Guideline for Infection Prevention in NICU Patients: Workgroup Update

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Overview

- *S. aureus*
  - Key Question Reorganization
  - Draft Recommendations
- CLABSI
  - Update
- Respiratory Illness
  - Update
- Core Practices for the NICU *(new)*

S. aureus Section 2017 Key Questions

1.1 What are the risk factors for endemic *S. aureus* infection in NICU patients? Do these factors differ between MRSA and MSSA? Do these factors differ in the setting of an outbreak?

1.2 What are the risk factors for endemic MRSA colonization in NICU patients? Do these factors differ in the setting of an outbreak?

1.3 What are the risk factors for endemic MSSA colonization in NICU patients? Do these factors differ in the setting of an outbreak?

2. Which anatomic sampling sites and laboratory assays most effectively identify *S. aureus* colonization in NICU patients?

3. What are the most effective strategies for preventing *S. aureus* transmission from colonized or infected NICU infants to other patients? Do these strategies differ between MRSA and MSSA or in the setting of an outbreak?

S. aureus Section 2018 Key Questions

1.A. What are effective strategies for preventing *S. aureus* transmission from colonized or infected NICU infants to other patients? Do these strategies differ between MRSA and MSSA or in the setting of an outbreak?

1.B. If active surveillance is conducted, which anatomic sampling sites and laboratory assays most effectively identify *S. aureus* colonization in NICU patients?

2.A. What are the risk factors for *S. aureus* infection in NICU patients? Do these factors differ between MRSA and MSSA or in the setting of an outbreak?

2.B. What are the risk factors for *S. aureus* colonization in NICU patients? Do these factors differ between MRSA and MSSA or in the setting of an outbreak?

S. aureus: Draft Recommendations - Summary

Evidence:

- KQ 1.A: 17 Observational studies
- All studies examined interventions of any kind (single or multi-strategy) and had to provide a clear description of the interventions and statistical analysis comparing time points before and after intervention
    - Multi Intervention Strategies: 9 studies
    - Single Intervention Strategies: 3 studies
    - Active Surveillance Testing to Guide Implementation of Infection Prevention and Control Measures: 10 studies
    - Infant Decolonization: 4 Studies

S. aureus: Draft Recommendations - Summary

Evidence:

- 5 diagnostic studies (KQ 1.B)
  - Studies of *S. aureus* test performance had to report test characteristics
  - Optimal testing strategy: 3 studies
  - Optimal site: 2 studies

S. aureus: Draft Recommendations

2.1.A. *Statement* **(Recommendation; Conditional Recommendation; No Recommendation)**

Supporting Evidence:

Level of confidence in evidence:

Benefits:

Harms:

Resource use:

Balance of benefits and harms:

Value judgments

Intentional vagueness:

Exceptions:

S. aureus: Draft Recommendations

2.1.A.1. Perform active surveillance testing for *S. aureus* in neonatal intensive care unit patients when there is an increased incidence of S. aureus infection or in an outbreak setting. **(Recommendation)**

Supporting Evidence: The evidence supporting this recommendation consists of ten observational studies reporting overall reductions in the outcomes of *S. aureus*, MRSA, or MSSA infection, colonization, or transmission. Transmission is a composite outcome of infection and colonization. (Delaney, Farrington, Geraci, Gill, Jernigan, Kaushik, Milstone Popoola, Wisgrill, Voskertchian)

Level of confidence in evidence: The level of confidence in this evidence is low because observational studies are considered at higher risk of bias than randomized controlled trials.

Benefits: The benefits that would result from implementing this intervention are a reduction in *S. aureus* infection, colonization, and transmission that would result from facility implementation of strategies targeting patients identified by active surveillance testing.

S. aureus: Draft Recommendations

2.1.A.1.(cont) Perform active surveillance testing for *S. aureus* in neonatal intensive care unit patients in an outbreak setting or when there is increased incidence of infection. **(Recommendation)**

Harms: Harms that could result from this recommendation include minor patient discomfort from performing nasal swabs. Identification of some infants with methicillin-resistant *S. aureus* colonization may result in the institution of Contact Precautions, which has inconsistently been associated with unintended consequences, such as decreased healthcare worker contact, in other populations. This literature search did not retrieve data suggesting harm from use of Contact Precautions in NICU populations.

