Effectiveness of formal hand hygiene education and feedback on healthcare workers’ hand hygiene compliance and hospital-associated infections in adult intensive care units: a systematic review protocol

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Review question/objective: The objective of this quantitative systematic review is to identify and synthesize evidence on the effectiveness of formal hand hygiene education with and without feedback on healthcare workers’ hand hygiene compliance and healthcare-associated infections in adult intensive care units.

Keywords Compliance; education; hand hygiene; healthcare-associated infection; intensive care


Background

Healthcare-associated infections, while often preventable, continue to plague the healthcare world, especially in adult intensive care units (ICUs) where the sickest patients receive care. Healthcare-associated infections, namely central line-associated bloodstream infection, catheter-associated urinary tract infection (CAUTI), ventilator-associated pneumonia and surgical site infection, are infections that patients acquire while receiving care for medical or surgical conditions and are the most adverse events in hospitalized patients.¹ Healthcare-associated infections pose major threats to patient safety.² Approximately, 1.7 million patients per year are diagnosed in the United States with a healthcare-associated infection.³ Healthcare-associated infections rank among the leading causes of death in the United States and are responsible for over 90,000 deaths each year.⁴ The burden of healthcare-associated infections on the national economy was estimated at between $335 and $45 billion annually.⁵ Healthcare-associated infections have endemic effects on global morbidity, mortality and the economy. The crude mortality rate associated with healthcare-associated infections is 12–80%, depending on the population and setting; some European countries report 16 million extra patient hospital days annually due to healthcare-associated infections.⁶

Hand hygiene is a critical and fundamental strategy in preventing healthcare-associated infections. However, healthcare workers continue to struggle with hand hygiene procedures with less than 50% compliance rates.⁷ Healthcare workers are hospital staff that provide direct care to adult patients in the ICU. These include physicians, nurses, therapists, technicians and ancillary staff.⁸ As reported by Mathur,⁹ healthcare workers’ hands are colonized with pathogens; consequently, they could inadvertently transfer germs to critically ill patients in the adult ICU through suboptimal hand hygiene practices. Studies reported by Boyce and Pittet¹⁰ showed 36% hand hygiene compliance rates in ICUs compared with other settings. Further, the study showed adherence decreased by 5% (±2%) on average for each increase of 10 hand hygiene opportunities per hour when patient care intensity exceeded 10 opportunities per hour.¹⁰

Hand hygiene compliance involves cleansing the hands with soap and water or alcohol hand rub as per institutional guidelines. Hand hygiene compliance guidelines vary by institutions, for example, observing the rate of before and after patient contact...
or measuring the amount of antiseptic product used.\textsuperscript{6} Non-compliance with hand hygiene guidelines can contribute to extended hospital stays, increased patient mortality, higher readmission rates, lower hospital reimbursements\textsuperscript{11} and financial burdens on patients and families. The effectiveness of hand hygiene compliance on healthcare-associated infection reduction when healthcare workers comply with institutionally adopted hand hygiene guidelines has been documented in studies.\textsuperscript{12-13} However, measuring hand hygiene compliance has been a daunting task as there is currently no consensus on optimal standards for measurement.\textsuperscript{14-15} The direct observational method has been hailed as the gold standard for hand hygiene compliance measurement because the hand hygiene technique can be observed; however, it is labor intensive, costly and sometimes inaccurate due to several factors. Other methods include self-reporting and electronic monitoring, which are not without pitfalls.\textsuperscript{16} Because there is currently no consistent standard for measuring hand hygiene compliance, this systematic review will report on the methods used in the articles being reviewed.

Many global and national initiatives have been launched over the years to combat healthcare-associated infections. The Institute of Healthcare Improvement launched the 100,000 Lives Campaign\textsuperscript{17} – and the Protecting 5 million Lives Campaign,\textsuperscript{18} and the World Health Organization (WHO) Save Lives: Clean Your Hands annual day is May 5, 2016,\textsuperscript{19} among others. Over 40 other countries\textsuperscript{19} including private organizations\textsuperscript{20} also joined efforts with WHO on hand hygiene campaigns. Other types of campaigns include a multimodal approach\textsuperscript{6} to reduce healthcare-associated infections. Nonetheless, compliance remains low among healthcare workers.\textsuperscript{21-22}

Although there have been some reductions in healthcare-associated infections in ICUs\textsuperscript{2,23} there is still room for improvement. Approximately, 30\% of ICU patients are diagnosed with a healthcare-associated infection.\textsuperscript{1} The 2009–2014 data on healthcare-associated infections showed no change in ICU CAUTI rates;\textsuperscript{2} however, steps can be taken to reduce hospital healthcare-associated infections up to 70\%.\textsuperscript{2} According to studies, when healthcare workers demonstrate an awareness of the infection process, they take specific steps to prevent it.\textsuperscript{2} Studies also show that formal hand hygiene education and performance feedback can be beneficial.\textsuperscript{24-26} Knowledge influences individual behavior, and it is crucial that the individual understands that certain behavior can increase or decrease the threat.\textsuperscript{25}

