

New Perspectives in CHG Bathing: Beyond Just the ICU

By:

Chad Flora, RN,BSN,CNOR,
Lorrie Calabrese, BSN RN CNOR GTS CCSVP,
Ann Meyer, RN,BSN,
Eric Davis, RN,BSN,CNOR and
Jana Meisler, BSN, RN, CWS, CWOCN, CFCN



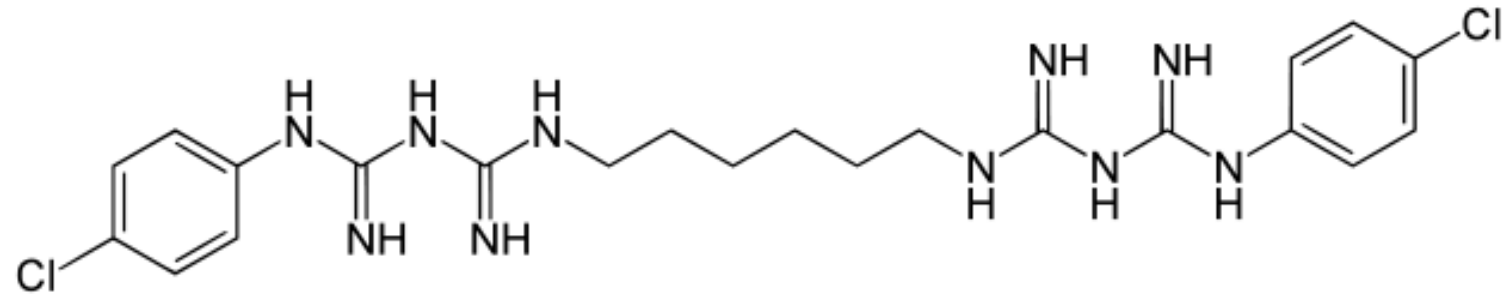
Objectives:

- Understand how organisms become virulent and create a culture for infection in acute care hospital and long-term care of patients.
- Examine how clinicians work together to intercept HAC's with new perspectives on prevention
- Identify how CHG can be used effectively for infection prevention



What is Chlorhexidine Gluconate (CHG)?

- Cationic (positively charged) base
- Insoluble in water
- Bonds strongly to the stratum corneum
- Attacks cytoplasmic membrane, disrupting cell wall



Utilized to Help Prevent Infection for Over 60 Years

1950s

Chlorhexidine is discovered while researching the synthesis of anti-malarial agents

1954

Chlorhexidine is first introduced commercially in the UK as a disinfectant and topical antiseptic

1970s

Hand washing with chlorhexidine is shown to reduce skin flora by 86% - 92%. Chlorhexidine is first introduced in the US

1976

Chlorhexidine demonstrates ability to inhibit the formation and the development of plaque

1981

The first urology lubricant with chlorhexidine

1988

The first chlorhexidine and alcohol skin preparation

1992

The first chlorhexidine-based vascular access catheter

2010

The first chlorhexidine-impregnated needless connectors

2012

The first chlorhexidine-based PICC

Powerful Antiseptic Properties

Broad spectrum action against pathogens

Bacteria¹

- both gram+ and gram-
- MRSA and VRE²

Viruses¹

- Hep B, Hep C, HIV
- Influenza, H1N1
- CMV, RSV, Herpes

Fungus and Yeasts¹

- Candida albicans

CHG is non-sporicidal¹

Antimicrobial Activity

Immediate

Antimicrobial effect on resident microorganisms begins immediately after application

Persistent

Able to prevent microbial counts from exceeding the baseline numbers for up to 48hrs

Residual

Cumulative antimicrobial effects when used repeatedly over a number of days

Which Patients Can Benefit the Most From CHG?

Patients with Indwelling Devices

Central lines, PICCs, dialysis catheters, Foleys

70% of patients with a CVC were located outside the ICU

Surgical Patients

Orthopedics, OBGYN, Cardiovascular, Colorectal

21.8% of all hospitalized patients are surgical

Patients at Risk for MDRO-Related

MRSA, VRE, CDI, CRAB

Typically affect anywhere from 10-25% of patients, even as high as 60%

CHG BATHING IS NOT JUST FOR PATIENTS IN CRITICAL CARE

Patients in any unit can benefit from a daily CHG Bathing to help reduce risk of infection

Device Related Infections

Central Line Associated Bloodstream Infection (CLABSI)

Despite a **46%** reduction in CLABSI in recent years, 30,100 central line patients develop bloodstream infections annually in the US

Result: \$45,800 in excess costs 10.4 extra hospital days

Etiology

- Contamination upon insertion
- Contaminated injection hub
- Hand touching the lines

Organisms

- Staphylococcus aureus
- Enterococcus
- Klebsiella
- Candida
- Escherichia coli

15 million
CVC line
days per
year in
the U.S.

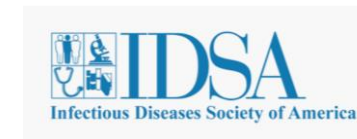
Infection can be prevented through proper insertion techniques and daily management of the central line

CLABSI Prevention Basics

CDC Guidelines for the Prevention of Intravascular Catheter-Related Infections

Recommendations

- Education and training – only personnel demonstrating competence for insertion and maintenance
- Selection of catheters and sites – based on intended purpose and length of use
- Hand hygiene – soap and water or alcohol-based hand rubs
- Maximal sterile barrier precautions – cap, mask, sterile gown, gloves, drapes for arterial, central, and midlines
- Antiseptic skin prep – alcohol/CHG preparations
- CHG-impregnated dressings
- Daily CHG skin cleansing

