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BSI: Addressing Clinical Challenges with Catheter Maintenance

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Important Information

- Prior to the use of any Solventum Therapy System, it is important for the provider to consult the treating physician and read and understand all Instructions for Use, including Safety Information, Dressing Application Instructions, and Therapy Device Instructions.
- Specific indications, contraindications, warnings, precautions, and safety information exist for these products and therapies. Please consult a clinician and product instructions for use prior to application. Rx only
- To the extent this presentation contains case studies and clinical reports, the results and outcomes should not be interpreted as a guarantee or warranty of similar results. Individual results may vary depending on the patient's circumstances and condition
- This information is intended for healthcare professionals only. Solventum recommends that clinicians participate in device in-service and training prior to use
- Solventum and the other marks shown are marks and/or registered marks. Unauthorized use prohibited
- Follow local institutional protocols for infection control and waste disposal procedures. Local protocols should be based on the applicable federal, state and/or local government environmental regulations

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Disclosure

- Joseph Hommes BSN, RN, VA-BC
- Employed by Solventum as Application Engineer

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Learning Objectives

1. Identify sources of contamination that can lead to bloodstream infection (BSI)
2. Describe recommended standards of practice, guidelines and evidence-based interventions for catheter maintenance to reduce BSI risk
3. Discuss other clinical challenges associated with catheter maintenance that can impact outcomes
4. Identify solutions to address these challenges and clinical studies that support these solutions

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Vascular access and bloodstream infection (BSI)

60% *of all hospital acquired bloodstream infections (BSIs) originate from some form of vascular access*[1]

Risk of BSIs vary and may be due to intrinsic or extrinsic factors:[2-6]

Catheter-related	Operator-related	Patient-related
• Intravascular device • Type of and intended use for the catheter • Insertion site • Frequency with which the catheter is accessed, and/or • Duration of catheter placement	• Experience and education of the individual who inserts the catheter, and/or • Use of proven preventative strategies	• Characteristics of the catheterized patient: – Patient age – Severity of underlying illness – Patient nutrition – Poor skin integrity, and – Immunocompromised

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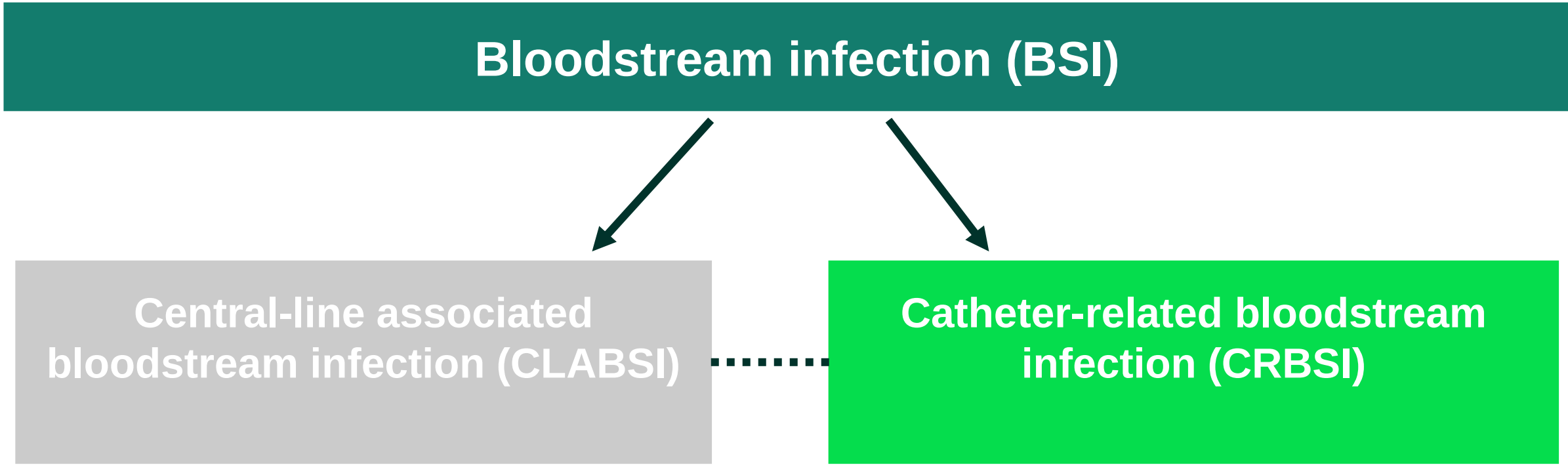
Terminology



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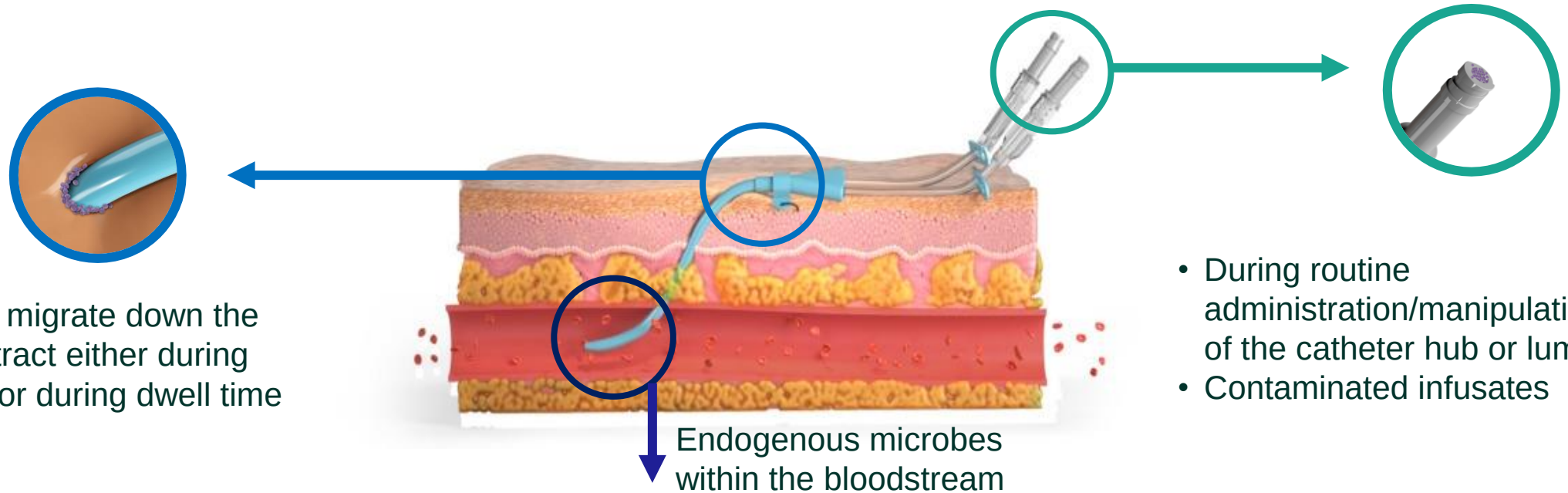
Infection

Infusion Therapy Standards of Practice (INS) 2024

CABSI

Catheter-associated bloodstream infection

Term used when referring to bloodstream infections originating from either peripheral and/or central vascular access devices/catheters



Microbes migrate down the catheter tract either during insertion or during dwell time

Endogenous microbes within the bloodstream

- During routine administration/manipulation of the catheter hub or lumen
- Contaminated infusates

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Nickel B, Gorski LA, Kleidon TM, et al. Infusion therapy standards of practice. *J Infus Nurs*. 2024;47(suppl1):S1-S285. doi:10.1097/NAN.0000000000000532

Bloodstream infections:
A critical issue for every health care facility

All IVs are at risk for microbial contamination. Bloodstream infections are associated with significant increases in care and costs. They are more common than you think and, in some cases, they can be deadly.

In the United States, the annual cost to treat CLABSI exceeds

$2.3 billion[1]

CRBSIs are associated with

1.57x

higher risk of mortality in critically ill adults[2]

Short-term PVCs accounted for

22%

of hospital-acquired CRBSIs[3]

1. Pronovost P, Needham D, Berenholtz S, et al. An intervention to decrease catheter-related bloodstream infections in the ICU. *N Engl J Med.* 2006;355(26):2725-2732.
2. Siempos II, Kopterides P, Tsangaris I, Dimopoulou I, Armaganidis AE. Impact of catheter-related bloodstream infections on the mortality of critically ill patients: A meta-analysis. *Crit Care Med.* 2009;37(7):2283-2289.
3. Mermel L. Short-term Peripheral Venous Catheter-Related Bloodstream Infections: A Systematic Review. *Clin Infect Dis.* 2017:65(10):1757-1762.

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Patient impact

Healthcare-associated infections (HAI) account for a large proportion of the harm to patients caused by health care[9]

1.27 cases per 1000 device-days[9]	Incidence rate estimated for hospitalized adult populations at risk for CLABSI.
1.57 times higher risk of mortality in critically ill adults[10]	CRBSIs are significant contributors to preventable hospital deaths.[2]
12-24 more hospitalization days	Real world evidence has demonstrated an increase in hospital resources - and associated cost - required to treat morbidities due to CRBSIs[11-15]

Neutropenic oncology patients have **36% mortality rate** with CRBSI according to Biehl publication[30]

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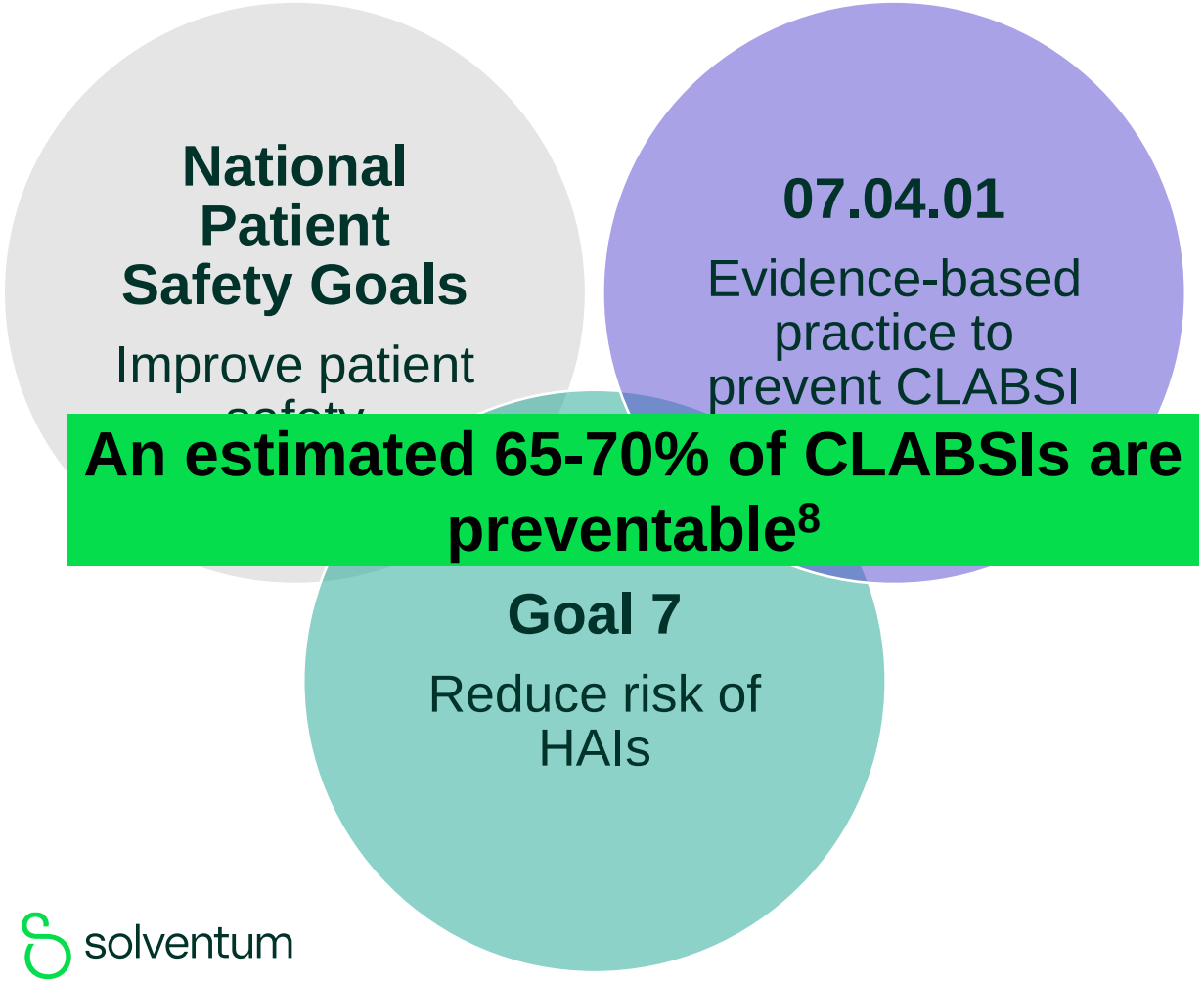
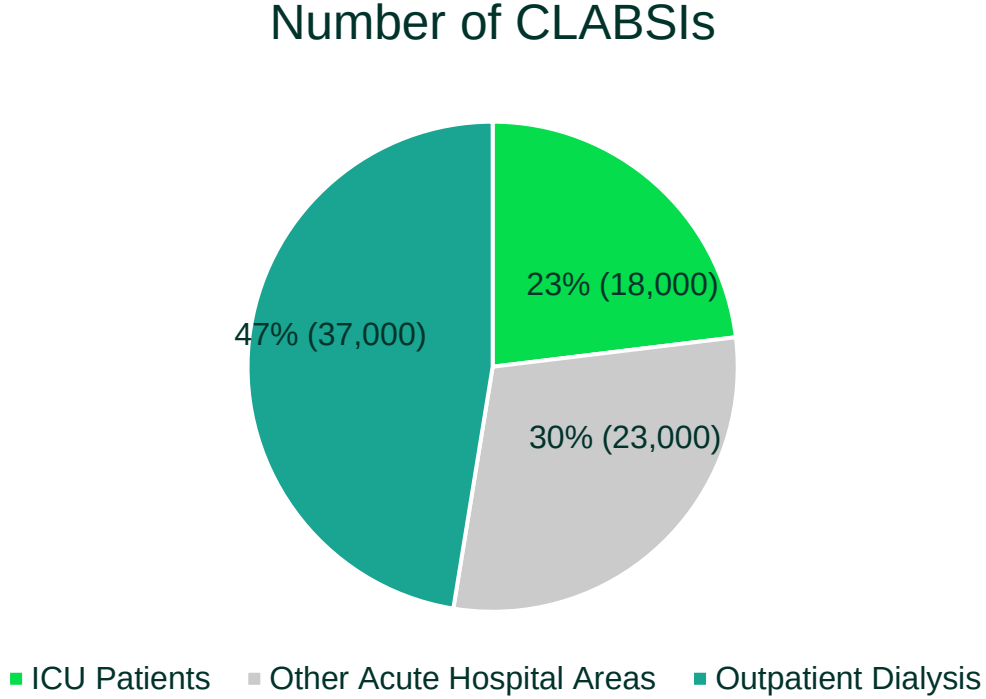
Biehl LM, Huth A, Panse J, et al. A randomised trial on chlorhexidine dressings for the prevention of CRBSIs in neutropenic patients. *Ann Oncol.* 2016; 10: 1916-1922.

CLABSI

- Improvements made: CLABSI decreased by 58% in hospital ICUs since 2001[7]



78,000 bloodstream infections affect central line patients each year (2009)[7]



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Troubling trends: CABSI rates rise as hospital resources are strained

Staffing shortages have shown startling changes on healthcare-associated infections (HAIs). The ability to follow infection control policies declined, likely from high patient case loads and poor staffing.[31]

More than 250,000 additional nurses are needed from 2020 to 2030[32]

The registered nurse workforce fell by about 100,000 in 2021[33]

Overall, 7% increase in CLABSIs from 2020 to 2021 in acute care hospitals[34]

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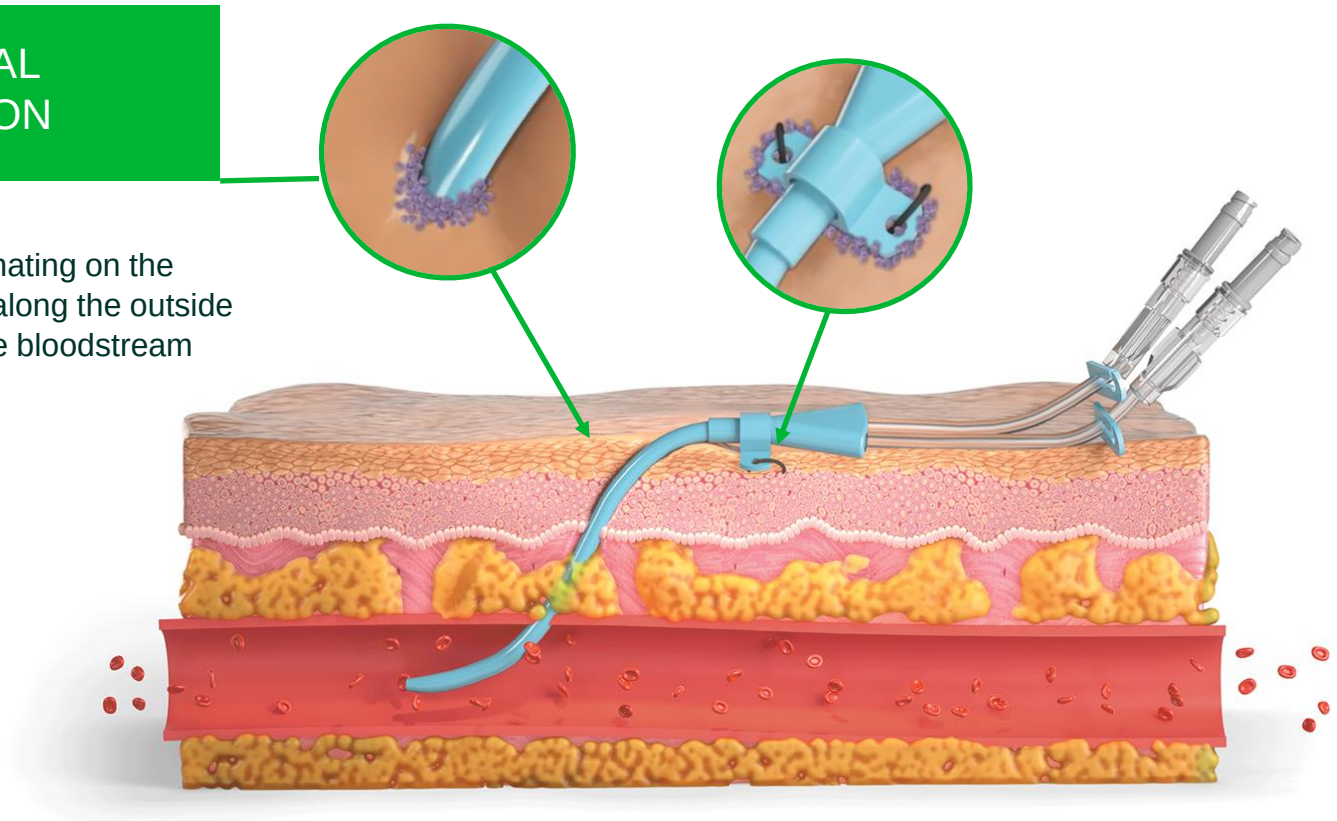
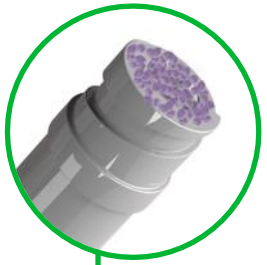
Sources of infection

While vascular catheters provide the advantage of prolonged venous access, they present a risk of infectious complications. In fact, 60% of all hospital-acquired bloodstream infections originate from some form of vascular access.[1] These infections can be acquired at the time of the initial insertion or anytime throughout the duration of the venous access.[2]

EXTRALUMINAL CONTAMINATION

Results when bacteria originating on the surface of the skin migrate along the outside of the catheter and enter the bloodstream through the insertion site.





INTRALUMINAL CONTAMINATION

Results when bacteria migrate through the catheter post insertion, typically via contamination of the lumen through the catheter port.

1. Scheithauer S, Lewalter K, Schröder J, et al. Reduction of central venous line-associated bloodstream infection rates by using a chlorhexidine-containing dressing. *Infection.* 2014;42(1):155-159.
2. Association for Professionals in Infection Control and Epidemiology, Inc. APIC Implementation Guide: Guide to Preventing Central Line-Associated Bloodstream Infections, 2015. apic.org/Resource_/TinyMceFileManager/2015/APIC_CLABSI_WEB.pdf.

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CHG dressing clinical evidence

- Meta-analyses
- Randomized control trials
- Peer-reviewed
- Products evaluations
- Health economics

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Safdar (2014) Crit Care Med[20]

Infection Reduction

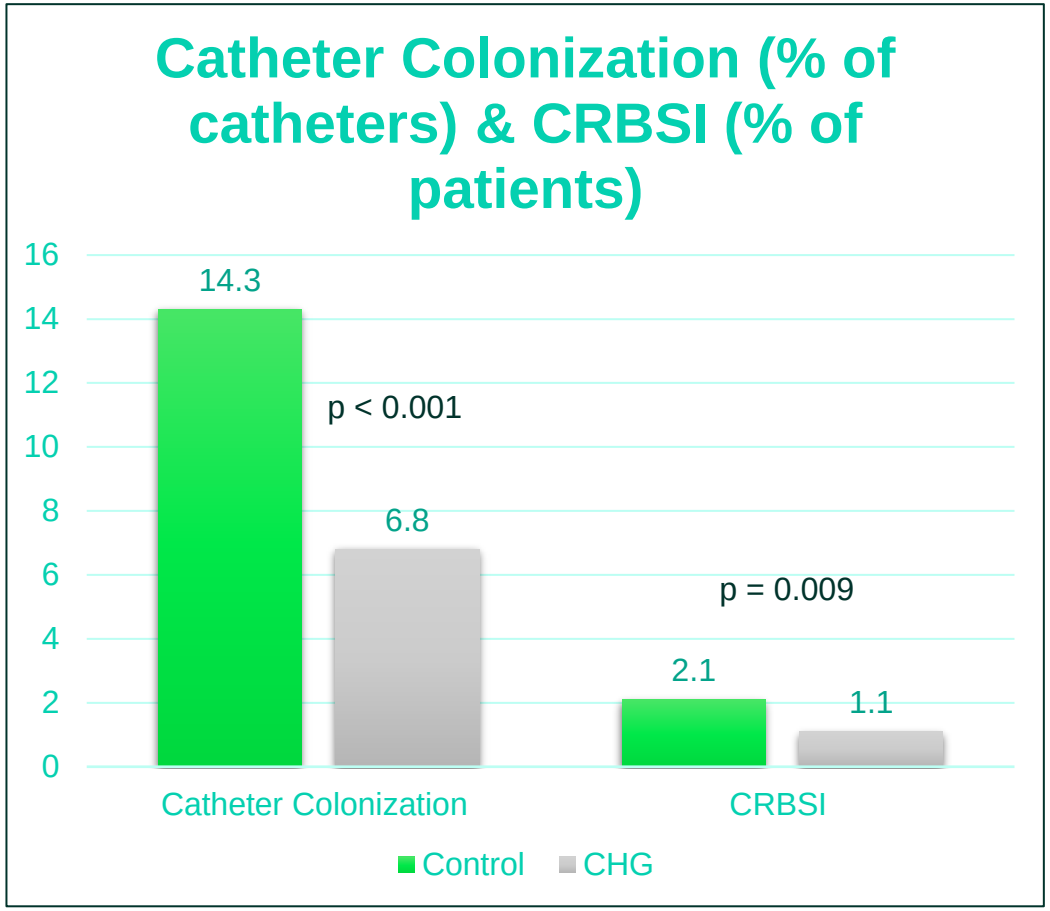
Chlorhexidine-impregnated dressing for the prevention of CRBSIs: A meta-analysis

Meta-analysis: CHG Dressings

DESIGN: Meta-analysis of nine randomized controlled trials that met inclusion criteria.

METHODS: Studies were randomized controlled trials comparing a chlorhexidine-impregnated dressing with conventional site care to assess the efficacy of a chlorhexidine-impregnated dressing for prevention of central venous (CVC) and arterial catheter-related colonization and catheter-related bloodstream infection (CRBSI).

RESULTS: There was a significant benefit to using a chlorhexidine-impregnated dressing for CVC and arterial catheters.



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Safdar N, O'Horo JC, Ghufran A, et al. Chlorhexidine-impregnated dressing for prevention of CRBSIs: A meta-analysis. *Crit Care Med.* 2014: 42(7); 1703-1713.

"Chlorhexidine-impregnated dressing is beneficial to prevent CVC-related complications."

Wei L, Li Y, Li X, Bian L, Wen Z, Li M. Chlorhexidine-impregnated dressing for the prophylaxis of central venous catheter-related complications: a systematic review and meta-analysis. *BMC Infect Dis.* 2019;19:(1). *https://bmcinfectdis.biomedcentral.com/articles/10.1186/s12879-019-4029-9.*

TOPIC(S)

Infection
Reduction

DESIGN

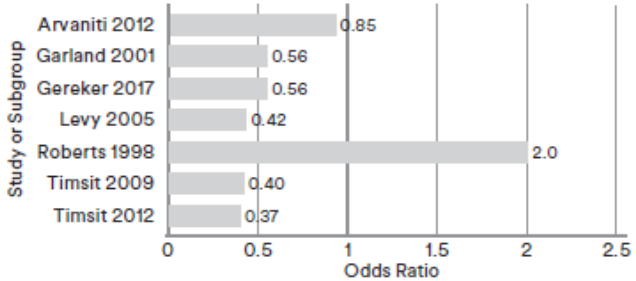
Meta-analysis of 12 randomized controlled trials with 6,028 patients that met inclusion criteria.