Formal hand hygiene education is defined as providing education to healthcare workers on the importance of hand hygiene and the correct procedures.\textsuperscript{10} The WHO Safe Lives: Clean Your Hands campaign focuses on increased education and awareness of hand hygiene on healthcare.\textsuperscript{6} The reduction in healthcare-associated infections through education also produced a cost saving of over $2.8 million in one surgical intensive care unit setting.\textsuperscript{27} Performance feedback is defined as providing the result from monitoring hand hygiene compliance and healthcare-associated infection rates to healthcare workers and stakeholders.\textsuperscript{28} Performance feedback can be accomplished at an individual level or to a group on a regular basis. The implementation of formal hand hygiene education and performance feedback among other strategies for hand hygiene promotion has each resulted in a significant increase in hand hygiene compliance and reduction of healthcare-associated infections.\textsuperscript{13,25,29-30} In a quasi-experimental study in which performance feedback was used, there was a documented report of significant improvement in hand hygiene compliance and reduction in healthcare-associated infection rates.\textsuperscript{31}

A preliminary search was conducted on Cochrane Database of Systematic Reviews, Campbell Systematic Reviews, JBI Database of Systematic Reviews and Implementation Reports, Embase, PROSPERO and DARE. Previous systematic reviews were found on strategies to promote healthcare-associated infections reduction, hand hygiene compliance in hospitals and in neonatal ICUs.\textsuperscript{28,30,32} However, there are no current or underway systematic reviews that have been identified on this topic within this population.

The current systematic review will compare the use of education with and without feedback on rates of healthcare workers’ hand hygiene compliance and rates of healthcare associated infections in the adult ICU. Hand hygiene education and feedback are strategies that have been used either separately, or in combination with other strategies, based on WHO recommendations.\textsuperscript{8} In the absence of other strategies or when it is practically impossible to implement WHO hand hygiene recommendations,\textsuperscript{8} the findings of this review may be of benefit to healthcare workers in adult ICU.
Inclusion criteria

Types of participants
The current review will consider studies that include any adult ICUs’ clinical staff who provide direct care to patients, including physicians, nurses, therapists, technicians and ancillary staff.

Intervention(s)
The current review will consider studies that evaluate formal hand hygiene education feedback. Formal hand hygiene education will consist of any hand hygiene education or training using any method such as videos, poster, classroom or return demonstration. Feedback to healthcare workers will include regular reports on current outcome statistics. Feedback showing performances will be provided through any means where data is easily accessible, such as in presentations, poster display and/or emails.

Comparator(s)
The comparator is formal hand hygiene education without feedback.

Outcomes
The current review will consider studies with the following outcomes:
- Adult ICUs healthcare workers’ hand hygiene compliance
- Adult ICUs healthcare-associated infections

Types of studies
The current review will consider both experimental and quasi-experimental study designs including randomized controlled trials, non-randomized controlled trials, before and after studies, and interrupted time-series studies. In addition, analytical observational studies including prospective and retrospective cohort studies, case-control studies and analytical cross-sectional studies will be considered for inclusion. This review will also consider descriptive observational study designs including case series, individual case reports and descriptive cross-sectional studies for inclusion.

Studies published in the English language will be included. There is currently no capability of translation; therefore, English language is preferred. The review will consider all published studies with no limit on publication dates for the purpose of examining their relevance and methodological quality.

Search strategy
The search strategy will aim to find both published and unpublished studies. An initial limited search of MEDLINE and CINAHL has been undertaken to identify articles on this topic, followed by analysis of the text words contained in the title and abstract, and of the index terms used to describe these articles. This informed the development of a search strategy including identified keywords and index terms that will be tailored for each information source. The reference list of all studies selected for critical appraisal will be screened for additional studies.

Studies published in the English language will be included. There is currently no capability of translation; therefore, English language is preferred. The review will consider all published studies with no limit on publication dates for the purpose of examining their relevance and methodological quality.

Information source
The databases to be searched will include: CINAHL, Embase, PUBMED, SCOPUS and PsycINFO.

The search for unpublished studies/Grey Literature will include: The New York Academy of Medicine Library, ProQuest Theses and Dissertations, and Mednar.

Initial keywords to be used will be: hand hygiene, compliance, adherence, education, feedback, intensive care and healthcare-associated infection.

Additional keywords will include: training, performance and nosocomial infection.

