**Title:** Epidemiology and Genomics of a Slow Outbreak of MRSA in a NICU: Successful Chronic Decolonization of MRSA-Positive Health Care Personnel

**Supplementary Material**

**Supplementary Methods**

We isolated DNA from the MRSA samples and constructed sequencing libraries on a microfluidics platform based on the Nextera protocol1 and sequenced on the Illumina Hiseq2500. All samples were dual indexed 2x151bp reads and sequenced to a minimum of 100X depth. Duplicate reads were marked and ignored using Picard tools v1.8 (https://broadinstitute.github.io/picard/). Genome assemblies were generated using SPAdes v3.12.02. We determined multi-locus sequence typing (MLST) in silico using de novo assemblies and PUBMLST ([https://pubmlst.org/saureus/](https://urldefense.proofpoint.com/v2/url?u=https-3A__pubmlst.org_saureus_&d=DwMFaQ&c=WO-RGvefibhHBZq3fL85hQ&r=IO9bqyd-bJxQHVdEqT0rAuAuGNsMADmtXOE9nKCLjP8&m=LR4w6vfzRUXrVGYtQA8EKEZnrSBTqhV1eIZXGSnTHVU&s=97j1qoUjRbwzX8g2KrfU49Y_SwPe6VwgJ150xnkEdfM&e=)) using custom scripts. Recombination events were predicted and masked using Gubbins3. Paired end reads from the outbreak specimens were mapped by BWA mem v0.7.134 to matching MLST USA300-TCH1516 (NC\_010079.1), and ST5 and ST6 and ST72 isolates were mapped to N315 (NC\_002745.2). We called SNPs via Pilon v1.22 ([https://www.broadinstitute.org/gaag/pilon](https://urldefense.proofpoint.com/v2/url?u=https-3A__www.broadinstitute.org_gaag_pilon&d=DwMFaQ&c=WO-RGvefibhHBZq3fL85hQ&r=IO9bqyd-bJxQHVdEqT0rAuAuGNsMADmtXOE9nKCLjP8&m=LR4w6vfzRUXrVGYtQA8EKEZnrSBTqhV1eIZXGSnTHVU&s=XlqPdy6Ab7kFGu5kc-IVlYMLVeRRD8LQjpeKtPR8VGU&e=))5 requiring a read depth of 10, minimum mapping quality of 30 and major allele fraction >0.85. Pairwise SNP distance matrix was computed using snp-dists (https://github.com/tseemann/snp-dists). We used RAxML to generate Maximum likelihood phylogenies5. We reconstructed potential transmission events using SCOTTI, a structured coalescent-based tool for reconstructing transmission within outbreaks6, combining epidemiological data and the genetic data from ST8 outbreak isolates. SCOTTI parameters were set for 100 million iterations sampling every 10000, the number of hosts was set at 32 allowing for unsampled hosts and first baby case date was used as the outbreak start date. We confirmed convergence using Tracer7 and used Figtree v1.4.3 to visualize the phylogeny. Raw sequencing reads are available through NCBI SRA, project accession PRJNA787392.

**Supplementary discussion:**

MRSA-positive isolates from babies and HCP that were closely genetically related (<26 SNPs) indicated likely transmission within the unit. This continued to intermittently occur despite decolonization efforts and cultures confirming MRSA clearance, suggesting either re-colonization after successful decolonization or poor sensitivity of the 3-site screens (Figure 3, Supp. Figures 1, 4). The isolates collected form HCP 02H-A had higher SNP distances (up to 22 SNPs) compared to the rest of the hosts (< 6 SNPs); this may reflect greater within-host diversity in 02H-A. The intermittent screening of HCPs, which only began in January 2017 complicates accurate transmission reconstruction, as the analysis is sensitive to collection and exposure dates. In addition, HCP carriage is unknown during the period without screening, and undetected colonization can allow for continued *S. aureus* accumulation of genetic diversity within hosts.

Although transmission reconstruction can provide useful information about the outbreak dynamics, a number of factors may influence the accuracy of transmission reconstruction. These include biases in sampling, uncertainty in the timing of onset of colonization (Supp. Figure 5), imperfect MRSA screening, within host genetic diversity, transmission bottlenecks, as well as sequencing and SNP calling artifacts. Caution is therefore warranted in interpreting the results. The genomic information can however reliably infer clonality of isolates as well as exclude individuals or transmission events.