METHODS

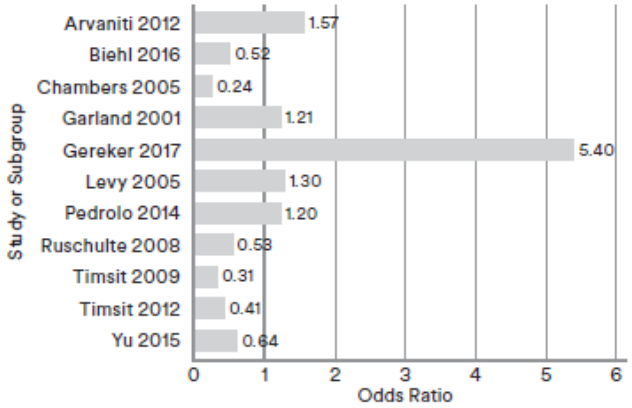
Studies were randomized controlled trials comparing chlorhexidine-impregnated dressing versus other dressing or no dressing for prophylaxis of central venous catheter (CVC)-related complications.

RESULTS

Risk of Catheter Colonization



Incidence of CRBSI



Ratios <1 favor chlorhexidine-impregnated dressing.
Ratios >1 favor other dressing or no dressing.

KEY FINDINGS

Chlorhexidine-impregnated dressing is beneficial to **reduce the risk of catheter colonization** for catheter-related bloodstream infections (CRBSI) for patients with CVC.

Chlorhexidine-impregnated dressings were conducive to **reduce the incidence of CRBSI.**

Chlorhexidine transparent dressing could effectively **reduce the frequency of dressing changes** to ease workload of nursing staff.

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Bashir (2012) Am J Infect Control[12]

Antimicrobial Protection

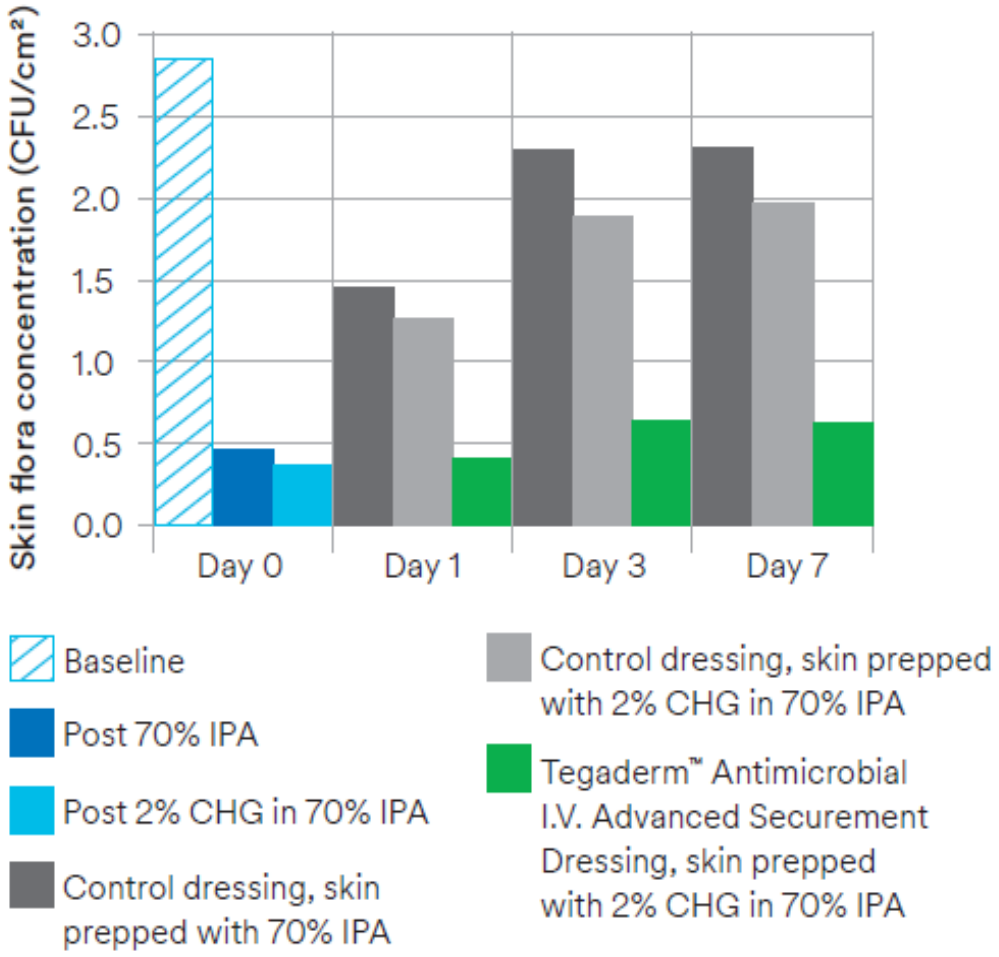
CHG Gel Securement Dressing Results

DESIGN: Randomized controlled trial comparing suppression of microbe regrowth on CHG-prepped skin between control, CHG gel dressings and CHG disks.

METHODS:

- All patients (N = 30) treated with CHG skin prep
- Randomized to either:
  - Transparent film dressing (control)
  - CHG gel dressing
  - CHG disk + transparent film dressing

RESULTS: The CHG gel dressing demonstrated significantly greater microbial suppression than CHG disk on day 7 (p = 0.01).



3M data on file. EM-05-305455

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Bashir MH, Olson LK, Walters SA. Suppression of regrowth of normal skin flora under chlorhexidine gluconate dressings applied to chlorhexidine gluconate-prepped skin. *Am J Infect Control*. 2012; 40(4): 344-348.

Timsit (2012) Am J Respir Crit Care Med[21]

Randomised controlled trial of chlorhexidine dressing and highly adhesive dressing for preventing CRBSIs in critically ill adults

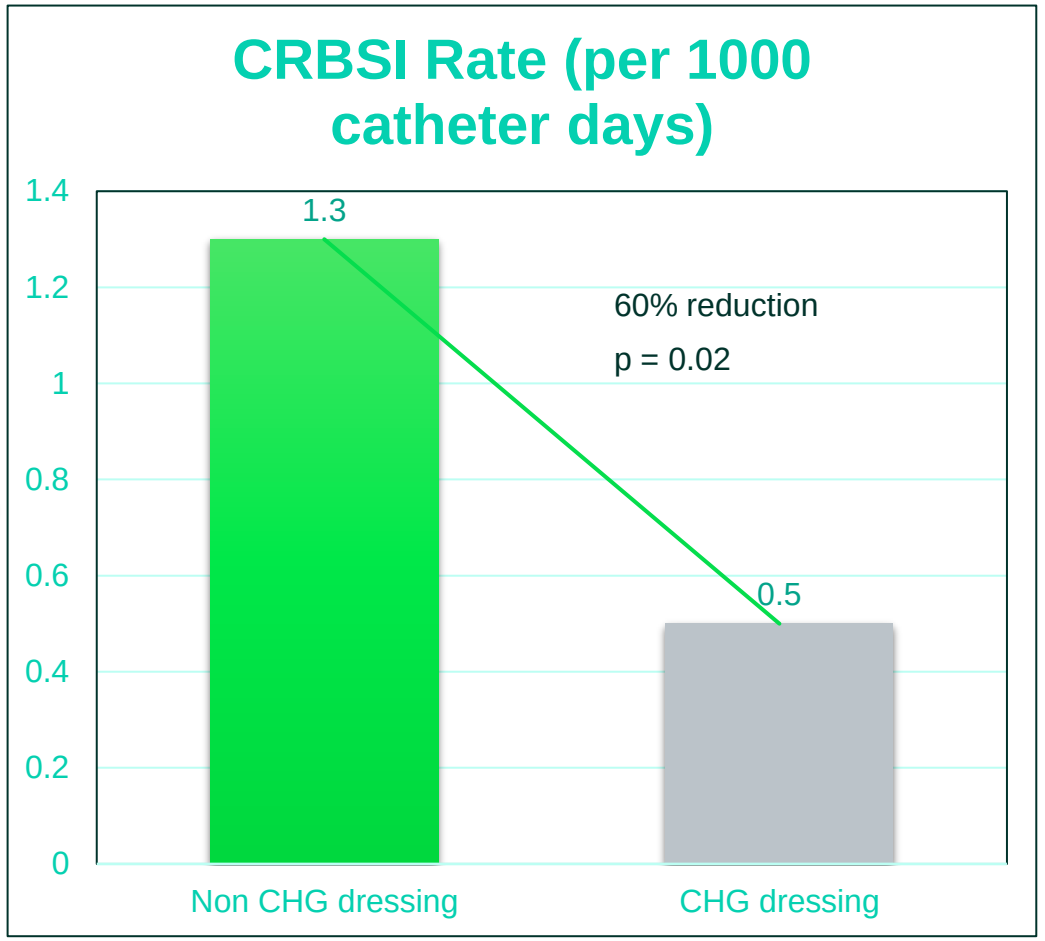
Infection Reduction

CHG Gel Securement Dressing Results

DESIGN: Multi-center randomized controlled trial comparing major catheter-related infections (CRI) with or without catheter-related bloodstream infections (CRBSI) and catheter colonization rates within central venous (CVC) and arterial catheters.

METHODS: Trial compared chlorhexidine to non-chlorhexidine dressings to determine if Tegaderm™ CHG Dressing decreases catheter colonization and CRBSI rates in CVC and arterial catheters. Studies were conducted in 12 French ICUs with a total of 1,879 patients evaluated.

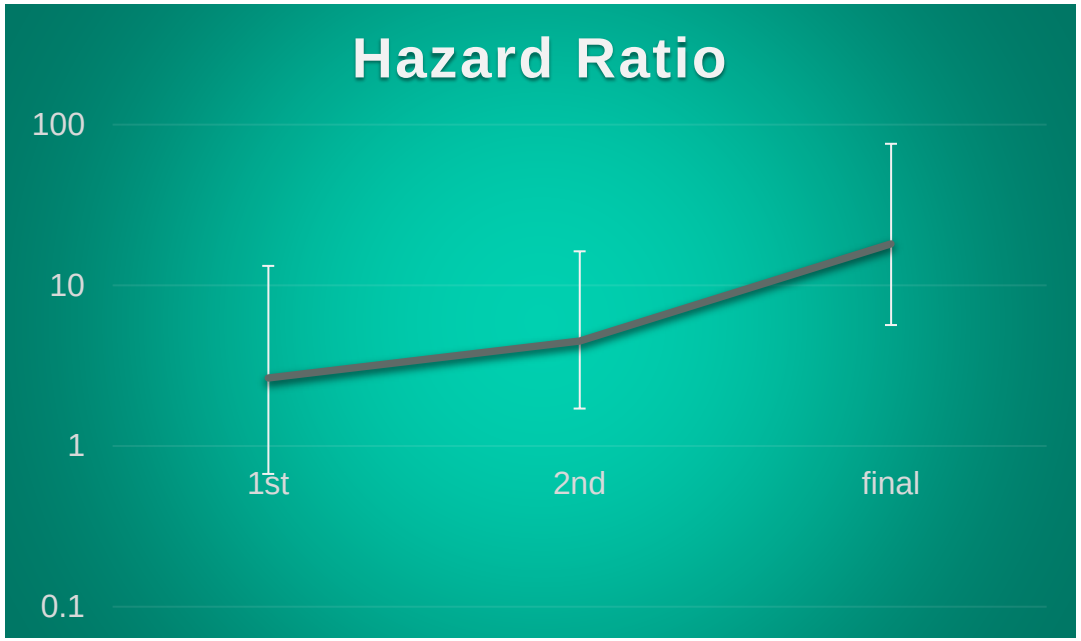
RESULTS: CRBSI rate was 60% lower with Tegaderm™ CHG Dressing versus non-chlorhexidine dressing.



Timsit JF, Mimoz O, Mourvillier B, Souweine B, Garrouste-Orgeas M et al. Randomised controlled trial of chlorhexidine dressing and highly adhesive dressing for preventing CRBSIs in critically ill adults, *Am J Resp Crit Care Med.* 2012: 186(12): 1272-1278.

Does dressing disruption lead to more CRBSI?

- Statistical correlation has been found between central line dressing disruption and infection rate
- >2 dressing disruptions has 10x increase in infection risk for central lines



Timsit, Jean-Francois. Dressing disruption is a major risk factor for catheter-related infections. 2012; Critical Care Medicine

Timsit JF, Schwebel C, Bouadma L, et al: Dressing Study Group: Chlorhexidine-impregnated sponges and less frequent dressing changes for prevention of catheter-related infections in critically ill adults: A randomized controlled trial. *JAMA* 2009; 301:1231–1241

Timsit 2009 Study results (CVC and art Catheters)

- Reduced CRBSI rates from 1.3 to 0.4/1000 cd (P=0.005)
- BioPatch® vs standard dressing (1626W)
- 7 day dressing change group
- 3 day dressing change group
- Statistically higher catheter colonization in 7 day group vs 3 day group.
- CRBSI rates similar (7 day vs 3 day)
- Unscheduled dressing changes due to soiled or non-adherent dressings was 67% (p=0.46).
- When dressing disrupted catheter site was found to be exposed (BioPatch® lift)
- Unscheduled dressing changes = higher catheter colonization and CRBSI

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Biehl (2016) Ann Oncol[24]

A randomized trial on chlorhexidine dressings for the prevention of CRBSIs in neutropenic patients

Infection Reduction

Ease of Use

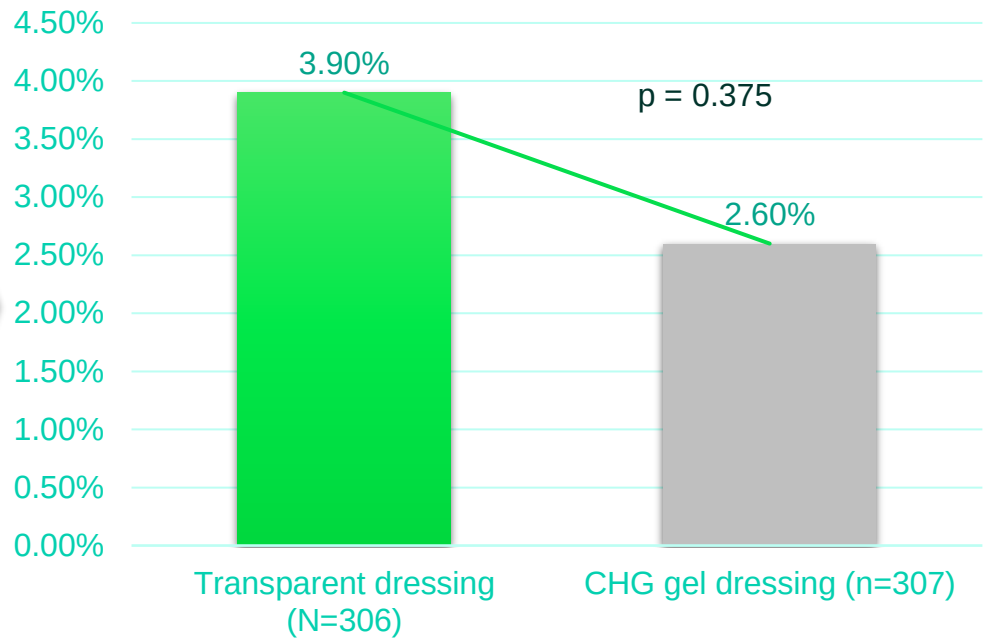
CHG Gel Dressing Study Results

DESIGN: Open-label randomized, multi-center trial in 10 German hematological departments measuring definite catheter-related bloodstream infections (CRBSI) with the first 14 days of central venous catheter (CVC) placement.

METHODS: Study assessed 613 neutropenic patients (307 in the Tegaderm™ CHG Group and 306 in the standard dressing group).

RESULTS: Tegaderm™ CHG Dressing was well tolerated and significantly reduced definitive and probable CRBSI.

Definite CRBSI w/in first 14 days of CVC placement



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Biehl LM, Huth A, Panse J, et al. A randomised trial on chlorhexidine dressings for the prevention of CRBSIs in neutropenic patients. *Ann Oncol.* 2016; 10: 1916-1922.

Righetti (2017) J Vasc Access[23]

Tegaderm™ CHG dressing significantly improves catheter infection rate in hemodialysis patients

Infection Reduction

Health Economics

CHG Gel Securement Dressing Results

DESIGN:

Prospective randomized cross-over trial measuring catheter-related infections (CRI) and catheter-related bloodstream infections (CRBSIs) in prevalent hemodialysis patients in inpatient and outpatient settings.

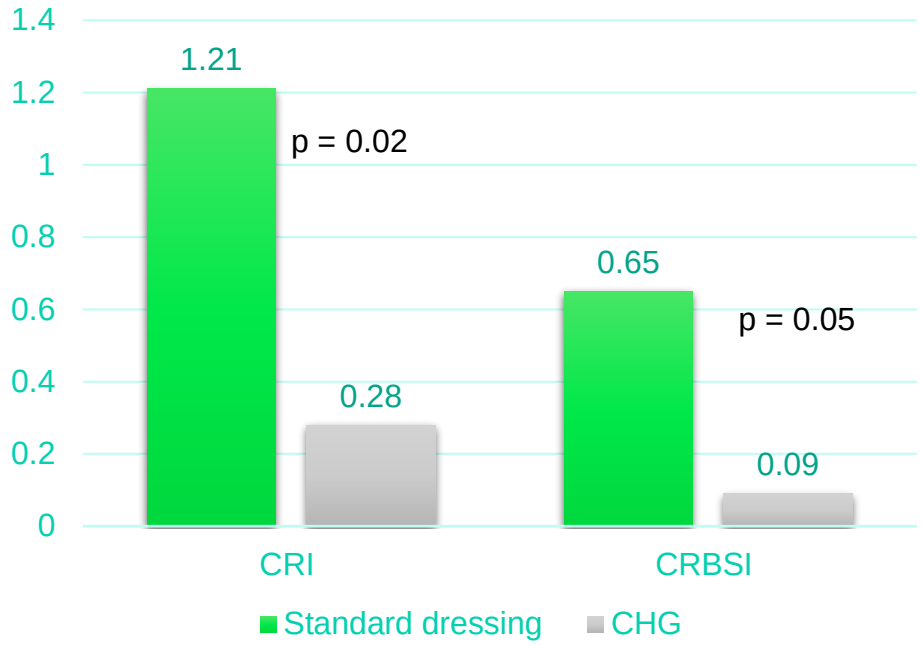
METHODS:

Study compared two treatments – Tegaderm™ CHG Dressing (n=29) changed weekly versus a standard dry gauze dressing (n=30) changed three times/week at every dialysis session (n=59).

RESULTS:

86% reduction in CRBSI incidence rate with Tegaderm™ CHG Dressing.

CRI & CRBSI Rate (per 1000 catheter days)



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Righetti M, Palmieri N, Bracchi O, et al. Tegaderm™ CHG dressing significantly improves catheter infection rate in hemodialysis patients. *J Vasc Access.* 2016; 17(5): 417-422.

Roethlisberg

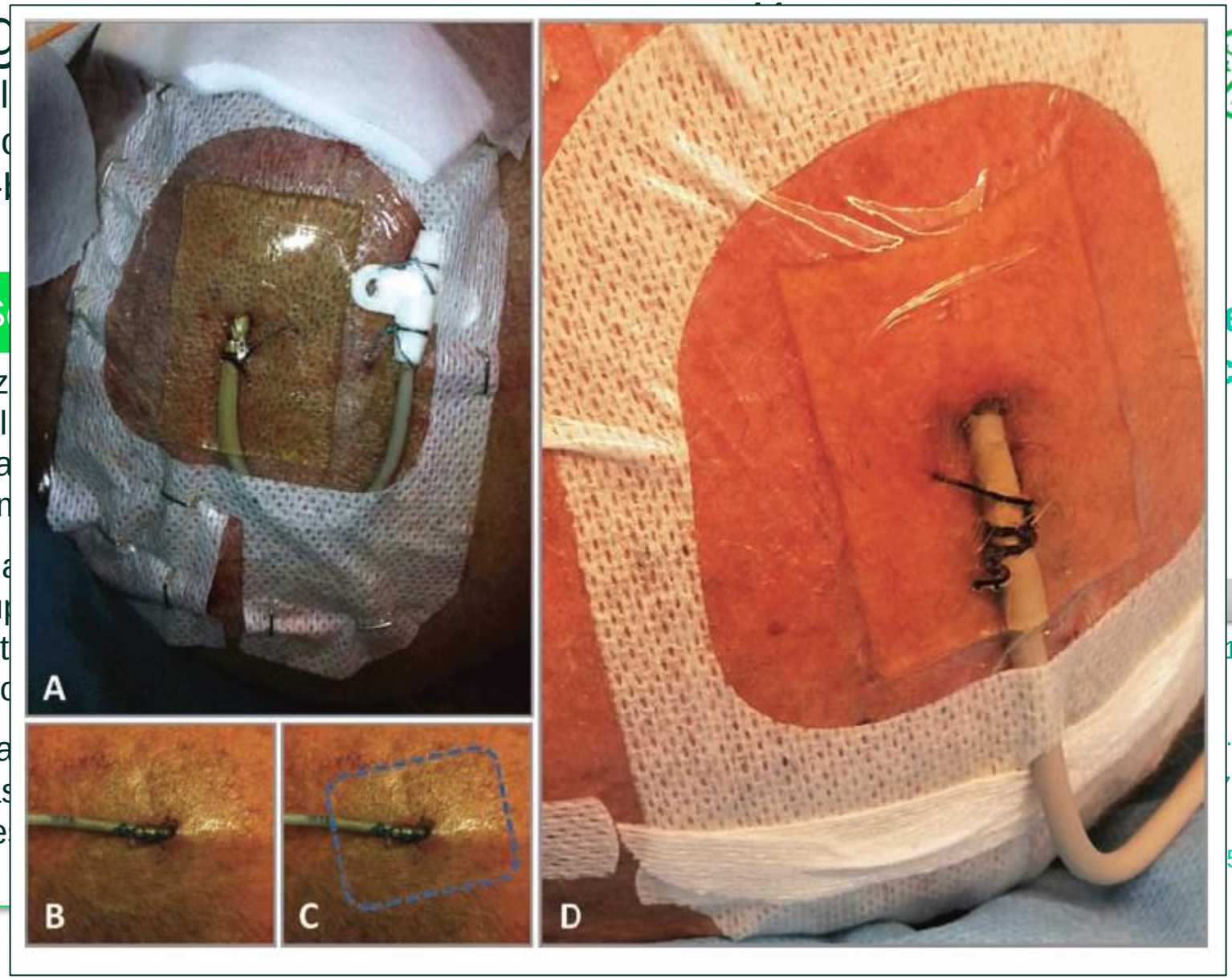
Effectiveness of a Chl
associated Colonizatio
A Prospective Single-

CHG Gel S

DESIGN: Randomiz
regrowth at external
between control (sta
dressings (Tegaderm

METHODS: Study a
CHG Dressing group
Secondary endpoint
infections and surgic

RESULTS: Bacteria
segment and tip was
versus standard dre



Antimicrobial Protection

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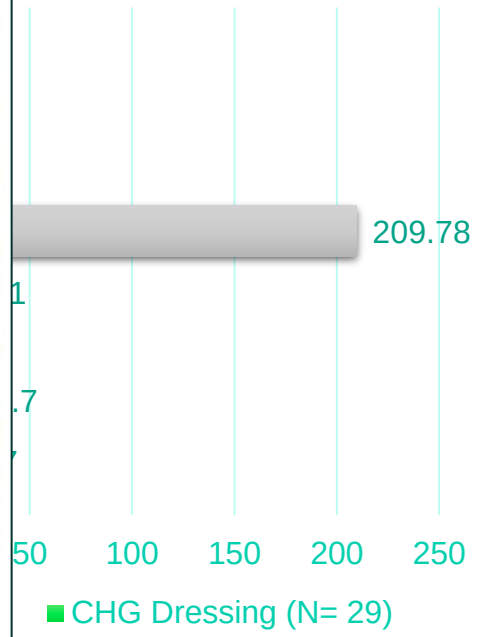

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Roethlisberger. Effectiveness of a Chlorhexidine Dressing on Silver-coated External Ventricular Drain–associated Colonization and Infection: A Prospective Single-blinded Randomized Controlled Clinical Trial. Clin Infect Dis. 2018.

The Tegaderm™ CHG Dressing demonstrated broad-spectrum antimicrobial activity against all 37 strains of microorganisms tested.

Hensler JP, Schwab DL, Olson LK, Palka-Santini M. Growth inhibition of microorganisms involved in CRBSIs by an antimicrobial transparent I.V. dressing containing chlorhexidine gluconate (CHG). Poster session presented at: 19th Annual Conference of the European Society of Clinical Microbiology and Infectious Diseases 2009; May 16-19, 2009.

TOPIC(S)

Antimicrobial Protection

DESIGN

In vitro study to assess zone of inhibition and aged zone of inhibition (22 months aged dressings).*

METHODS

The antimicrobial activity of the Tegaderm™ CHG Dressing gel pad was tested against a panel of 37 microorganism strains, comprised of 21 gram-positive and 14 gram-negative bacteria and two yeasts. The antimicrobial activity of Tegaderm™ CHG Dressing was evaluated against these microorganisms commonly associated with catheter-related bloodstream infections using *in vitro* zone of inhibition.*

*No clinical correlations intended.

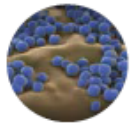
RESULTS

Tegaderm™ CHG Dressing demonstrates *in vitro* efficacy against 37 strains of microorganisms including gram-positive and gram-negative bacteria and yeasts.