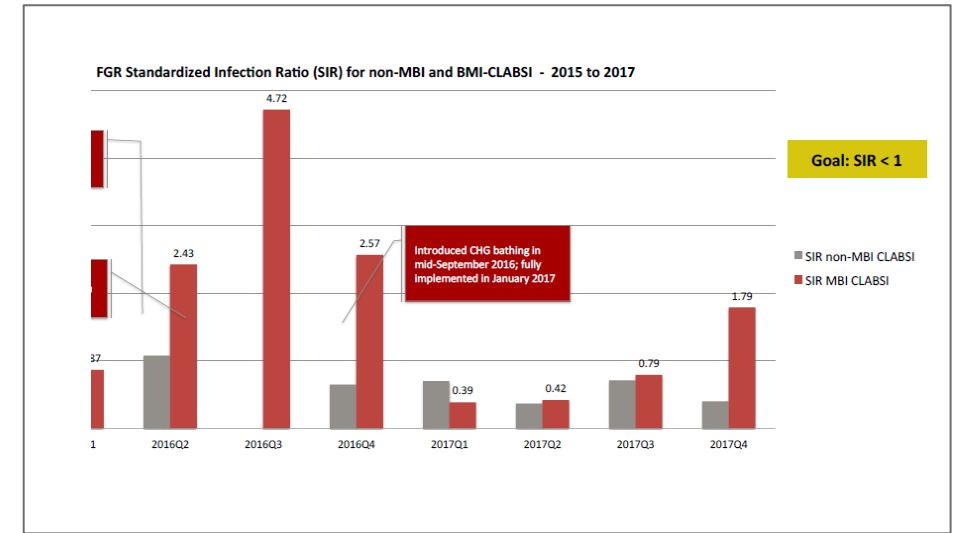


CHG bathing as an essential element of CLABSI reduction bundles

Stanford Health Care oncology unit was experiencing a CLABSI Rate of 4.12 per 1000-line days. An infection reduction bundle was implemented including strategy elements:

- CVC education and training
- Hand hygiene and CVC maintenance audits
- Standardized environmental cleaning
- Daily bathing with 4% CHG antiseptic skin cleanser

Result: **63%** reduction in CLABSI 4.12 to 1.53 per 1000-line days



CLABSI rates declined significantly after CHG bathing was added in September 2016

Adherence to a CLABSI Bundle

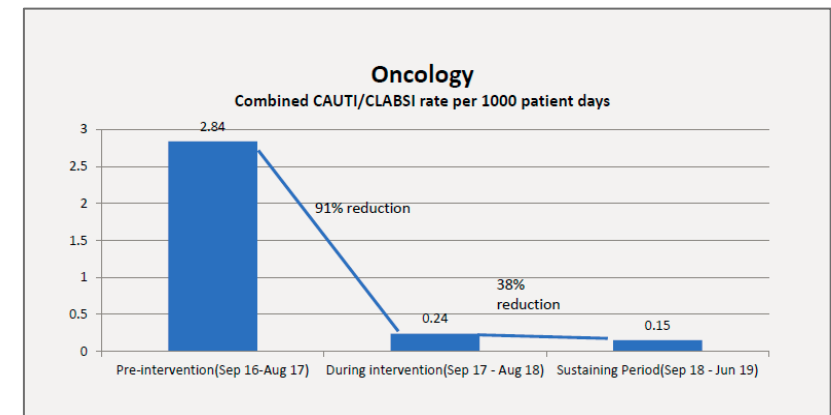
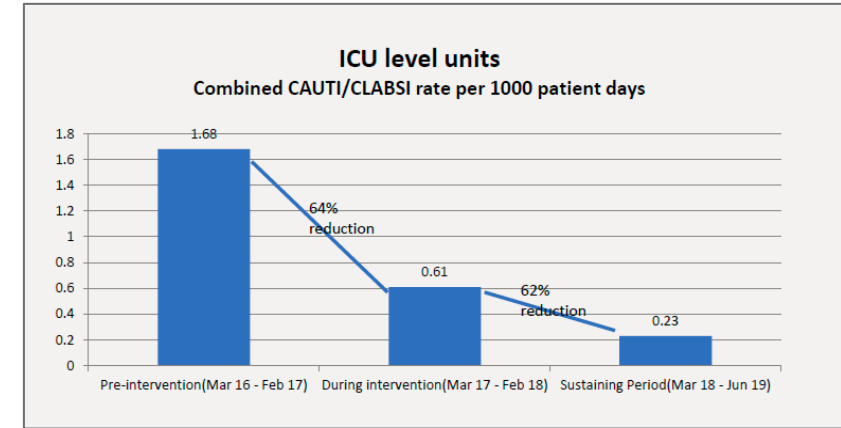
Carolina East Medical Center CLABSI rates were increasing despite line care bundles, removal protocols, and decreased device usage. Problem Areas: ICU, CVICU and Oncology Units.

- Audit tool to encourage peer accountability in adherence to practices
- Targeted daily 4% CHG bathing and line maintenance
- A Bundle Brigade was developed to continue driving the project

CHG Bathing Practice Accountability is Key

Bundle compliance increased to almost 90%

CLABSI and CAUTI rates dropped 92%



Catheter Associated Urinary Tract Infections (CAUTI)

Accounting for 30% of all Healthcare-Associated Infections there are an estimated 440,334 CAUTI events annually in the US

Etiology

- Contaminated hands - staff and patient
- Microbial entry - extra/intra-luminal
- Patient colonic or perineal flora

Organisms

- Escherichia coli
- Enterococcus
- Klebsiella
- Pseudomonas
- Candida

15-25%
of patients
catheterized
during
hospital stay

The risk of infection can be decreased through proper insertion techniques and daily management of the urinary catheter

CAUTI Prevention Basics

The Toolkit for Reducing Catheter-Associated Urinary Tract Infections (CAUTI) in Hospitals



Agency for Healthcare Research and Quality (AHRQ)