Resource use: Implementing active surveillance testing would result in increased human and material costs, however it is anticipated that these costs will be less than the cost of invasive S. aureus infections in this vulnerable population that could be prevented by subsequent implementation of additional infection prevention strategies.

Balance of benefits and harms: There is a preponderance of benefit over harm for active surveillance testing for *S. aureus*.

S. aureus: Draft Recommendations

2.1.A.1.(cont) Perform active surveillance testing for *S. aureus* in neonatal intensive care unit patients in an outbreak setting or when there is increased incidence of infection. **(Recommendation)**

Value judgments: Infection prevention, patient safety, and outbreak management in this high-risk population were all considered in the formulation of this recommendation.

Intentional vagueness: The term *S. aureus* includes both methicillin sensitive *S. aureus* (MSSA) and methicillin resistant *S. aureus* (MRSA). An increased incidence of *S. aureus* infection may include a cluster of S. aureus infections or an increase in the endemic incidence of *S. aureus* infection compared to historical data from the unit or the published literature.

Exceptions: There are no exceptions to this recommendation.

S. aureus: Draft Recommendations

2.1.A.2. Perform active surveillance testing for MRSA colonization in neonatal intensive care unit patients when there is evidence of ongoing healthcare-associated transmission within the unit. **(Recommendation)**

Supporting evidence: The evidence supporting this recommendation consists of five observational studies reporting the outcomes of MRSA infection, colonization, or transmission. Transmission is a composite outcome of infection and colonization. (Farrington, Geraci, Jernigan, Kaushik, Milstone)

Level of confidence in evidence: The level of confidence in this evidence is low because observational studies are considered at higher risk of bias than randomized controlled trials.

Benefit: Implementation of active surveillance testing for MRSA will result in the implementation of infection control strategies that will result in a reduction in MRSA colonization and infection when there is evidence of ongoing healthcare associated transmission.

S. aureus: Draft Recommendations

2.1.A.2.(cont) Perform active surveillance testing for MRSA colonization in neonatal intensive care unit patients when there is evidence of ongoing healthcare-associated transmission within the unit. **(Recommendation)**

Risks, harms: Harms that could result from this recommendation include minor patient discomfort from performing nasal swabs. Identification of some infants with methicillin-resistant *S. aureus* colonization may result in the institution of contact precautions, which has been associated with harms in other populations. This literature search did not retrieve data suggesting harm from use of Contact Precautions in the NICU populations.

Resource Use: Implementing active surveillance testing for MRSA would result in increased human and material costs, however it is anticipated that these costs will be less than the cost of possible MRSA infections in this vulnerable population that could be prevented by subsequent infection prevention strategies.

S. aureus: Draft Recommendations

2.1.A.2.(cont) Perform active surveillance testing for MRSA colonization in neonatal intensive care unit patients when there is evidence of ongoing healthcare-associated transmission within the unit. **(Recommendation)**

Benefit-harm assessment: There would be a greater benefit than harm if this recommendation is followed.

Value judgments: Values considered in the formulation of this recommendation include patient safety and resource considerations.

Intentional vagueness: Healthcare-associated transmission within the unit is suggested by an increase in cases of MRSA colonization or infection determined by cultures obtained for clinical indications.

Exceptions: This recommendation only applies to MRSA.

S. aureus: Draft Recommendations

2.1.A.3. The use of active surveillance testing for MSSA colonization in neonatal intensive care unit patients to detect ongoing healthcare-associated MSSA transmission is an unresolved issue. **(No Recommendation)**

Supporting evidence: No evidence was retrieved evaluating the use of active surveillance testing to prevent transmission of MSSA colonization.

Level of confidence in evidence: This criterion is not applicable if there is no evidence.

Benefit: If a facility implements active surveillance testing for MSSA, it is likely that interventions implemented to reduce MSSA transmission would result in a decrease in MSSA infections.

Risks, harms: If facilities choose to conduct active surveillance for MSSA colonization, there may be minor patient discomfort from performing nasal swabs.

