Available online at www.sciencedirect.com

ScienceDirect

Research paper

Improving hospital environmental hygiene with the use of a targeted multi-modal bundle strategy

Michelle Allen [a], Lisa Hall [a,b,*], Kate Halton [a], Nick Graves [a]

[a] Centre for Research Excellence in Reducing Healthcare Associated Infections, Institute of Health and Biomedical Innovation, School of Public Health and Social Work, Queensland University of Technology, Australia
[b] School of Public Health, University of Queensland, Australia

Abstract *Background:* Improving hospital environmental hygiene can reduce environmental contamination and cross-transmission risk, a precursor to healthcare associated infections (HAI). With poor cleaning practice a demonstrated problem, the process of converting evidence into practice requires investigation. The aim of this study was to assess the effectiveness of an environmental hygiene bundle in terms of changes to HAI rates, cleaning performance and environmental services workers (ESW) knowledge and attitudes.

Methods: A multi-modal bundle was designed and implemented with ESW in eight wards, in a 400-bed metropolitan teaching hospital, using a prospective, before-and-after study design. This consisted of a three-month pre-intervention phase and six-month intervention phase. This research used an implementation science framework to guide the transition from evidence into practice, with data collected in the pre-intervention phase synthesised to design the implementation strategy.

Results: There was no statistically significant change in infection rates in the six-month period. Significant improvements in cleaning performance were observed, with the average proportion of ultraviolet markers removed during cleaning across the wards increasing from 61.1% to 95.4%. Results also demonstrate improvements to both the knowledge and attitudes of ESW.

Conclusion: By combining infection prevention and implementation science, this bundle was an effective way to engage environmental services staff and improve hospital cleaning.

© 2018 The Authors. Published by Elsevier B.V. on behalf of Australasian College for Infection Prevention and Control. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

* Corresponding author. Epidemiology and Biostatistics Division, School of Public Health, 288 Herston Road, Herston, QLD, 4006, Australia.
 E-mail address: l.hall3@uq.edu.au (L. Hall).

Highlights

- Improving hospital environmental hygiene can reduce environmental contamination and risk for transmission of healthcare associated infections (HAI).
- This study assessed the effectiveness of an environmental cleaning bundle in terms of changes to HAI rates, cleaning performance and environmental services staff knowledge and attitudes.
- A cleaning bundle was designed, and then implemented in eight wards, in a 400-bed metropolitan teaching hospital, using a prospective, before and after study design.
- This research used an implementation science framework to guide the transition from evidence into practice, with data collected in the pre-intervention phase synthesised to design the implementation strategy.
- By combining infection prevention and implementation science, this bundle was an effective way to engage environmental services staff and improve hospital cleaning.

Introduction

Healthcare-associated infections (HAIs) are a major patient safety issue in hospitals internationally, resulting in increased morbidity, mortality and cost to health services [1,2]. Organisms can survive for a long time on hospital surfaces [3], with contaminated surfaces an important source for potential transmission [4]. Acquisition risk, which is a precursor to HAI, significantly increases when the prior occupant of a patient room has been infected or colonised [5], but reduction in surface contamination and removal of these organisms through thorough cleaning and disinfection practices reduces this risk [6,7]. However, in practice, hospital hygiene is poorly executed [8]. This is not only due to inconsistencies in agreed best practice, but also in practical translation. For implementation to be successful it is important to focus on evidence-based strategies that consider local contextual issues, and utilise effective approaches to facilitate change [9]. One such approach is a "bundle" - set of key practices introduced simultaneously — a method demonstrated to be highly successful in infection prevention [10]. However, a bundle is often conducted at a set time point e.g. on insertion of a device, therefore this is a novel interpretation of a bundle as it incorporates strategic components in a multi-modal fashion, as well as a defined set of practices. As such it has been termed a multi-modal environmental hygiene bundle for the purposes of this paper.

Methods

This research team developed a targeted multi-modal environmental hygiene bundle in 2013, then implemented it into a single hospital, and evaluated it in terms of changes to HAI rates, cleaning performance as assessed by ultraviolet (UV) marker audits, environmental services worker (ESW) knowledge and attitudes, and costs.

A systematic search was undertaken to identify published scientific literature and existing guidelines relating to hospital cleaning. This evidence was reviewed for intervention effectiveness. Subsequently a multi-disciplinary expert panel was convened to assess all effective interventions for practicality and feasibility of implementation, and relative importance for inclusion into the bundle. A three round, nominal group technique was used [11]. During the first round, experts individually completed a text-based scoring process. Subsequent rounds involved discussion of these results, assessment of interventions against the criteria in smaller groups, and then overall prioritisation as a whole group. The panel consisted of experts from environmental services, infection prevention, infectious diseases, epidemiology and microbiology. Table 1 outlines the bundle interventions prioritised by the panel.

A prospective before and after quasi-experimental design was used, with a three-month pre-intervention phase and six-month intervention phase. The study was undertaken at a Tertiary 400 Bed Public Teaching Hospital in Brisbane, Australia.

The pre-intervention phase was March to May 2014. Data were collected on the local context covering the hospital structure, policies and procedures, organisational culture, leadership, patient satisfaction, ESW's knowledge and attitudes, baseline infection rates and cleaning performance. This was achieved through a hospital document and data review, workflow observations, ESW discussion groups, and an ESW knowledge and attitudes survey. Outcomes were synthesised and mapped to the Promoting Action on Research Implementation in Health Services (PARIHS) framework [12] to provide a profile of the hospital context and the recipients in order to target bundle implementation to local needs.

The intervention phase was June to November 2014. The bundle was implemented with ESW in eight wards, including the intensive care unit (ICU). Wards selected included two very-high risk wards and six high risk wards. Wards were prioritised per the National Health Performance Authority risk factors for patient vulnerability [13].

The implementation approach emerged from the data gathered during the pre-intervention phase. An implementation strategy was designed for the multi-modal bundle that included five elements: a multidisciplinary implementation team - representatives from infection control, environmental services and a member of the research team; bundle training and supporting educational materials for ESW - two hour-long sessions on the bundle components, including scenario-based learning, and hands-on simulations, plus an instructional booklet for each cleaning cart and after-hours instructions; improved documentation - duty statements, policies and procedures were updated to reflect the bundle, plus collection of process measures e.g. daily record for product; ESW feedback -