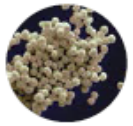

Enterococcus (5 strains)

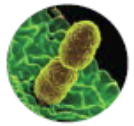

Pseudomonas aeruginosa (5 strains)

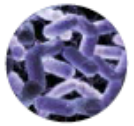

Candida (2 strains)


Staphylococcus aureus (8 strains)


Escherichia coli (1 strain)


Coag Neg Staph (7 strains)


Klebsiella (2 strains)


Enterobacter (1 strain)


Other (6 strains)

KEY FINDINGS

Many of the 37 strains tested were resistant organisms, including **MRSA, MRSE, VRE, and MDR** strains.

Tegaderm™ CHG Dressing **retains its antimicrobial properties** as demonstrated by the aged dressing's ability to produce similar zones of inhibition* compared to unaged dressings.

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Tegaderm™ CHG Dressing provides antimicrobial protection under the catheter.

Schwab D, et al. Antimicrobial activity of a CHG-impregnated gel pad for I.V. site protection. Poster presented at: the conference of Infusion Nursing Society; May, 2008.

TOPIC(S)

Antimicrobial Protection

DESIGN

In vitro study to assess the zones of inhibition generated from surface CHG and diffused CHG.*

METHODS

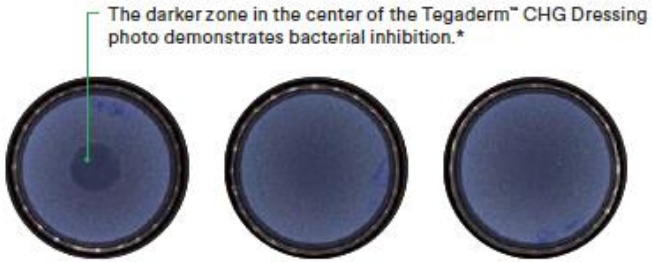
Multiple *in vitro* methodologies were used in this study:

1. **Surface availability:** Evaluated the presence of CHG on the surface of Tegaderm™ CHG Dressing and BIOPATCH® in the absence of additional moisture.
2. **CHG diffusion:** Evaluated the diffusion of CHG from Tegaderm™ CHG Dressing through an agar plate to areas not in direct contact.

RESULTS

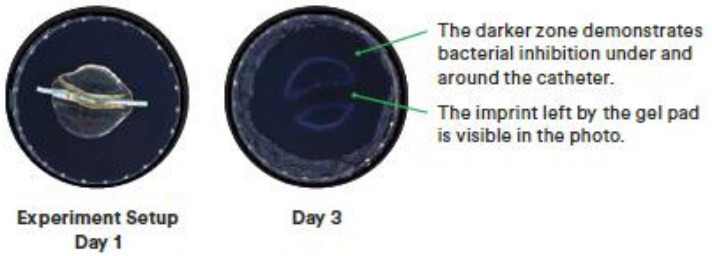
Method 1: Provides Antimicrobial Protection without Moisture

Images of agar plates inoculated with *S. epidermidis* at 24 hours



Method 2: Provides Antimicrobial Protection under the Catheter

Images of agar plates inoculated with *S. epidermidis*



*No clinical correlations intended.

KEY FINDINGS

Tegaderm™ CHG Dressing provides antimicrobial protection **without any additional moisture.**

CHG from the Tegaderm™ CHG Dressing is **diffused** under the catheter.

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Tegaderm™ CHG Dressing provides continuous antimicrobial activity.

Maki D, Stahl J, Jacobson C, et al. 2008. A novel integrated chlorhexidine-impregnated transparent dressing for prevention of vascular catheter-related bloodstream infection: a prospective comparative study in healthy volunteers. Poster presentation at The Society for Healthcare Epidemiology of America annual conference.

TOPIC(S)

Antimicrobial Protection

DESIGN

In vivo trials in healthy volunteers of immediate and long-term cutaneous antimicrobial activity to analyze prevention of skin floral regrowth on alcohol prepped subclavian sites and cumulative kill of skin flora on unprepped sites over 10 days of exposure.

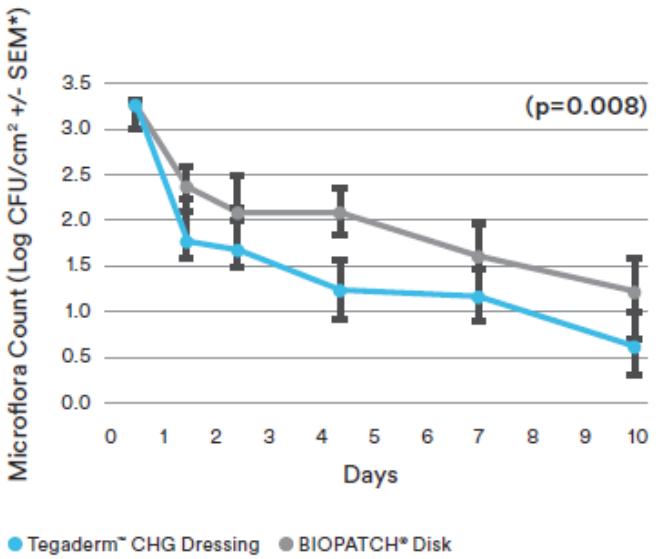
METHODS

Study compared the antimicrobial effectiveness of Tegaderm™ CHG Dressing to BIOPATCH® Disks on healthy adult volunteers.

RESULTS

Provides Immediate and Persistent Reduction of Microbes

In vivo kill time of normal flora on unprepped skin on healthy adult volunteers



*SEM: Scanned Electron Microscopy

KEY FINDINGS

Tegaderm™ CHG Dressing is proven to be **as effective as or better than** BIOPATCH® Disks at persistently reducing microbes at each time point.

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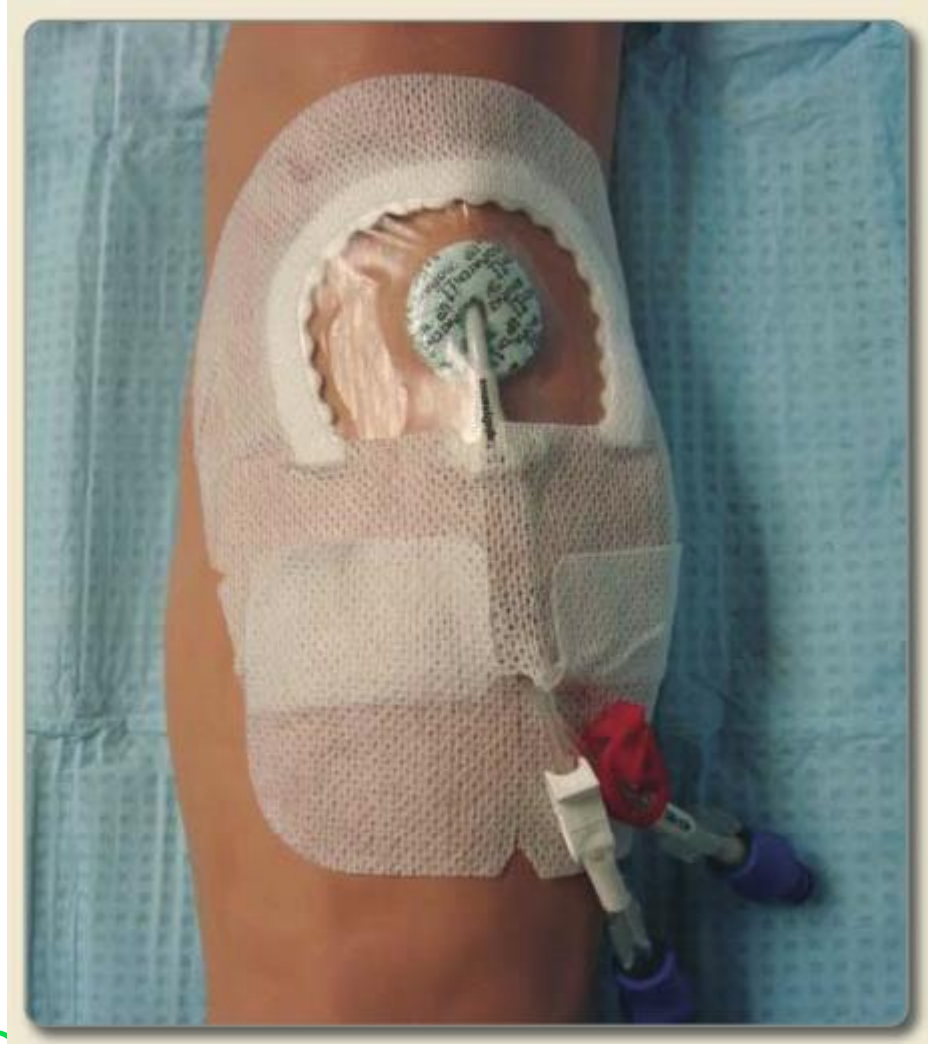
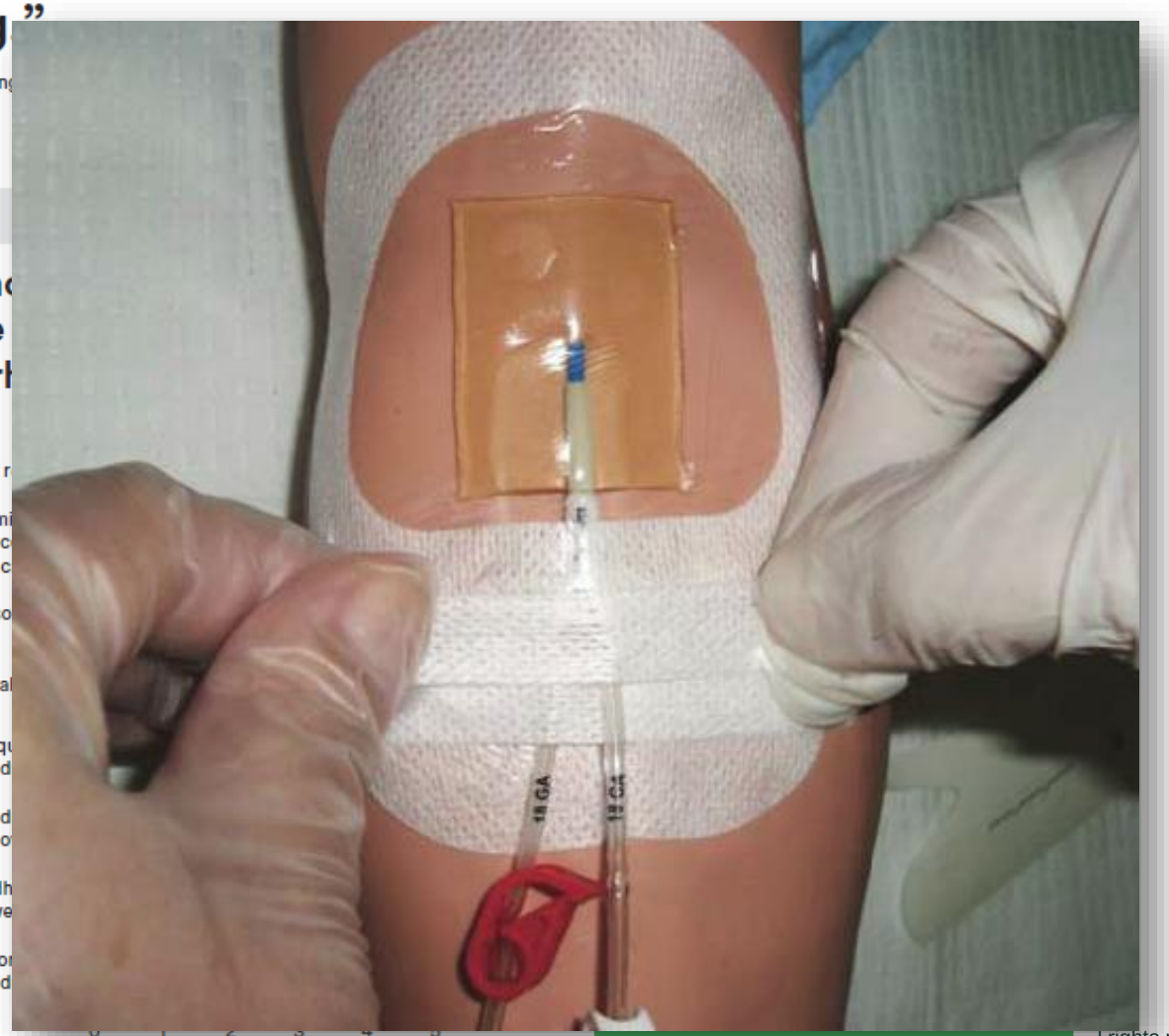
PEER REVIEWED

3M™ Tegaderm™ CHG Chlorhexidine Gluconate
I.V. Securement Dressing

"A low rate of catheter-related bloodstream infections can be maintained, nurses' satisfaction achieved, and cost

ing."





Much Worse

Much Better

Kohan (2013) Am J Infect Control[14]

A Different Experience with Two Different Chlorhexidine Gluconate Dressings for use on Central Venous Devices

Ease of Use

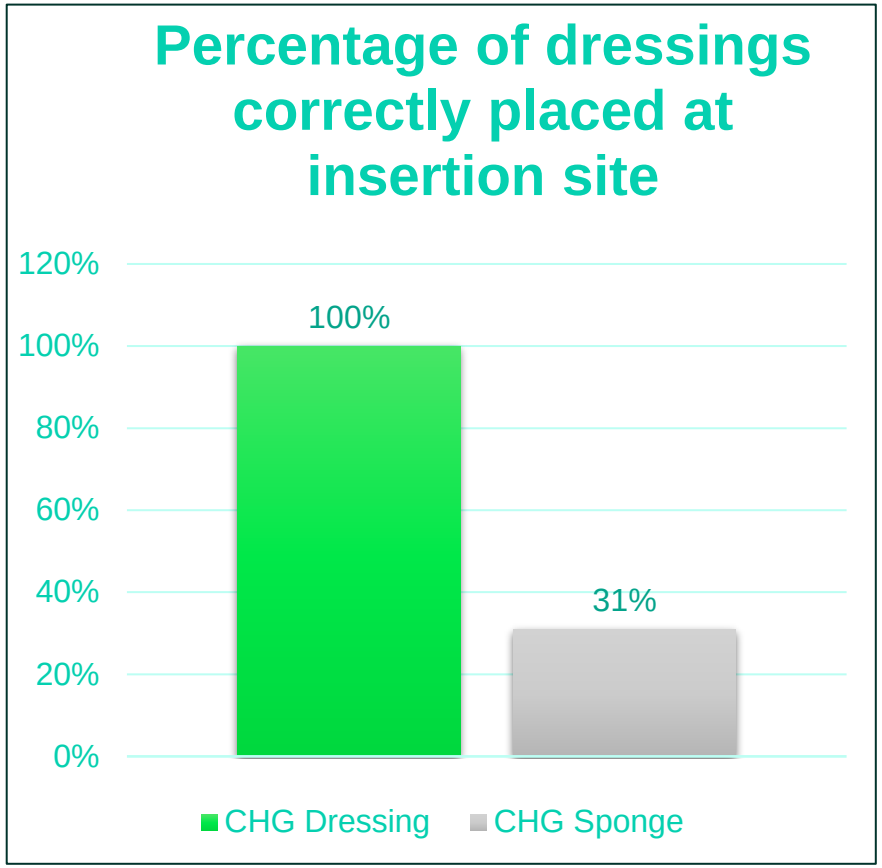
CHG Gel Securement Dressing Results

DESIGN: Clinical audits of dressing application and occlusiveness conducted in 2009 while using a BIOPATCH® Disk and in 2012 while using a Tegaderm™ CHG Dressing.

METHODS:

- Audit evaluated the frequency of correct application for BIOPATCH® Disks and Tegaderm™ CHG Dressing in 248 dressing applications.
- Staff re-educated on both products

RESULTS: BIOPATCH® Disks were placed incorrectly at the insertion site 69% of the time despite repeated educational sessions.



Kohan C, Boyce J. A different experience with two chlorhexidine gluconate dressings for use on central venous devices. *Am J Infect Control*. 2013; 41 (6); S142–S143.

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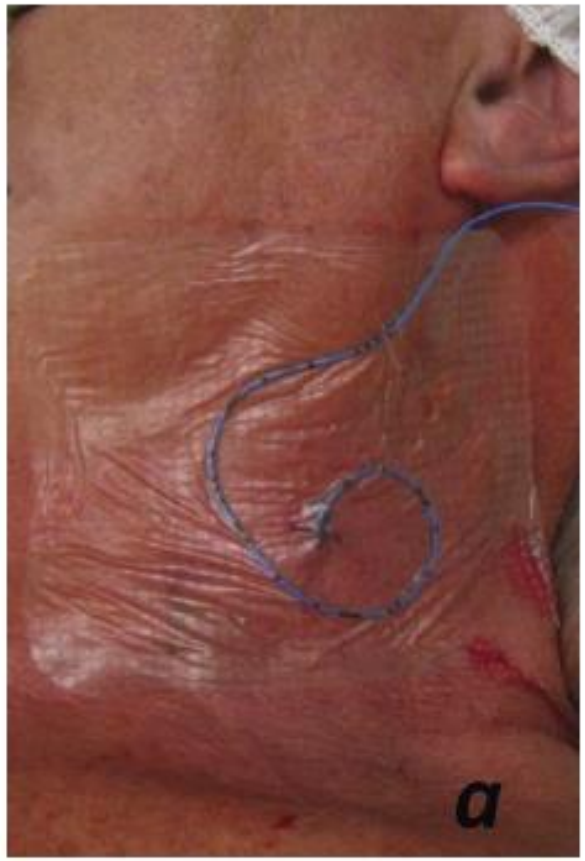
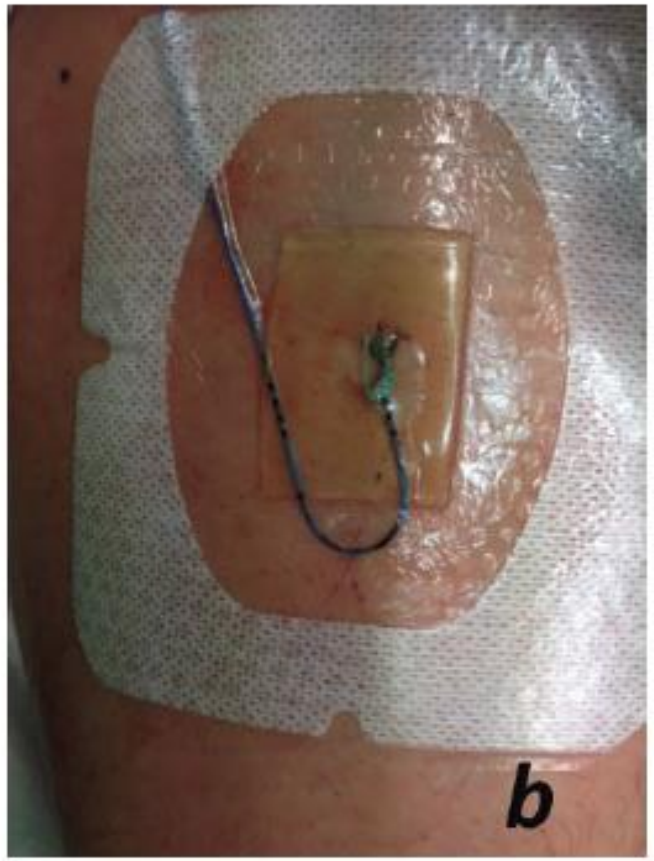
Tegaderm™ CHG Dressing helps reduce the risk of bacterial colonization of the tip and the insertion site of epidural and local regional catheters used in anesthesia.

Kerwat K, Eberhart L, Kerwat M, et al. Chlorhexidine gluconate dressings reduce bacterial colonization rates in epidural and peripheral regional catheters. *Biomed Res Int.* 2015;2015:149785. doi: 10.1155/2015/149785.





KEY FINDINGS

80% reduction
in insertion site colonization with use of Tegaderm™ CHG Dressing.

86% reduction
in catheter tip colonization with use of Tegaderm™ CHG Dressing.

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Scheithauer (2016) Clin Infect Dis[25]

Significant Reduction of External Ventricular Drainage–Associated Meningoventriculitis by Chlorhexidine-Containing Dressings: A Before-After Trial

Infection Reduction

Health Economics

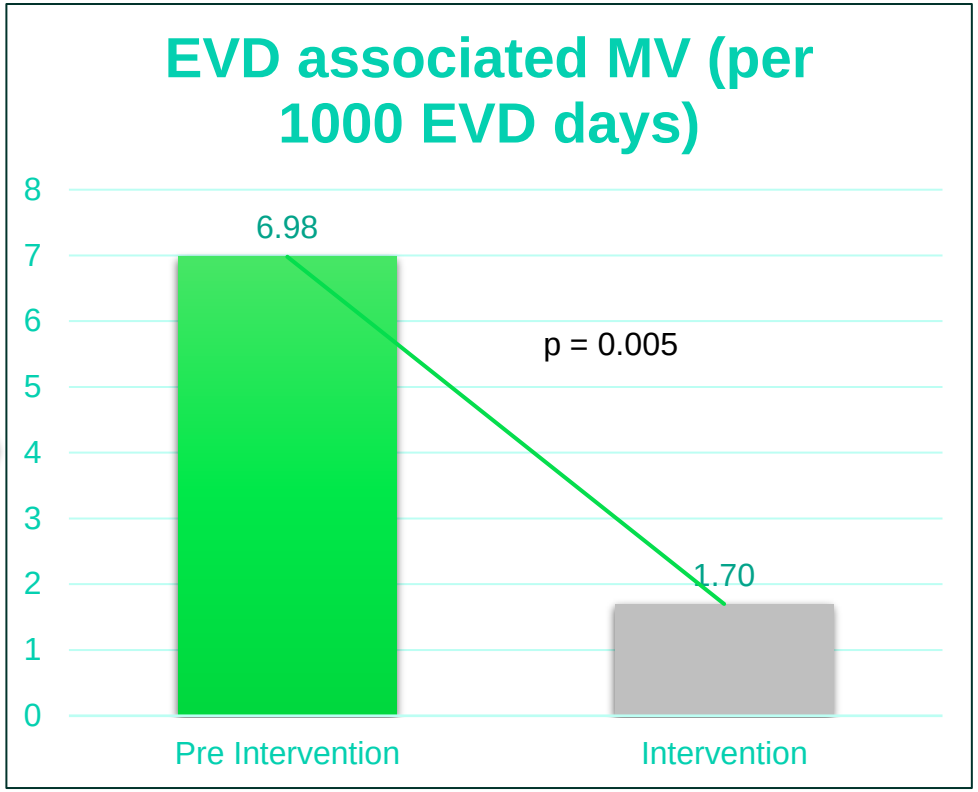
CHG Gel Securement Dressing Results

DESIGN: Before and after intervention study comparing external ventricular drainage (EVD)-associated meningoventriculitis (MV)

METHODS: Study replaced standard gauze dressings with

Tegaderm™ CHG Dressing. Evaluation and calculation of the EVD-associated MV rates were performed by an interdisciplinary and interprofessional health team twice weekly during infectious disease rounds

RESULTS: 68% reduction in MV rates. No adverse events.



Scheithauer S, Schulz-Steinen H, Hollig A, et al. Significant Reduction of External Ventricular Drainage–Associated Meningoventriculitis by Chlorhexidine-Containing Dressings: A Before-After Trial. *Clin Infect Dis*. 2016; 62(3): 404-405. **doi: 10.1093/cid/civ887**

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99% of clinical staff surveyed recommended continuing the use of Tegaderm™ CHG Dressing.

Karpanen TJ, Casey AL, Das I, Whitehouse T, Nightingale P, Elliott TSJ. Transparent film intravenous line dressing incorporating a chlorhexidine gluconate gel pad: A clinical staff evaluation. *J Assoc Vasc Access*. 2016:September:21(3):133-138.

TOPIC(S)

Ease of Use

DESIGN

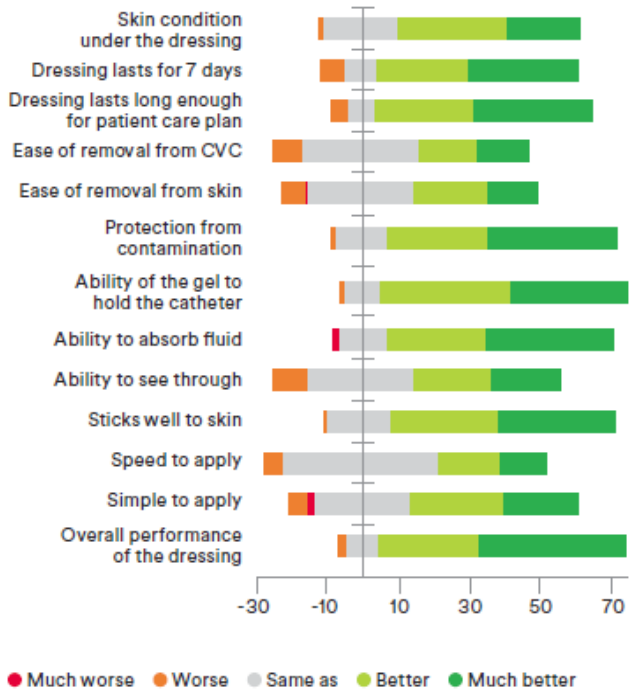
Clinical staff evaluation of a Tegaderm™ CHG Dressing compared to a standard dressing (n=81).

METHODS

The study group was from the Critical Care unit and followed patients (>14,200) with short-term central venous catheter (CVC) or vascular access catheter (VAC) for dialysis. Study was divided into two phases: 9 months of Tegaderm™ CHG Dressing use was compared to 12 months of standard dressing use. Staff completed evaluation following implementation of Tegaderm™ CHG Dressing.

