Assessment of chlorhexidine gluconate (CHG) resistance in the setting of suboptimal compliance of CHG use on medical inpatient units

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Abstract

Background: Patient bathing with chlorhexidine gluconate (CHG) is being increasingly used as a horizontal approach to prevent nosocomial infections. Bathing compliance is critical to ensure the effectiveness of this approach, and poor compliance may result in the development of CHG resistance. After trialing CHG cloths on medical inpatients in an urban, academic hospital, compliance was estimated at 62%. This study sought to determine if resistance was induced in the context of suboptimal compliance.

Methods: A 6-month prospective study of CHG on 4 medical wards was conducted from June 2 – December 2, 2014, with 2 wards serving as controls, at an urban, academic hospital in Vancouver, Canada. All nosocomial isolates of methicillin-resistant Staphylococcus aureus (MRSA) from any clinical site (>3 days after admission or ≤3 days with a previous admission in the past 4 weeks), as well as all blood cultures positive for methicillin-susceptible Staphylococcus aureus (MSSA) identified >3 days after admission were included. For patients with multiple isolates, only the first isolate was tested. An in-house developed real-time PCR for the qacA/B and smr genes was utilized. Statistical analysis was based on Fisher’s exact test.

Results: 21 S. aureus isolates were identified during the study period, including 19 MRSA and 2 MSSA. Of the 21 isolates, 6 were recovered from the intervention wards and 15 from the control wards. One MRSA isolate (sputum) was positive for qacA/B and 1 MSSA isolate (blood) was positive for smr on the CHG intervention wards. For patients on the intervention unit, median time to identification of a nosocomial MRSA was 7 days (estimated time of potential exposure to CHG use on the unit). No qacA/B or smr positive isolates were identified on the control wards (2/6 vs 0/15, p=0.07).

Conclusion: No significant difference in the detection of qacA/B and smr genes were identified in S. aureus recovered from the intervention wards utilizing CHG, despite a compliance of 62% over a 6-month period. However, continued monitoring for resistance is required, particularly for non-ICU settings in which selection of resistant strains may theoretically occur due to the likelihood of suboptimal compliance.

Introduction

CHG is an antiseptic agent increasingly being utilized for daily bathing of hospitalized patients in an effort to decrease hospital transmission of antibiotic resistant organisms.

With increased use in ICU and non-ICU wards, there is a potential to develop resistance to CHG. The most common mechanism of resistance to CHG are through efflux pumps (qacA/B or smr). 2% CHG cloths (Sage Products) were introduced into 2 medical units at our facility, with a compliance estimated of 62%. With suboptimal compliance, we implemented a PCR for qacA/B and smr to monitor for resistance in Staphylococcus aureus.

Table 1. qacA/B and smr PCR for nosocomial S. aureus from wards utilizing 2% CHG for daily bathing

<table>
<thead>
<tr>
<th></th>
<th>qacA/B</th>
<th>Smr</th>
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<tbody>
<tr>
<td>CHG Unit (n=6)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Control Unit (n=15)</td>
<td>0</td>
<td>0</td>
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</table>

Results

Over 6 months, 21 nosocomial S. aureus were identified (4 blood, 7 nares, 4 perineum, 4 skin and 2 sputum). 19 isolates were MRSA (4 intervention vs 15 control) and 2 were MSSA (both from intervention ward).

PCR testing for qacA/B and smr are presented in Table 1. One sputum (MRSA) was positive for qacA/B and 1 blood culture was positive for smr. No statistically significant difference was identified between intervention and control wards (p=0.07).

The median time to identification of a nosocomial MRSA was 7 days (estimated time of potential exposure to CHG use on the unit).

Conclusion

Implementation of CHG on non-ICU wards can be an important component of infection control interventions to reduce nosocomial MRSA and VRE. However, maintenance of compliance can be challenging in this setting which can theoretically select for resistance.

Despite a compliance of 62% over a 6-month period, no significant difference in the detection of qacA/B and smr genes were identified in nosocomial S. aureus recovered from the intervention wards utilizing CHG.

Ongoing surveillance for CHG resistance should be conducted, particularly in settings of suboptimal compliance.

Acknowledgements

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References