®