

## Implementing and sustaining a hand hygiene culture change programme at Auckland District Health Board

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### Abstract

**Aim** In January 2009 Auckland District Health Board commenced implementation of the Hand Hygiene New Zealand (HHNZ) programme to bring about a culture change and to improve hand hygiene compliance by healthcare workers. We describe the implementation process and assess the effectiveness of this programme 36 months after implementation.

**Method** In keeping with the HHNZ guideline the implementation was divided into five steps: roll-out and facility preparation, baseline evaluation, implementation, follow-up evaluation and sustainability. The process measure was improvement in hand hygiene compliance and the outcome measure was *Staphylococcus aureus* clinical infection and bacteraemia rates.

**Results** The mean (95% CI; range) baseline compliance rates for the national reporting wards was 35% (95% CI 24–46%, 25–61%). The overall compliance by the 7<sup>th</sup> audit period was 60% (95% CI 46–74; range 47–91). All healthcare worker groups had improvement in compliance. The reduction in healthcare-associated *S. aureus* bacteraemia rates following the implementation was statistically significant ( $p=0.027$ ).

**Conclusion** Compliance with hand hygiene improved following implementation of a culture change programme. Sustaining this improvement requires commitment and strong leadership at a senior level both nationally and within each District Health Board.

Hand hygiene is one of the most effective means of reducing healthcare-associated infections, yet it is done poorly by healthcare workers for many reasons.<sup>1</sup> In a recent systematic review of studies looking at hand hygiene compliance in hospitals, the overall median compliance with hand hygiene was only 40%.<sup>2</sup> Multimodal programmes to achieve improvement in hand hygiene compliance by healthcare workers can achieve significant sustained improvements in hand hygiene compliance and reductions in infections due to methicillin-resistant *Staphylococcus aureus* (MRSA) and other nosocomial pathogens.<sup>3-5</sup>

*S. aureus* causes a significant number of healthcare-associated infections; at Auckland District Health Board (ADHB) it is the leading cause of surgical site infections, and is the second leading cause of healthcare-associated bloodstream infections (unpublished data). Whilst MRSA bacteraemia remains an uncommon event in New Zealand hospitals the rates of patients colonized or infected with MRSA and extended-spectrum beta lactamase-producing Enterobacteriaceae continue to increase

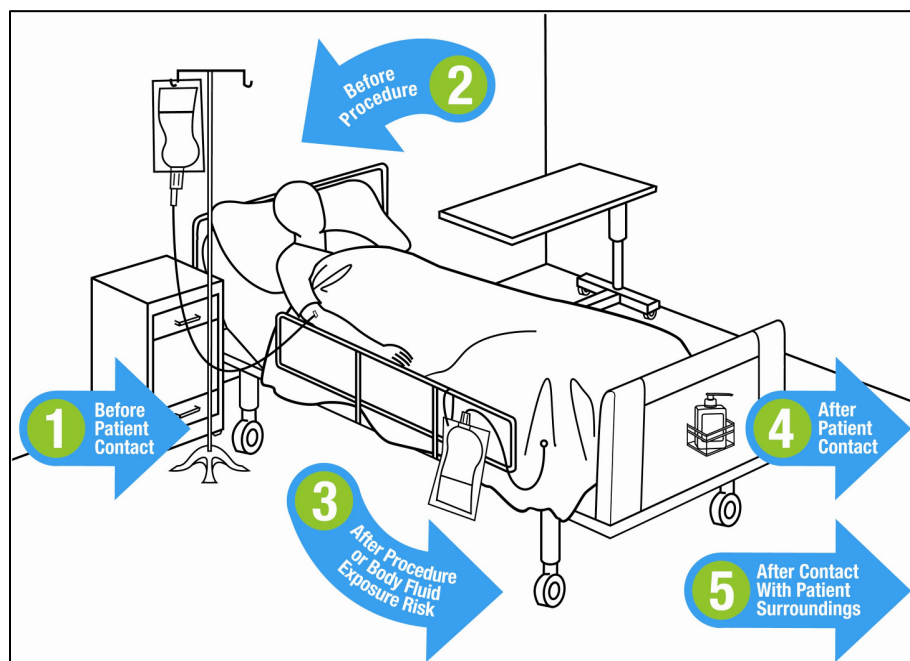
in New Zealand<sup>6,7</sup> and concerted efforts to prevent healthcare-associated infections with these organisms is even more pressing.