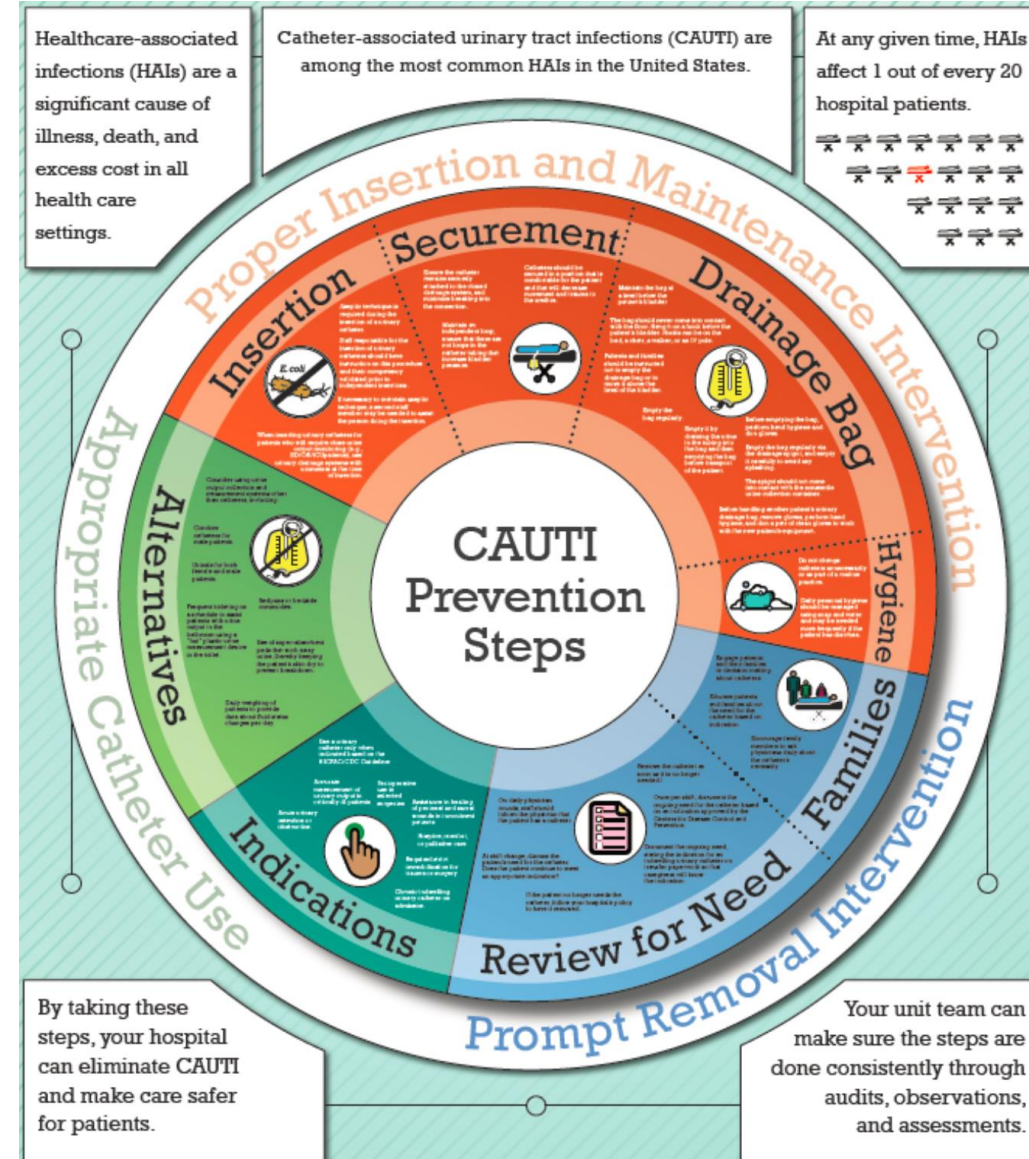
Centers for Disease Control (CDC)



Association for Professionals in Infection Control and Epidemiology (APIC)

Recommendations

- Education and training
- Appropriate catheter indications and usage / exploring alternatives
- Proper aseptic insertion technique
- Hand hygiene – soap and water or alcohol-based hand rubs
- Daily personal hygiene – more frequently if patient is incontinent
- Maintain sterile, continuously closed system

