Decolonization Decision-Making and Readiness for Implementation

ICU & Non-ICU

For more in-depth information on the implementation of decolonization, please refer to the presentation “[**Implementation of Chlorhexidine Gluconate (CHG) Bathing and Nasal Decolonization**](http://www.ahrq.gov/hai/tools/mrsa-prevention/toolkit/decolonize-patients.html),” available on the Decolonization topic page on the Toolkit website.

## Review and Share the Evidence for Decolonization

Prior to implementation of decolonization, it is worthwhile to review the supporting evidence. Sharing the relevant literature on decolonization and evidence of its potential benefit can help to persuade frontline staff, leaders, and other stakeholders of the benefits of decolonization.

The table below highlights some of the more notable studies on decolonization. For more in-depth information, please refer to the presentation“[**The Evidence Behind Decolonization Strategies for MRSA**](http://www.ahrq.gov/hai/tools/mrsa-prevention/toolkit/decolonize-patients.html)” for a detailed overview of the current research on decolonization in acute care settings.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Author** | **Study Year** | **Study Type** | **Hospitals** | **Units** | **N** | **Findings** | **Publication** |
| Vernon1 | Oct 2002–Dec 2003 | Obs | 1 | 1 (ICU) | 1,787 | **65% less VRE acquisition**  **40%**–**70% less VRE on skin, HCW hands, environment** | Arch Int Med 2006;166:306-12 |
| Climo2 | Dec 2004–Jan 2006 | Obs | 4 | 6 (ICU) | 5,293 | **66% less VRE BSI**  **32% less MRSA acquisition**  **50% less VRE acquisition** | Crit Care Med 2009, 37:1858-65 |
| Bleasdale3 | Dec 2005–Jun 2006 | Obs | 1 | 2 (ICU) | 836 | **61% less primary BSI** | Arch Int Med 2007; 167(19):2073-9 |
| Popovich4 | Sep 2004–Oct 2006 | Obs | 1 | 1 (ICU) | 3,816 | **87% less CLABSI**  **41% less blood contaminants** | ICHE 2009; 30(10):959-63 |
| Climo5 | Aug 2007–Feb 2009 | Cluster RCT | 6 | 9 (ICU) | 7,727 | **23% less MRSA/VRE acquisition** | N Engl J Med 2013; 368:533-42 |
| Milstone6 | Feb 2008–Sep 2010 | Cluster RCT | 5 | 10 (ICU) | 4,947 | **36% total BSI (as treated)** | Lancet 2013; 381(9872):1099-106 |
| Huang7 | Jan 2009–Sep 2011 | Cluster RCT | 43 | 74 (ICU) | 122,646 | **37% less MRSA clinical cultures**  **44% less all-cause BSI** | N Engl J Med 2013; 368:2255-65 |
| Huang8 | Mar 2013–Feb 2016 | Cluster RCT | 53 | 194 (Non-ICU) | 528,983 | **General population: No difference**  **Patients w/medical devices: 31% reduction in all-cause bacteremia and 37% reduction in MRSA or VRE clinical cultures when compared to control** | Lancet 2019; 393(10177):1205-15 |

Sharing the evidence among staff and stakeholders helps to establish a shared understanding as implementation gets underway.

## Assess Your Unit’s Current MRSA Status

In addition to reviewing the evidence, it is useful to conduct an assessment of your unit’s current MRSA rates. These data will provide a clearer picture of your unit’s baseline status to inform your decision-making and help you set your targets and goals.

It’s important to share this baseline information to your team, staff, leadership, and other stakeholders. It helps to establish a shared understanding of your unit’s current status and the opportunities for improvement.

Ideally, you should be able to obtain the data directly from your hospital’s Infection Preventionist. Involve them in your project. Discuss your unit’s baseline MRSA rates over the past year with them.