Resource use: There would be no additional resource use if facilities choose not to conduct active surveillance for MSSA. However, if facilities choose to conduct active surveillance for MSSA to implement interventions to reduce MSSA infection and colonization, there would be increased human and material costs.

S. aureus: Draft Recommendations

2.1.A.3.(cont) The use of active surveillance testing for MSSA colonization in neonatal intensive care unit patients to detect ongoing healthcare-associated MSSA transmission is an unresolved issue. **(No Recommendation)**

Benefit-harm assessment: MSSA is pathogenic and can cause invasive infections, however colonization with MSSA is common in the NICU setting. At this point, it is not clear that conducting active surveillance for MSSA colonization will lead to subsequent interventions that will reduce MSSA transmission, so the resource cost may outweigh the benefit. However, recent studies suggest that ASC may lead to subsequent interventions that can decrease MSSA infections.

Value judgments: Values considered in the formulation of this recommendation include the supporting evidence, patient safety, and resource considerations.

Intentional vagueness: Healthcare-associated transmission within the unit is suggested by an increase in cases of MSSA colonization or infection determined by cultures obtained for clinical indications.

Exceptions: This recommendation only applies to MSSA.

S. aureus: Draft Recommendations

2.1.A.4. If active surveillance testing for S. aureus colonization is implemented for neonatal intensive care unit patients, test routinely to promptly identify newly colonized patients. **(Recommendation)**

Supporting evidence: The evidence supporting this recommendation consists of ten observational studies. (Delaney, Geraci, Farrington, Jernigan, Kaushik, Milstone, Popoola, Ristagno, Voskertchian, Wisgrill)

Confidence in evidence: The level of confidence in this evidence is low because observational studies are considered at higher risk of bias than randomized controlled trials.

Benefit: Implementation of routine active surveillance testing will enable facilities to identify colonized patients promptly and guide implementation of appropriate infection prevention and control measures to reduce person-to-person transmission.

Risks, harms: There may be minor discomfort from performing nasal swabs in NICU patients.

S. aureus: Draft Recommendations

2.1.A.4.(cont) If active surveillance testing for S. aureus colonization is implemented for neonatal intensive care unit patients, test routinely to promptly identify newly colonized patients. **(Recommendation)**

Resource use: The frequency of testing will directly affect the costs, including human resources and laboratory resources.

Benefit-harm assessment: There is a preponderance of benefit over harm if this recommendation is implemented.

Value judgments: Values considered in the formulation of this recommendation include patient safety and resource considerations.

S. aureus: Draft Recommendations

2.1.A.4.(cont) If active surveillance testing for *S. aureus* colonization is implemented for neonatal intensive care unit patients, test routinely to promptly identify newly colonized patients. **(Recommendation)**

Intentional vagueness:

- The frequency for active surveillance testing is noted as “routinely” to allow facilities to sample weekly, or more or less frequently depending upon the facility’s baseline rates of colonized and infected patients, or as the unit epidemiology changes.
- The addition of admission testing in combination with routine testing is best determined by the facility.

Exceptions: There are no exceptions to this recommendation.

S. aureus: Draft Recommendations

2.1.A.5. If active surveillance testing for *S. aureus* colonization in neonatal intensive care unit patients is implemented, consider testing outborn infants or infants transferred from other newborn care units on admission to promptly identify newly admitted colonized patients. **(Conditional Recommendation)**

Supporting evidence: The evidence supporting this recommendation consists of five observational studies. (Delaney, Ristagno, Milstone, Popoola,, Voskertchian)

Level of confidence in evidence: The level of confidence in this evidence is low because observational studies are considered at higher risk of bias than randomized controlled trials. Additionally, three of the five studies supporting this recommendation are published by the same facility, potentially limiting the applicability of these results.

Benefit: If a facility implements this recommendation, due to higher endemic rates in the outborn population, a reduction in *S. aureus* colonization and infection could be seen.

S. aureus: Draft Recommendations

2.1.A.5.(cont) If active surveillance testing for *S. aureus* colonization in neonatal intensive care unit patients is implemented, consider testing outborn infants or infants transferred from other newborn care units on admission to promptly identify newly admitted colonized patients. **(Conditional Recommendation)**

Risks, harms: There may be minor discomfort from performing nasal swabs in NICU patients.