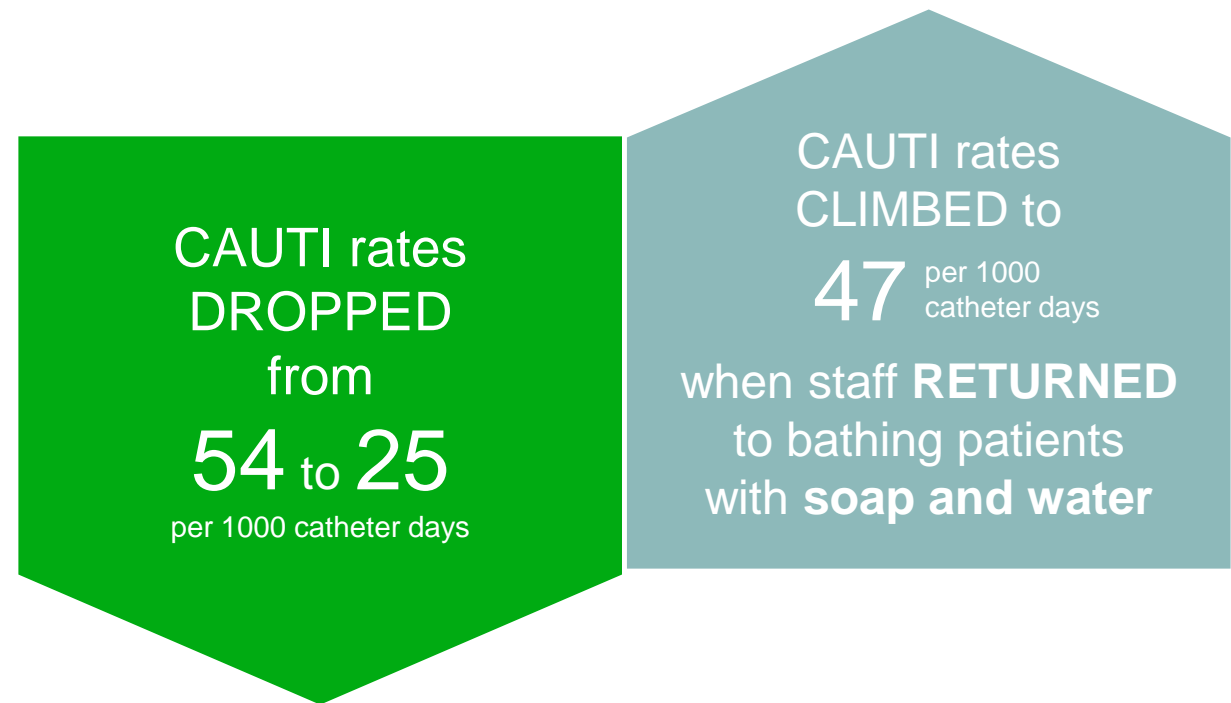


Reference: AHRQ Infographic Poster – Program for Reducing CAUTI in Hospitals <https://www.ahrq.gov/sites/default/files/wysiwyg/professionals/quality-patient-safety/haics/cauti-tools/impl-guide/implementation-guide-appendix-k.pdf>.

CHG Bathing Effects on CAUTI Rates

University Hospital in Monterrey studied the effects of CHG bathing on nosocomial infections. The first 6 months soap and water daily bathing was used, the second 6 months patients used daily CHG bathing then returned to soap and water daily bathing for 6 months.

- Researchers speculated that the lower CAUTI rates were related in part to the effect of residual chlorhexidine on patient skin
- Reducing the risk of contamination of the catheter by manipulation from the patient can be an important risk reduction strategy

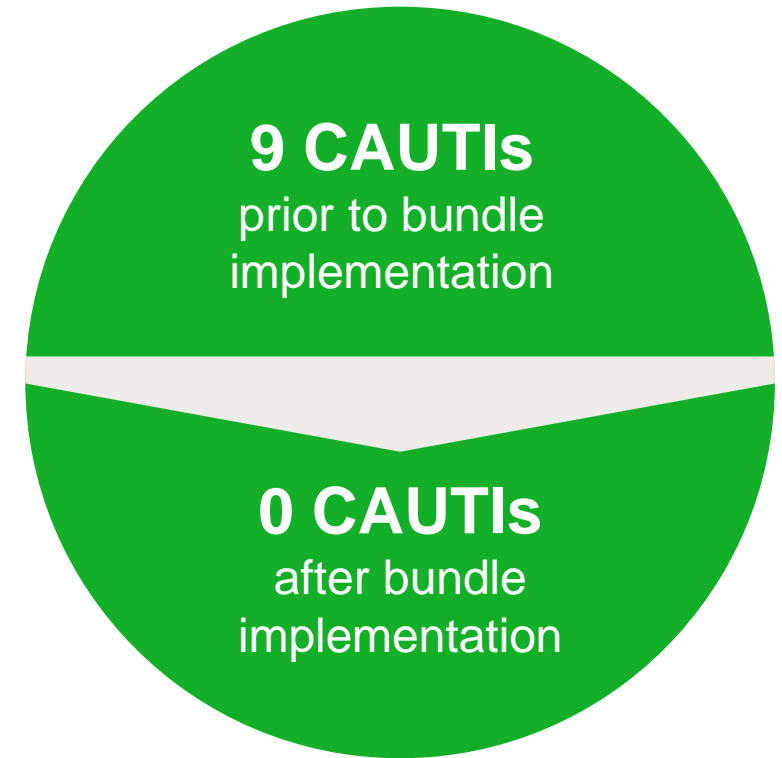


CAUTI Bundles with CHG Bathing

Yale-New Haven Hospital in Connecticut implemented several key bundle elements including:

- Standardized closed system used for urinary catheter placement
- Daily rounding with checklist for surveillance
- Foleys were changed if in place >48 hours prior to sample collection time
- Daily whole-body bathing with 4% CHG antiseptic cleanser

CHG bathing can be an essential element in a successful CAUTI reduction bundle



CHG Bathing vs. Soap and Water for Perineum Care?

CHG is highly efficacious in reducing microbial burden and healthcare associated infections.

- Current guidelines recommending soap and water cleansing are based on studies more than 10 years old.
- Studies supporting CHG cleaning of the perineum were based on more recent evidence ranging. Of those studies, no skin irritation or complications were reported.

Regulatory guidelines should be updated to reflect more current evidence supporting the use of CHG cleansing of the perineum as an appropriate alternative to soap and water.

Multi-drug Resistant Organisms (MDRO)

MDROs, bacteria that have developed resistance to many types of antibiotics.

What We Know.....