**Supplementary Figures and Tables**



Supplementary Figure 1: Outbreak timeline showing screening dates and swab results. Y-axis labels with an “H” indicate HCP, and “B” for babies. Point shape represent PFGE pattern. White circles represent negative screens, colored points represent positive screens. Point color represents MLST. Admission and discharge dates of babies represented by blue segment length. All HCP continued to work throughout the outbreak timeline except for one denoted by an asterisk (\*).



Supplementary Figure 2. Proposed indirect network inferred using SCOTTI for the outbreak ST8 isolates ignoring negative screens (methods T-1). Blue rings correspond to HCW and grey rings to patients. Arrows represent predicted transmission direction and corresponding probability (P > 0.15); arrow color intensity is proportional to probability.



Supplementary Figure 3: Proposed indirect network inferred using SCOTTI for the outbreak ST8 isolates factoring in negative screens (method T-2). Blue rings correspond to HCW and grey rings to patients. Arrows represent predicted transmission direction and corresponding probability (P > 0.15); arrow color intensity is proportional to probability. Grey circle indicates inferred index case and corresponding probability is denoted with in.



Supplementary Figure 4: Pairwise SNP distance matrix of all isolates collected from the NICU during the outbreak period. Order corresponds to maximum likelihood phylogeny tree (left and bottom panels). Isolate labels from HCPs are colored in red. Color intensity within the matrix corresponds to SNP distance, with lighter color representing lower pairwise SNP count and grey squares denoting self. SNP distances <100 are displayed within cells.



Supplementary Figure 5: Inferred direct transmission network inferred by SCOTTIE ignoring negative screens and assuming that the first HCP carrier may have preceded the first baby case thus modifying outbreak start date to 6 months prior to first baby positive screen (April 2016). Blue rings correspond to HCP. arrows represent predicted transmission direction and corresponding probability (P > 0.15); arrow thickness is proportional to probability.

Supplementary Table 1: Genotype-derived resistance phenotype\* for all cases with cluster strain

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Oxacillin N (%) | Penicillin N (%) | Trimethoprim/ Sulfamethoxazole N (%) | Ciprofloxacin N (%) | Erythromycin N (%) | Clindamycin N (%) | Mupirocin N (%) | Tetracycline N (%) |
| Babies (N=15) | 15 (100%) | 15 (100%) | 15 (100%) | 13 (87%) | 6 (40%) | 5 (33%) | 5 (33%)\*\* | 6 (40%) |
| HCW (N=6) | 6 (100%) | 6 (100%) | 6 (100%) | 6 (100%) | 3 (50%) | 2 (33%) | 2 (33%) | 2 (33%) |
| hosts with variable ASTs |  |  |  |  | 02H-A 15B-J | 02H-A | 02H-A | 02H-A |

\* Resistance here is based upon the presence of a resistance gene or mutation rather than microbiologic susceptibility testing in the laboratory”.

\*\* Mupirocin-resistance was first identified in case #9 when persistent carriage was noted despite decolonization. It was also found in isolates from cases #11, #12, and, retrospectively, from cases #2 and #3.

**Supplementary References**

1. Kim S, Jonghe JD, Kulesa AB, et al. High-throughput automated microfluidic sample preparation for accurate microbial genomics. *Nat Commun* 2017;8:13919.
2. Bankevich, A. *et al.* SPAdes: A New Genome Assembly Algorithm and Its Applications to Single-Cell Sequencing. *Journal of Computational Biology* **19**, 455–477 (2012).
3. Croucher, N.J., Page, A.J., Connor, et al. Rapid phylogenetic analysis of large samples of recombinant bacterial whole genome sequences using Gubbins. *Nucleic Acids Res* 2015;43:e15.
4. Li, H., and Durbin, R. Fast and accurate short read alignment with Burrows-Wheeler transform. *Bioinformatics* 2010;26:589-595.
5. Walker BJ, Abee T, Shea T, et al. Pilon: An integrated tool for comprehensive microbial variant detection and genome assembly improvement. *PLoS One* 2014;9:e112963.
6. Stamatakis, A. RAxML version 8: a tool for phylogenetic analysis and post-analysis of large phylogenies. *Bioinformatics* 2014;30, 1312–1313.
7. Maio ND, Wu CH, and Wilson DJ. SCOTTI: Efficient reconstruction of transmission within outbreaks with the structured coalescent. *PLoS Comput Biol* 2016;12:e1005130.
8. Bouckaert R, Heled J, Kuhnert D, Vaughan T, Wu C-H, et al. BEAST 2:A Software Platform for Bayesian Evolutionary Analysis. *PLoS Comput Biol* 2014;10(4): e1003537.