Resource Use: Implementing this recommendation would result in increased material and human resource costs.

Benefit-harm assessment: Implementing this recommendation would result in a balance of benefit and harm in situations where the difference in outborn and inborn colonization rates are minimal. There is a greater likelihood of benefit in situations where outborn and transferred infants have a higher *S. aureus* colonization rate.

Value judgments: Values considered in the formulation of this recommendation include patient safety, and economic and human resource costs.

S. aureus: Draft Recommendations

2.1.A.5.(cont) If active surveillance testing for S. aureus colonization in neonatal intensive care unit patients is implemented, consider testing outborn infants or infants transferred from other newborn care units on admission to promptly identify newly admitted colonized patients. **(Conditional Recommendation)**

Intentional vagueness:

- Benefit has also been seen in the literature in testing all neonates on admission. The recommendation specifies outborn infants or transferred infants because there was slightly greater benefit seen in this population in the literature. Units can consider their own unique epidemiologic needs when deciding the optimal population to test on admission.
- *S. aureus* includes methicillin resistant *S. aureus* (MRSA) and methicillin sensitive *S. aureus* (MSSA).

Exceptions: There are no exceptions to this recommendation.

S. aureus: Draft Recommendations

2.1.B.1. If active surveillance for *S. aureus* colonization in neonatal intensive care unit patients is performed, use culture-based or polymerase chain reaction detection methods. **(Recommendation)** (See Implementation Considerations).

Supporting Evidence: The literature search retrieved three diagnostic studies which support this recommendation. (Frances, Paule, Sarda)

Level of Confidence in the Evidence: The overall confidence in this evidence is moderate due to imprecision in the estimate of effect.

Benefits: If the recommendation is followed, facilities would be able to select the laboratory assay that best fits facility considerations and the needs at hand. This is because, while marginal, PCR offers increased sensitivity over culture for detecting *S. aureus*, yet culture has the advantage that if there is an isolate available for molecular typing and susceptibility tests.

S. aureus: Draft Recommendations

2.1.B.1.(cont) If active surveillance for *S. aureus* colonization in neonatal intensive care unit patients is performed, use culture-based or polymerase chain reaction detection methods. **(Recommendation)** (See Implementation Considerations).

Harms: PCR is more sensitive for detection of *S. aureus* and offers a small additional benefit over culture. PCR can have a more rapid turnaround depending on lab capabilities; however it has a lower specificity for detecting MRSA. While the workgroup concluded that culture is not likely to miss detecting a large number of *S. aureus*-colonized infants, the possibility exists that culture may result in a small number of *S. aureus*-colonized infants not being identified.

Resource Use: PCR is more expensive than culture.

S. aureus: Draft Recommendations

2.1.B.1.(cont) If active surveillance for *S. aureus* colonization in neonatal intensive care unit patients is performed, use culture-based or polymerase chain reaction detection methods. **(Recommendation)** (See Implementation Considerations).

Benefit-harm assessment: There is a benefit to using PCR vs. culture-based methods to detect *S. aureus* colonization, but this benefit is offset by important considerations. The sensitivity of PCR is slightly higher, but facilities should balance performance characteristics of the test, clinical management considerations, susceptibility testing, facility volume, outbreak identification, and test turnaround time when choosing an assay, as outlined above.

Value judgments: Value judgements include, test characteristics and availability, outbreak management, unit volume, economic considerations, need for a full susceptibility panel, speed of test turnaround, and resource utilization.

Intentional vagueness: The term *S. aureus* incudes MRSA and MSSA.

Exceptions: There are no exceptions to this recommendation.

S. aureus: Draft Recommendations

2.1.B.1. If active surveillance for *S. aureus* colonization in neonatal intensive care unit patients is performed, use culture-based or polymerase chain reaction detection methods. **(Recommendation)** (See Implementation Considerations).