RESULTS

Tegaderm™ CHG Dressing Ratings Relative to a Standard Dressing



KEY FINDINGS

86% of the clinical staff surveyed rated the performance of the Tegaderm™ CHG Dressing as **better or much better** than the standard dressing.

The Tegaderm™ CHG Dressing **performed well** in a **diverse group** of critical care patients.

98.7% of clinicians **recommended continued use** of Tegaderm™ CHG Dressing.

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Grigonis (2016) AJCC[28]

Use of a Central Catheter Maintenance Bundle in Long-term Acute Care Hospitals (LTACHs)

Bundle Study Results

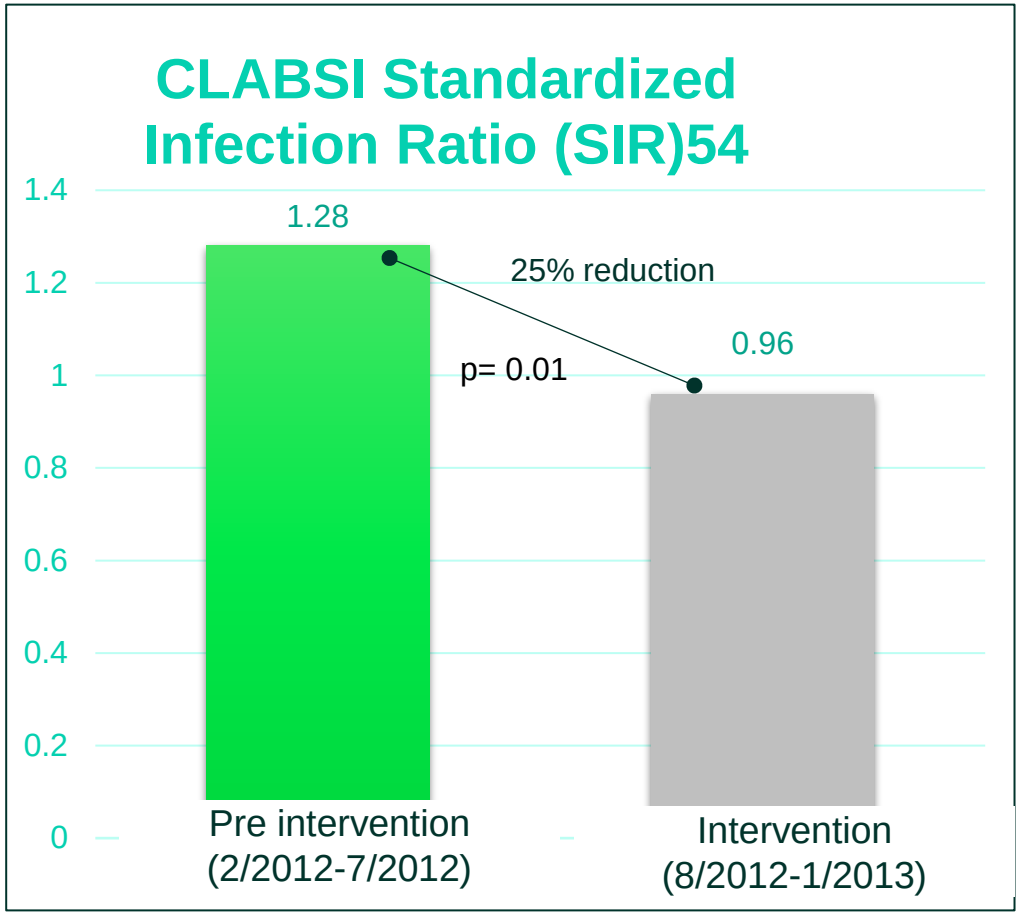
DESIGN: Before and after intervention study bundle in 30 LTACHs

INTERVENTION:

- Implemented central line bundle
- Bundle included: education, mandatory use of disinfecting caps on CVC and tubing, chlorhexidine gluconate dressings, and formation of central line team

RESULTS:

- Infection reduction translate to a savings of approximately $3.7 million annually for the 30 LTACHs
- Potentially saved 20 patients' lives



Grigonis AM, Dawson AM, Burkett M, et al. Use of a central catheter maintenance bundle in long-term acute care hospitals. *Am J Crit Care*. 2016; 25(2): 165-172.

Apata (2017) J Vasc Access

Chlorhexidine-impregnated transparent dressings decrease catheter-related infections in hemodialysis patients: a quality improvement project

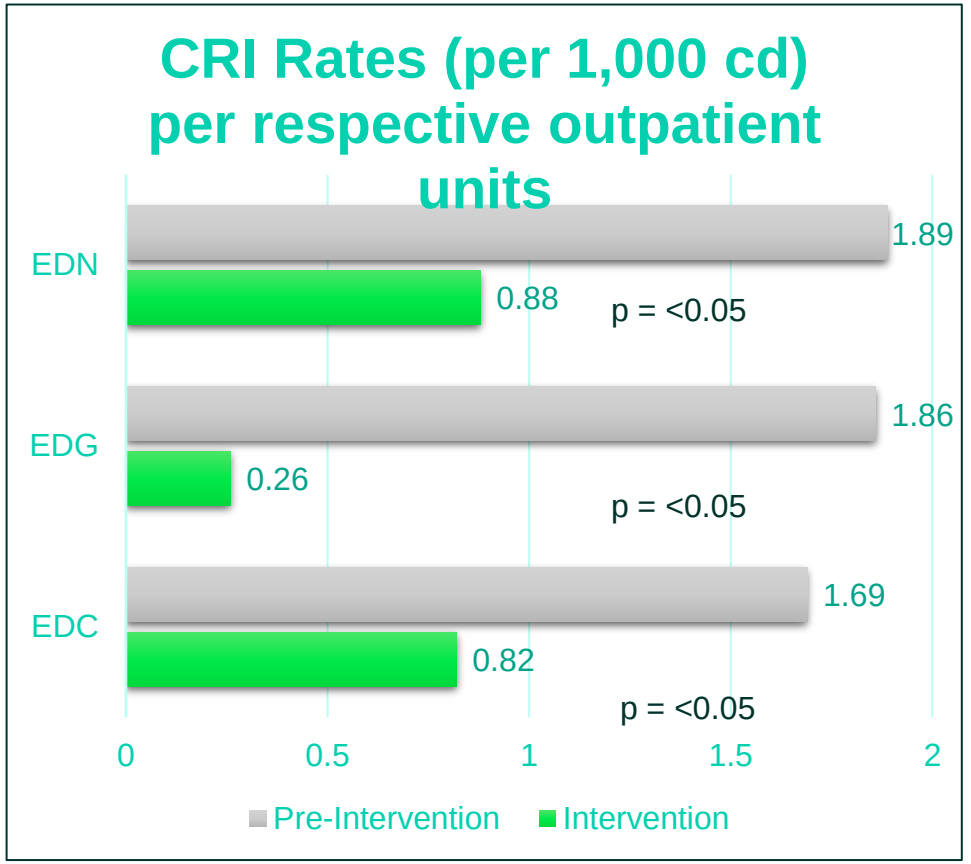
Infection Reduction

CHG Gel Securement Dressing Results

DESIGN: Prospective before and after intervention study measuring catheter-related infection (CRI) rates in patients with dialysis catheters.

METHODS: Comparison of CRI rates in two dressing regimens – Tegaderm™ CHG Dressing and adhesive dry gauze dressings with an antibiotic ointment in hemodialysis patients having tunneled central venous catheters (CVC). The study was conducted in two phases: Phase 1 assessed the impact of Tegaderm™ CHG Dressing on one dialysis unit (EDC) versus two control dialysis units (EDG and EDN); Phase 2 introduced Tegaderm™ CHG Dressing to the two control dialysis units.

RESULTS: In one unit, there was an 86% reduction in infection rate.



Apata, I, Hanflet, J, Bailey, J, et al. Chlorhexidine-impregnated transparent dressings decrease catheter-related infections in hemodialysis patients: a quality improvement project. *J Vasc Access.* 2017; 18(2): 103-108.

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Eggimann (2019) Intensive Care Med

Infection Reduction

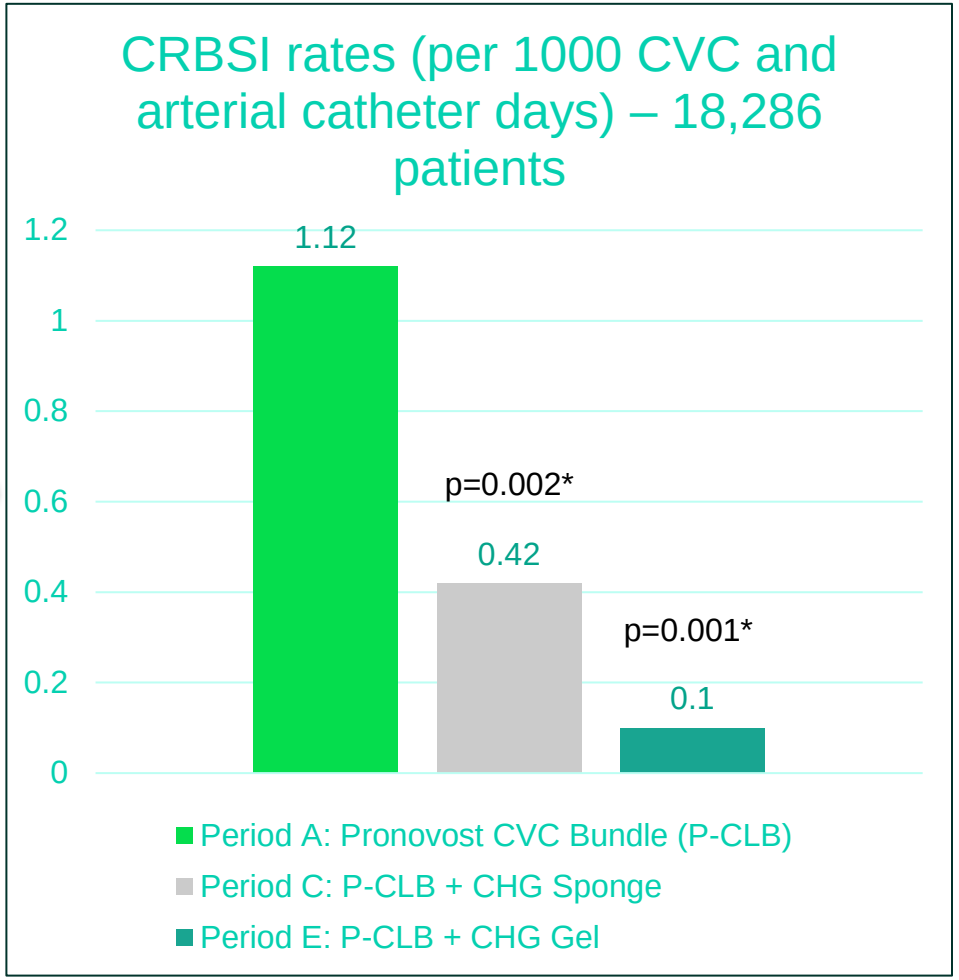
Sustained reduction of catheter associated bloodstream infections with enhancement of catheter bundle by chlorhexidine dressings over eleven years

Chlorhexidine Dressing Study Results[62]

DESIGN: Real-world data study from 2006 to 2014 at a 35-bed mixed adult ICU in the Centre Hospitalier Universitaire Vaudois, Lausanne, Switzerland, a primary and referral hospital for a population of 250,000 and 1,500,000, respectively.

METHODS: 11-year study evaluated the impact of incrementally introducing CHG dressings (sponge or gel) to an ongoing catheter bundle on the rates of catheter-related bloodstream infections (CRBSI). This was measured as part of a surveillance program and expressed as incidence density rates per 1,000 catheter-days for every central venous catheter (CVC), including dialysis catheters and introducer sheaths for pulmonary artery (PA) catheters, and arterial catheters.

RESULTS: CHG dressings were associated with a sustained 11-year reduction of CRBSI. Skin reaction rates equivalent between CHG gel and CHG sponge.



* p-values represent comparisons to period A

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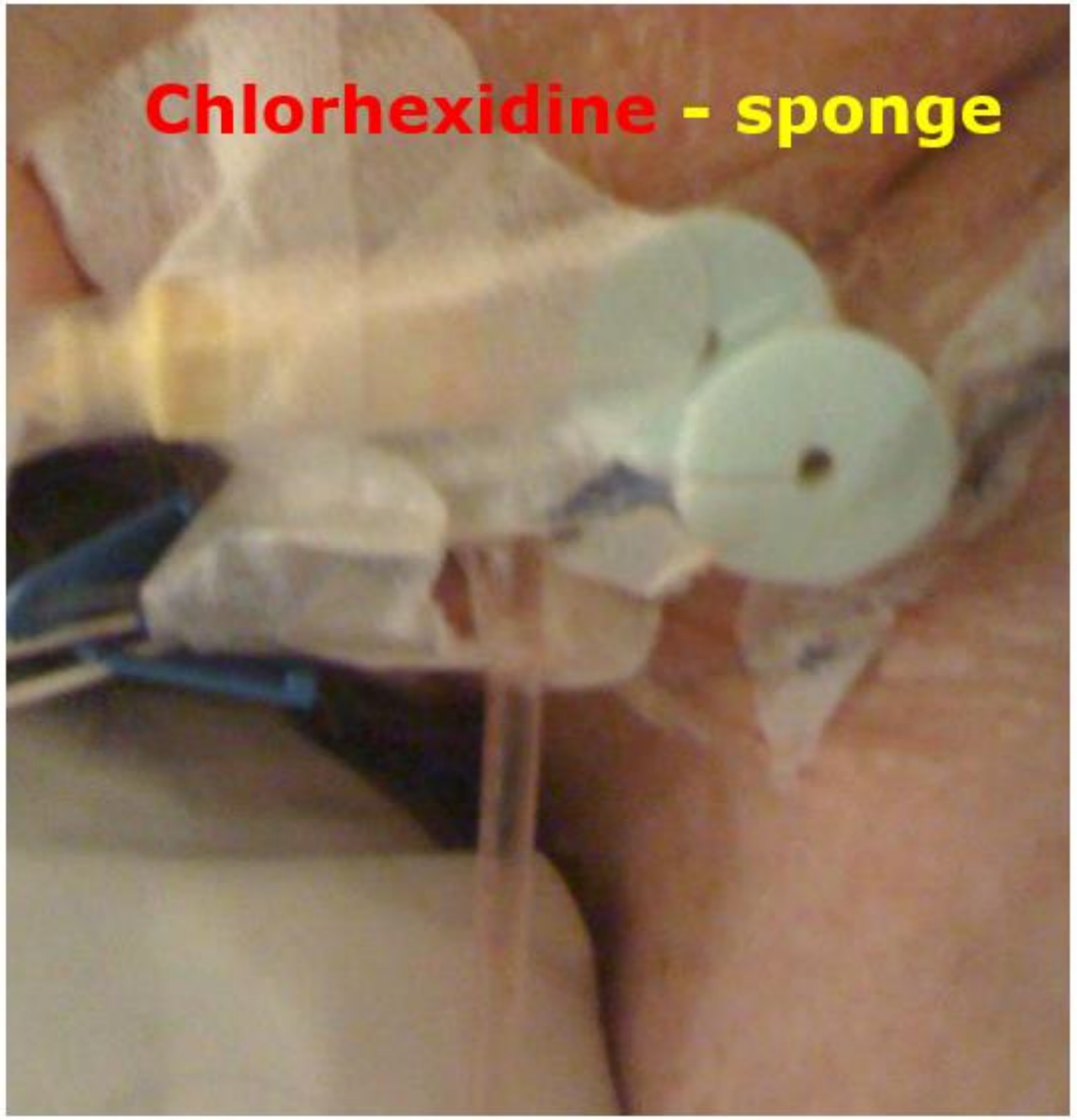
Eggimann. Sustained reduction of catheter-associated bloodstream infections with enhancement of catheter bundle by chlorhexidine dressings over 11 years. *Intensive Care Med.* 2019. online edition ahead of print.

Images from Eggimann study:
Enhanced catheter bundle by CHG-dressings



BIOPATCH® was replaced with Tegaderm™ CHG for all central venous catheters and arterial lines for all ICU patients because healthcare workers reported significant improvement in fitness of use.

Eggimann P, Joseph C, Thévenin MJ. Fitness of use of Biopatch® and Tegaderm™ CHG for protecting central venous catheters and arterial lines in critically ill patients. Oral presentation at: 3rd International Conference on Prevention and Infection Control; June, 2015; Geneva, Switzerland.

TOPIC(S)

Ease of Use

DESIGN

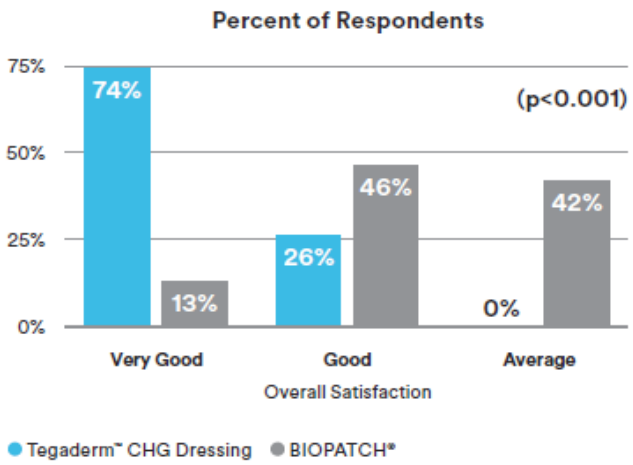
Clinical staff evaluation at 5 ICUs (2,000 admissions and 11,000 patient-days annually).

METHODS

Study compared the fitness of use of BIOPATCH® Disks (n=24) and Tegaderm™ CHG Dressings (n=42) in a mixed ICU based on a questionnaire given to healthcare workers.

RESULTS

Comparison of Staff Satisfaction Evaluation



KEY FINDINGS

There was significant improvement of the **ease of installation** reported for Tegaderm™ CHG Dressing compared to BIOPATCH® Disks.

In most cases, staff reported that Tegaderm™ CHG Dressing **improved coverage** of the insertion and suture sites.

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Retrospective Study

The impact of replacing peripheral intravenous catheters when clinically indicated on infection rate, nurse satisfaction and costs in the CCU, Step-down and Oncology units

Oliver R, Wickman M, Skinner C, et al. The impact of replacing peripheral intravenous catheters when clinically indicated on infection rate, nurse satisfaction and costs in the CCU, Step-down and Oncology units. *AJIC.* 2021: 49: 327-332.

Topics

PIVC Bundle
Health Economics
Failure rates/complication rates
Infections rates
Practice changes

Design

Retrospective study

Method

Quantitative retrospective study implementing a new PIV bundle with endpoints measuring PIV dwell times, phlebitis, PIV-CRBSI rates, adverse events, clinician feedback, and costs.
N = 473 (patients), 737 PIVs
January – September of 2018.

Results

- PIV average dwell time was 7 days (3-28 days).
- Phlebitis rate was 3% (<5% is acceptable according to INS)
- No PIV-Related BSI
- 2 skin tears (0.27%) out of 737 PIVS
- Cost Savings: $17,000/year in PIV supplies

https://doi.org/10.1016/j.ajic.2020.07.036

Key Findings

Clinician satisfaction: 94.2%
(17 month sustained feedback)

Prior bundle included flat film and PIV Statlock, routine PIV replacement every 96 hours.

New PIV bundle: 3M Tegaderm CHG 1660 IV Securement Dressing, hand hygiene, tubing change every Tues and Sun, scrub the hub, needleless connector maintenance, site assessment, flushing protocol, and removal of unnecessary PIVs.

PIV needles: 3,622 less PIV needles used reported 1 year post implementation (15% decrease and savings of $5,542). Supports culture of needle-safety.

St. Jude Medical Center, Fullerton, CA

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Evaluation study

Adoption of CHG impregnated transparent gel pad dressing on haemodialysis patient population with long-term central venous access

Juhoor, Khalid. Adoption of CHG impregnated transparent gel pad dressing on haemodialysis patient population with long-term central venous access. *Jour Kidney Care. 2022. Vol. 7. No. 1.*

Topics

- CRBSI
- Hemodialysis catheters
- HAI organisms
- CHG Gel Dressing
- CHG Sponge Dressing

Design

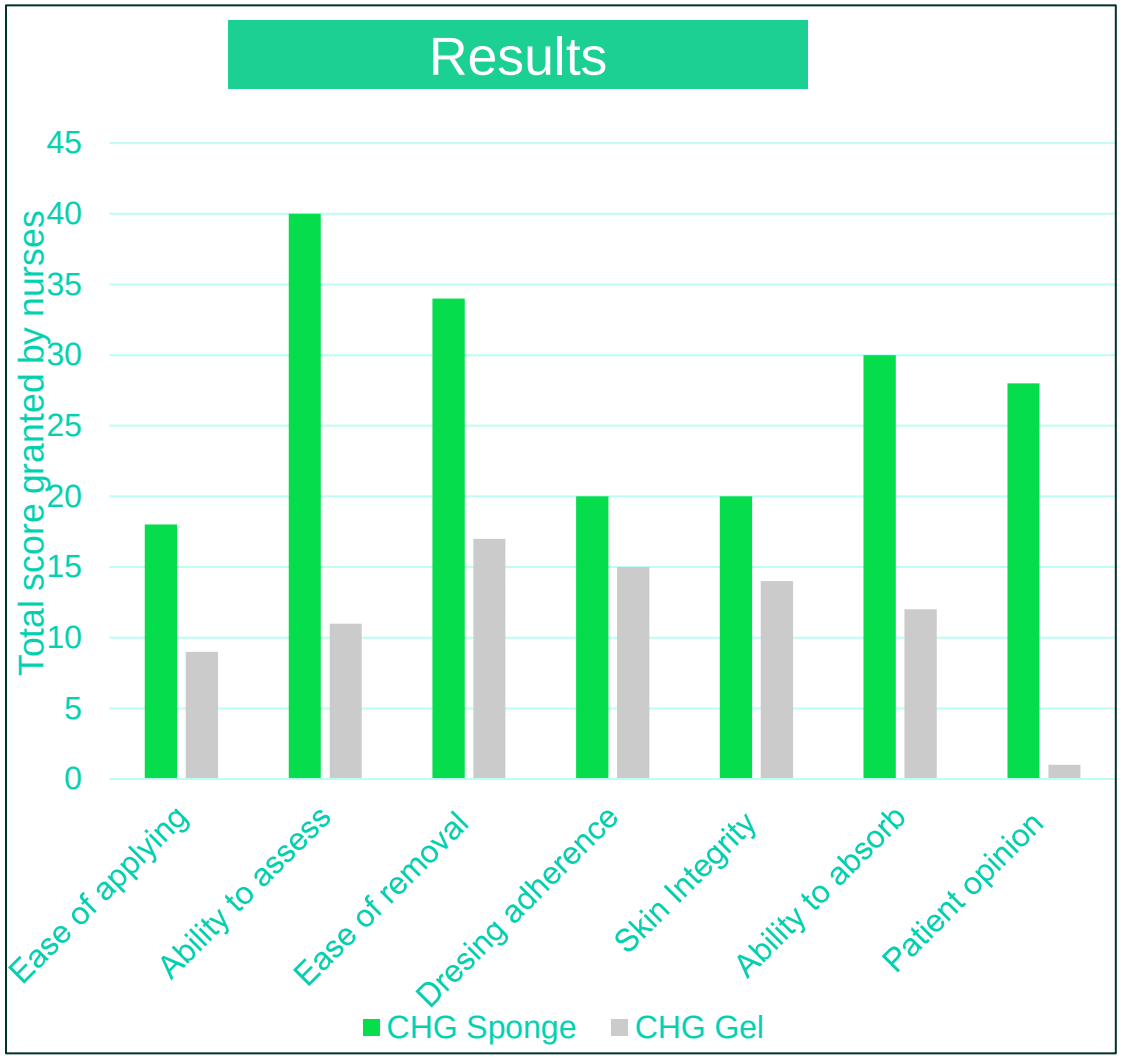
Comparative evaluation study

Method

- 2-week trial (2017)
- 18 evaluation forms
- 9 dialysis nurses
- Average dwell time:12.2 days

DOI:10.12968/jokc.2022.7.1.6

Results



Key Findings

- 49/72 individual scores showed a preference for Tegaderm™ CHG
- Reduction of CRBSI cases reported from 2017 to 2021

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PEER REVIEWED

"Comparative effectiveness of two chlorhexidine gluconate-containing dressings in reducing central line-associated bloodstream infections, hospital stay, and costs."

Hou Y, Griffin L, Bernatchez SF, Hommes J, Kärpänen T, Palka-Santini M. Comparative effectiveness of two chlorhexidine gluconate-containing dressings in reducing central line-associated bloodstream infections, hospital stay, and costs. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing*. 2023;60:1-9.

3M Tegaderm™
CHG Chlorhexidine Gluconate I.V. Securement Dressing

DESIGN

Retrospective analysis

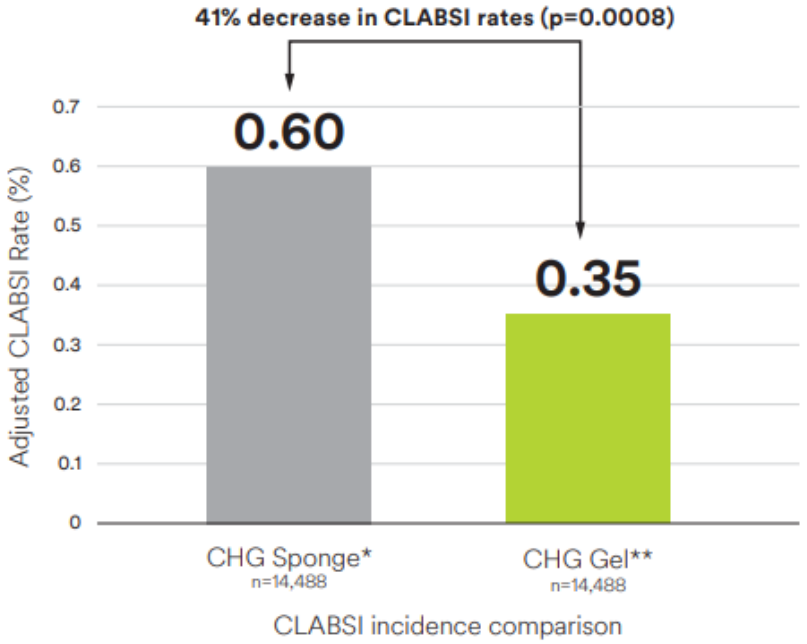
METHODS

Study compared the effect of two CHG dressings on central line-associated bloodstream (CLABSI), clinical utilization, cost of care and contact dermatitis using the Premier Healthcare Database of patients across 217 U.S. hospitals (n=53,149) with central venous catheters (CVCs). Inpatient cases received either a transparent CHG gel dressing or an opaque CHG sponge dressing between January 2019 and September 2020.