**Supplementary Protocols**

1. **University of California Irvine Health:**

**NICU Infection Prevention Policy**

1. **Policy**
2. An initial hand wash to the elbows with soap and water is required by all personnel when initially entering unit. All visitors will perform a hand wash at the sink with **EVERY** entry.
3. For healthcare staff re-entering NICU (after initial hand wash has been performed), hand gel prior to re-entry.
4. Additional hand hygiene (soap and water or alcohol-based gel) should be performed immediately prior to and after contact with an infant, before and after room entry, before and after use of the bedside computers/equipment.
5. Infants requiring airborne precautions should be transferred to a negative –pressure isolation room. Epidemiology and Infection Prevention (EIP) should be notified of the patient and will assist in further determining how long the infant needs to remain in airborne precautions.
6. Standard Precautions are the primary method to prevent infection. Utilize appropriate personal protective equipment based on activity regardless of isolation status.
7. No balloons, plants, or food are allowed.
8. No stuffed animals or toys are allowed in patient’s bed. Washable developmental toys will be wiped with disinfectant solution and dried before and after use.
9. Infants requiring isolation precautions (except airborne precautions) can be cared for in any bed location, by any staff member in the NICU. It is not routinely necessary to cohort or alter normal staffing ratios or assignments.
10. All infants transported in from an outside facility or admitted directly from home or outpatient clinic will be placed in contact precautions and placed in a single patient room until the initial MRSA screen has resulted. **EXCEPTION:** NICU team attends delivery at outside facility; in this case contact precautions are not indicated.
11. “Code clean” activities occur each shift (1300, 0100) to include a pause in activities, and a wipe down of NICU common surfaces antiseptic wipes. Common surfaces include but not limited to: Pyxis surface, common desk surfaces, medication room, door handles (see attached document, “NICU Cleaning Activities”).
12. **Required Steps**
13. **Initial Unit Entry Protocol (see attached)**

**Initial Hand Wash:** Health Care Provider and Visitors

* 1. Prior to entry to the NICU, clean cell phone and badge with alcohol wipe.
  2. Remove wrist jewelry and any rings, keep in pocket or locker. Remove any clothing or lab coat to expose forearms.
  3. At the sink, use nail pick to clean underneath all fingernails.
  4. Turn water on to a comfortable temperature using foot control. Wet forearms and hands.
  5. Apply soap. Rub hands and arms to elbows using mechanical action and friction. Care must be taken to include cleaning between fingers.
  6. Rinse hands and arms thoroughly. Dry using paper towels and discard towels in step-on trash receptacle.

1. **Re-Entry Protocol: Health Care Providers ONLY**
2. Use antiseptic gel with every re-entry. Gel should also include the wrists
3. **Re-Entry Protocol: Visitors**
4. Same as Initial Unit Entry Protocol
5. **Room Clean Following Patient Turnover:** Nursing and Housekeeping (see attachment)
6. Daily Cleaning Activities (Environmental Services, Nursing, Respiratory) (see attachment)
7. **Guidelines**
8. The content of this policy is in addition to the specific Epidemiology and Infection Prevention (EIP) policies available on the intranet including:
9. Hand Hygiene
10. Isolation Precautions and Standard Precautions
11. Multi Drug Resistant Organisms
12. Cleaning: Patient Care Items and High Touch Surfaces
13. Personnel will demonstrate accountability for their own health status by reporting off duty when they have a potential communicable disease or condition, complying with Occupational Health policies and procedures.
14. In the NICU, patients have the right to “bare arms” when receiving care. Implementation of this includes no rings or wrist jewelry of any kind is worn while providing direct patient care; sleeves will be pushed up to the elbows.
15. To reduce bioburden, staff perform three separate cleaning activities (see attached, **“NICU Cleaning Activities”):**
16. Beginning of Shift (BOS) Wipe Down (every 12 hours)
17. High Touch Cleaning (HTC) PRIOR TO routine hands-on care of patient: includes wiping down with disinfectant wipes those areas that may be touched while providing direct patient care. This may include but not limited to the following (see attached “NICU Cleaning activities”):