If this information is not available, we have provided steps to determine general estimates. The following baseline assessments are suggested:

* **All-Cause Bloodstream Infection Rates:** These are total bloodstream infection rates from all causes for patients in the unit, not just central-line infection bloodstream events. These data will help estimate the expected impact of adopting decolonization in the unit. Census data and data from the clinical microbiology laboratory will be needed for this estimate.
  + **Comprehensive estimate:** Bloodstream infection rates are calculated as the total number of patients with bloodstream infections attributed to the unit (numerator) divided by the number of attributable unit patient-days (denominator).
    - *If you are planning to use a Targeted Decolonization approach, calculate using totals among the patients who meet your targeted criteria.*

The Centers for Disease Control and Prevention (CDC) defines attribution to a unit as events that occur more than 2 days after unit admission through 2 days after unit discharge**.** The number of attributable bloodstream infections within a reasonable length of time (i.e., 1 year) should be divided by the total number of patient-days attributable to the unit in that same period.

Attributable bloodstream infection should be counted from positive blood cultures taken more than 2 days after unit admission through 2 days after unit discharge. Only one event per patient should be counted, to avoid inflating numbers due to persistent bacteremia. Two positive blood cultures should be required for skin commensals to be considered an infection. This is consistent with CDC guidance.9,10

Attributable patient-days should be counted from Day 3 of a patient’s unit stay through 2 days after unit discharge, if the patient remains hospitalized.

To express the rate as total events per 1,000 patient-days, multiply the calculated rate (number of events divided by unit patient-days) by 1,000.

* + **Simplified estimate**: If the comprehensive estimate is too difficult to obtain, a simplified method is to sum all unique patients on the unit with a positive blood culture during their unit stay, divided by the total number of unit patient-days.
    - *If you are planning to use Targeted Decolonization, remember to use the numbers appropriate for the patients who meet your targeted criteria.*

Remember to estimate based on bloodstream infections from all causes, not just those limited to central-line infection bloodstream events.

* **MRSA Clinical Cultures:** The total number of MRSA clinical cultures will help estimate your unit’s current MRSA burden and assess the potential benefit of decolonization. This can be estimated in two ways:
  + **Comprehensive estimate:** Calculate the percentage of patients on the unit who have any positive MRSA clinical cultures within a reliable window of time (e.g., 1 year).
  + **Alternative estimate:** Calculate the percentage of patients on the unit either infected or colonized with MRSA (often based on a MRSA flag or tag in the medical record). Use a reliable window of time (e.g., 1 year).

## Identify Whether You Will Use a Universal or Targeted Decolonization Strategy

There are two primary approaches to decolonization: **Universal Decolonization** and **Targeted Decolonization**. Your choice of strategy will significantly affect your planning and implementation process. Your assessment of current MRSA status conducted in the previous step will be valuable in determining which strategy will be of most benefit to your unit. For more detailed guidance, please refer to the document: “[**Which Type of Decolonization Would Work Best in My Unit?**](https://www.ahrq.gov/sites/default/files/wysiwyg/hai/tools/mrsa/159-which-type-decolonization-work-best.docx)”

In **Universal Decolonization**, all patients in a unit receive decolonization, regardless of individual characteristics. In **Targeted Decolonization**, only patients who meet criteria for higher risk receive decolonization.

By and large, intensive care units (ICUs) should implement universal decolonization; evidence consistently supports universal over targeted decolonization in the ICU setting.5-7 For non-ICUs, targeted decolonization is generally more suitable.8 However, specific non-ICUs that often see a large number of patients who meet high-risk criteria may want to consider a universal approach.

**Criteria for high risk** include patients with medical devices such as central lines, midline catheters, PICC lines, and lumbar drains, as these devices can function as entry points for infection. Alternatively, you may opt to target patients who are infected or colonized with MRSA based on screening results or patient history.

## Garner Institutional Support From Key Stakeholders

Securing the support of key stakeholders and partners within your institution early in the process is crucial. Below are some actions that you can take to help you gain institutional support:

* **Prepare a Business Case:** If needed, you may consider developing a business case for hospital leadership and other stakeholders. Basic steps needed to develop a business case for infection prevention strategies have been well described by Perencevich and colleagues.11
  + ***Key elements to include in your business case:***
    - Number of annual unit-specific bloodstream infections. For Targeted Decolonization, use the number of annual unit-specific bloodstream infections among patients who meet criteria.
      * + The REDUCE-MRSA Trial7 implemented Universal Decolonization in the ICU, resulting in a 44 percent reduction in bloodstream infections from all causes.
        + The ABATE Infection Trial8 was conducted among non-ICUs, where it showed a 31 percent reduction in bloodstream infections among patients with medical devices.
    - Estimated excess cost of a unit-attributable bloodstream infection. This is around $18,000 ($7,000–$55,000) based on several commonly cited sources.12-16
    - Number of total patient-days in the unit, as an estimate of the number of baths to be given. For Targeted Decolonization, use the number of total unit patient-days for patients who meet criteria.
    - Number of total unit admissions as an estimate of the number of nasal decolonization courses to be given. For Targeted Decolonization, use the number of total unit admissions for patients who meet criteria.
    - Unit-specific cost of chlorhexidine gluconate (CHG) bathing product (each bath).
    - Unit-specific cost of a 5-day course of mupirocin (or iodophor) (or the average length of stay on the unit, if shorter than 5 days).
* **Identify and Engage Key Stakeholders:** Obtaining stakeholder support for decolonization will require identifying and approaching key stakeholders. Key stakeholders include high-position personnel who are able to offer institutional support for the implementation of the protocol. Some potential stakeholders you may consider approaching include the Chief Medical Officer, Chief Nursing Officer, Director of Infection Control and Prevention, and Director of Quality Improvement. Who and how you approach these key stakeholders will depend on the culture, standard processes, and existing relationships at your hospital. Brainstorm within your team to decide on the list and order of key stakeholders who you will need to approach. The diversity of perspectives among team members and leaders could be very useful.

Consider approaching the following groups:

* + ***Infection Prevention Program:*** The hospital Infection Prevention and Control program will be a crucial partner in the implementation of decolonization. Ensure that the entire Infection Prevention program (e.g., hospital epidemiologist, director of infection prevention, and the infection preventionist providing support to your unit) is fully supportive, understand the rationale and the evidence, and are willing to speak to this endeavor. Invite a representative to join your team (if a representative is not part of your team already).
  + ***Unit Directors (nursing, physician):*** Unit leadership, including the medical director, nurse manager, or nurse educator, is essential for support. The nursing and physician leadership can provide important logistical support and critical insight into items—such as bathing shifts, recommended bathing time, approaches to developing a standardized protocol, successful methods for rollout, and concurrent campaigns. Their input and support will be essential for your team; ideally, they would be involved in your team’s meetings.
  + ***Purchasing:*** The purchasing department can provide estimates of current hospital-specific product costs and may be able to engage in price negotiations due to bulk purchasing of decolonization supplies.
  + ***Hospital Administration and Leadership:*** Gaining the support from the Chief Executive Officer, Chief Medical Officer, and Chief Nursing Officer will be important for a successful decolonization program. Be prepared to present the business case (including anticipated product costs), provide a list of supporting stakeholders, and outline your implementation strategy, including your targets and goals. Having an engaged and active senior executive as a member of your team is invaluable to secure broad institutional backing. If you do not yet have a senior executive member on your team, this would be a good time to recruit one.

### Common Stakeholder Questions

It’s helpful to be prepared for common stakeholder questions on decolonization. Below are some typical questions and tips on how to address them:

1. **What is the evidence for decolonization?**You should refer to the presentation titled **“**[**The Evidence Behind Decolonization Strategies for MRSA**](http://www.ahrq.gov/hai/tools/mrsa-prevention/toolkit/decolonize-patients.html)**,**” available on the Toolkit’s Decolonization topic page, for more in-depth information and talking points.

Some of the more notable studies on decolonization are listed below:

* + **Vernon MO, Hayden MK, Trick WE, et al.1**   
    Chlorhexidine gluconate to cleanse patients in a medical intensive care unit: the effectiveness of source control to reduce the bioburden of vancomycin-resistant enterococci.   
    *Arch Intern Med*. 2006 Feb 13;166(3):306-12. PMID: 16476870.
  + **Climo MW, Sepkowitz KA, Zuccotti G, et al.2**The effect of daily bathing with chlorhexidine on the acquisition of methicillin-resistant *Staphylococcus aureus*, vancomycin-resistant *Enterococcus*, and healthcare-associated bloodstream infections: results of a quasi-experimental multicenter trial.   
    *Crit Care Med*. 2009 Jun;37(6):1858-65. PMID: 19384220.
  + **Bleasdale SC, Trick WE, Gonzalez IM, et al.3**  
    Effectiveness of chlorhexidine bathing to reduce catheter-associated bloodstream infections in medical intensive care unit patients.   
    *Arch Intern Med*. 2007 Oct 22;167(19):2073-9. PMID: 17954801.
  + **Popovich KJ, Hota B, Hayes R, et al.4**   
    Effectiveness of routine patient cleansing with chlorhexidine gluconate for infection prevention in the medical intensive care unit.   
    *Infect Control Hosp Epidemiol*. 2009 Oct;30(10):959-63. PMID: 19712033.
  + **Climo MW, Yokoe DS, Warren DK, et al.5**   
    Effect of daily chlorhexidine bathing on hospital-acquired infection.   
    *N Engl J Med*. 2013 Feb 7;368(6):533-42. PMID: 23388005.
  + **Milstone AM, Elward A, Song X, et al.6**  
    Daily chlorhexidine bathing to reduce bacteraemia in critically ill children: a multicentre, cluster-randomised, crossover trial.   
    *Lancet*. 2013 Mar 30;381(9872):1099-106. PMID: 23363666.6
  + **Huang SS, Septimus E, Kleinman K, et al.7**  
    Targeted versus universal decolonization to prevent ICU infection.   
    *N Engl J Med*. 2013 Jun 13;368(24):2255-65. PMID: 23718152.
  + **Huang SS, Septimus E, Kleinman K, et al.8**  
    Chlorhexidine versus routine bathing to prevent multidrug-resistant organisms and all-cause bloodstream infections in general medical and surgical units (ABATE Infection trial): a cluster-randomised trial.   
    *Lancet.* 2019 Mar 23;393(10177):1205-1215. PMID: 30850112.

1. **What is the unit’s need for this intervention?**To answer this question, consider sharing your hospital’s and unit’s MRSA and bloodstream infection rates, current national guidelines and benchmarks, and relevant regulations. In particular, highlight any elevated rates of MRSA. Consult your hospital’s Infection Preventionist for accurate data. You may want to refer to the above section on **Assess Your Unit’s Current MRSA Status**.

Existing guidance and position statements from national committees and societies, survey requirements for accreditation, and state laws related to healthcare-associated infections may also be cited in support of decolonization. Some of these are listed below:

* + **CDC Healthcare Infection Control Practices Advisory Committee (HICPAC)17:**   
    <https://www.cdc.gov/infectioncontrol/guidelines/index.html>
  + **Society for Healthcare Epidemiology of America (SHEA)18:**<https://shea-online.org/guidance/>
  + **SHEA/IDSA/APIC Compendium of Strategies to Prevent HAIs in Acute Care Hospitals19:**   
    <https://shea-online.org/compendium-of-strategies-to-prevent-healthcare-associated-infections-in-acute-care-hospitals/>

You can also mention these materials from the [**AHRQ Toolkit for MRSA Prevention for ICU and non-ICU**](https://www.ahrq.gov/hai/tools/mrsa-prevention/toolkit/welcome.html), which includes program development materials and educational and training materials, available for your use. These materials can be customized to fit your needs.

1. **What is the cost of this intervention?**In response to this question, you may want to put together a business case to concisely deliver this information. Refer to Prepare a Business Case in the previous section on **Garner Institutional Support**.
2. **Who is supportive of this intervention?**   
   Be prepared to demonstrate support from key stakeholders within your institution. Consult closely with your team members to discuss which stakeholders you should approach. Refer to the previous section on **Garner Institutional Support**.
3. **Is decolonization just about reducing MRSA?**   
   No, decolonization is not limited to MRSA reduction. In fact, studies have shown that decolonization with daily chlorhexidine bathing and nasal mupirocin is effective at reducing bloodstream infections caused by a variety of pathogens. For example:
   * The REDUCE MRSA trial demonstrated that Universal Decolonization in ICUs reduced all-cause bloodstream infections by 44 percent.7
   * The ABATE trial resulted in a reduction of 31 percent in all-cause bacteremia and 68 percent in VRE clinical culture among patients with devices in non-ICUs.8

Chlorhexidine is broadly active against most bacteria and some fungi, supporting its use in reducing infections due to all pathogens. For more information on the evidence, refer to the presentation“[**The Evidence Behind Decolonization Strategies for MRSA**](http://www.ahrq.gov/hai/tools/mrsa-prevention/toolkit/decolonize-patients.html)” on the Decolonization page of the Toolkit website.