In 2007 the Quality Improvement Committee of the Ministry of Health initiated a number of quality improvement projects. ADHB was the lead DHB for the Infection Prevention and Control projects. In conjunction with Waikato and Tairāwhiti DHBs, ADHB participated in stage 1 of the national rollout of the Hand Hygiene New Zealand (HHNZ) programme<sup>8</sup>, a culture change programme aimed at improving hand hygiene compliance in all clinical areas. The programme was based on the World Health Organisation (WHO) '5 moments for hand hygiene' initiative, Figure 1, and was aligned with Hand Hygiene Australia (HHA).

The key components to the programme were as follows:

- Culture change—adopt and promote behaviour which supports hand hygiene practices.
  - The use of alcohol-based hand rubs (ABHR) with placement of the product at the point of care – bedside or clinic room
  - Educating healthcare workers about the '5 moments for hand hygiene'
- Measuring outputs (hand hygiene compliance) and outcomes (*Staphylococcus aureus* bacteraemia and clinical infections) with prompt feedback of results.

**Figure 1. WHO 5 moments for hand hygiene**



In January 2009 ADHB commenced implementation of the HHNZ programme. We describe the implementation process and assess the effectiveness of this programme 36 months after implementation.

## Method

Auckland District Health Board (ADHB) provides care for an estimated 460,000 people. The clinical services consist of Auckland City Hospital, Starship Children's Hospital and Green Lane Clinical Centre comprising of 1100 in-patient beds. In keeping with the HHNZ guideline<sup>8</sup> the implementation was divided into five steps: roll-out and facility preparation, baseline evaluation, implementation, follow-up evaluation and sustainability.

**Roll-out and facility preparation**—A fulltime project manager was employed to implement the HHNZ project. A steering group was formed to oversee the implementation; the membership of the group included members of the senior management team (Director's of Performance and Innovation, Nursing, Allied Health, Clinical Training, General Manager of Operations, Quality Manager, Nurse Leader of Women's and Child Health, Materials Manager), a Clinical Microbiologist and the project manager. The responsibilities of this group were to be the sponsors of the project, ensure that the project was delivered and that it aligned with the strategic goals of the ADHB.

A working group was tasked with the implementation of the project and this group worked with the project manager to provide among other things operational advice and assistance. The membership of this group included senior nurses with expertise in infection control, education and occupational health, the Daily Operations Manager, Procurement Specialists and a Clinical Microbiologist.

The specifications for the ABHR required a product that contained a minimum of 70% alcohol and 0.5% chlorhexidine. The choice of alcohol-based hand rub was made after a period of evaluation in selected clinical areas. Sterigel + (Solumed, Les Entreprises Solumed Inc, Laval (Québec) Canada) met the requirements of the programme and 500ml dispensing bottles were placed at the end of the beds in brackets and 780 ml wall dispensers were also placed outside patient rooms and in other relevant clinical areas.

The Occupational Health and Safety Department undertook to monitor adverse events associated with the product.

**Baseline evaluation**—For reporting purposes, and in keeping with HHA recommendations, HHNZ required a hospital with > 400 beds to report the results of hand hygiene audits in 7 wards/clinical areas and undertake 350 observations in each of these areas during each audit period. These wards/clinical areas were termed the national reporting wards. The 7 national reporting wards were chosen for a number of reasons; the wards/clinical areas had high risk patients for whom healthcare-associated infections had serious consequences, outbreaks or higher rates of multiple antibiotic resistant organisms had been reported in these areas and the senior staff showed a willingness to be involved in the programme.

Baseline evaluation of hand hygiene compliance was undertaken in a staged manner starting with the 7 wards/clinical areas designated as the national reporting wards. All other clinical areas were audited over the next 12 months. Clinical areas were grouped together in medical or surgical services to reduce the volume of auditing required and were audited in a stage manner, groups 2-8. For example, group 2 included the general medical, medical specialty and older person health wards and group 3 included the general and specialty surgical wards. 200 observations were made in each ward/clinical area within each group and then the mean hand hygiene compliance was calculated for each group.