* Bedside cardiac monitor (silence buttons)
* Thermometer
* Stethoscope
* Ventilator screen, dials, blender dials

1. Code Clean

The details of each cleaning activity is outlined in the attachment

1. Within the infant’s immediate environment (crib or isolette), maintain a clean environment by separating “clean from dirty”:
2. Dirty items are at the foot of the bed
3. Clean items are kept at the head of the bed (stethoscope should be at the head of the bed)
4. Use the portable waste bags to contain dirty items while providing care (this is the preferred method to contain dirty items). Alternatively, use a white chux placed at the foot of the bed to collect dirty items. Dirty diapers are not to be placed on top of the isolette or trash can, on the floor or on patient bedside chart.
5. Bedside supply carts (nurse servers) are considered clean; enter with clean hands only
6. Toys: washable toys will be cleaned with disinfectant before leaving the patient’s room and cleaned again before placing in patient's room.
7. When holding infants, use a clean barrier (infant blanket, gown) to limit contact of infant with healthcare provider clothing and skin. Avoid close face-to-face contact with infant. Also consider additional precautions, as follows:
8. When providing care that requires close (12 inches or less), face-to-face contact for a prolonged period (15-20 minutes), wearing a mask is recommended
9. Gowning and use of mask with eye shield for any procedures in which respiratory secretions may be splashed (such as ventilator circuit change, tracheostomy care)
10. Hair should be restrained in a manner that prevents any contact with infant
11. Visitors (other than mothers; see guidelines below for specific information related to mother’s infectious disease status) identified with diagnosed communicable conditions (i.e. lice, scabies, flu, MRSA, etc.) will be required to be appropriately treated or symptom free prior to visiting. Please contact EIP for consultation and specific recommendations. Please refer to NICU Visitor Policy for additional recommendations pertaining to visitors.
12. Specific isolation precautions include:

|  |
| --- |
| **ISOLATION: Contact Precautions**  **(e.g. MRSA, VRE, C. difficile, Rotavirus and any diarrheal illness, Varicella/Chicken Pox lesions, RSV)** |
| 1.Place Contact Precautions sign on the isolette/crib |
| 2. Wear gloves and gown for all direct patient care, and any contact with patient items. Perform hand hygiene before and after glove use. |
| 3. Single patient rooms, staff gown and glove prior to entry to room and remove prior to exit |
| 4. Instruct visitors regarding precautions to be observed emphasizing hand hygiene and standard precautions. Gown and gloves are generally not required for visitors unless visitor has broken skin to cover. |
| 5.  If infant is to be transferred to another facility or unit, notify the receiving facility/unit of the organism/disease/condition prior to the transfer. |

|  |
| --- |
| **ISOLATION: Droplet Precautions**  **(e.g. Influenza, Pertussis, Rubella/German Measles, Bacterial meningitis)** |
| 1. Place a Droplet Precautions sign on the isolette/crib. |
| 2. Wear mask for all direct patient care |
| 3. If the infant has Rubella/German Measles, determine the immunization status/disease history of those caring for the infant. Those that do not have immunity must not care for the infant. (Per EIP policy). |
| 4. Instruct visitors regarding precautions to be observed including hand hygiene. Visitors should follow the same precautions as staff. |
| 5. If infant is to be transferred to another facility or unit, notify the receiving facility/unit of the organism/disease/condition prior to the transfer. |

|  |
| --- |
| **ISOLATION: Airborne Precautions**  **(e.g. Tuberculosis, Varicella/Chicken Pox, Rubeola/Measles)** |
| 1. Admit or transfer infant to a negative-pressure isolation room. |
| 2. Notify EIP of the patient for assistance in determining how long the infant will need to remain in Airborne Precautions. |
| 3. If the infant has Varicella/Chicken Pox or Rubeola/Measles, determine the immunization status/disease history of those caring for the infant. Those that do not have immunity must not care for the infant. (Per EIP policy). |
| 4. Instruct visitors regarding precautions to be observed including hand hygiene. Visitors should follow the same precautions as staff. |
| 5. If infant is to be transferred to another facility or unit, notify the receiving facility/unit of the organism/disease/condition prior to the transfer. |