Implementation Considerations

Although PCR may have higher sensitivity, multiple considerations influence which test a facility may use to screen for *S. aureus* colonization. These include, but are not limited to, outbreak identification; turnaround time; performance characteristics of the test; clinical management; the number of specimens combined with the capabilities of the laboratory providing the service; and resource utilization. Depending on laboratory capacity, molecular diagnostic testing methods such as PCR may be more useful in circumstances such as identifying an outbreak when there may be an increased volume of cultures to process and a faster turnaround time is needed. However, culture-based methods provide the benefit of lower cost and capturing specific susceptibility patterns to optimize patient treatment. Facilities and providers can balance these situation-specific needs to select the assay that best benefits their NICU patients.

S. aureus: Draft Recommendations

2.1.B.2. If active surveillance for *S. aureus* colonization of neonatal intensive care unit patients is performed, collect samples from at least the anterior nares of neonatal intensive care unit patients. **(Recommendation)** (See Implementation Considerations).

Supporting Evidence: The literature search identified two diagnostic studies which support this recommendation (Huang, Singh)

Level of Confidence in the Evidence: The level of confidence in this evidence is moderate due to inconsistent results across studies.

Benefits: The sensitivity of the anterior nares has the highest yield of the anatomic sites for identifying *S. aureus* colonization.

Harms: There may be minor discomfort from performing nasal swabs in NICU patients.. However, if neonates are not colonized in the anterior nares, and only the nares are sampled, then the colonization of that neonate at another anatomic site may be missed.

S. aureus: Draft Recommendations

2.1.B.2.(cont) If active surveillance for *S. aureus* colonization of neonatal intensive care unit patients is performed, collect samples from at least the anterior nares of neonatal intensive care unit patients. **(Recommendation)** (See Implementation Considerations).

Resource Use: There is increased cost, and use of laboratory and human resources associated with sampling more than one site.

Benefit-harm assessment: There is a preponderance of benefit over harm: The anterior nares is the most sensitive anatomic site for identifying colonized with *S. aureus* colonization, however there are some infants colonized at sites other than the anterior nares and those infants would be missed if only the nares are sampled. There is no patient level harm associated with sampling to axilla, rectum, or umbilicus. There is only the additional resource utilization and cost. While collecting samples from additional sites to the anterior nares increases sensitivity, it is not clear that the additional sites will have a meaningful impact on outcome or that the additional costs are warranted.

S. aureus: Draft Recommendations

2.1.B.2.(cont) If active surveillance for *S. aureus* colonization of neonatal intensive care unit patients is performed, collect samples from at least the anterior nares of neonatal intensive care unit patients. **(Recommendation)** (See Implementation Considerations).

Value judgments: Value judgements include test characteristics and resource utilization.

Intentional vagueness: The term *S. aureus* incudes MRSA and MSSA. "At least" is left intentionally vague to allow providers to determine alternate sampling sites.

Exceptions: There are no exceptions to this recommendation.

S. aureus: Draft Recommendations

2.1.B.2.a. Consider also collecting samples from the axilla, rectum, and umbilicus to increase yield. **(Conditional Recommendation)** (See Implementation Considerations).

Supporting Evidence: The literature search identified two diagnostic studies which support this recommendation (Huang, Singh)

Level of Confidence in the Evidence: The level of confidence in this evidence is moderate due to inconsistent results across studies.

Benefits: The yield from collecting samples from additional sites offers an incremental increase in sensitivity. During outbreak settings with a highly virulent strain, sampling additional sites might provide greater benefit.

Harms: There may be minor discomfort from performing nasal swabs in NICU patients. However, if neonates are not colonized in the anterior nares, and only the nares are sampled, then the colonization of that neonate at another anatomic site may be missed.

S. aureus: Draft Recommendations

2.1.B.2.a. (cont) Consider also collecting samples from the axilla, rectum, and umbilicus to increase yield. **(Conditional Recommendation)** (See Implementation Considerations).

Resource Use: There could be increased costs associated with running multiple assays (these costs include time, financial, human, and material resources).

Benefit-harm assessment: The benefit is possible but may not outweigh the costs and resources required. The benefit of testing additional sites may strengthen in periods in which increased sensitivity is needed, such as during an outbreak.

Value judgments: Sampling additional sites could increase the sensitivity of detection.