DOWNLOAD THE FULL ARTICLE:
journals.sagepub.com/doi/10.1177/00469580231214751

RESULTS

Central Line-associated Bloodstream Infection (CLABSI) Incidence Rates



*Ethicon BIOPATCH® Disk
**3M™ Tegaderm™ CHG Chlorhexidine Gluconate I.V. Securement Dressing

CHG Gel cohort had
41% fewer
incidences of CLABSI
(p=0.0008)

CHG Gel cohort showed
0.4-day reduction
in hospital stay
(p=0.0001)

CHG Gel cohort cost
$3,576 less
per hospital stay
(p=0.0179)

No significant difference between CHG gel and CHG sponge in
contact dermatitis
per hospital stay
(p=0.7854)

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Thokala P, (2016) J Infec Prev[29]

Economic impact of Tegaderm™ CHG IV securement dressing in critically ill patients

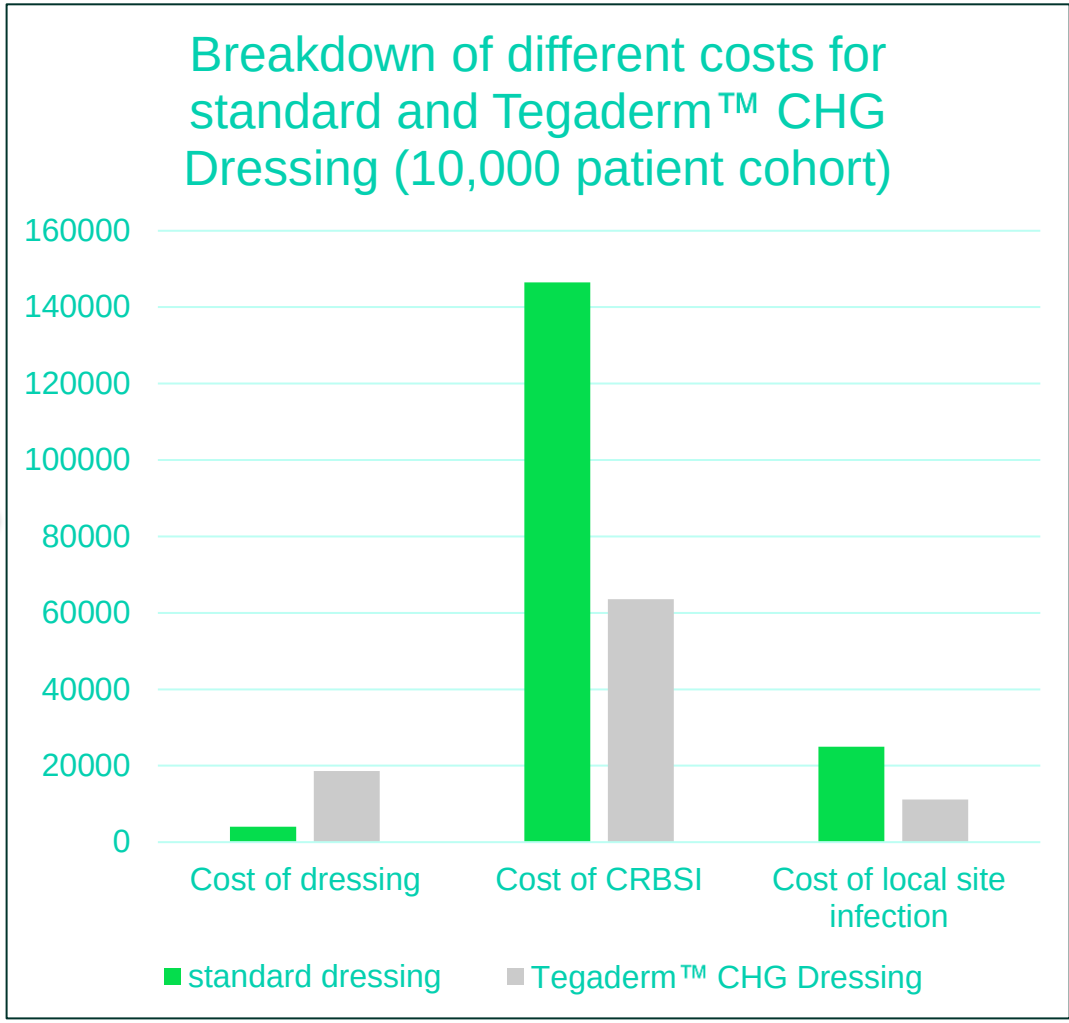
Health Economics

Chlorhexidine Dressing Results

DESIGN: Analytical cost-consequence model populated with data from published sources.

METHODS: Estimation of the economic impact of a Tegaderm™ CHG Dressing compared with a standard dressing.

RESULTS: Tegaderm™ CHG has a 98.5% probability of saving £77,000 per year per 1,000 patients. CRBSI risk with Tegaderm™ CHG Dressing was 0.6 per 1,000 catheter days, versus 1.48 per 1,000 catheter days with a standard dressing.



Thokala P, Arrowsmith M, Poku E, et al. Economic impact of Tegaderm™ CHG chlorhexidine gluconate IV securement dressing in critically ill patients. *J Infect Prev.* September 17, 2016; (5): 216-223.

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Maunoury F, (2015) PLoS[29]

Cost-effectiveness analysis of a transparent antimicrobial dressing for managing central venous and arterial catheters in intensive care units.

Health Economics

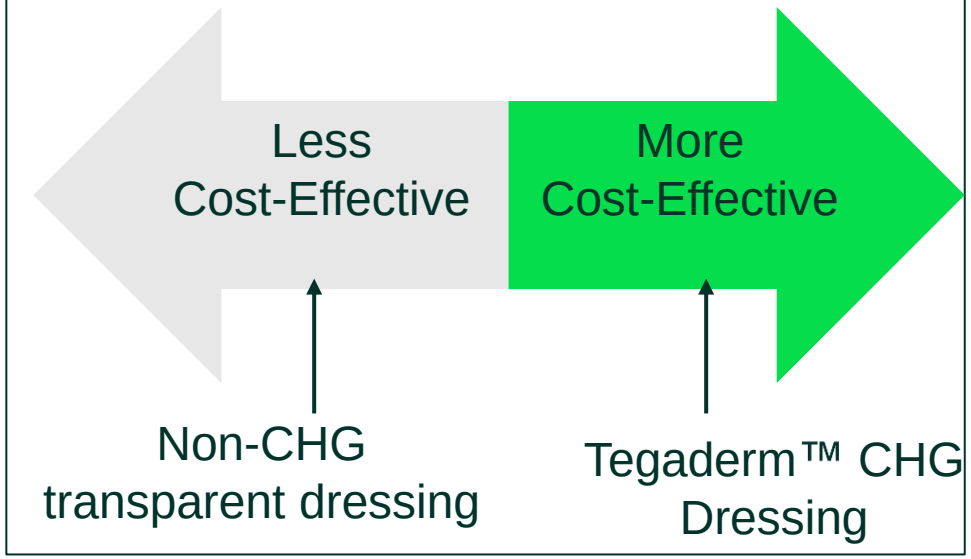
Chlorhexidine Dressing Results

DESIGN: A novel health economic model (30-day time non-homogenous Markov model).

METHODS: Study used to estimate cost-effectiveness of using Tegaderm™ CHG Dressing compared to non-chlorhexidine dressings in a multi-center French ICU scenario (12) based on the number of catheter-related bloodstream infections (CRBSI) avoided.

RESULTS: Tegaderm™ CHG Dressing was associated with 11.8 fewer infections per 1,000 patients. The incremental cost-effectiveness ratio is €12,046 per CRBSI reduction.

Using a Tegaderm™ CHG Dressing is more cost effective than using a non-CHG transparent dressing



Maunoury F, Motrunich A, Palka-Santini M, Bernatchez SF, Ruckly S, Timsit JF. Cost-effectiveness analysis of a transparent antimicrobial dressing for managing central venous and arterial catheters in intensive care units. PLoS One. 2015;10(6):e0130439.

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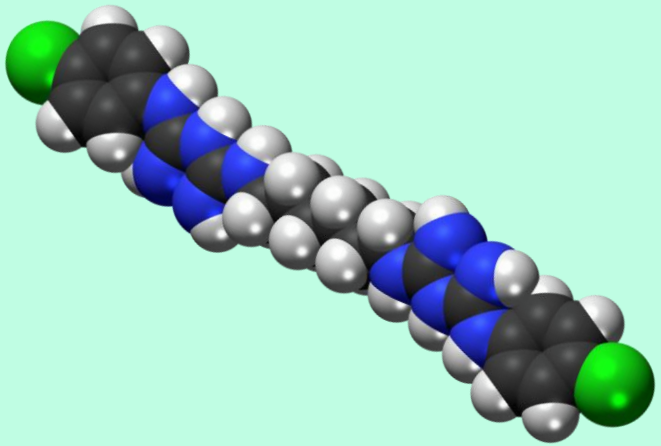
Science of Chlorhexidine



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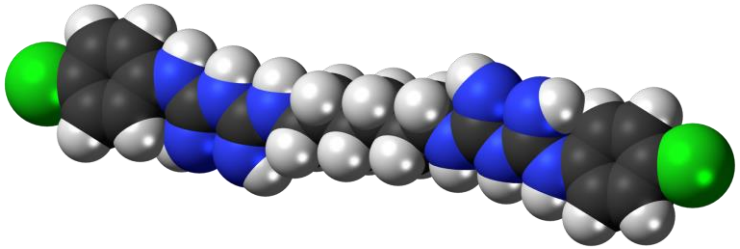
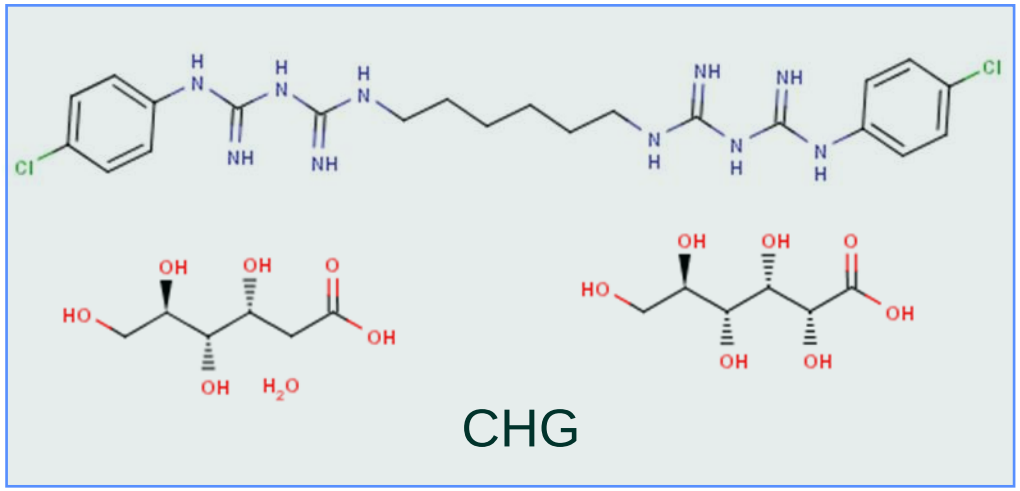
Chlorhexidine



By itself, it is water insoluble



With the addition of gluconic acid,

we get chlorhexidine gluconate (CHG)

CHG is the most water soluble chlorhexidine salt,

making it the most commonly used form in healthcare applications

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CHG – How it works

Mitchell GJ, Wiesenfeld K, Nelson DC, Weitz JS, “Critical cell wall hole size for lysis in Gram-positive bacteria,” J R Soc Interface 20120892 (2013): http://dx.doi.org/10.1098/rsif.2012.0892.

- Its high solubility makes CHG available quickly
- CHG does not readily bind to interfering substances in blood and sweat
- This allows CHG to rapidly attack microbes

How does CHG select microbes over host cells?

- CHG is a positively charged antimicrobial
- It is attracted to microbial cells that contain a negatively charged cell wall
- Human cells do not have a cell wall and human cell membranes are mostly neutral
- CHG works by breaking open the cell wall of microbes which allows for their cellular contents to leak out and the cell to die

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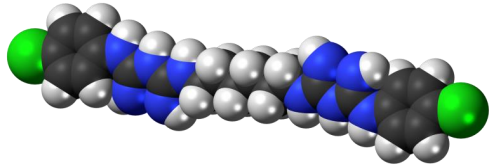
CHG – Is persistent



- Positively charged CHG prefers the negatively charged microbes
- However, unused CHG molecules will bind to skin and remain there for several days
- These CHG molecules will release from the skin and preferentially bind to the more negatively charged microbe.
- Additionally, tissue associated CHG can create a bacteriostatic and fungistatic effect, meaning any surviving microbes will be unable to reproduce keeping microbial numbers low and in check

- CHG has been used in healthcare applications since the 1950’s
- It’s mechanism of action of destabilizing microbial cell walls and membranes means antibiotic resistance mechanisms have no effect against CHG
- This coupled with its broad-spectrum activity against gram positive and gram negative bacteria as well as pathogenic yeasts make CHG a powerful ally in preventing infections

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Antimicrobial Effectiveness

Broad Spectrum Antimicrobial Effectiveness

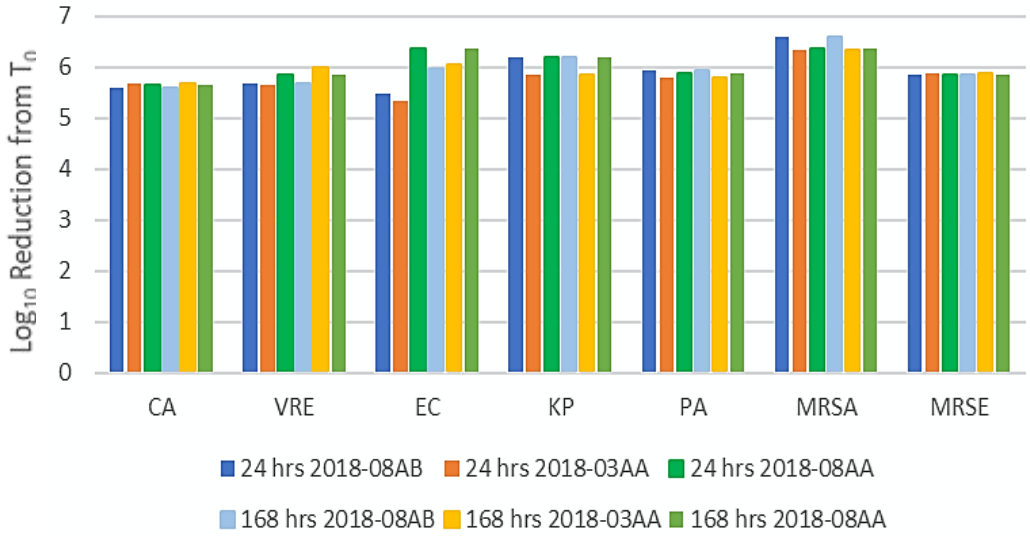
in vitro studies show 7-day antimicrobial efficacy* against Gram-positive, Gram-negative bacteria, yeast and mold (>4 log reduction)

No clinical correlations are intended with *in vitro* testing.

* Samples was preconditioned with 2X gel pad weight of simulated wound fluid for 7 days prior to inoculation

2020 data

in vitro time kill study



Challenge microorganisms:

- *CA: Candida albicans*
- *VRE: Enterococcus faecium (VRE)*
- *EC: Escherichia coli (CRE)*
- *KP: Klebsiella pneumoniae (CRE)*
- *PA: Pseudomonas aeruginosa*
- *MRSA: Staphylococcus aureus (MRSA/MDR)*
- *MRSE: Staphylococcus epidermidis (MRSE)*

EM-05-666609, EM-05-666611

Karpanen, T et al. (2011). Antimicrobial activity of a chlorhexidine intravascular catheter site gel dressing. *J. Antimicrobial. Chemotherapy*.66:1777–1784

Kärpänen (2016) Am J Infect Control[19]

Clinical evaluation of a chlorhexidine intravascular catheter gel dressing on short-term central venous catheters

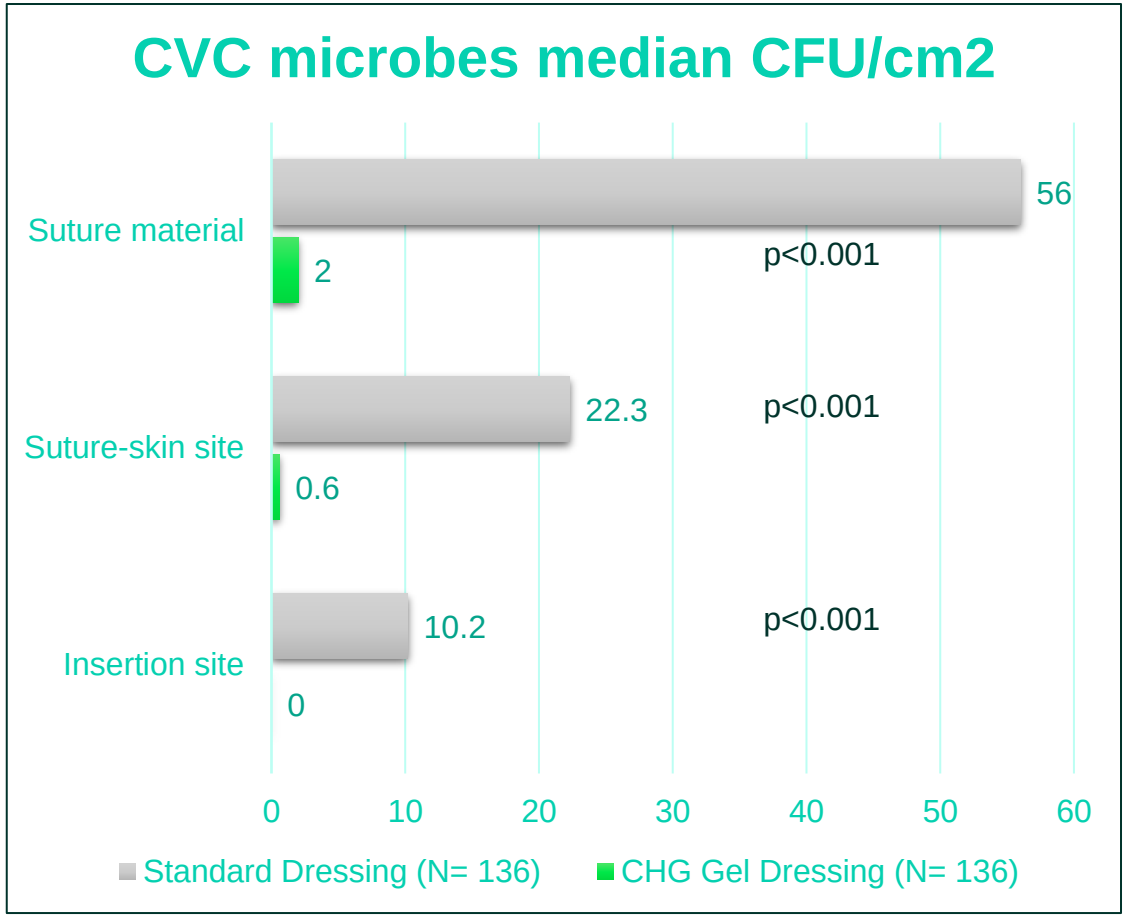
Antimicrobial Protection

CHG Gel Securement Dressing Results

DESIGN: Prospective, cross-over, comparative, non-blinded, single center clinical study.

METHODS: Study assessed the antimicrobial efficacy of Tegaderm™ CHG Dressing in patients with an antimicrobial central venous catheter (CVC). Comparator was a standard dressing with an antimicrobial CVC. All patients except two had an antimicrobial CVC inserted. CVCs were secured with braided silk sutures.*

RESULTS: Tegaderm™ CHG Dressing significantly reduced the number of microorganisms at all sites compared to standard dressing (p<0.001).



Karpanen TJ, Casey AL, Whitehouse T, Nightingale P, Das I, Elliott TSJ. Clinical evaluation of a chlorhexidine intravascular catheter gel dressing on short-term central venous catheters. *Am J Infect Control.* 2016: 44(1): 54-60.

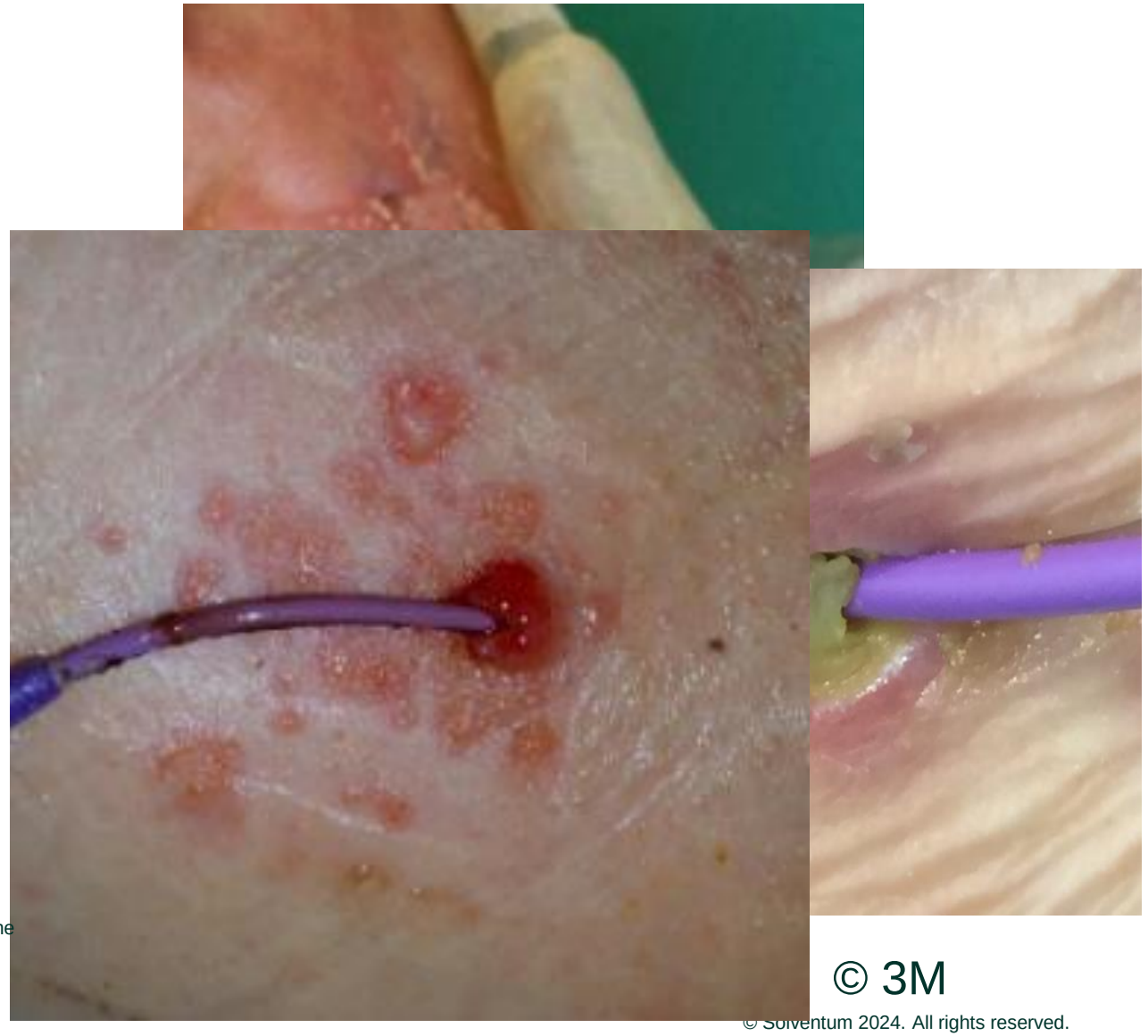
Incidence and Impact of Skin Reactions and CHG

Study	Date	Reaction Rate
Safdar Meta-analy		
Timsit (*AJRC*		CHG
Biehl (*Annals*		CHG
Righetti (*J Va*		e no essing
Rothlisberger		
Scheithauer (		ays)
Eggimann (*In*		and version es/1000 on
Hou (Inquiry)		to be similar (p=0.7854) between the CHG sponge cohort (0.18%) and the CHG gel cohort (0.20%).

AEs related to CHG dressings are ~1% according global reporting rates and studies. In most cases these AEs are preventable when following the IFU and monitoring dressings for wetness.

CHG Dressings and skin reactions

- Maceration
- Irritant Contact/Chemical Dermatitis
- Skin Tear
- Skin Stripping
- Phlebitis: Chemical, mechanical or bacterial
- Allergy
- Infiltration and Extravasation
- CASI (include pressure injuries)



Weitz N, Lauren C, Weiser J, et al., Chlorhexidine Gluconate-Impreganted Central Access Catheter Dressings as a Cause of Erosive Contact Dermatitis, A Report of 7 Cases. *JAMA Dermatol*. 2013. Vol. 149.2.