1. **What is the added benefit of nasal decolonization over the daily chlorhexidine baths alone?**There are several benefits to combining chlorhexidine bathing and nasal decolonization.
   * *Staphylococcus aureus* is the second-most reported cause of healthcare-associated infections in the United States. It is the most common cause of ventilator-associated pneumonia, the most common cause of surgical site infections, and the third most common cause of central line-associated bloodstream infections in ICUs. This includes both methicillin-sensitive (MSSA) and methicillin-resistant (MRSA) strains.20
   * The nose serves as the major reservoir of *S. aureus.*21,22 Because of the nasal reservoir, evidence shows that combining nasal decolonization with CHG bathing is significantly more effective for eradication of MRSA and MSSA than use of chlorhexidine alone.23-25
   * The best researched and most effective nasal decolonization agent is mupirocin. However, nasal iodophor (povidone-iodine) is a viable alternative for nasal decolonization.26 Compared with mupirocin, iodophor is considered less likely to lead to resistance and does not require a prescription.
2. **What if our clinicians prefer to use another nasal decolonization product instead of mupirocin?**While mupirocin has proven more effective than iodophor,27 some facilities may prefer iodophor due to concerns of developing mupirocin resistance, or for logistical reasons, such as avoiding the need for prescription, especially in outpatient settings (e.g., preoperative decolonization) where filling a prescription may pose a challenge for patients. For this reason, this toolkit also provides guidance and material on the use of nasal iodophor as an alternative to mupirocin.26

However, in a recent large-scale study, the “Mupirocin-Iodophor Swap Out Trial,” the authors found that a universal decolonization strategy combining mupirocin and CHG use was more effective for prevention of *S. aureus* and MRSA clinical isolates than a strategy combining iodophor and CHG use.27

The trial also examined a health system that had been using universal mupirocin and CHG in ICUs and found that the associated clinical benefit had not diminished across 7 years of continuous use. This suggested no clinically significant resistance to mupirocin had emerged across this period.

For more detailed information on nasal decolonization, please refer to the presentation,“[**The Evidence Behind Decolonization Strategies for MRSA**](http://www.ahrq.gov/hai/tools/mrsa-prevention/toolkit/decolonize-patients.html)” on the Decolonization page of the Toolkit website.

* **Are there specific formulations of chlorhexidine and nasal decolonization products that should be used?**The protocols provided in this toolkit include:
  + Bed bathing with 2-percent CHG pre-impregnated cloths
  + Bed bathing with 2-percent CHG liquid solution, diluted from 4-percent CHG liquid in a basin
  + Patient self-showering with 4-percent CHG liquid
  + Nasal decolonization with 2-percent mupirocin ointment
  + Nasa decolonization with 10-percent iodophor (povidone-iodine)

There have been no notable trials directly comparing the effectiveness of different CHG formulations or other antiseptic bathing products.

It is worth noting that different methods of application may affect the concentrations of CHG applied to the skin. The protocols provided in this toolkit are based on the protocols utilized in the REDUCE-MRSA trial, ABATE trial, and the Mupirocin-Iodophor Swap Out Trial, which compared the use of intranasal 10-percent povidone-iodine swabs plus 2-percent no-rinse CHG cloth baths to intranasal 2-percent mupirocin ointment plus 2-percent no-rinse CHG cloth baths, and found that mupirocin was superior.8,27 Theoretically, methods that deliver a similar amount of active decolonizing agent to the skin and nose should achieve similar outcomes.