|  |
| --- |
| **ISOLATION Precautions and Multidrug Resistant Organisms (MDRO)** |
| 1. **For babies of +MRSA/VRE/CRE/ESBL/MDRO moms:**  * No contact precautions (unless baby is also positive, then follow contact precautions) * Place in area with fewest other patients as possible; single patient room is preferred * Education of parents how to prevent MDRO transmission (hand hygiene). |
| 1. **For +MDRO babies:**  * Contact precautions * Decolonize for MRSA as appropriate * For breastfeeding, mom should wash hands and breast area first * For breastfeeding mom of multiples, mom should breastfeed the negative baby first, followed by the positive baby. * For multiples, visitors to hold negative baby first. |
| 1. **If Mom is +MRSA, recommend decolonization for mom (regardless of baby’s status)**    1. Mupirocin twice daily to both nares for a minimum of 5 consecutive days   AND daily chlorhexidine bathing for a minimum of 5 consecutive days |
| 1. If baby is +MRSA and mom is +MRSA or of unknown status, recommend decolonization of parents/primary caregivers. |

1. **References**
   1. Epidemiology and Infection Prevention Policy/Procedures as listed.
   2. NICU Visitor Policy
   3. Breastfeeding Under Special Circumstances
2. **Attachments:**
   1. NICU Entry Protocol
   2. Moving A Patient to a New Room Checklist
   3. Daily Cleaning Responsibilities
   4. NICU Cleaning Activities (Beginning of Shift Wipe Down, High Touch Cleaning, Code Clean)
3. **References**

Pickering LK, ed. Red *Book: 2021 Report of the Committee on Infectious Diseases*. 28th ed. Elk Grove Village, IL: American Academy

1. **University of California Irvine Health**

**NICU Decolonization Protocol: CHG Bathing Protocol and Nasal Mupirocin**

**Decolonization Protocol:**

1. Eligible patients will be bathed, using CHG (chlorhexidine gluconate) cloths (see below for bathing procedure)
2. Eligible patients will have nasal mupirocin applied to anterior nares twice daily X 5 days

**Decolonization Bathing Protocol:**

|  |  |
| --- | --- |
| **Criteria** | **Bathing Frequency** |
| Gestational age at birth ≤24 weeks **AND** greater than 6 weeks of age | Bathe, using CHG cloths (see below for bathing procedure) **ONCE** every 48 hours X 2 |
| Gestational age at birth ≥25-36 weeks **AND** ≥4 weeks of age | Bathe, using CHG cloths (see below for bathing procedure) **ONCE** every 48 hours X 2 |
| Gestational age at birth ≥36 weeks **AND** ≥ 3 days of age | Bathe, using CHG cloths (see below for bathing procedure) **ONCE** every 48 hours X 3 |
| All gestational ages ≥ 2 months of age (all gestational ages) | Bathe, using CHG cloths (see below for bathing procedure) **ONCE DAILY**, x 5 days |

**Exclusion: NO CHG bathing will be used in these infants:**

1. 72 hours of age or less, regardless of gestational age at birth
2. Unstable medical condition in which handling is contraindicated and/or may result in destabilization (unstable infants on iNO, pressors, etc); evaluate every shift if infant may tolerate decolonization bathing)
3. Infants with epidermolysis bullosa, or other significant skin disease (consult with medical team)

**Documentation:**

1. Document bathing occurrence in Epic, on the A/I flowsheet, under “cares”, and make the notation “CHG Bath” on the head-to-toe flowsheet, under hygiene/care and “bath”.

**Procedure:**

**A. Use provided 2% CHG cloths (2 per package)**

**B. DO NOT** use CHG wipes on eyes, ears, scalp, mucous membranes, or perineal area.

**C.** For infants **LESS THAN 2 months of age**, avoid the face.

**D. DO:** wipe the back, groin, axilla, arms, legs, torso, neck

**E.** Regular baths can be given on the non-CHG bath days

**Do not bathe immediately before CHG bath and no rinsing after CHG bathing:**

1. Obtain cloths and place in isolette approximately one hour before bathing is planned (warming is for patient comfort and not for product effectiveness); if infant is not in isolette, cloths do not need to be warmed but perform bath in warmed environment (use heat lamp to warm immediate area, per NICU routine)
2. Immediately prior to bathing, carefully inspect skin for rashes and document carefully in electronic medical record. If rash is extensive or any skin breakdown noted, do not bathe and notify medical team.
3. **Only 2 cloths** are needed for infants without devices (such as a central line or GTT).
4. For those infants with a central line, use a separate cloth **(cloth #3) to clean the extremity with the central line.**