Jennifer B. Wall PA-C, Sherrie J. Divito MD, PhD, Simon G. TalbotMD, Chlorhexidine gluconate-impregnated central line dressings and necrosis in complicated skin disorder patients. *Journal of Critical Care.* 2014. doi: 10.1016/j.jcrc.2014.06.001

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Standards, guidelines and bundles of care

The use of bundles

Evidence-based recommendations and performance improvement initiatives or strategies are bundled together to improve compliance[26]

Central line insertion bundles[26-29]
✓ Hand hygiene
✓ Skin antisepsis using >0.5% chlorhexidine in alcohol solution
✓ Maximal sterile barrier precautions (mask, cap, sterile gown, large sterile drape and sterile gloves)
✓ Avoid the femoral vein for CVC placement

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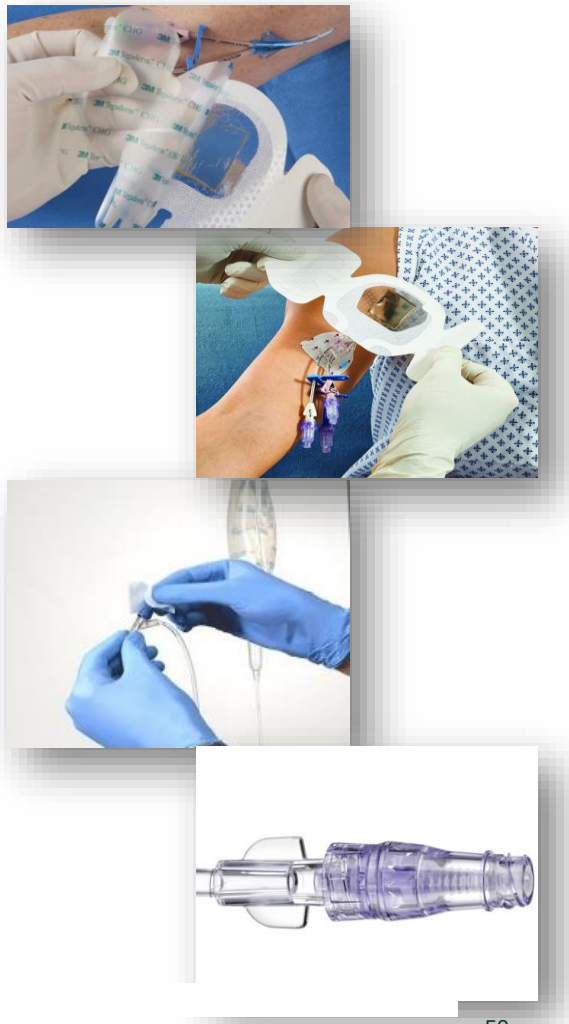
Maintenance includes many interventions

After catheter insertion, maintenance bundles have been proposed to ensure optimal catheter care[29]

	Maintenance bundles[26-29]
✓	Assess need for catheter daily
✓	Perform hand hygiene before manipulation of IV system
✓	Dressing change recommendations and guidelines based on dressing type
✓	IV tubing administration set, secondary set and add-on device change guidelines based on medication or product infused
✓	Disinfect IV access ports with appropriate disinfectant for a period of time



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Infusion Therapy Standards of Practice (ITSP) 2024: CHG-dressing practice recommendations

Product	Practice	Level of evidence
Chlorhexidine gluconate (CHG) - containing dressings	To prevent CLABSI in patients greater than 2 months of age with short-term CVADs	I
Chlorhexidine gluconate (CHG) - containing dressings	Around (port) needle sites for infusions exceeding 4-6 hours	V
Chlorhexidine gluconate (CHG) - containing dressings	Both inpatient and outpatient hemodialysis patients to reduce catheter-related infections	III
Chlorhexidine gluconate (CHG) - containing dressings	Use a transparent dressing to allow for site visualization; consider a CHG-impregnated dressing.	I
CHG bathing	Consult with manufacturer regarding proper use with CHG-impregnated dressings.	Committee consensus
Chlorhexidine gluconate (CHG) - containing dressings	Weigh the risk vs benefit using CHG-impregnated dressings with complicated skin disorders (e.g., Stevens Johnson syndrome, graft-vs-host, etc.), with highly exudative sites, infants/children and as indicated by IFU	III

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Nickel B, Gorski LA, Kleidon TM, et al. Infusion therapy standards of practice. J Infus Nurs. 2024;47(suppl1):S1-S285. doi:10.1097/NAN.0000000000000532

Best Practice Guidelines: Dressings

Strategies to Prevent Central Line-Associated Bloodstream infections in Acute Care Hospitals (2022)

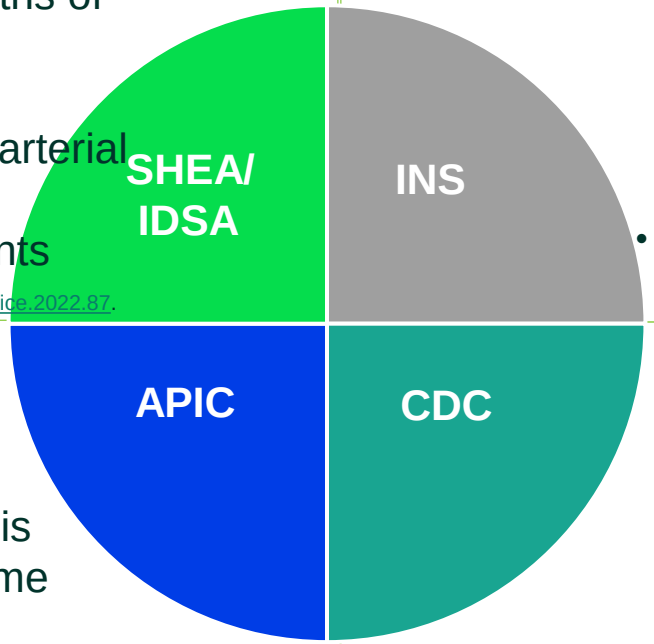
- Chlorhexidine-containing dressings are an essential practice for patients over 2 months of age (quality of evidence: HIGH).
- In addition to CVCs, short-term PIVs, PICCs, midline catheters, and peripheral arterial catheters also carry a risk of infection.
- Excluded: skin glues and hemostatic agents

Buetti, et al., (2022). Strategies to prevent central line-associated bloodstream infections in acute-care hospitals: 2022 Update. *Infect Control & Hosp Epid.* https://doi.org/10.1017/ice.2022.87.

Infusion Therapy Standards of Practice (2024)

- Use chlorhexidine gluconate (CHG)-containing dressings to prevent CLABSIs in patients greater than 2 months of age with short-term CVADs, unless contraindicated (eg, sensitivity or allergy to CHG), including patients with oncohematological disease (see Standard 39, Vascular Access Device Post-Insertion Care). 1,20,23-31 (I)
- Also includes ports, dialysis and epidurals.

Nickel B, Gorski LA, Kleidon TM, et al. Infusion therapy standards of practice. J Infus Nurs. 2024;47(suppl1):S1-S285. doi:10.1097/NAN.0000000000000532



- If applicable, chlorhexidine-impregnated sponge dressing (1B) or chlorhexidine-impregnated dressing can be used. If a chlorhexidine-sponge dressing is used, it is oriented correctly and changed as the same time as the transparent dressing.

Association for Professionals in Infection Control and Epidemiology. APIC Implementation Guide: Guide to Preventing Central Line-Associated Bloodstream Infections. 2015. https://apic.org/Resource_/TinyMceFileManager/2015/APIC_CLABSI_WEB.pdf. Accessed September 2017.

Guide to Preventing Central-Line Associated Bloodstream Infections (2015)[10]

- Chlorhexidine-impregnated dressings with an FDA cleared label that specifies a clinical indication for reducing CRBSI or CABSI are recommended to protect the insertion site of short-term, non-tunneled central venous catheters. (Category IA)

Updated Recommendations on the Use of Chlorhexidine-Impregnated Dressings for Prevention of Intravascular Catheter-Related Infections (2017) CDC website link

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*According to CDC, due to a lack evidence, the use of CHG-impregnated dressings on patients younger than 18 years of age is an unresolved issue.

2019 CDC Checklist for Prevention of Central Line-Associated Bloodstream Infections: checklist

Insertion	Maintenance	Additional Strategies
Hand hygiene	Hand hygiene	Provide daily audits for line necessity
Aseptic technique	Daily CHG bathing in ICU (> 2 months of age)	Provide staff training at regular intervals: insertion, maintenance and aseptic technique
Maximum barrier precautions (mask, cap, gown, sterile gloves, ultrasound guidance, and sterile full body drape)	Disinfect the access port or hub (CHG, povidone iodine, iodophor or alcohol 70%)	Specialized IV teams
Insertion site: avoid femoral site	Use sterile devices to access catheters	Assess knowledge of staff
Antiseptic scrub: CHG >0.5% with alcohol	Replace dressings: loose, soiled, damp or bloody	Insertion checklist (STOP if breach in aseptic technique)
Chlorhexidine-impregnated dressing with FDA clearance for reducing CRBSI or CABSI (18 years and over)	Routine dressing changes at least every 7 days using aseptic technique (CHG dressings)	Bundle for Insertion and Maintenance and measure outcomes
Sterile gauze or transparent, semi-permeable dressing also acceptable	Change continuous IV admin sets no more than every 4 days and at least every 7 days	Antimicrobial catheters Antiseptic impregnated caps

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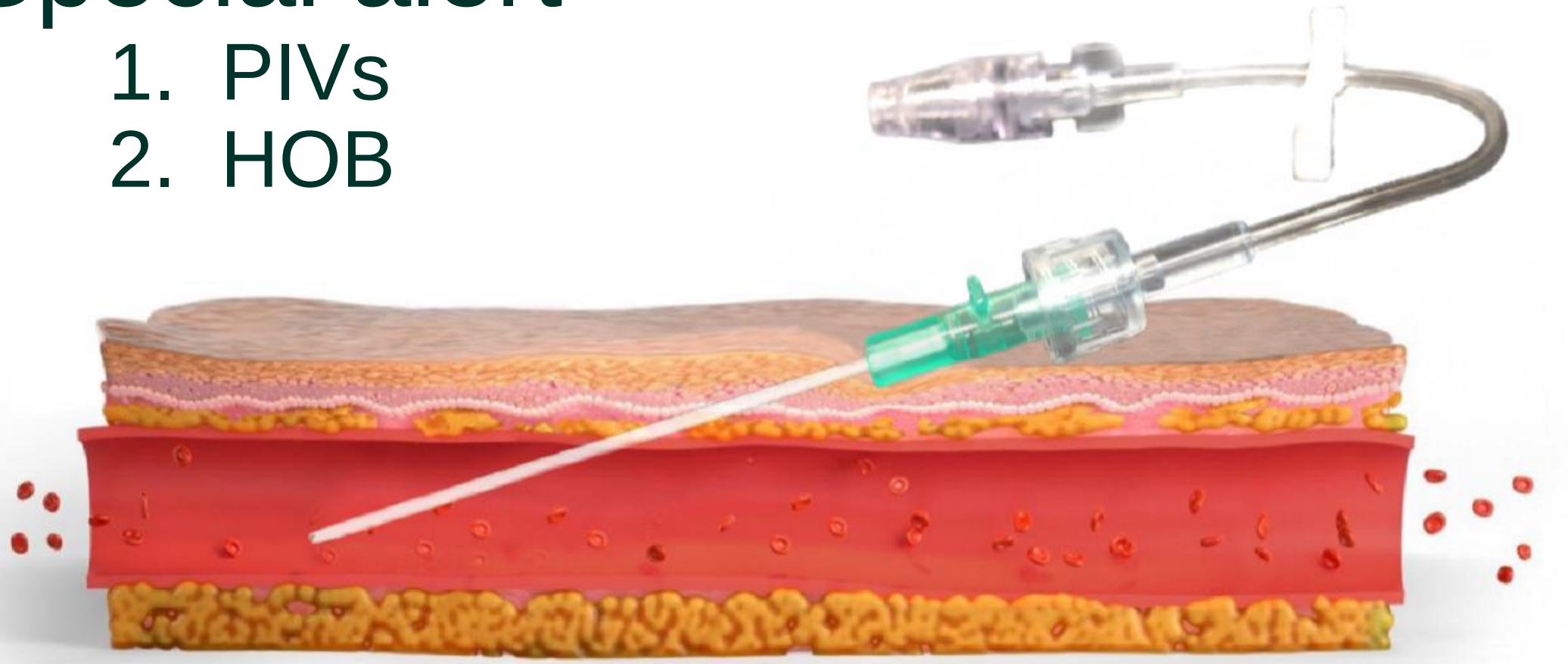
https://www.cdc.gov/hai/pdfs/bsi/checklist-for-CLABSI.pdf

Special alert

1. PIVs
2. HOB



Hospital Onset Bacteremia and Fungemia (HOB)

Definition:

A bacterial or fungal pathogen from a blood culture specimen collected on the 4th calendar day of admission or later (where the date of admission to an inpatient location is day 1)

Shrank, 2023

HOB is a much broader metric than the current central line only surveillance that most organizations perform for bloodstream infections. It recognizes that there are risks beyond just central lines and beyond just vascular access devices. DeVries, 2023

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Antimicrobial Stewardship & Healthcare Epidemiology (2023), **3**, e198, 1–4
doi:10.1017/ash.2023.486

SHEA

Concise Communication

Hospital-onset bacteremia and fungemia: examining healthcare-associated infections prevention through a wider lens

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Abstract

A hospital-onset bacteremia and fungemia (HOB) metric will expand hospital surveillance of bloodstream infections beyond current state and provide an opportunity to re-evaluate infection prevention strategies. Here we consider the added value and potential pitfalls of HOB surveillance and present a framework for the standardized assessment of HOB events.

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2024 INS Guidelines for PVC Management

Implementation of a post insertion bundle in conjunction with a culture of safety to reduce infection risk with daily care. 3M™ Tegaderm™ IV Advanced dressings provide site visibility, catheter securement and a bacterial and viral barrier.

Multidisciplinary assessment of PVC need daily.

Assessment of the entire infusion system- bag to catheter with each infusion intervention and at regularly established intervals

- Patency
- Site assessment visually and with palpation

Dressing changes using aseptic technique at least every 7 days for transparent dressings and at least every 48 hours for gauze (neonatal exception)

Use of sterile alcohol-free skin barrier such as 3M™ Cavilon™ Advanced Skin Protectant to protect at risk skin.

Use a securement method to stabilize all vascular access devices. 3M™ Tegaderm™ IV Advanced dressings meet the definition of an integrated securement device.

Protect the PVC when bathing or showering to prevent water contamination

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Gorski et. al. (2024)

AVA PIV Consensus Article: Public access. September 2024

1. Assess IV access needs
2. Educate, inform and collaborate w/ patients and caregivers
3. Clincian education and competiecny
4. Ensure safety
5. Choose the right insertion site and device
6. Pain reduction
7. Maximize first insertion success
8. Insert and secure
9. Routine use and post-insertion care
10. Ongoing need for PIV
11. PIV removal
12. Documentation
13. Remove and replace only if needed
14. PIV quality management
15. Psychological and cultural safety
16. Health equity

Highlights:

- PIVs fail at high rates, and the complications to patients are severe.
- Clinicians who insert and maintain PIVs, currently lack knowledge, skill, awareness, and competency.
- Clinically indicated replacement practices for PIVs should only be implanted when facilities have adopted optimized PIV insertion and care practices (including technology).
- Clinicians employ ANTT during PIV insertion, maintenance and removal.
- Use CHG as skin antiseptic and consider CHG dressing for PIVs.

Thompson J, Steinheiser M, Hotchkiss B, et al., Standards of Care for Peripheral Intravenous Catheters: Evidence-Based Expert Consensus. JAVA. 2024. https://doi.org/10.2309/JAVA-D-24-00011

NICE MIB 231 (2020)[17]

- The intended place in therapy would be to secure vascular access devices for haemodialysis in people with tunnelled central venous catheters, **intravenous (IV) chemotherapy in people with cancer,** people who need total parenteral nutrition and children's intensive care.

- NICE has published guidance on using Tegaderm CHG IV securement dressings in critically ill adults who need a central venous or arterial catheter in intensive care or high dependency units.

NICE National Institute for Health and Care Excellence

NICE advice

Tegaderm CHG securement dressing for vascular access sites

Medtech innovation briefing
Published: 27 October 2020
www.nice.org.uk/guidance/mib231

Summary

- The **technology** described in this briefing is Tegaderm CHG IV securement dressing. It is used to secure vascular access devices and contains an integrated chlorhexidine gluconate (CHG) gel pad. This pad is designed to reduce catheter-related bloodstream infections.
- The **innovative aspects** are that it is the only securement dressing available containing CHG. The dressing is transparent so that the access site can be continually monitored.
- The intended **place in therapy** would be to secure vascular access devices for haemodialysis in people with tunnelled central venous catheters, intravenous (IV) chemotherapy in people with cancer, people who need total parenteral nutrition and children's intensive care. NICE has published guidance on using Tegaderm CHG IV securement dressings in critically ill adults who need a central venous or arterial catheter in intensive care or high dependency units.
- The **main points from the evidence** summarised in this briefing are from 6 studies, including 3 randomised controlled trials, with a total of 1,273 people, including children needing vascular access in intensive care and adults needing vascular access for chemotherapy, dialysis, or total parental nutrition. They show that Tegaderm CHG is more effective at reducing catheter-related infections than standard sterilised dressings in people needing dialysis or chemotherapy.

17. www.nice.org.uk/guidance/mib231

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SEOM-SEEO (2020)

Safety recommendations guideline for cancer patients receiving intravenous therapy, 2020

ECO-SEOM-SEEO recommendations for safe use of venous accesses in cancer patients
Maintenance and management of potential complications

- For short-term peripheral catheters, chlorhexidine dressings are recommended to reduce infection rates

Magallón-Pedrera I, Pérez-Altozano J, Virizuela Echaburu JA, Beato-Zambrano C, Borrega-García P, de la Torre-Montero JC. ECO-SEOM-SEEO safety recommendations guideline for cancer patients receiving intravenous therapy. Clin Transl Oncol. 2020;22(11):2049-2060.

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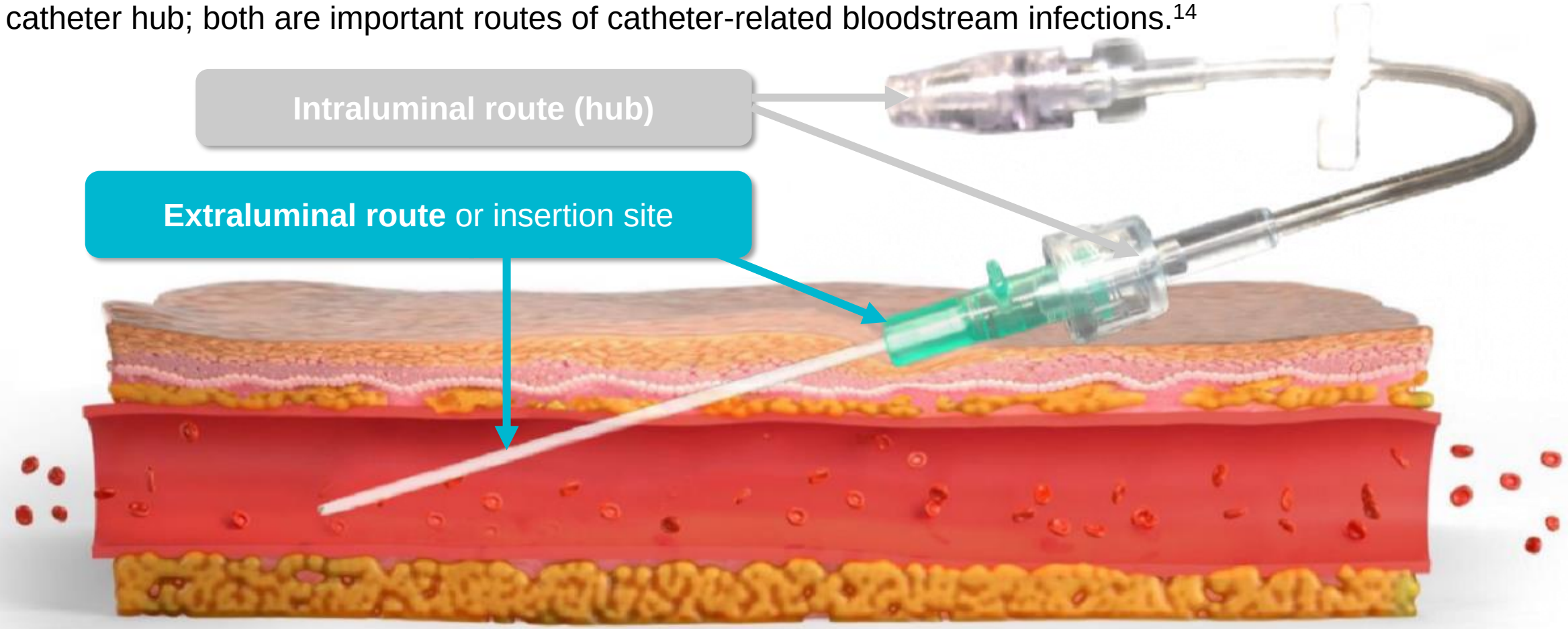
The majority of PVCR-BSIs emanate from either the insertion site or the hub (Mermel 2017[4])

Organisms on the skin gain access to the bloodstream via migration along the external surface of the catheter or catheter hub; both are important routes of catheter-related bloodstream infections.[14]



Accepted but unacceptable: Peripheral IV catheter failure

Helm RE, Klausner JD, Klemperer JD, Flint LM, Huang E. Accepted but unacceptable: Peripheral IV catheter failure. *J Infus Nurs.* 2015;38(3):189-203. doi:10.1097/NAN.0000000000000100

TOPICS

- PIVC failure modes
- PIVC infection rates

DESIGN

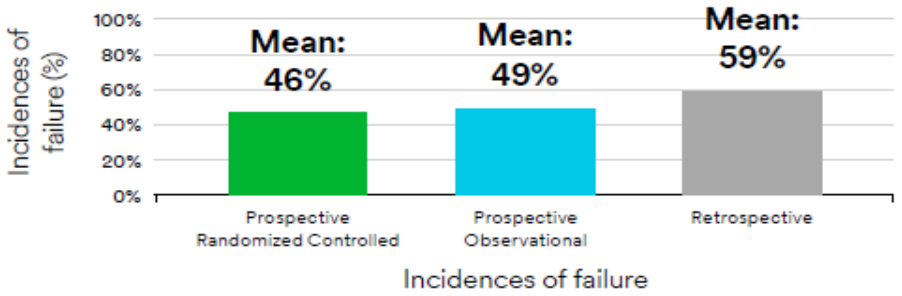
Literature review of 162 papers from 1990 – 2014.

METHOD

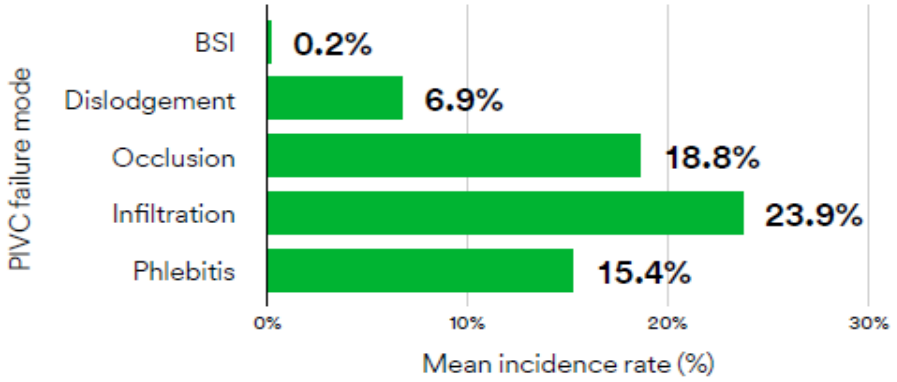
Studies were prospective randomized control trials (RCTs) and prospective observational studies with endpoints encompassing PIVC failure modes.

RESULTS

Peripheral IV Catheter Failure Rate, Assorted Studies, 1990 – 2014



The Five Modes of Peripheral IV Catheter Failure (prospective RCTs 1990 – 2014)



Incidence rate is a measure of the probability of occurrence of a given event within a population for a specified period of time.

Well-trained professionals see high PIVC failure rates of

36% to 63%

(mean failure rate of 46%).

These rates are "unacceptable to patients, caregivers, and the health care system."

"Meaningful change

will require that the concept of the peripheral IV catheter as an expendable and replaceable tool be discarded."