Study selection
Following the search, all identified citations will be collated and uploaded into EndNote and duplicates removed. Titles and abstracts will then be screened by two independent reviewers for assessment against the inclusion criteria for the review. Studies that may meet the inclusion criteria will be retrieved in full and their details imported into the Joanna Briggs Institute’s System for the Unified Management, Assessment and Review of Information (JBI-SUMARI). The full text of selected citations will be retrieved and assessed in detail against the inclusion criteria by two independent reviewers. Full-text studies that do not meet the inclusion criteria will be excluded and reasons for exclusion will be provided in an appendix in the final systematic review report. Included studies will undergo a process of critical appraisal. The results of the search
will be reported in full in the final report and presented in a Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram. Any disagreements that arise between the reviewers will be resolved through discussion or with a third reviewer.

Critical appraisal

Selected studies will be critically appraised by two independent reviewers at the study level for methodological quality in the review using standardized critical appraisal instruments from the Joanna Briggs Institute for experimental and quasi-experimental studies (Appendix I). Any disagreements that arise between the reviewers will be resolved through discussion or with a third reviewer. The results of critical appraisal will be reported in a narrative form and in a table. Following critical appraisal, studies that do not meet a quality threshold of six out of 10 will be excluded.

Data extraction

Data will be extracted from papers included in the review using the standardized data extraction tool available in JBI-SUMARI (Appendix II) by two independent reviewers. The data extracted will include specific details about the interventions, populations, study methods and outcomes of significance to the review question and specific objectives. Any disagreements that arise between the reviewers will be resolved through discussion or with a third reviewer. Authors of papers will be contacted to request missing or additional data where required.

Data synthesis

Papers will, where possible, be pooled in statistical meta-analysis using JBI-SUMARI. Effect sizes will be expressed as either odds ratios (for dichotomous data) or weighted (or standardized) mean differences (for continuous data) and their 95% confidence intervals will be calculated for analysis. Heterogeneity will be assessed statistically using the standard chi-square and $I^2$ tests. The choice of model (random or fixed effects) and method for meta-analysis will be based on the guidance by Tufanaru et al. (2015). Subgroup analyses will be conducted where there are sufficient data to investigate, such as the type of professionals, ICU size or type of hospital. Sensitivity analyses will be conducted to test decisions made regarding hand hygiene education with and without feedback on hand hygiene compliance and healthcare-associated infections in adult ICU. Where statistical pooling is not possible, the findings will be presented in a narrative form including tables and figures to aid in data presentation where appropriate.

A funnel plot will be generated within JBI-SUMARI to assess publication bias if there are 10 or more studies included in a meta-analysis. Statistical tests for funnel plot asymmetry (Egger test, Begg test and Harbord test) will be performed where appropriate.

Acknowledgements

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Janet Harris, RN, DNP, Professor and Associate Dean, University of Mississippi Medical Center
Michelle Palokas, RN, DNP, Assistant Professor, University of Mississippi Medical Center

References

Appendix I: Appraisal instruments

**MAStARI appraisal instrument**

**JBI Critical Appraisal Checklist for Randomised Control / Pseudo-randomised Trial**

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<th>Yes</th>
<th>No</th>
<th>Unclear</th>
<th>Not Applicable</th>
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<tr>
<td>1. Was the assignment to treatment groups truly random?</td>
<td>☐</td>
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<td>2. Were participants blinded to treatment allocation?</td>
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<td>3. Was allocation to treatment groups concealed from the allocator?</td>
<td>☐</td>
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<td>4. Were the outcomes of people who withdrew described and included in the analysis?</td>
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<td>5. Were those assessing outcomes blind to the treatment allocation?</td>
<td>☐</td>
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<td>6. Were the control and treatment groups comparable at entry?</td>
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<td>7. Were groups treated identically other than for the named interventions?</td>
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<td>8. Were outcomes measured in the same way for all groups?</td>
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<td>9. Were outcomes measured in a reliable way?</td>
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<td>10. Was appropriate statistical analysis used?</td>
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Overall appraisal: Include ☐ Exclude ☐ Seek further info. ☐

Comments (Including reason for exclusion)

________________________________________________________________________
Appendix II: Data extraction instruments

**JBI Data Extraction Form for Experimental / Observational Studies**

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<td>Year</td>
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<tr>
<td>Journal</td>
<td>Record Number</td>
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**Study Method**

- RCT
- Quasi-RCT
- Longitudinal
- Retrospective
- Observational
- Other

**Participants**

Setting

Population

**Sample size**

Group A ________________ Group B ________________

**Interventions**

Intervention A

Intervention B

Authors Conclusions:

Reviewers Conclusions:
### Study results

#### Dichotomous data

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#### Continuous data

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