Intentional vagueness: The term *S. aureus* incudes MRSA and MSSA.

Exceptions: There are no exceptions to this recommendation.

S. aureus: Draft Recommendations

2.1.B.2. If active surveillance for *S. aureus* colonization of neonatal intensive care unit patients is performed, collect samples from at least the anterior nares of neonatal intensive care unit patients. **(Recommendation)** (See Implementation Considerations).

Implementation Considerations

- The available evidence suggests that the nares demonstrate higher sensitivity to detect MRSA in NICU patients. To increase the sensitivity of assay results, providers can sample at least two sites in NICU patients. If additional sites are desired, use the test that has been validated for the site to be sampled.
- In general, testing and sampling strategies that apply to MRSA also apply to MSSA, however future research may provide greater insight.

S. aureus: Draft Recommendations

2.1.C.1. Consider targeted decolonization therapy for *S. aureus*-colonized neonatal intensive care unit patients in an outbreak setting, or when there is on-going healthcare-associated transmission, or an increase in the incidence of infection, in addition to the implementation of and adherence to appropriate infection prevention and control measures. **(Conditional Recommendation)**

Supporting evidence: The evidence supporting this recommendation consists of three observational studies. (Huang, Popoola, Voskertchian)

Level of confidence in the evidence: The level of confidence in this evidence is low because observational studies are considered at higher risk of bias than randomized controlled trials. Two of these studies were performed in a single center NICU population

Benefit: Implementing decolonization therapy can result in a reduction in the *S. aureus* colonization rate of NICU patients, which then results in a reduction in *S. aureus* transmission and infection in NICUs.

S. aureus: Draft Recommendations

2.1.C.1.(cont) Consider targeted decolonization therapy for *S. aureus*-colonized neonatal intensive care unit patients in an outbreak setting, or when there is on-going healthcare-associated transmission, or an increase in the incidence of infection in addition to the implementation of and adherence to appropriate infection prevention and control measures. **(Conditional Recommendation)**

Risks, harms: Harms resulting from the implementation of this recommendation include significant systemic absorption of decolonizing agents, increased resistance to the decolonizing agent and adverse skin reactions.

Resource Use: Implementing this recommendation will result in increased material and human resource costs.

Benefit-harm assessment: The reduction in *S. aureus* colonization is balanced by concern for the development of antimicrobial resistance, antiseptic resistance, cross-resistance, and safety concerns due to significant systemic absorption of decolonization agents seen in this population.

S. aureus: Draft Recommendations

2.1.C.1.(cont) Consider targeted decolonization therapy for *S. aureus*-colonized neonatal intensive care unit patients in an outbreak setting, or when there is on-going healthcare-associated transmission, or an increase in the incidence of infection in addition to the implementation of and adherence to appropriate infection prevention and control measures. **(Conditional Recommendation)**

Value judgments: Values considered in the formulation of this recommendation include patient safety, antimicrobial stewardship and resistance concerns, federal regulatory approvals, and resource utilization.

Intentional vagueness: While colonized NICU patients are the most frequently targeted population for decolonization, the optimal population to target is left for the facility to determine.

Exceptions: There are no exceptions to this recommendation.

S. aureus: Draft Recommendations

2.1.C.2. The use of universal decolonization therapy in *S. aureus*-colonized neonatal intensive care unit patients is an unresolved issue. **(No Recommendation/ Unresolved Issue)**

Supporting evidence: The evidence supporting this recommendation consists of two observational studies. (Ristagno, Wisgrill)

Level of confidence in the evidence: The level of confidence in this evidence is low because observational studies are considered at higher risk of bias than randomized controlled trials.

Benefit: There could be a reduction of *S. aureus* colonization and infection rates in NICU patients if universal decolonization therapy was implemented.

Risks, harms: Harms include significant systemic absorption of decolonizing agents, and adverse events from the agent chosen for decolonization therapy. There is a greater concern for an increase in resistance to decolonizing agents if decolonization therapy is less discriminate in its application.