A 2019 paper acknowledged that **PIVC failure had been much less accepted since 2015,** but had yet not seen significant improvement.[5]

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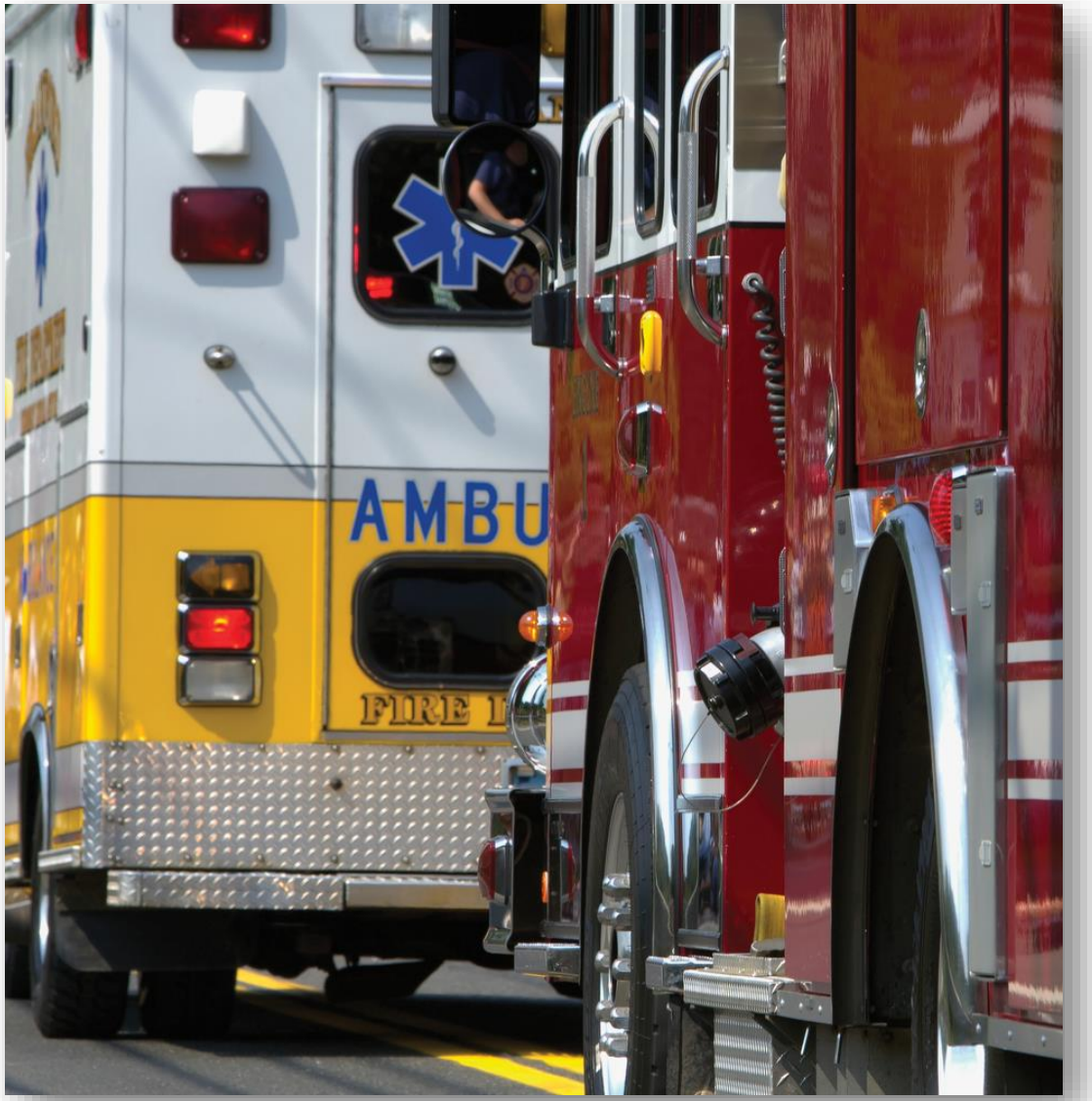
Emergently placed PIVCs

- Stuart 2016 - 137 S. aureus PVCR-BSIs[37]
- 61% inserted by the ambulance service or ED
- 45% involved PVCs in situ beyond 4 days

- Trihn 2011 – Emergency Department PIVCs[36]
- 67% increased risk PVCR S. aureus bacteremia
-

- INS 2024 - Consider labeling catheters inserted under suboptimal aseptic conditions in any health care setting (eg, “emergent”). Remove and insert a new catheter as soon as possible, preferably within 24 to 48 hours.[16]



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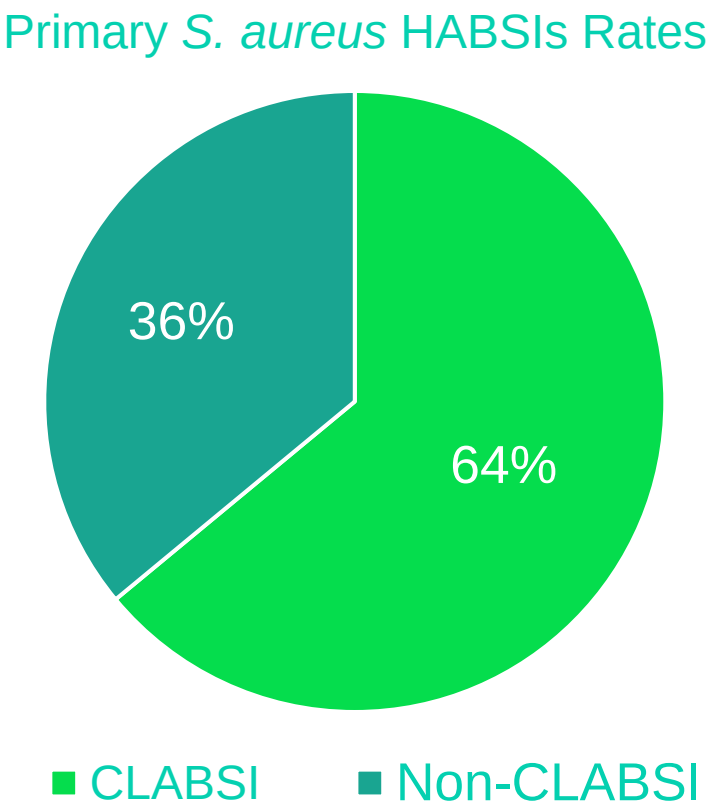
Kovacs (2016) Am J Infect Ctrl

- **Hospital-acquired Staphylococcus aureus primary bloodstream infection: A comparison of events that do or do not meet the central line-associated bloodstream definition.**

PIV Complications Study Results[63]

- DESIGN
  - Retrospective study measuring incidence and impact of primary hospital acquired bloodstream infection (HABSI) secondary to S. aureus (SA)
- INTERVENTION
  - 48 month study period
  - Identified SA HABSI which did or did not meet HNHSN definitions of CLABSI and non-CLABSI (PIV or mid-line)
- RESULTS
  - 122 total SA HABSIs: 78 (64%) = CLABSI, 44 (36%) non-CLABSI (PIV or midline-related infections)
  - SA HABSI Complications much higher in non-CLABSI (15.9% vs 0%, P≤0.001).



Kovacs C, Fatica C, Butler R, et al. Hospital-acquired Staphylococcus aureus primary bloodstream infection: A comparison of events that do or do not meet the central line-associated bloodstream definition. *Amer J Infect Ctrl*. 2016: 44(1252-5).

Comparison of routine replacement with clinically indicated replacement of peripheral intravenous catheters

Buetti N, Abbas M, Pittet D, et al. Comparison of routine replacement with clinically indicated replacement of peripheral intravenous catheters. *JAMA Intern Med.* 2021;181(11):1471-1478. doi:10.1001/jamainternmed.2021.5345

TOPICS

- Clinically indicated PIVCs
- Routine replacement PIVCs
- PIVC-BSI

DESIGN

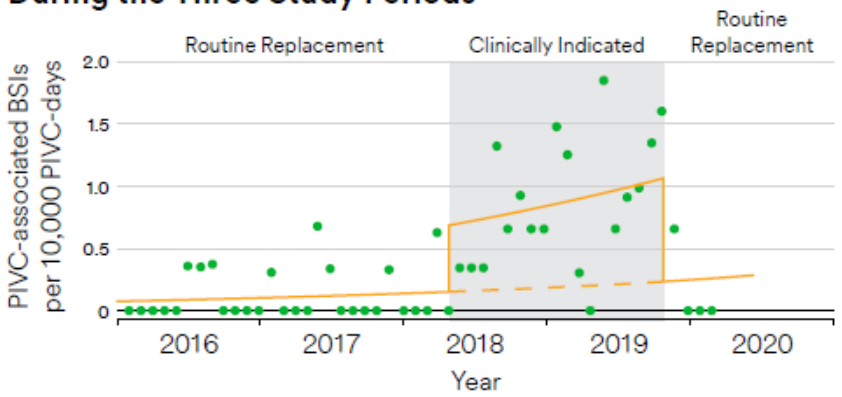
Single center, 10-site, observational cohort study (2008 beds)

METHOD

- Routine Replacement (every 96 hours): Jan. 1, 2016 – Mar. 31, 2018
- Clinically Indicated Replacement: Apr. 1, 2018 – Oct. 15, 2018
- Return to Routine Replacement: Oct. 16, 2018 – Oct. 16, 2019
- Overall n=412,631 PIVCs, 164,331 total patients
- n=241,432 baseline PIVCs (11 PIVC-BSI)
- n=130,779 intervention PIVCs (46 PIVC-BSIN=40,420 reversion PIVCs)
- Average PIVC dwell time increased during intervention period

RESULTS

Monthly Incidence of Peripheral Venous Catheter (PIVC)-Associated Bloodstream Infections (BSIs) During the Three Study Periods



PIVC Dwell Time	Baseline	Intervention	Reversion
> 4 days	26,372 (10.9%)	26,656 (20.4%)	5170 (12.8%)
> 7 days	5745 (2.4%)	10,656 (8.1%)	947 (2.3%)

Insertion site	Baseline	Intervention	Reversion	p-value
Forearm	130,877 (54.2)	50,584 (38. 7}	15,276 (37.8)	<.001
Arm	6930 (2.9)	2105 (1.6)	675 (1. 7)	
Elbow	12,247 (5.1)	21,508 (16.4)	7530 (18.6)	
Hand	69,615 (28.8)	30,930 (23.7)	9141 (22.6)	
Other	6018 (2.5)	2636 (2.0)	771 (1.9)	
Wrist	15,745 (6.5)	23,016 (17.6)	7027 (17.4)	
Operator				
Out-of-hospital	18,909 (7.8)	10,573 (8.1)	2786 (6.9)	<.001
In-hospital	222,523 (92.2)	120,206 (91.9)	37,634 (93.1)	
PIVC-BSI	11 (<0.1)	46 (<0.1)	4 (<0.1)	<.001

Clinically indicated replacement:
0.9 BSI per 10,000 cd

Routine replacement:
0.13 per 10,000 cd

Routine group:
15 microbes identified (60% coag-negative *Staph*)

Intervention group:
46 microbes identified (21.7% *S. aureus*)

Clinically indicated replacement associated with higher rates of PIVC-BSI when compared to routine (IRR, 7.20; 95% CI, 3.65-14.22; p < .001)

PIVC-BSI: Defined per European Centre for Disease Prevention and Control

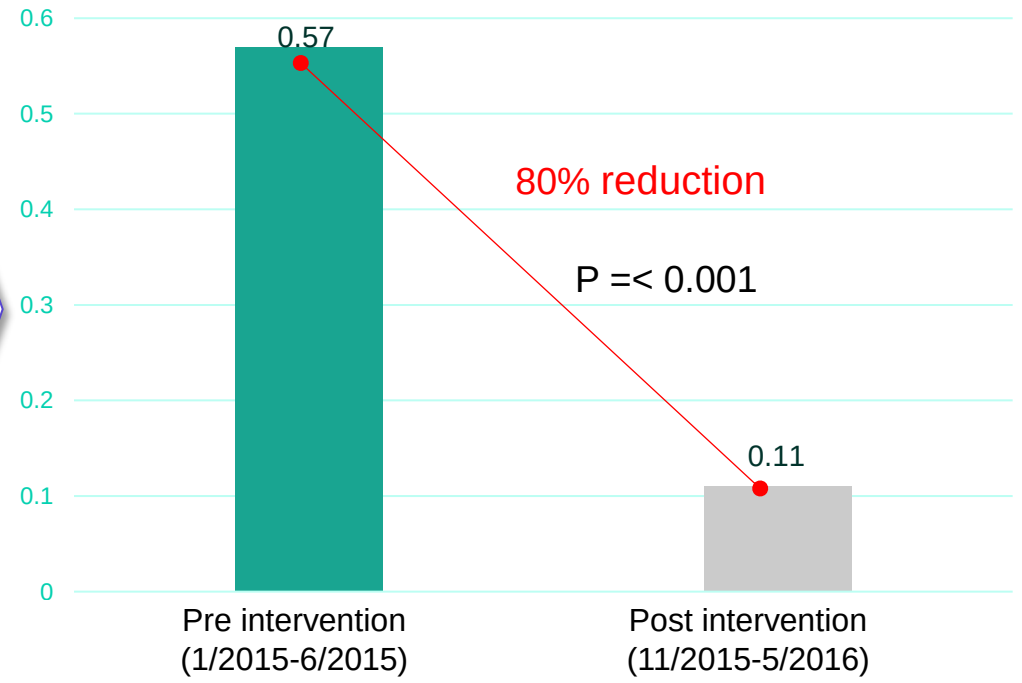
Duncan (2018) J Assoc Vasc Access[59]

A Bundled Approach to Decrease Primary Bloodstream Infections Related to Peripheral Intravenous Catheters

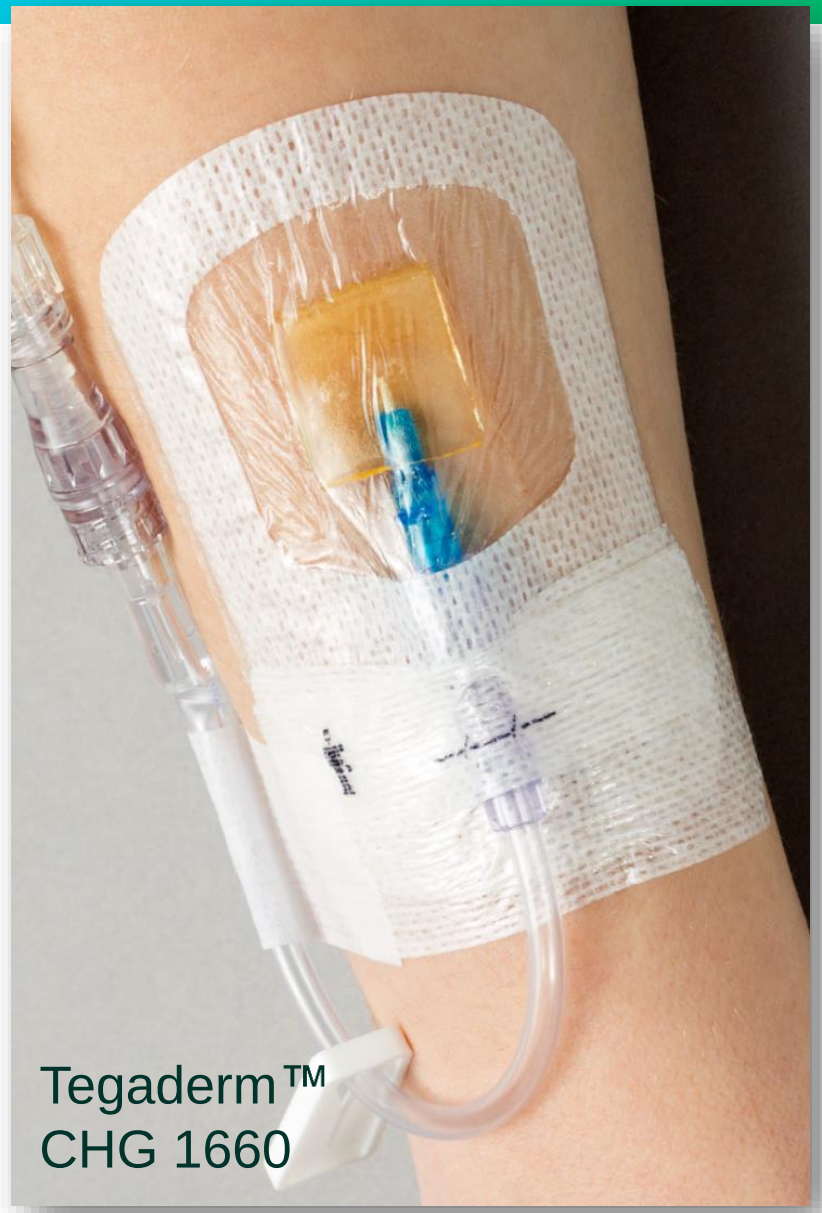
Disinfecting Cap Study Results[58]

- DESIGN
  - Before and after intervention study on peripheral line associated bloodstream infections (PLABSIs)
- INTERVENTION
  - PIV bundle implemented and compliance monitored
  - Bundle included: disinfecting cap for needleless connectors, disinfecting cap for male luers, change all IV tubing every 96 hours and prohibit disconnecting IV tubing for convenience
- RESULTS
  - PLABSI rate was reduced from 0.57 to 0.11 infections per 1000 patient days (p =< 0.001)
  - Compliance near 90% was attained

PLABSI infections per 1000 patient days[58]



Duncan M, Warden P, Bernatchez S, Morse D. A bundled approach to decrease primary bloodstream infections related to peripheral intravenous catheters. *J Assoc Vasc Access.* 2018; 23(1): 15-22.



Impact of clinically indicated PIV replacement on infection rate, nurse satisfaction and costs in the CCU, Step-down and Oncology units

According to an American Journal of Infection Control retrospective study on before and after implementation:[22]

- Phlebitis rate was 3%
  (<5% is acceptable according to INS)
- No PIV-Related BSI
- Clinician Satisfaction: 94.2%
  (17 month sustained feedback)
- Cost Savings: $17,000/year in PIV supplies.
- Average dwell time of PIVs was 7 days

Olivier R, Wickman M, Skinner C, et al., The impact of replacing peripheral intravenous catheters when clinically indicated on infection rate, nurse satisfaction and costs in CCU, Step-Down and Oncology units. *Am J Infect Control*. 2021 Mar;49(3):327-332. doi:10.1016/j.ajic.2020.07.036

9132 CHG dressing
PIV study
3 sites
Preliminary data

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (https://doi.org/10.1136/bmjopen-2024-084313).

Received 16 January 2024
Accepted 28 June 2024

Open access Protocol

BMJ Open

Protect peripheral intravenous catheters: a study protocol for a randomised controlled trial of a novel antimicrobial dressing for peripheral intravenous catheters (ProP trial)

Claire M Rickard,[1,2,3,4,5] Bertrand Drugeon ,[6,7] Amanda Ullman,[1,2,5,8] Nicole M Marsh,[1,2,3] Amanda Corley,[1,2,3] Daner Ball,[1,2,4] Catherine O'Brien,[2,3] Tricia M Kleidon ,[1,2,8] Jérémy Guenezan,[6,7] Raphael Couvreur,[6] Kate L McCarthy,[9] Sabrina Seguin,[6] Guillaume Batiot,[6] Joshua Byrnes,[2,10] Jessica Schults,[1,2,4] Syeda Farah Zahir,[11] Olivier Mimoz [6,7]

Rickard CM, et al. BMJ Open 2024;14:e084313. doi:10.1136/bmjopen-2024-084313

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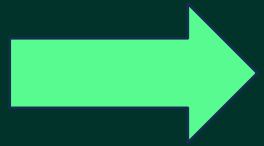
Advent Health - CLABSI Preventive Initiative for COVID Positive ICU Patients



CPI2

Recommendations:

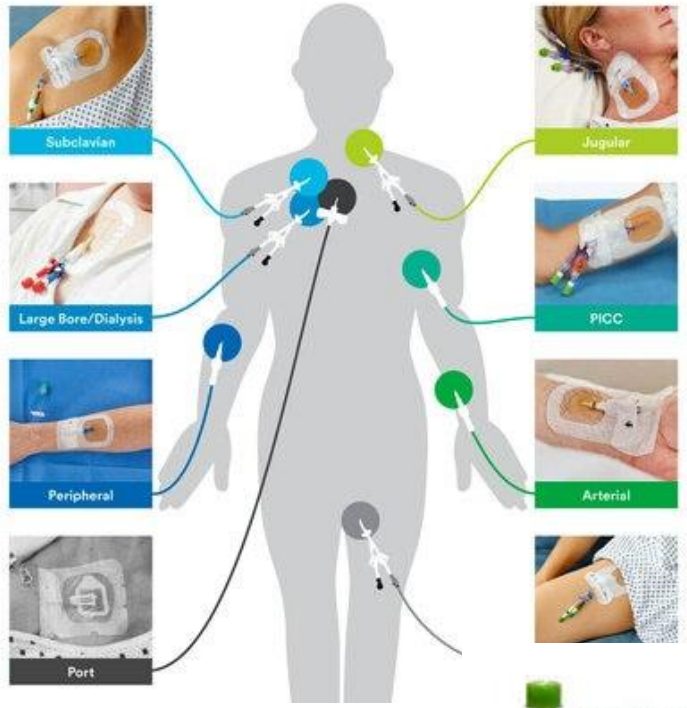
- ANM suggested use of a blood culture initial specimen diversion device (ISDD).
- Nursing recommended use of CHG dressings at all points of access
- Infection prevention recommended use of alcohol impregnated caps for all ports of access

Caicedo L, Vasquez S, Simmonds A. CLABSI Reduction in the ICU: Is it time to update your bundle. Association for Vascular Access National Conference 2023.

CPI2 Bundle

In efforts to improve our CLABSI rates within our COVID + ICU patient population, the following measures will be followed for all COVID (+) patients admitted to the ICU.

- Strict utilization of PPE and hand hygiene compliance
- Daily review of line necessity and duration of use during MDR.
- Daily proper CHG bathing.
- Wipe down of all equipment, side rails, IV pumps, lift equipment, keyboards, and door handles with purple top.
- IV tubing labeling with strict compliance
- CHG dressing on **ALL access sites** (PIV, a-line, CVC, PICC, HD, etc.) PIV and a-lines must use the CHG dressing (1660). All dressings must remain intact and dated.
- Utilization of Curos caps, tips, and stoppers on all access points.



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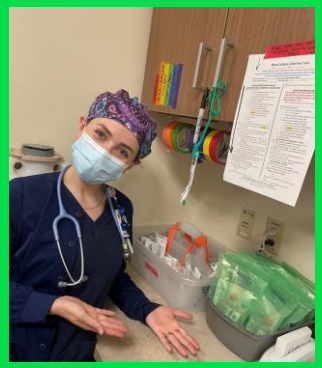
CLABSI Prevention Celebration Bundle

CHG coverage for all points of access

#1660 PIV Dressing 3M “Chiclet Dressing”

Alcohol-impregnated caps for all access ports



Blood culture kits, use of selfies, and daily rounding on all central lines

Initial specimen diversion device

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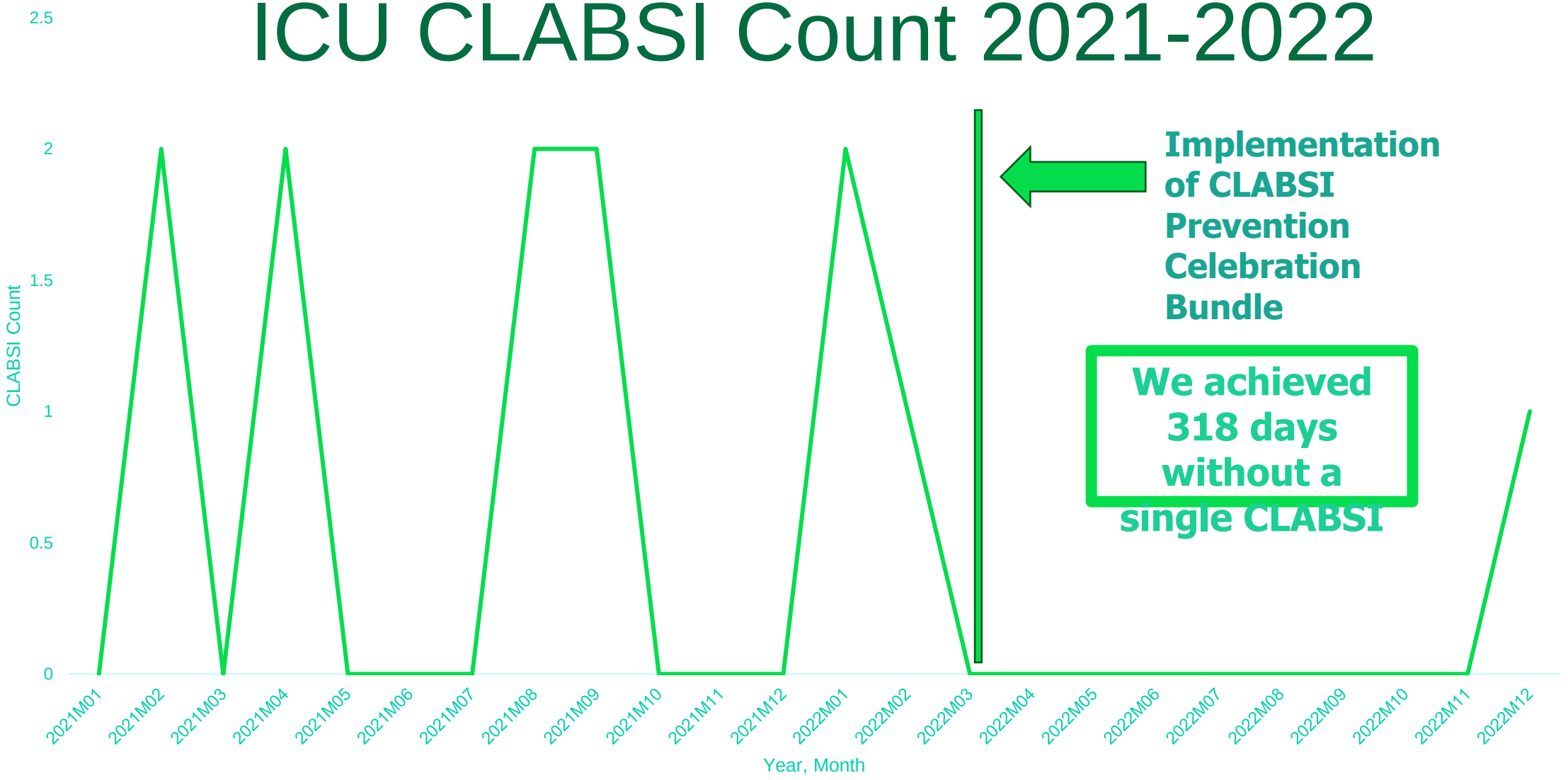
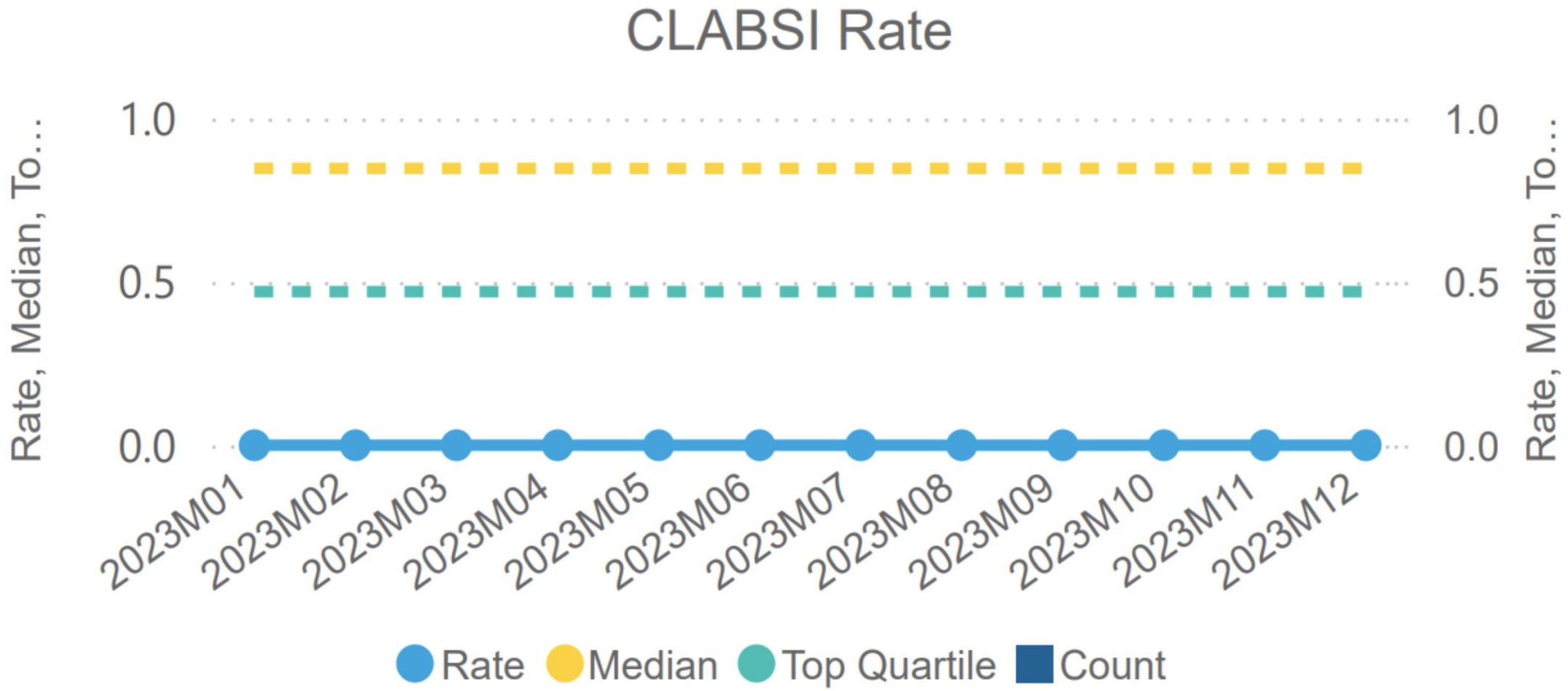
Caicedo L, Vasquez S, Simmonds A. CLABSI Reduction in the ICU: Is it time to update your bundle. Association for Vascular Access National Conference 2023.

