CSIRO PUBLISHING

Healthcare Infection, 2014, **19**, 128–134
http://dx.doi.org/10.1071/HI14033

Changes in healthcare-associated infections after the introduction of a national hand hygiene initiative

Adrian G. Barnett[1,4] BSc, PhD

Katie Page[1] BA (Hons-I), PhD

Megan Campbell[1] BApSc

David Brain[1] BSocSc, MPH

Elizabeth Martin[1] BAppSci (Food Science and Nutrition), MHlthEcon

Shirley Winters[1] MLitt

Lisa Hall[1,2] BTech(BiomedSci)(Hons), PhD

David Paterson[2,3] MBBS, FRACP, PhD

Nicholas Graves[1,2] BA (Econ) Hons, MA, PhD

[1]Institute of Health and Biomedical Innovation, Queensland University of Technology, Qld 4059, Australia.
[2]Centre for Healthcare Related Infection Surveillance and Prevention, Queensland Health, Qld 4006, Australia.
[3]The University of Queensland Centre for Clinical Research, Qld 4029, Australia.
[4]Corresponding author. Email: a.barnett@qut.edu.au

Abstract. ***Introduction*:** Interventions that prevent healthcare-associated infections should lead to fewer deaths and shorter hospital stays. Cleaning hands with soap and water or alcohol rub is an effective way to prevent the transmission of organisms, but compliance is sometimes low. The National Hand Hygiene Initiative in Australia aimed to improve hand hygiene compliance among healthcare workers, with the goal of reducing rates of healthcare-associated infections.

***Methods*:** We examined if the introduction of the National Hand Hygiene Initiative was associated with a change in infection rates. Monthly infection rates for six types of healthcare-associated infections were examined in 38 Australian hospitals across six states. Infection categories were: bloodstream infections, central-line associated bloodstream infections, methicillin-resistant and methicillin-sensitive *Staphylococcus aureus*, *Staphylococcus aureus* bacteraemia and surgical site infections.

***Results*:** The National Hand Hygiene Initiative was associated with a statistically significant reduction in infection rates in 11 out of 23 state and infection combinations studied. There was no change in infection rates for nine combinations, and there was an increase in three infection rates in South Australia.

***Conclusions*:** The intervention was associated with reduced infection rates in many cases. The lack of improvement in nine cases may have been because they already had effective initiatives before the national initiative's introduction.

Additional keywords: intervention, nosocomial.

Received 18 September 2014, accepted 7 October 2014, published online 10 November 2014

Introduction

Healthcare-associated infections increase the risk of death and cause longer stays in hospital.[1] Colonisations and infections can occur when microorganisms are transferred from the hands of healthcare workers to the environment and to patients. Hand hygiene is a key strategy for breaking the transmission cycle from healthcare workers, patients and the environment. The 2014 Society for Healthcare Epidemiology of America (SHEA) guidelines called hand hygiene a 'fundamental strategy for the prevention of pathogen transmission in healthcare facilities'.[2]

The success of hand hygiene programs depends on high rates of compliance among hospital staff. Studies of compliance have shown highly variable rates from below

Implications

- The National Hand Hygiene Initiative was broadly successful as it was associated with reduced infection rates in many states and infection types.
- The initiative may have been counter-productive in South Australia because of a potential shift in resources away from existing infection-control strategies.

50%[3,4] to close to 90%.[5] The Australian National Hand Hygiene Initiative (NHHI) aimed to improve hand hygiene compliance and monitor its effectiveness in reducing infections (www.hha.org.au). The initiative was based on the World Health Organization's 'Clean care is safer care' campaign.[6,7] The NHHI aimed to achieve sustained improvements in hand hygiene compliance by using: ongoing education, regular hand hygiene compliance auditing using the '5 moments' program,[6] and standardised assessment of *Staphylococcus aureus* bloodstream (SAB) infection rates.[8] The aim was for every hospital in Australia to adopt the initiative, and it is now mandatory as part of the National Safety and Quality Health Service Standards.

In a previous paper we examined the change in SAB rates after the introduction of the NHHI.[9] The results were mostly positive, with a reduction in four out of six states and no change in two states. However, only examining SAB may be too narrow a view as the NHHI may have reduced other infections as well, and multiple outcomes should be used to evaluate infection-prevention initiatives.[10] Detrimental effects also need to be considered as it is possible that the focus of the NHHI on SAB may have reduced attention on the prevention of other infections or caused resources to be redirected from other programs. The latest SHEA practice recommendations include hand hygiene as a strategy for: methicillin-resistant *Staphylococcus aureus* (MRSA),[2] central line-associated bloodstream infections (CLABSI),[11] surgical site infections (SSI),[12] and *Clostridium difficile*.[13] Including all the potential benefits is key for considering the overall economic costs and benefits of the NHHI.[14,15]

We tested the effectiveness of the Australian National Hand Hygiene Initiative by examining whether it was associated with a reduction in six types of infection rates. We used an observational quasi-experimental design based on monthly infection rates. We obtained data from six of the eight states and territories, and present separate results for each state and territory due to differences between the states in pre-existing hand hygiene practices.

Methods

Our hypothesis was that the intervention changed the monthly rates of infections. We did not specify a direction for this change, so all hypotheses tests were two-sided. The analysis plan was developed *a priori* and no post-hoc tests were made.

Data

Data on healthcare-associated infections (HAIs) are routinely collected by Australian hospitals and reported both to their state or territory health authority, and nationally for performance monitoring. The hospitals chosen were: the five largest public hospitals (by number of acute beds) in New South Wales, Victoria, Queensland, Western Australia and South Australia; the three largest public hospitals in Tasmania; and the single main public hospital in the Northern Territory and Australian Capital Territory. This gave 30 hospitals. We then selected the next largest 20 public hospitals Australia-wide to give 50 hospitals in total. We requested all the available monthly data for the 50 hospitals.

Infections were defined according to each state and territory.[16] Although there are differences between states in how infections are defined this is not of concern for our analyses that focus on changes within a state.

We analysed data by jurisdiction, as we knew there were slight differences in data collection and definitions used. Data was collected for surveillance purposes by infection-control practitioners.

We checked to ensure that the data had been collected in line with the respective jurisdictional definitions for healthcare-associated infections. As such, colonisations and screening specimens, and community-associated infections were excluded.

The data used here were provided to us by individual hospitals or via the state units who support healthcare-associated infection surveillance including validating infection numbers. We further verified the data quality and checked the infection definitions used. Sufficient data for all time periods were not available for the Northern Territory or Victoria.

The roll-out of the NHHI included education and auditor training. The roll-out was implemented at different times across the country. As collection of auditing data formed the basis of the intervention, we used the first report of auditing data for each hospital to be the start of the intervention.

The study was approved by the appropriate Human Research Ethics Committees in each state and territory, and the release of data was additionally approved through the research governance processes appropriate to each hospital. The study was also approved by the Queensland University of Technology Human Research Ethics Committee.

Study design

We used a before-and-after quasi-experimental design[17] by comparing the infection rates after the intervention with those before. The complete details of the methods are in our previous paper which only examined SAB infection.[9]

We ran the analyses separately for each infection type in each state and territory as the intervention was implemented on a state basis, with overall co-ordination at both a state and national level. There were also important differences between states in terms of average infection rates and pre-existing hand hygiene campaigns and infection-prevention policies. Hence