**Bathe** In this sequence (following clean to dirty):

1. Place blue chux down to cover bed linens
2. **Using cloth #1**, wipe the back from the neck to the top of the buttock, legs, and groin
3. **Using cloth #2**, wipe the face (for infants 2 months or greater, carefully avoiding eyes), front of the torso, axillae, and arms
4. **If using cloth #3** (for infants with a central line or device only), wipe the arm/leg, or chest area in which the central line is located with cloth #3 and lightly over the central line dressing. Use this cloth also to clean GTT site and approximately six inches of the GTT tubing
5. Dispose of each cloth in the regular trash
6. Change linen after each bath

**Application of Nasal Mupirocin**

**Goal:** application of topical ointment to internal nares surfaces

1. Apply ointment to cotton-tip applicator, assuring coverage of ointment onto applicator is generous (but not occlusive to nares)
2. Insert into nares and swab all internal surfaces in a circular motion; perform at least two circles to assure spread of ointment
3. Repeat procedure for other nares, using new cotton-tip applicator

**Other Steps:**

1. After last decolonization bath, change isolette/crib/bassinet
2. After last application of mupirocin, change nasal cannula/CPAP prongs
3. **University of California Irvine Health:**

**Occupational Health: Healthcare worker *Staphylococcus aureus* Decolonization and Screening Regimen Guidance**

Developed by Multi-Disciplinary Working Group, including Epidemiology and Infection Prevention, Occupational Health, and Nursing Leadership in conjunction with Human Resources

**Purpose:** To address healthcare worker (HCW) colonization with *S. aureus* that poses a risk to the worker or to patients for transmissible spread. The most common contexts to which this guidance document will be applied will be 1) healthcare-related clusters or outbreaks, 2) HCW who present to occupational health with skin issues and a determination of safe return to work is needed. This document serves as a guidance document to support decision-making, which may need to be individualized depending on the situation.

1. **HCW with *S. aureus* Positive Status in Context of Cluster/Outbreak** 
   1. **Identification of HCW as a S. aureus Carrier and Initial Clearance**

* HCW may be screened for *S. aureus* (methicillin-resistant (MRSA) or methicillin-susceptible (MSSA)) in the setting of a MRSA/MSSA cluster/outbreak
* **Action 1:** During active outbreak, HCW with the organism of concern (MRSA/MSSA) should be removed from work regardless of clonality (often not yet known), given a 5-day decolonization (daily CHG bathing/showering plus bid nasal decolonization product), and required to have 3 negative 3-body site screens (nares, inguinal, axilla) on separate days before being cleared to return to work. NOTE: clearance requires BOTH the below
  + 3 negative 3-body site screens on 3 separate days in reasonable proximity
  + Skin status does not pose a risk to self or others
  1. **Identification of Additional HCW Risk Factors**

In evaluating the risk of the HCW as a source of transmission to patients and other HCW in the clinical setting the following should be assessed:

* Whether the current strain matches a current or prior cluster/outbreak strain
* Whether the HCW has a prior history of positivity for *S. aureus*
* Whether the HCW has skin issues
  1. **Scenario 1: HCW with an Outbreak Strain and Skin Condition**
* **Action 2:** After initial clearance, a long-term regimen of decolonization plus screening is strongly recommended due to the presence of skin issues and colonization with the outbreak strain. This is recommended to prevent transmission to patients and other HCW as well as to protect the HCW from infection.

***Initial Recommended Regimen:***

* Decolonization for 5 days every other week
* Weekly 3-site body screen (off decolonization for at least 2 days)
* Occ Health evaluations to include: documented assessment of skin status, adherence to decolonization regimen, and adherence to screening schedule
* Summarize status after 3 months to determine if there are issues related to skin status, failure to adhere, failure to screen in timely manner
* Re-evaluate status and regimen after **6 months** to possibly reduce frequency

***Recommended De-escalation Pathway if Successful:***

* After 6 months, if skin resolved/deemed minimal risk and all screens negative
  + In general, options are to double the time between screenings OR double the time between decolonization regimens
  + **Option 1:** Reduce screening to monthly, continue decolonization every other week
  + **Option 2:** Reduce decolonization to monthly, continue to screen every other week
  + Summarize status after 3 months to determine if there are issues related to skin status, failure to adhere, failure to screen in timely manner
  + Re-evaluate status after **6 months** to possibly reduce frequency
    - Elongate the element that was not elongated previously

***Recommended Escalation Pathway for Failure:*** Should resume the last regimen prior to de-escalation with negative screens for 6 months prior to consideration of another de-escalation attempt.