ICU CLABSI Count 2021-2022



Caicedo L, Vasquez S, Simmonds A. CLABSI Reduction in the ICU: Is it time to update your bundle. Association for Vascular Access National Conference 2023.

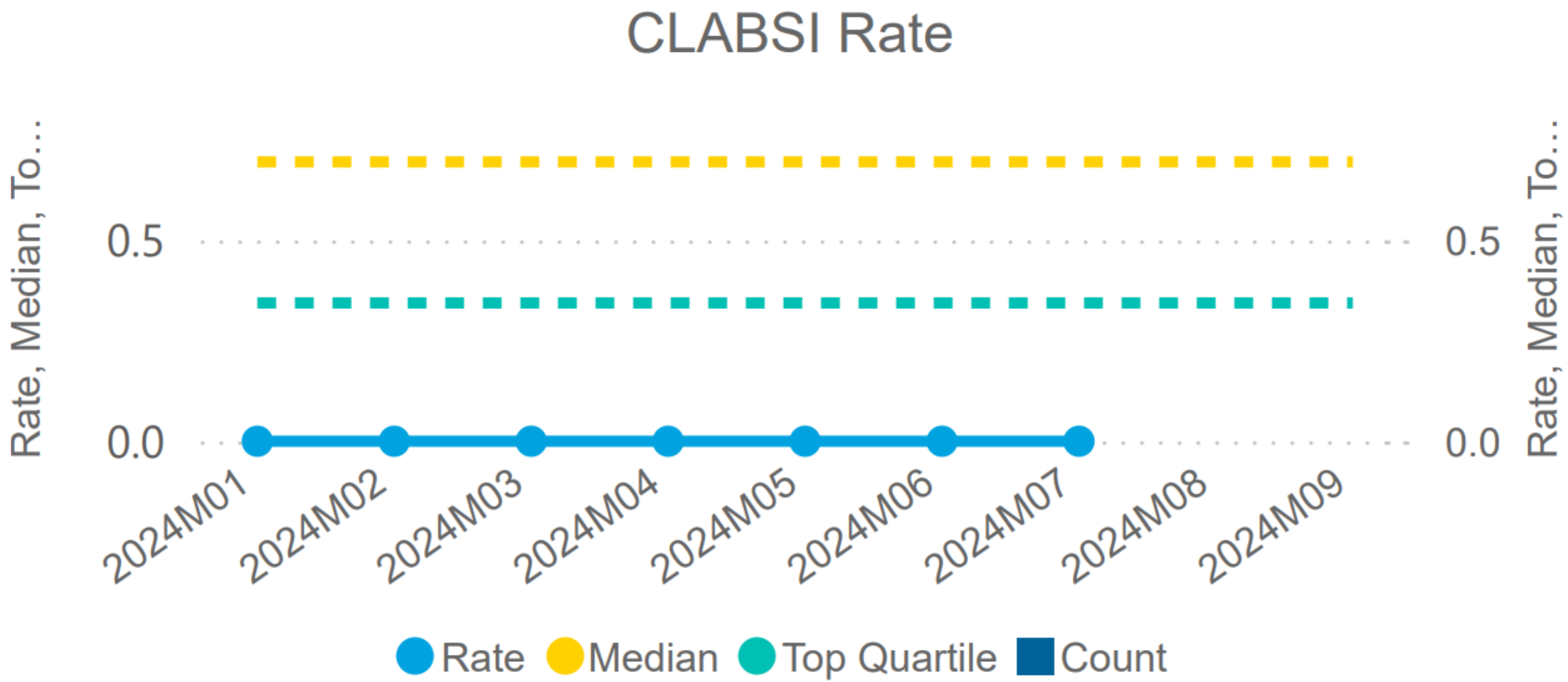
2023 CLABSI NSICU and CVICU



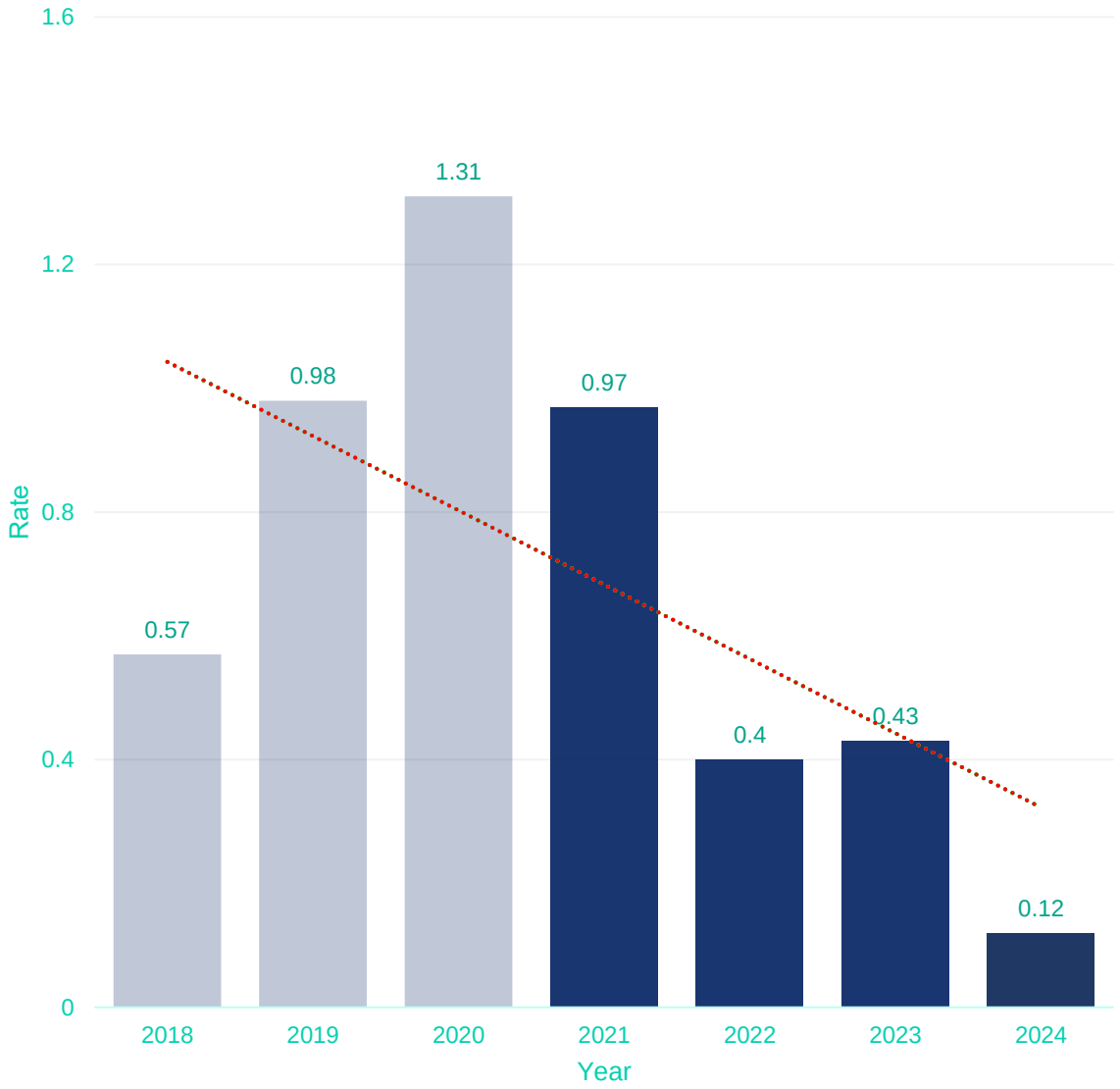
Caicedo L, Vasquez S, Simmonds A. CLABSI Reduction in the ICU: Is it time to update your bundle. Association for Vascular Access National Conference 2023.

73

2024 CLABSI NSICU and CVICU



Campus Wide CLABSI Rates



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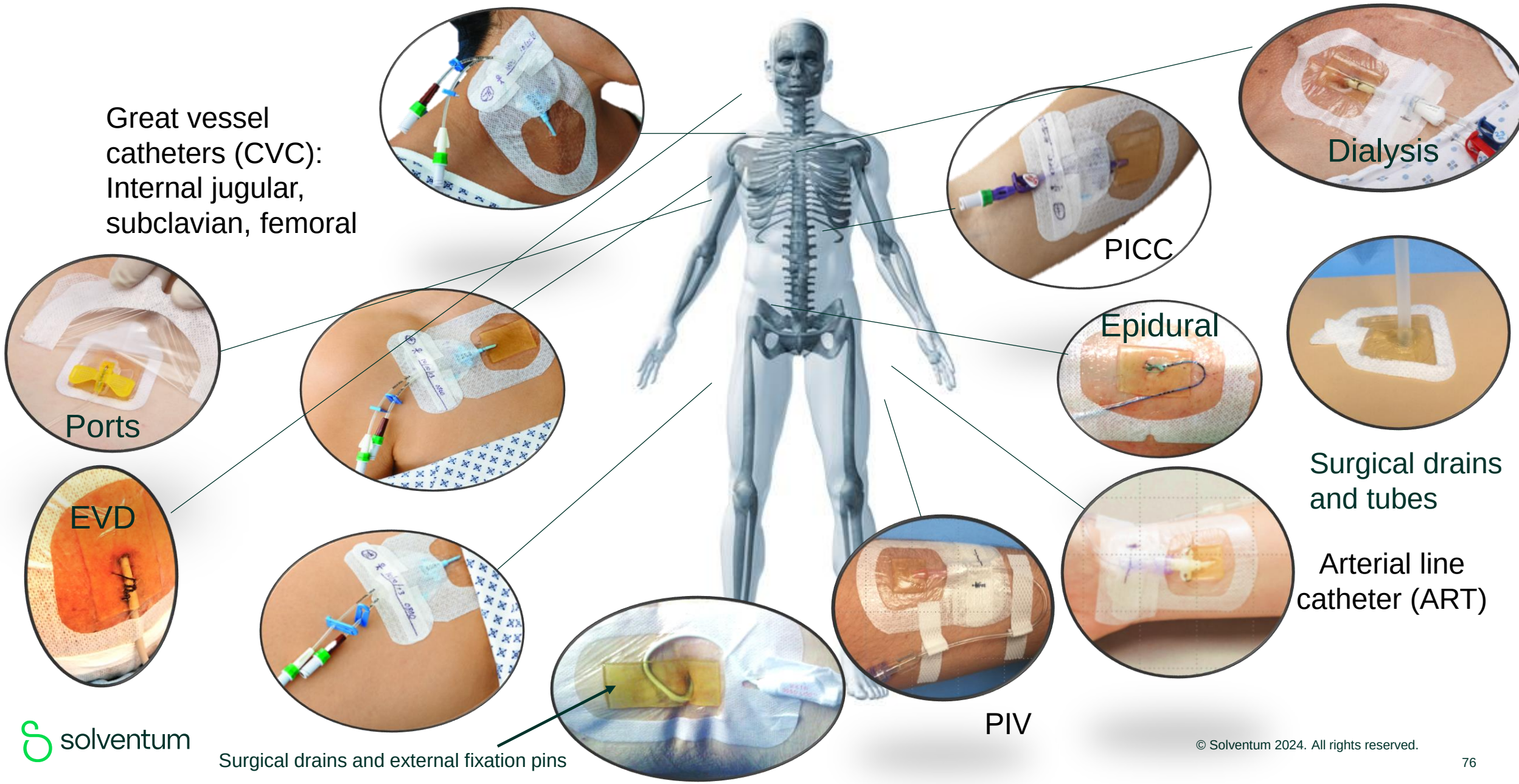
All intravascular and percutaneous devices = Infection risk



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Bonus Section: Surgical drains and bone pins

Complications for External Fixation (Bone Pins)

Standard of Care:

- Ointments
- Gauze and tape
- Swab w/ CHG or H^2O^2
- Antimicrobials

Length of Fixation:

- 2-10 Weeks

Infection Rates:

- 1-2% with closed fractures
- 30-40% with open fractures

Lobst CA. Liu RW. A systematic review of incidence of pin track infections associated with external fixation. *J Limb Lengthen Reconstr.* 2016: 2:6-16.

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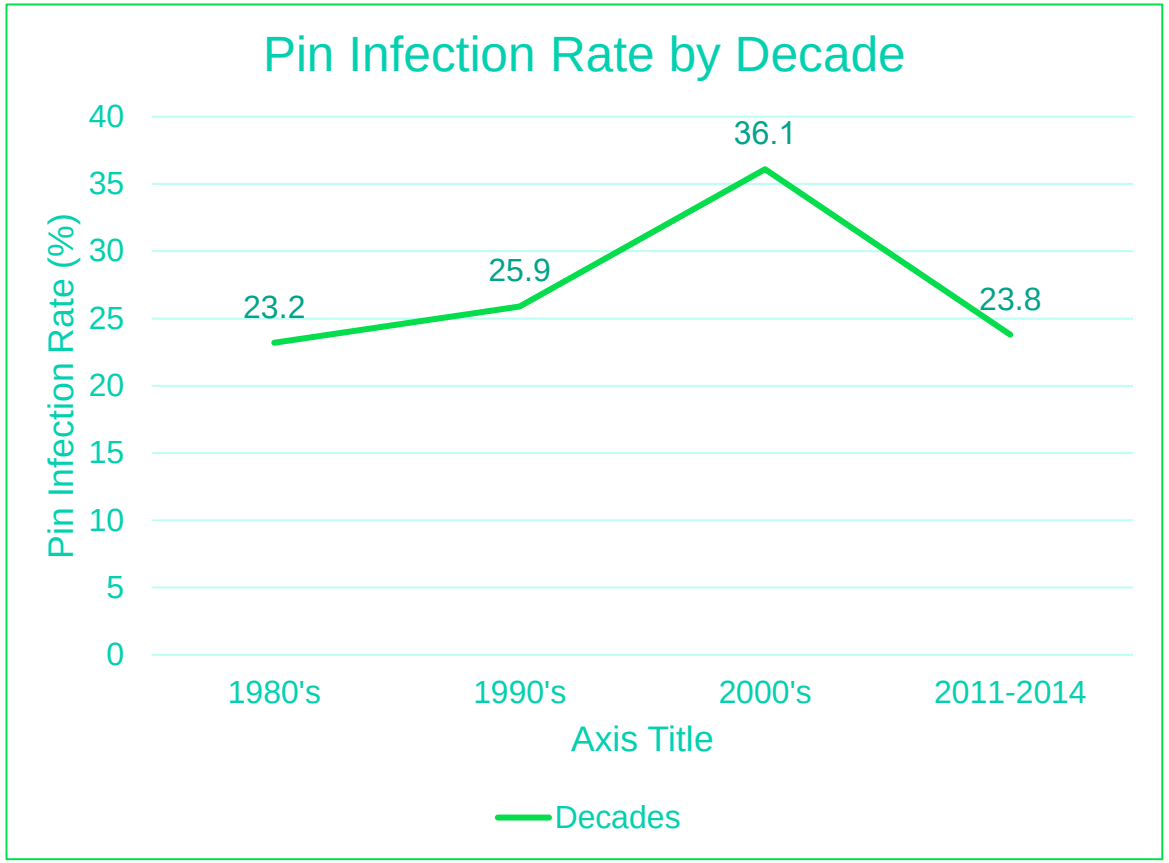
Systematic Review – External Fixation

- **27%** average pin site infection rate

- Factors which increase pin site infection risk include:
  - Pediatric age (less than 18 years)
  - Greater than 2 points of fixation (more hardware sites),
  - Limb lengthening fixation
  - Longer duration of fixation

<u>Important Observation:</u>
The rate of infection for external fixation has not improved since the 1980's



Lobst CA. Liu RW. A systematic review of incidence of pin track infections associated with external fixation. *J Limb Lengthen Reconstr.* 2016: 2:6-16.

Complications for Surgical Drains

Standard of Care: 7–32 French (most common 15 French)

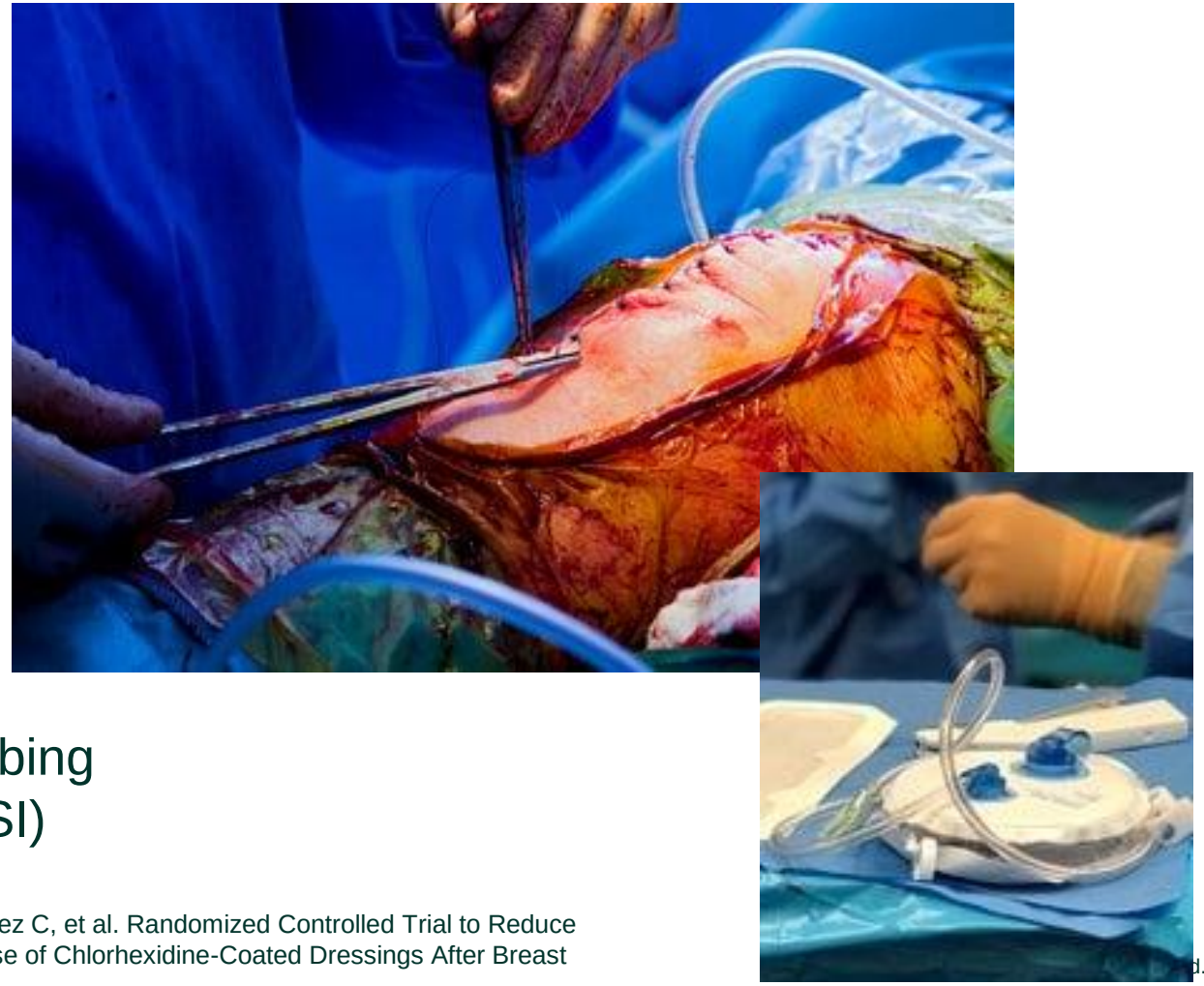
- Passive – Active
- Tube – Sheet/Flat
- Open – Closed
- Internal – External
- Inert - Irritant

Length of Wear:

- Several Days - 3 Weeks

Infection Rates:

- 5-15% Bulb fluid microbes Surgical tubing colonization Surgical site infection (SSI)



Rivera-Buendia F, Franco-Cendejas R, Roman-Lopez C, et al. Randomized Controlled Trial to Reduce Bacterial Colonization of Surgical Drains with the Use of Chlorhexidine-Coated Dressings After Breast Cancer Surgery. *Annals of Surg Oncol*. 2019.

CHG Dressing Studies: Surgical Drains

Study Author	Year	Data	Results
Rivera	2019	SSI rate of radical mastectomy surgical drains is 12-15%. Drains may be in place for up to 3 weeks.	N = 104 patients CHG gel dressing reduced drain cultures post-op 2 weeks (p = 0.001). Lower SSI rate with CHG gel group (p = 0.11) Positive drain-tubing cultures = >15CFU
Felippe	2007	Breast cancer surgical drain study Brazil	N = 354 women. 17% (n=60) SSI rate. Common pathogen = Staph aureus. Bacterial colonization of 33% POD7, rose to 80.8% on POD14. >80% of cases the bulb fluid microbe = SSI pathogen. Bacterial colonization of the surgical drain was independently Assoc with higher SSI risk (p = 0.03)
Chen	2016	Surgical drain cohort study	N = 659 patients. Drain volume <30ml/day is acceptable to remove or discontinue the drain. Drains with longer dwell times of >21 days = 76.2% higher infection rate (P = 0.001). Remove drains <3 weeks even if drainage is >30ml/day.
Degnim	2014	BioPatch Breast CA surgical drain RCT	Mayo Clinic, MN. Positive drain cultures = >1+ growth of drain fluid and > 50 CFU for tubing colonization. BP reduced positive drain cultures compared to control 9.9% vs 20.8%. N = 202. SSI risk is ~5% for mastectomy with reconstruction.
Rothlisberger	2018	External Ventricular Drains RCT	N = 57. CHG gel vs non-CHG dressing showed 95% less bacterial colonization of tubing
Mana	2019	CHG dressing (ReliaTect BD) and porcine surgical incision	CHG dressing significantly reduced MRSA compared to non-CHG gauze.
Scheithauer	2016	CHG gel reduce EVD meningoventriculitis before-after trial	Compared to standard dressing CHG gel dressing reduced MV rates by 68% (safety data available)

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Thank you

Questions?

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