The auditing was undertaken by auditors. The auditors were members of the Infection Prevention and Control Service (IP&CS) at ADHB and had successfully undertaken training in hand hygiene compliance assessment, the use of the data collection tool and data analysis provided at training workshops conducted by HHNZ. Prior to each audit period the auditors were required to demonstrate acceptable inter-observer variability. No less than 85% inter-observer variability agreement in all observations is required before formal data collection can commence.

HHNZ developed an electronic data collection tool using a PDA. Hand hygiene compliance for each of the 5 moments is recorded. At each session, information about the session, type of healthcare worker, hand hygiene product used, glove use and inter-patient healthcare worker activities were recorded.

Compliance was measured against each of the five moments; moment 1, before patient contact, moment 2, before a procedure, moment 3, after a procedure or body fluid exposure, moment 4, after patient contact and moment 5, after contact with the patient environment.

**Implementation**—Baseline evaluation of hand hygiene compliance was carried out and the results were feedback to the ward/clinical area. Healthcare workers in each ward/clinical area were then educated about hand hygiene and the WHO ‘5 moments for hand hygiene’.

Oral presentations at ward-based education sessions, at medical grand rounds and other clinical forums were undertaken and an online learning package was developed. Promotional activities have included the development of themed posters, participation in World Hand Hygiene Day (5<sup>th</sup> May), ward compliance competitions and display boards, give-aways, IPC newsletters. The implementation of the programme across all clinical areas took 18 months.

**Follow-up evaluation and sustainability**—Following baseline auditing and education in the ward/clinical area a programme of regular auditing of hand hygiene compliance across all clinical areas was undertaken. The number of observations recorded per audit period for national reporting wards was 350 and for all other clinical areas it was 200.

During auditing the auditors record compliance data directly into the PDA and upon return to their work space the data is automatically downloaded to the national HHNZ database. The data can then be analysed and reported in a variety of ways. The overall compliance rate for each clinical area was determined along with compliance rate per moment and per healthcare worker group.

Since *S. aureus* is the most common healthcare acquired pathogen in New Zealand hospitals, the number of patients with clinical infections and with healthcare-associated *S. aureus* bloodstream infections were calculated as a rate per inpatient days and compared over time.

Baseline rates for the preceding 36 months were available for healthcare-associated episodes of blood stream infection and for the preceding 12 months for clinical infections. The quarterly rate was reported as this information was already been collected for reporting purposes. The rates were compared pre and post implementation using segmented piecewise regression analysis.

The project manager was fulltime during the first 18 months of the project and subsequently the role has reduced to 0.5FTE and integrated into the IP&CS. The role of the hand hygiene coordinator was to promote and sustain improvement in hand hygiene compliance across ADHB.