S. aureus: Draft Recommendations

2.1.C.2.(cont) The use of universal decolonization therapy in *S. aureus*-colonized neonatal intensive care unit patients is an unresolved issue. **(No Recommendation/ Unresolved Issue)**

Resource Use: If this recommendation were followed, resource use would change from lab costs to treatment costs, which, in some cases may increase, or decrease overall resource use.

Benefit-harm assessment: Universal decolonization may be more feasible and easier to implement, but would have unclear additional benefit beyond targeted decolonization therapy. There is a greater concern over the evolution of harms such as resistance to the decolonizing agent if it is applied broadly to an entire population in a unit.

Value judgments: Values incorporated into the formulation of this recommendation include patient safety, antimicrobial stewardship and resistance concerns, federal regulatory approvals, and resource utilization

Intentional vagueness: There is no intentional vagueness in this recommendation.

Exceptions: There are no exceptions to this recommendation.

S. aureus: Draft Recommendations

2.1.C.3. The optimal decolonization agent and/ or combination of agents remains an unresolved issue**. (No recommendation/unresolved issue)**

Supporting evidence: The evidence supporting this recommendation is approved labels from the U.S. Food and Drug Administration, and five observational studies. (Huang, Popoola, Ristagno, Voskertchian, Wisgrill)

Level of confidence in the evidence: This evidence is regulatory and low quality evidence because observational studies are at higher risk of bias than randomized controlled trials.

Benefit: A reduction is seen in *S. aureus* infection and colonization when intranasal decolonization is implemented, alone or in combination with antiseptic, in addition to the implementation of core infection prevention and control practices.

S. aureus: Draft Recommendations

2.1.C.3.(cont) The optimal decolonization agent and or combination of agents remains an unresolved issue**. (No recommendation/unresolved issue)**

Risks, harms: The safety and efficacy of intranasal mupirocin is not established in ages less than 12 years of age. Additionally, in neonates and premature infants, significant systemic absorption occurred following intranasal administration. Topical chlorhexidine cautioned for use with care in this population as well. The evidence retrieved by this analysis did not analyze systemic absorption. The harms of these decolonizing agents retrieved by this analysis include the development of resistance to the antiseptic or antibiotic agent, the development of cross-resistance, and the possibility of adverse skin reactions.

Resource use: Implementation of decolonization therapy would result in increased material and human resource costs.

Benefit-harm assessment: The harms include significant systemic absorption, the development of resistance or cross resistance, and topical reactions and the balance of these harms with the benefits is unclear.

S. aureus: Draft Recommendations

2.1.C.3.(cont) The optimal decolonization agent and or combination of agents remains an unresolved issue**. (No recommendation/unresolved issue)**

Value judgments: Values included in the formulation of this recommendation include federally approved labels, patient safety, antimicrobial stewardship, and resistance concerns, and resource utilization

Intentional vagueness: This recommendation does not specify a specific decolonization therapy because no single FDA-approved decolonization therapy has been consistently proven effective and safe in this population.

Exceptions: There are no exceptions to this recommendation.

S. aureus: Draft Recommendations

2.1.C.4. Appropriate procedures to allow discontinuation of Contact Precautions is an unresolved issue for individual neonatal intensive care unit patients who have a history of colonization or infection with MRSA. **(No Recommendation)**

Supporting evidence: No evidence was retrieved which could be used to formulate a recommendation.

Level of confidence in the evidence: This criterion is not applicable if no evidence was retrieved

Aggregate evidence quality: For patients with a history of *S. aureus* colonization or infection, continuing Contact Precautions for the duration of hospitalization can prevent transmission of *S. aureus* from patients with recurrent colonization.

Risks, harms: Even after decolonization, neonates can have recurrent colonization. Early discontinuation of Contact Precautions for patients with a history of colonization or infection can contribute to increased transmission of *S. aureus*. Contact Precautions, has inconsistently been associated with unintended consequences, such as decreased healthcare worker contact, in other populations. This literature search did not retrieve data suggesting harm from use of Contact Precautions in NICU populations.

S. aureus: Draft Recommendations

2.1.C.4.(cont) Appropriate procedures to allow discontinuation of Contact Precautions is an unresolved issue for individual neonatal intensive care unit patients who have a history of colonization or infection with MRSA. (No Recommendation.)