If using iodophor, the protocol provided is based on a single 10-percent iodophor swab per nostril. A recent study has shown that regimens of 1-swab-per-nostril 10-percent iodophor and 2-swabs-per-nostril 5-percent iodophor demonstrated equivalent effectiveness.28

1. **Should we be concerned about producing antimicrobial resistance?**   
   As with all antimicrobials, we must be vigilant about antimicrobial resistance. The benefits and potential risks should be weighed with any strategy. Some discussion points include:
   * Because chlorhexidine is an antiseptic and is not used to treat active infection, resistance to this agent will not result in the loss of an antimicrobial for therapy.
   * Iodophor is also an antiseptic, so resistance will also not result in the loss of a therapeutic option.
   * Evidence for emergence of mupirocin resistance is mixed. Some studies have reported increased mupirocin resistance with broad mupirocin use,29,30 some reported increased resistance in the absence of broad mupirocin use,31 and some reported no increase in resistance with broad mupirocin use.32-35 Recently, the Mupirocin-Iodophor Swap Out Trial found that the clinical benefit associated with the mupirocin and CHG decolonization was undiminished after 7 years of continuous ICU use in the same health system, which suggested a lack of clinically significant resistance to mupirocin across this period.35 Nevertheless, ongoing surveillance by researchers and national surveillance systems will be important in monitoring for resistance to decolonization products.
   * If your hospital has data on local mupirocin resistance, these data can be used to guide decision-making. Since mupirocin resistance is not routinely tested, most hospitals will not have access to local resistance data.
   * Chlorhexidine resistance has rarely been reported in the United States.35
2. **Aren’t some bacteria good for us? Will this strategy remove good bacteria?**While it’s true that many bacteria on the skin are harmless or even beneficial, hospitalization increases the risk of these bacteria causing harm. The use of intravenous lines and medical devices, the presence of surgical wounds and other breaks in the skin, and reduced immunity due to illness or medication all contribute to an increased chance that normally harmless bacteria can enter sterile places and cause an infection.

## Develop a CUSP Team

The Comprehensive Unit-based Safety Program, or CUSP, is a proven patient safety and quality improvement framework that is integrated into the AHRQ Toolkit for MRSA Prevention. A core element of CUSP is the CUSP team, comprised of frontline staff who initiate and drive the implementation of patient safety interventions. For more detail on CUSP, refer to the sections on“[**Why Choose a CUSP Approach**](http://www.ahrq.gov/hai/tools/mrsa-prevention/toolkit/cusp-approach.html)” and “[**How To Integrate a CUSP Approach**](http://www.ahrq.gov/hai/tools/mrsa-prevention/toolkit/integrate-cusp-approach.html)” on the Toolkit website.

Implementing a CUSP program is not required to use these decolonization guides or materials. CUSP principles are embedded into the Toolkit’s design, so it can be used effectively without a formal CUSP structure.

Even without a formal CUSP team in place, assembling a dedicated **Decolonization Team** that will oversee the decolonization planning and rollout is essential for success. Your team should include representatives from all key roles involved in decolonization, including nurses, physicians, nurses’ aides, environmental services, and infection prevention personnel. A diversity of perspectives broadens your team’s awareness and helps prevent oversights.

Recruiting a senior executive to the decolonization team can significantly enhance your project. Their involvement lends credibility and facilitates access to resources necessary for implementation. Additionally, they serve as a liaison between the team and hospital administration, helping to navigate institutional challenges. The senior executive should be an active and engaged member of the team. If you are having trouble identifying a senior executive on your own, reach out to your hospital’s quality or leadership office for assistance.

Engagement is critical to the success of any patient safety initiative. Cultivate a shared understanding among your team members. Ensure that everyone has a role and that every task has someone assigned to it. Foster an environment where all team members are encouraged to speak up and contribute.

Building and developing your decolonization team is a continuous, ongoing process. The team should remain flexible, adapting to feedback and challenges. It’s advisable to welcome newcomers and keep meetings open for all who are interested. Sustaining team engagement is vital for the long-term success of your decolonization program.

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**Adapted from** “Universal ICU Decolonization: An Enhanced Protocol”:

[*https://www.ahrq.gov/hai/universal-icu-decolonization/index.html*](https://www.ahrq.gov/hai/universal-icu-decolonization/index.html)

and

“Toolkit for Decolonization of Non-ICU Patients With Devices”:

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