Analysis:

- Cost for treating infections linked to multidrug-resistant organisms is over \$2.39 billion.
- About 23,000 Americans die annually from antibiotic-resistant infections, according to the CDC.
- Risk factors include previous prolonged use of antibiotics, underlying disease (diabetes, chronic kidney disease, skin lesions, elderly or immunocompromised)

**Break the
cycle of
transmission!**



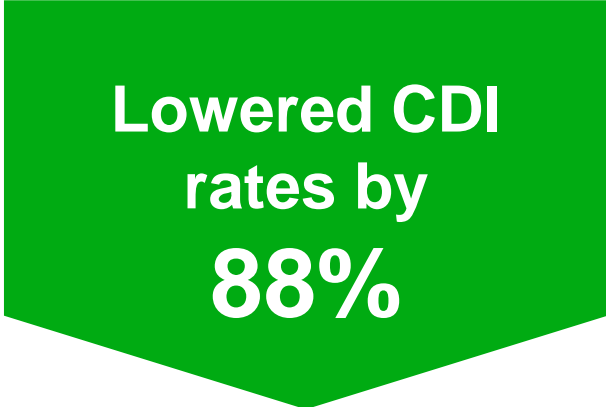
Ways to control the spread of MDRO's

Root Cause analysis, new strategies implemented

Clostridioides difficile is recognized as a top challenge in hospitals.
Excess costs per patient as compared to patients without a CDI: \$11,000

One acute care hospital **lowered CDI rates by 88%**, with only one hospital onset CDI in 100 days. As part of a multi-pronged approach, the facility attributed a change in patient bathing to 4% foam CHG for a significant part of the decrease.

- Environmental: Ultraviolet (UV) disinfection, sporicidal cleanser/disinfectant
- Increased communication between Nurses: implementation of a Decision Tree, patient risk factors, CHG bathing



**Lowered CDI
rates by
88%**

Evidence Based Control Measures

Jackson Health System evaluated bundled interventions on Hospital Onset (HO) MRSA bacteremia through a Quality Improvement Project (QIP) in a 380-bed acute care facility between January 2015 & March 2019.

- Four phases encompassed: Active surveillance testing, ICU on admission & once weekly; daily bathing 2% CHG cloth, in 2nd phase transitioned to 4% CHG foam to **ALL** Patients: nasal decolonization (alcohol based); patient hand hygiene 5 alcohol-based cloths; compliance monitored electronically & verbally

Results:

74% decrease in HO MRSA, hospital wide
Universal decolonization most successful.

Conclusion:

These strategies may be useful in institutions with excessively high MRSA rates

KPC in Long Term Acute Care Hospitals (LTACH)

Four LTACH facilities in Chicago implemented a bundled intervention to test the effect on *Klebsiella pneumoniae* carbapenemase–producing Enterobacteriaceae (KPC). Interventions included screening for KPC rectal colonization, contact isolation and separation of KPC- positive patients, daily CHG bathing and staff education and adherence monitoring.

Results:

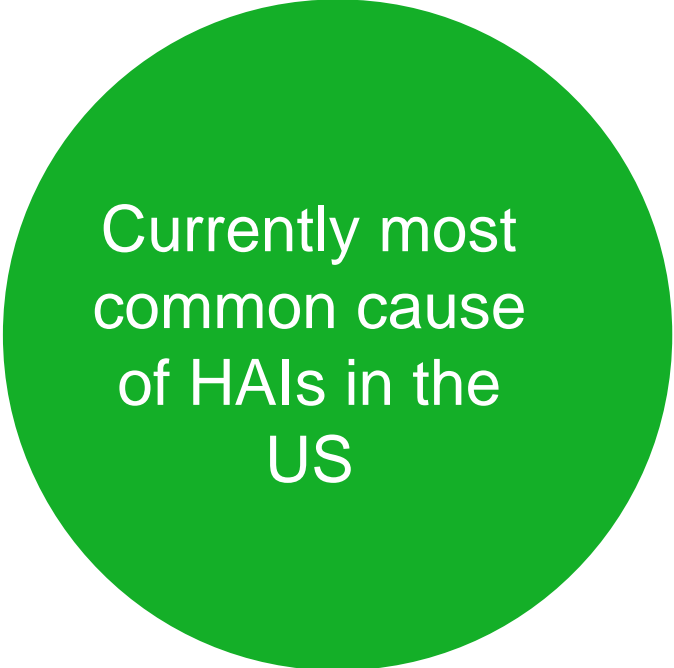
- KPC colonization fell **50%**
- KPC bloodstream infection fell almost **60%**
- Bloodstream infection due to any pathogen declined by **32%**
- Blood culture contamination declined by **53%**
- **56%** reduction in KPC bacteremia.

Speculated CHG bathing was the intervention most responsible for the sharp declines in all cause bloodstream infections and skin decolonization by significantly reducing skin burden of organisms

SSIs

Surgical Site Infections (SSIs): the Numbers

- ✓ **20%** of HAIs are SSIs
- ✓ **38%** of all postoperative infections
- ✓ **7-11** additional hospital days
- ✓ **2-11** times greater risk of death
- ✓ **77%** number of deaths in patients with SSIs directly related to the SSI
- ✓ **\$10** billion estimated cost to the healthcare system to treat SSIs each year



Currently most
common cause
of HAIs in the
US

Pre-surgical showering

CHG skin decolonization is an effective horizontal strategy to reduce both the bioburden on the skin and subsequent infection.

- Both the Colorectal Surgical Site Infection Reduction Team and the *Study to Optimally Prevent SSIs in Select Cardiac and Orthopedic Procedures (STOP SSI)* have reported significant declines in SSIs using CHG as a component of reduction bundles.

Pre-operative decolonization has the strongest evidence base

CHG Pre-op Protocol: Sole Intervention

Sinai Hospital in Maryland identified 2545 patients who underwent total hip arthroplasty between January 1, 2007 and December 31, 2011.

Compared the incidence of SSIs in total hip arthroplasty patients who used an advance pre-operative CHG skin preparation protocol compared to patients underwent standard in-hospital perioperative skin preparation only.

No additional pre-operative, peri-operative or post-operative protocols or procedures were altered.

No CHG pre-op application-only
in-hospital perioperative skin
preparation 1.7% SSI rate.

VS

Night before-morning of CHG
application 0.5% SSI rate

Patients with disseminated cancer are at a higher risk for developing SSIs

Memorial Sloan Kettering Cancer Center studied effects of a 13-component multidisciplinary SSI bundle among 425 colorectal and hepatic surgery patients.