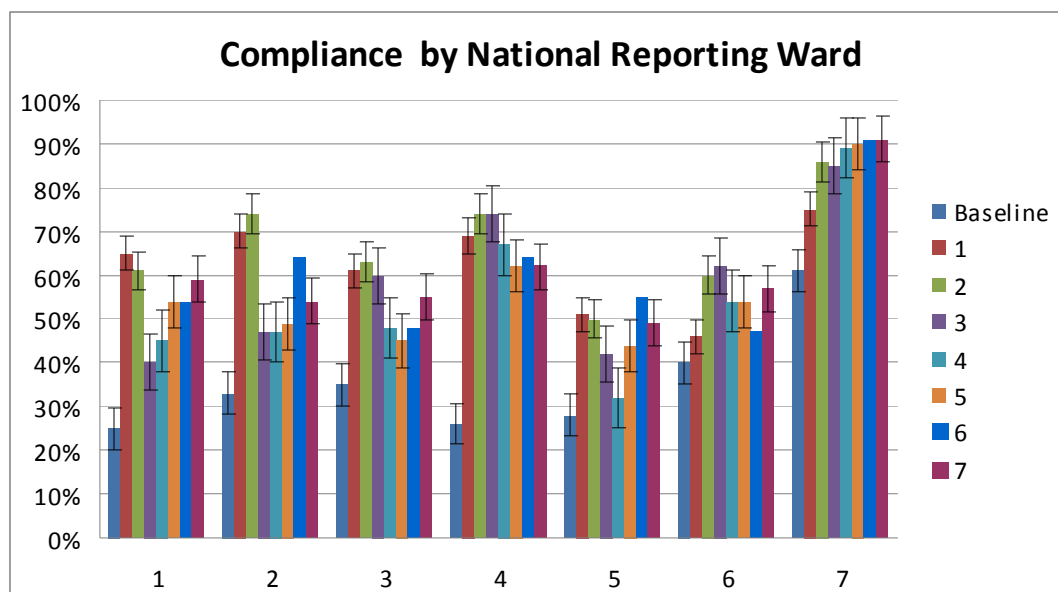
## Results

The project was started in January 2009 and auditing of baseline hand hygiene compliance rates for the national reporting wards was completed in March 2009. This was followed by a staged rollout across all other clinical areas which was completed by August 2010. Four monthly post implementation audits were undertaken in the national reporting wards and a one yearly post-implementation audit was done in all other clinical areas. By November 2011 the national reporting wards had completed seven post-implementation audits and all other areas had had at least one post-implementation audit.

**National Reporting Wards**—The mean (95% CI; range) baseline compliance rates for the national reporting wards was 35% (95% CI 24-46%, 25-61%). Compliance amongst healthcare workers was nurses 38%; doctors 33%, healthcare assistants 46%, and allied health staff 38%. Compliance with individual moments was as follows: moment 1, 28%; moment 2, 31%; moment 3, 42%; moment 4, 49% and moment 5, 24%.

The compliance rates increased over the first two audit periods for all areas. However, by the third and fourth audit period, compliance rates had fallen in three of the seven areas but still remained above baseline, Figure 2. At subsequent audits the compliance rate increased in these areas.

**Figure 2. Hand hygiene compliance rates (%) at baseline and after implementation for the national reporting wards**



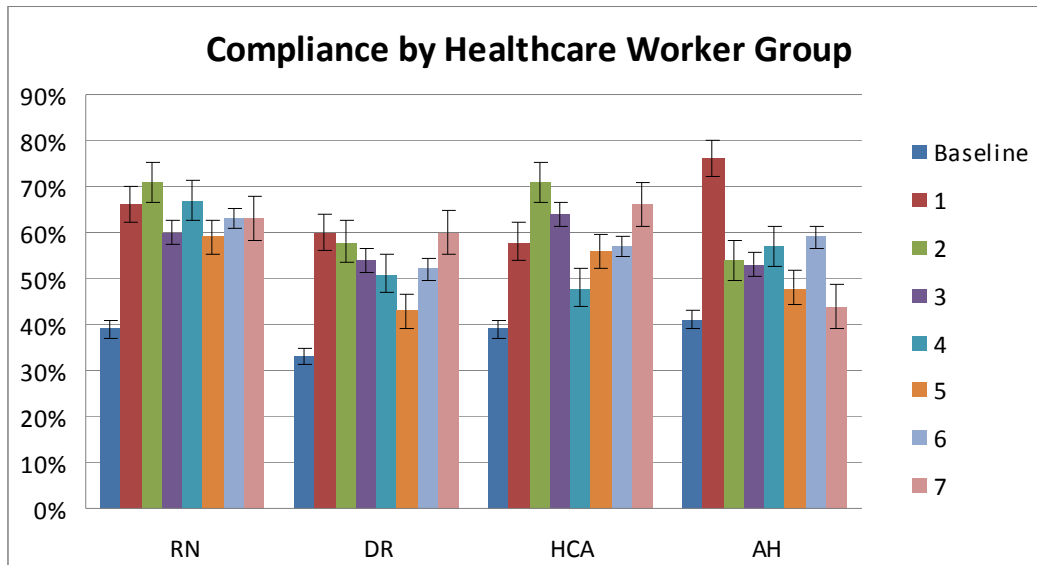
Amongst the healthcare worker sustained improvement was seen in all groups; overall compliance in these four groups by the 7th audit period was 60% (95% CI 46–74; range 47-91). Nursing staff showed the greatest sustained improvement from 39% to 63%, Figure 3. Doctors also increased from 33% at baseline to 60% by the 7<sup>th</sup> audit but improvement varied between audit periods..

There was also an improvement in compliance with individual ‘moments’; particularly moment 3 and moment 4, Figure 3.