* 1. **Scenario 2: HCW with an Outbreak Strain without Skin Condition**
* **Action 2:** After initial clearance, a longer-term regimen of decolonization plus screening is recommended due to colonization with the outbreak strain. This is recommended to prevent transmission to patients and other HCW.

***Initial Recommended Regimen:***

* Decolonization for 5 days every other week
* Weekly 3-site body screen (off decolonization for at least 2 days)
* Occ Health evaluations to include: documented assessment of skin status (to ensure still clear), adherence to decolonization regimen, and adherence to screening schedule
* Summarize status after 3 months to determine if there are issues related to skin status, failure to adhere, failure to screen in timely manner
* Re-evaluate status and regimen after **3 months** to possibly reduce frequency

***Recommended De-escalation Pathway if Successful:***

* After 3 months, if skin remains a non-issue **and all screens negative**
  + In general, options are to double the time between screenings OR double the time between decolonization regimens

***Recommended Escalation Pathway for Failure:*** Should resume the last regimen prior to de-escalation with negative screens for 3 months prior to consideration of another de-escalation attempt.

* 1. **Scenario 3: HCW with non-outbreak strain with skin condition**
* Refer to Section II below
  1. **Scenario 4: HCW with non-outbreak strain (incidental finding) without skin condition, but has a history of prior MRSA/MSSA status (propensity to carry/intermittent carrier established)**
* Needs discussion whether Action 1 sufficient or desire (by HCW or UCI multi-disciplinary team) to have further assessment.
* Option 1: Action 1 is sufficient
* Option 2: Institute monthly screens for 3 months and re-evaluate
  1. **Scenario 5: HCW with non-outbreak strain (incidental finding) without skin condition, and no history of prior MRSA/MSSA status**
* Action 1 is sufficient

**NOTE:** all the above regimens are subject to modification based upon individual considerations and discussion with EIP, Occ Health, HR, supervisor, and hospital leadership

**NOTE:** Efforts to ensure privacy (back entrance in Occ Health) will be made, if possible

1. **HCW with SubAcute or Chronic Skin Issues Reported to Occupational Health**

* NOTE: this guidance document does not apply to ***acute*** skin issues reported to Occupational Health (cut, abrasion, burn, fracture): Occ Health usual process applies
* **Action 1:** HCW should be assessed for *S. aureus* colonization status. If positive, give a 5-day decolonization (daily CHG bathing/showering plus bid nasal decolonization product), and require 3 negative 3-body site screens (nares, inguinal, axilla) on separate days before being cleared to return to work. NOTE: clearance requires BOTH the below
* 3 negative 3-body site screens on 3 separate days in reasonable proximity
* Skin status does not pose a risk to self or others
* **Action 2:** After initial clearance, a longer-term regimen of decolonization plus screening depends on persistence of skin issue and likelihood of transmission to patients and other HCW (extent, location, expected duration). If determined that a longer-term regimen is needed, then the below can be considered.

***Initial Recommended Regimen:***

* Decolonization for 5 days every other week
* Weekly 3-site body screen (off decolonization for at least 2 days)
* Occ Health evaluations to include: documented assessment of skin status (to ensure still clear), adherence to decolonization regimen, and adherence to screening schedule
* Summarize status after 3 months to determine if there are issues related to skin status, failure to adhere, failure to screen in timely manner
* Re-evaluate status and regimen after **3 months** to possibly reduce frequency

***Recommended De-escalation Pathway if Successful:***

* After 3 months, if skin remains a non-issue **and all screens negative**
  + In general, options are to double the time between screenings OR double the time between decolonization regimens

***Recommended Escalation Pathway for Failure:*** Should resume the last regimen prior to de-escalation with negative screens for 3 months prior to consideration of another de-escalation attempt.