Results:

A reduced rate of SSI for combined colorectal and liver resection by 61%, including 81% and 48% reductions in superficial/deep and organ space SSI, respectively.

Preoperative	<ul style="list-style-type: none">• Appropriate oral antibiotic selection• Appropriate oral antibiotic administration the night before surgery• Mechanical bowel preparation• Medical evaluation for elevated hemoglobin A1C• Skin cleansing with chlorhexidine the night before and the morning of surgery^a• Surgeon notification of SSI risk using MSK SSI prediction tool
Intraoperative	<ul style="list-style-type: none">• Antibiotic administration before initial incision^b• Appropriate method of hair removal (electronic clippers or no hair removal)• Maintenance of normothermia• Intraoperative antibiotic re-dosing• Separate surgical closing tray for open procedures
Postoperative	<ul style="list-style-type: none">• Discontinuation of antibiotics at 24 h• Patient shower on postoperative day 2

CHG and Enhanced Recovery After Surgery (ERAS) Shorter hospital stays with fewer readmissions

Massachusetts General Hospital sought to lower SSIs among colorectal surgery patients. To improve compliance, patients were provided with a Surgical Site Infection Prevention Kit (SSIPK) containing:

- 4% CHG as the preoperative skin cleanser with usage instructions, carbohydrate drink, antibiotics and bowel prep.
- Compliance increased, the SSI rate lowered from 11.4% to 5.9% and unplanned readmissions reduced from 14.6% vs. 5.9%.

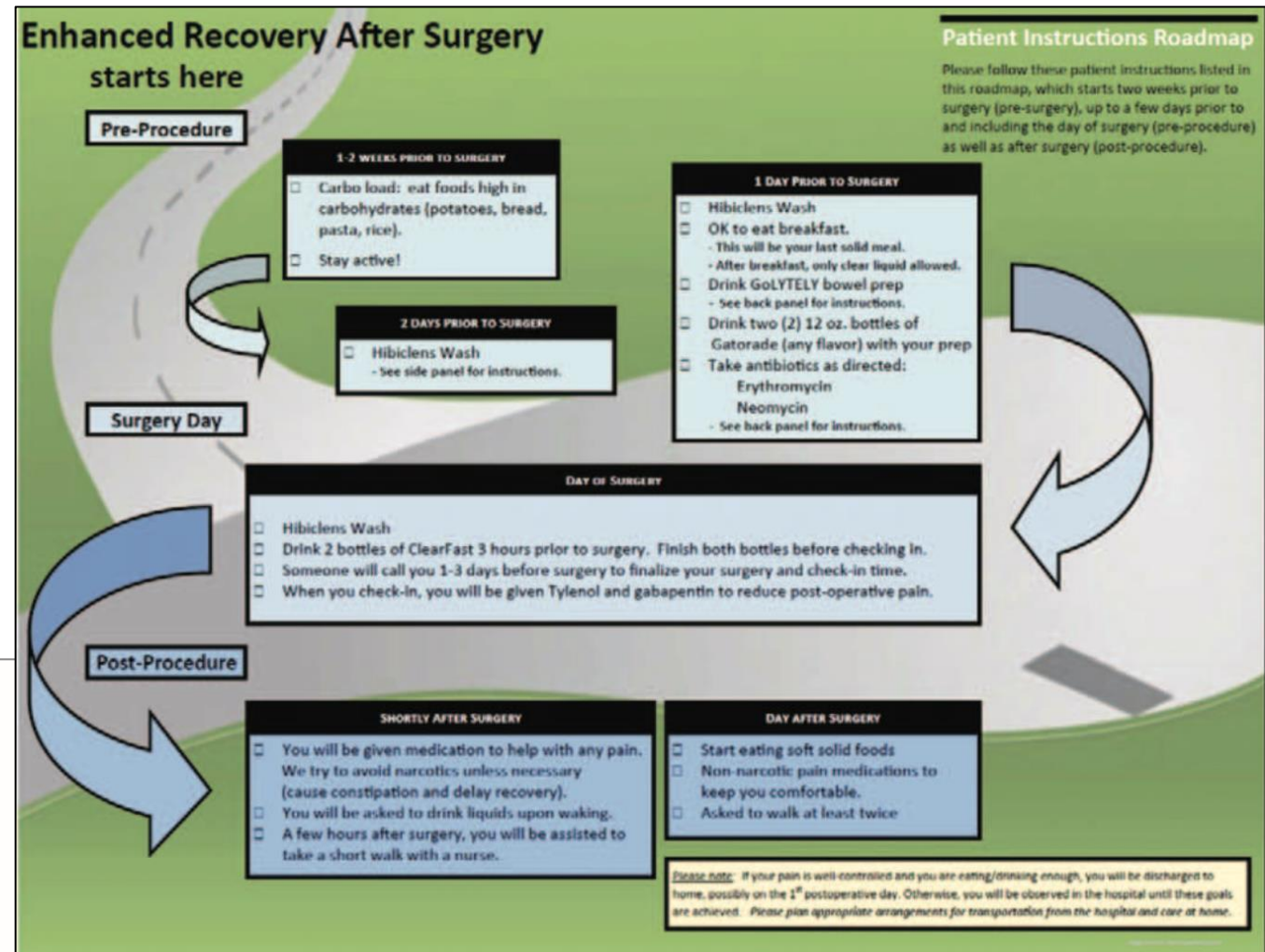
PATIENT KIT

This kit contains the following:

- ClearFast drink for day of surgery (2)
- GoLYTELY bowel prep
- Hibiclens body wash
- Two (2) antibiotics to be taken the night prior to surgery
 1. Erythromycin
 2. Neomycin

This kit does not include:

- Two (2) 12 oz. bottles of Gatorade



The National Rate of SSIs for Cesarean Delivery ranges from 2.5% to 18%.