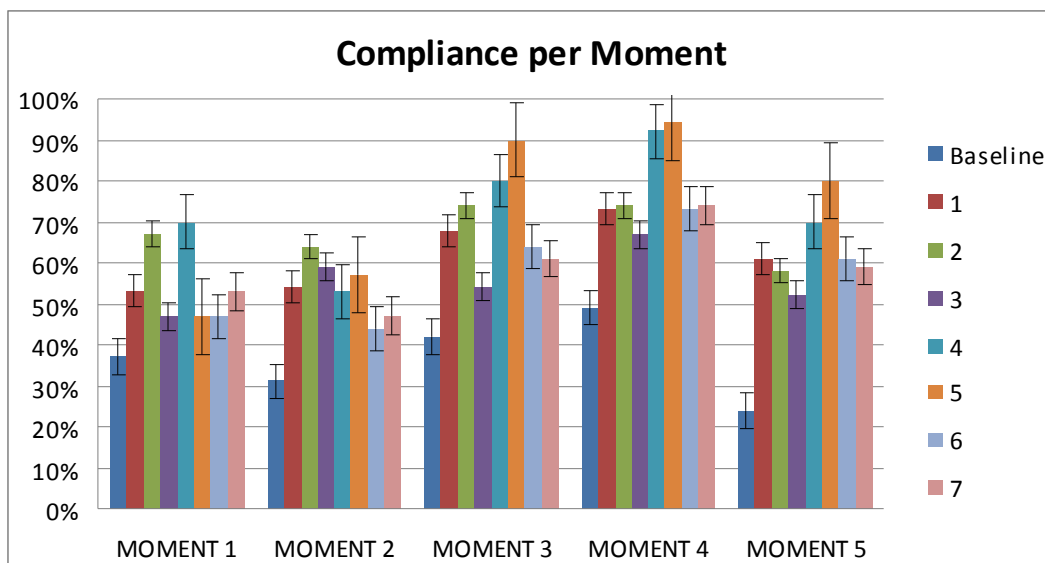
**Other clinical areas**—The mean (95% CI;) baseline compliance rate for the other clinical areas per group was: 2, 30% (95% CI 21-39); 3, 36% (95% CI 27-45); 4, 43% (95% CI 33-53); 5, 30% (95% CI 24-36); 6, 38% (95% CI 30-46); 7, 35% (95% CI 25-45) and 8, 45% (95% CI 33-71). The overall compliance rate for all these areas was 37% (95% CI 32-42, 29-45). The mean (95% CI; range) compliance rate one year after implementation for all these areas was 50% (95% CI 45-55, 41-58).

**Outcome measures**—The overall ADHB rate of healthcare-associated *S. aureus* bloodstream infection per 1000 inpatient days before implementation and for 36 months after implementation (March 2009 – December 2011) is shown in Figure 4. There was a statistically significant decrease in the rate over time ( $R^2=0.44$ ,  $p=0.027$ ).

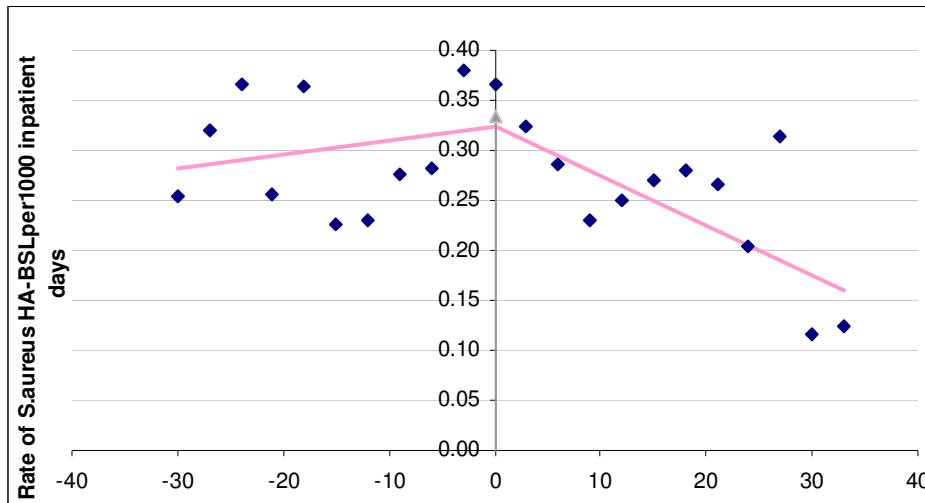
**Figure 3. Hand hygiene compliance rate (%) at baseline and post-implementation for healthcare worker groups and per 'moment' for the National Reporting Wards**