Resource Use: Implementation of Contact Precautions contributes to increased material and human resource costs.

Benefit-harm assessment: There would be a preponderance of benefit over harm, but this literature search retrieved no data to support a specific protocol by which to discontinue Contact Precautions (e.g. discontinue Contact Precautions after multiple negative cultures).

Value judgments: Value judgements used in the formulation of this recommendation include patient safety, familial bonding, local baseline colonization rates, and economic and human resource considerations.

Intentional vagueness: There is no intentional vagueness in this recommendation

Exceptions: There are no exceptions to this recommendation

Questions?

S. aureus KQ 2: Summary

- Risk factors were identified for *S. aureus* infection and for MRSA colonization
- For risk recognition, these demographic risk factors are worthy of further inquiry and could warrant the implementation of targeted interventions.
- This literature search did not retrieve evidence examining interventions for specific use in NICU patients at higher risk for *S. aureus* infection or colonization
- This literature search did not retrieve evidence targeting the optimal interventions to reduce *S. aureus* transmission specifically in NICU patients at higher risk of *S. aureus* infection or colonization
- Risk factors will be summarized in narrative.

S. aureus

Next Steps

- Workgroup review and incorporation of HICPAC Feedback
- Co-author approvals
- CDC Clearance
- Public Comment

CLABSI: What are effective strategies to prevent CLABSI in neonatal intensive care unit patients?

Literature Search

- 168 studies selected for inclusion
  - 72 studies included from 2012
    - under review
  - 96 pending extraction

CLABSI: What are effective strategies to prevent CLABSI in neonatal intensive care unit patients?

2012 Intervention categories with no new evidence:

- Closed Medication Systems
- Silver Alginate Dressing
- Filtered vs. non-filtered catheters
- Systemic Prophylaxis
  - Antimicrobial
  - Anticoagulant
- Central line antimicrobial locks

CLABSI: What are effective strategies to prevent CLABSI in neonatal intensive care unit patients?

New studies categorized according to intervention:

- Multi-intervention strategies, bundles, and checklists: 25
- Catheter site: 6
- Catheter type: 11
- Catheter duration: 2
- Catheter manipulation: 2
- Catheter tip placement: 5
- Insertion technique: 2
- Skin antisepsis: 3
- Line maintenance: 2 (e.g., catheter hub antisepsis)
- Chlorhexidine adverse events: 34
- Other: 4 (e.g., compliance measures; probiotic use)

CLABSI: What are effective strategies to prevent CLABSI in neonatal intensive care unit patients?

Next Steps

- Review 2012 analysis & draft recommendations
- Extract newly retrieved articles
- GRADE
- Draft Recommendations & Narrative

Respiratory Illness: What are effective strategies to prevent respiratory illness in NICU patients?

Progress

- 2012 extraction tables updated
  - 23 articles included
- Literature search update:
  - 557 studies retrieved for title and abstract screening
  - 112 studies selected for full text review

Respiratory Illness: What are effective strategies to prevent respiratory illness in NICU patients?

Next Steps

- Conduct full text review
- Extract and analyze studies

Core Practices for NICUs

- **2.1.A.1. (Original Draft Recommendation)** Implement core infection prevention and control strategies to prevent *S. aureus* transmission in neonatal intensive care unit patients. These strategies are hand hygiene, Standard Precautions, environmental cleaning, healthcare personnel education and training, and reinforcing implementation of and monitoring adherence to these strategies as outlined in Core Infection Prevention and Control Practices for Safe Healthcare Delivery in All Settings – Recommendations of the HICPAC (2017), and detailed in the respective guidelines. In addition to these strategies, implement Contact Precautions for MRSA-colonized or –infected infants. **(Recommendation)**

Core Practices for NICUs

NICU-specific practices

- Specific family & visitor education
- Recommendations on surveillance of high-risk population
- Hand hygiene appropriate to procedure performed
- Specific environmental recommendations (laundry, phenolics, isolette cleaning)
- Visitor screening

Questions

- Other NICU-specific core practices?
- NICU Core Practices Document format?

Workgroup members and support

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Thank you!

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.