The University of Alabama Birmingham Hospital sought to decrease SSIs among their C Section patients. Several categories were addressed: Patient education, antibiotic protocols, surgical site pre, post and incision care and staff engagement.

- Patients were provided an education tool kit including a web-based video and FAQs
- Staff provided 4% CHG for pre and post op showering and return demonstration education for cleansing incision sites.
- Performed advanced perineal cleansing with 4% CHG every 6 hours in ALL laboring patients.

Results: A decrease ↓ in SSI rates from 5.9% in 2015 to 0.6% in the first two quarters of 2017.

Horizontal vs Vertical

Infection Prevention Strategies: Horizontal vs. Vertical Approach

VERTICAL

- reduce infection or colonization due to a specific pathogen
 - Active Surveillance Testing (AST), Isolation, anti-microbial stewardship

HORIZONTAL

- aims to eliminate all infections and is population based
 - CHG Bathing, Universal Decolonization, Strict Environmental Cleaning, Increased Staff Hand Hygiene, Standardized Approach

While horizontal strategies are generally favored, vertical interventions are useful in certain situations (pathogen specific outbreaks). The choice of infection prevention strategies should be decided at the local level but adoption of one strategy can reduce variation in practice.¹

Horizontal and Vertical Infection Prevention Strategies have their Pros and Cons

VERTICAL

- Increased resource utilization
- Favors the hospital
- Short term approach
- Costly
- Single organism
- Exceptionalism
- Active Surveillance and Testing (AST)
- Reduce colonization/infection due to a specific pathogen

HORIZONTAL

- Decreased resource utilization
- Favors the patient
- Present/long term approach
- Less cost
- Multiple organisms
- Utilitarian
- Common bundled interventions
- Reduce the burden of all pathogens (false negatives²)

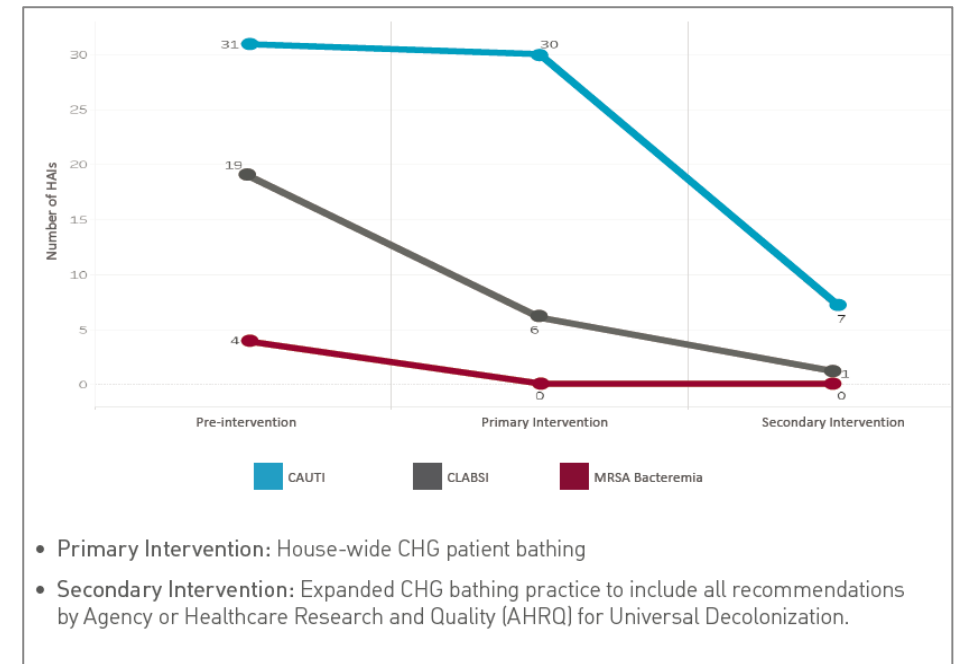
Cost of CHG Bathing vs. Cost of Infection

St. Joseph Health, a 451-bed hospital in NY had 27 CLABSIs in 2016 which cost the facility an estimated \$471,015. Following a dual-phased Intervention there was a 65% reduction in CLABSI with other HAI rate decreases ranging from 28% to 100%

- Primary Phase included daily CHG bathing for all patients
- Secondary Phase expanded practices to include all AHRQ guidelines

Financial impact of CLABSI reduction: \$226,087 saved
\$ saved across all HAI rate reductions: \$514,739

Cost to incorporate CHG bathing into daily practice: \$40,114.10



Decreased Costs Associated with Horizontal Approach and Elimination of Routine Contact Precautions

UCLA Medical Center implemented whole unit CHG bathing as part of their horizontal strategy to eliminate routine use of Contact Precautions.

- Eliminated routine CP
- PPE Costs decreased **\$729, 572**
- Increase in CHG bathing **\$85,796**
- Decreased nursing time for donning/doffing PPE=42K hours/year.
Potential labor savings of **\$4.2 M**
- **NO** increase in endemic MRSA/VRE or *cDiff*
- **NO** change in 30-day readmissions

No Change in Infection Rates/Acquisitions Associated with Horizontal Approach & Elimination of Routine Contact Precautions

VCU Medical Center phased in a 7-step horizontal bundle that included whole unit CHG bathing over a 5-year period.

- **NO** increase in MRSA/VRE Hospital Acquired Infection after routine Contact Precautions elimination
- MRSA/VRE rates decreased by 1.31 and 6.25 per 100K patient days respectively
- Device Associated Infection Rates decreased 2.44 per 10K patient days.
- No outbreaks seen during the implementation.