RN, registered nurse; DR, doctor; HCA, healthcare assistant and AH, allied health

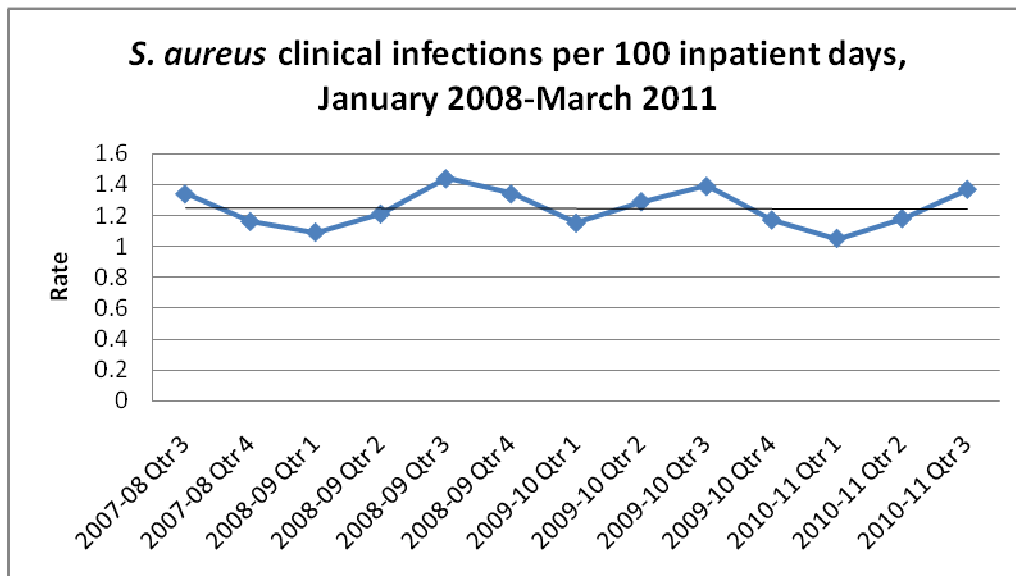


**Figure 4. Quarterly episodes of *S. aureus* healthcare-associated bloodstream infection per 1000 inpatient day's pre and post implementation of the HHNZ programme**



The overall ADHB rate of clinical infection caused by *S. aureus* per 100 inpatient days before implementation and for 24 months after implementation (March 2009 – March 2011) showed no reduction in the rate, Figure 5.

**Figure 5. Quarterly rate of clinical infections due to *S. aureus* per 100 inpatient day's before and after implementation of the HHNZ programme**



## Discussion:

This is the first report detailing the implementation of a hospital-wide 'culture change' hand hygiene programme in a New Zealand DHB. Baseline compliance rates with hand hygiene at ADHB were low but were consistent with reported rates.<sup>2</sup> Rates tend to be lower in intensive care settings, lower among doctors than among nurses and lower before, rather than after, patient contact.<sup>2</sup> Within the national reporting wards the compliance with hand hygiene for nurses was 38% and for doctors 33%. All healthcare worker groups improved compliance with hand hygiene following the implementation of the project. Whilst the nursing staff showed the greatest sustained improvement, the rate of compliance for doctors also increased but was less consistent.

Overall hand hygiene compliance in the national reporting wards increased from a mean rate 35% at baseline to 62% at 4 months and sustained at 60% 36 months after implementation. The improvement in compliance can be considered to be moderate at best in all areas except for one ward which achieved and sustained compliance over 80%.

The baseline rates for 'moment' 1 and 2, the before contact 'moments', were 37% and 31%, respectively compared to the rates for 'moment' 3 and 4, the after moments, which were 42% and 49%, respectively. The greatest improvement was seen with moments 3 and 4. Compliance with hand hygiene following patient contact is universally better than before patient contact.<sup>9</sup> HCW perform hand hygiene due to the perceived risk to themselves of pathogen transfer following contact with the patient or following blood and body fluid exposure. Preventing pathogen transfer to patients relies on the HCW performing hand hygiene before contact with patients and before performing clean or aseptic tasks.