TARGETED vs UNIVERSAL DECOLONIZATION

- 15-30% of healthy adults are nasally colonized with MSSA and 1-3% with MRSA
- Patients colonized are more than **twice** as likely to develop a *s.aureus* infection as non-colonized
- Decolonization only requires healthcare workers to provide decolonization agents (nasal agents and CHG bathing) without the labor of screening
- Targeted strategies may miss other organisms or miss false negative results
- Targeted strategies more expensive and time consuming
- Concern of antibiotic resistance to universal decolonization⁵

Targeted vs Universal Decolonization

Reduce MRSA Study

- 74 Adult ICU's
 - #1-MRSA Screening + Isolation
 - #2-MRSA Screening + Isolation + decolonization of MRSA carriers (CHG bathing and nasal mupirocin)
 - #3-no screening; all patients decolonized
- Group 3 was associated with the greatest decrease in all blood stream infections (44%), MRSA clinical cultures (37%). CHG Bathing reduced blood culture contamination by 44%.

Institute for Healthcare Improvement recommends
3 days CHG pre-operative
bathing and
5 days CHG pre-operative
bathing and nasal Bactroban
decolonization prior to
THA TKA surgery.⁷

Post Acute

Post Acute Care Challenges: LTCFs

Healthcare associated infections (HAIs) represent a significant cause of morbidity and mortality for the 2.5 million Americans residing in Long Term Care Facilities (LTCFs)

1.6-3.8 million HAI infections annually

Costs range from \$673 million to \$2 billion annually

CMS Quality Reporting Programs

Effects:

- Long-Term Care Hospitals (LTCHs)
- Skilled Nursing Facilities (SNFs)
- Home Health Agencies (HHAs)
- Inpatient Rehabilitation Facilities (IRFs)

If facilities fail to submit the required data, they will be subject to a 2-percentage point reduction in their Annual Payment Update (APU)

**Preventable
30-Day
Post-Discharge
Readmission**

**Infection Measures:
CAUTI, CLABSI, CDI
(LTCH)
CAUTI, CDI (IRF)**

CMS SNF Value-Based Purchasing Program

30-day All-Cause Readmission Measures:

- Estimates the risk rate of unplanned readmission within 30 days to acute care, critical access, psychiatric hospitals
- 2% automatically “withheld” for incentive program –has to be earned back

Partners: Hospital and Skilled Nursing Facilities

CarolinaEast Medical Center noted an increase in readmissions epidemiologically significant multidrug resistant (MDR) organisms in skilled nursing facility patients resulting in readmissions to the hospital for Surgical Site Infection and MDRO infections.

Targeted education plan developed by hospital IP for SNF

- 15-minute interactive micro-sessions by acute care IP utilizing return demonstration, stories and visual tools replicated by post acute IP on ongoing basis
- Hand Hygiene education using black light technology initiated by the acute IP and continued by post acute

Linking quality care to outcomes

Practice Changes:

- Created an EMR alert notification to increase communication between acute and post acute for MDRO patients.
- Implementation of 4% CHG bathing.
- Consistent cleaning of bath basins and designated disposal days.
- Changes in wound care aseptic technique.
- EVS changes to cleaning techniques.

SNF Onset MDRO decreased 90%
and transmission to acute halted

SSI readmissions decreased to zero

A Decolonization Collaborative: Stop Transmission

To reduce MDRO transmission across 35 Healthcare facilities (acute and post acute) in Orange County, CA. Shared Healthcare Intervention to Eliminate Life-Threatening Dissemination of MDRO's (SHIELD OC) implemented a decolonization strategy.

Intervention:

- Hospitals – decolonize all patients in contact precautions
 - ✓ Daily chlorhexidine bathing/showering
 - ✓ Nasal decolonization for 5 days
- Nursing homes – decolonize all residents
 - ✓ Switch out soap for CHG for all routine bathing/showering
 - ✓ Nasal iodophor on admit and every other week

Reductions:

11% in CP

22% NH

34% LTAC

**MDRO prevention
efforts must include
MDRO control in LTCFs**

Questions and Concerns

Permeation Profile of CHG

- Poor permeation of CHG through excised full thickness skin after 2 & 30 min of aqueous 2% CHG exposure
- Levels of CHG were highest in top 100 um sections of skin & remained consistently low in deeper layers.

CHG does not penetrate deeper levels & is not systemic

CHG Resistance

- Resistance has been demonstrated in the laboratory, not proven in real world clinical settings.
- **Concentration** of CHG is important
- If resistance develops, most likely due to inappropriate use; specifically follow manufacturers Instructions For Use (IFU's)

- 1,100 bacterial strains studied, showed low incidence of CHG resistance
- No isolates showed high level resistance Edmiston CE - AORN:2010

What effect is there on “Good Bacteria?”

Topic decolonization does not permanently eradicate the “good” bacteria on the skin.

- At least 80% of resident and transient flora is found in the first 5 epidermal layers of the skin.
- About 20% of skin flora remains on the skin even after antiseptics.
- Bacterial re-growth begins immediately (back to original level by 24 hours).

Is there an increase in CHG Allergy?

The incidence of CHG allergy will increase in parallel with **increased exposure to CHG.**

- Since 1998, the FDA has identified a total of 52 cases of anaphylaxis with the use of CHG products applied to the skin
- Worldwide, in the 46 years between January 1969 and early June 2015, the FDA received reports of 43 cases. More than half of the 43 cases were reported after 2010.
- Patients with anaphylaxis often reported previous milder reactions to CHG (e.g. itching, urticaria, angioedema). Earlier investigation of these symptoms may prevent severe reactions in the future.

Summary

- CHG patient bathing has been documented in literature in preventing HAI's and decreasing MDROs in both acute and post-acute care settings.
- CHG can be used effectively in Communal settings as well as inpatient settings.
- Evidence demonstrates bundled interventions including CHG reduce surgical site infections.
- A horizontal approach to infection prevention can be cost effective and drive compliance.

Thank you