The initial improvement was not sustained beyond 12 months in all areas. In early 2010 the project manager left and was not replaced until the middle of that year. The loss of a project manager has been shown to impact on the sustainability of hand hygiene compliance rates in a pilot programme in Victoria, Australia.<sup>5</sup> The project manager role was replaced with a 0.5 FTE Infection Prevention and Control Nurse Specialist and hand hygiene became core business for the IP&CS.

There was a statistically significant reduction in the rate of healthcare-associated *S. aureus* bacteraemia over the 36 month period following the implementation at ADHB. *S. aureus* bacteraemia causes significant morbidity and mortality in New Zealand and Australia; the all-cause mortality at 30 days is 20.6%.<sup>10</sup> About 40% of episodes of *S. aureus* bacteraemia arise in the hospital and the all-cause mortality at 30 days is significantly higher for hospital onset than community onset (p=0.004).<sup>10</sup> A number of infection control interventions have been shown to reduce healthcare-associated infections including those caused by *S. aureus*.<sup>11-13</sup>

Improvement in hand hygiene compliance was associated with a significant reduction in methicillin-resistant *S. aureus* (MRSA) bacteraemia in Victoria with 65 fewer patients with MRSA bacteraemia 24 months after implementation of a statewide hand hygiene culture-change programme.<sup>5</sup> With a more sustained improvement in hand hygiene compliance we would hope to see a further reduction in the rate of healthcare-associated *S. aureus* bacteraemia.



The rate of *S. aureus* clinical infections following implementation was unchanged. This is not surprising as skin and soft tissue infections caused by *S. aureus* are a common cause for admission to New Zealand hospitals.<sup>14-15</sup> Improvement in hand hygiene compliance by HCW is unlikely to impact on the rate of admissions for *S. aureus* skin and soft tissue infections because 60-75% of these infections are community acquired.<sup>10,15</sup> We conclude that this should no longer be used by HHNZ as an outcome measure.

The auditing is undertaken by trained auditors, members of the IP&CS, and this has ensured consistency of reporting hand hygiene compliance. It also avoids the risk of observer bias that may occur if the observer worked in the area being audited. The timetable for auditing is set by the IP&CS and this prevents avoidance of auditing in poorly performing areas. The results of each audit are promptly reported to the Charge Nurse Manager and Clinical Director in each area. Organisation wide disclosure of individual ward/clinical area results has not occurred; this is under review as it has been proposed as a means of improving quality of care while ensuring transparency and accountability.<sup>16</sup> The benefit of public reporting of hospital hand hygiene compliance is debated.<sup>17</sup>

Promotion of the programme is an important aspect of a culture change programme. Involvement of the Communications Department helped with the initial promotion of the programme and a detailed promotional package was developed. The “Talking Walls”<sup>2</sup> concept was modified to cover posters that were designed to promote hand hygiene. The initial set of posters used to promote hand hygiene at ADHB was from the HHNZ campaign and a further set were developed within house based on pop art. The posters were placed at the entrance to clinical areas and beside the ABHR dispensing units and basins in clinical areas. Individual ward/clinical areas were encouraged to develop their own promotional activities. The IP&CS promotes compliance with hand hygiene regularly and on occasions such as ‘World Hand hygiene Day’, the 5<sup>th</sup> May.

One ward had achieved over 80% compliance by the second audit period and has maintained hand hygiene compliance over 85% out to 36 months post-implementation. The healthcare-associated bloodstream infection rate for that ward for the 12 months prior (2008) to implementation was 3.3/1000 inpatient days (95% CI 2.3-4.2) and in 2010 the rate was 1.8/1000 inpatient days (95% CI 1.1-2.5).

Changing culture among healthcare workers with respect to hand hygiene practices is an ongoing challenge. However, multi-modal culture change programmes such as the one undertaken by ADHB can result in improvement in compliance rates and create safer environments for patients by reducing the risk of acquiring a serious healthcare-associated infection.<sup>5,18</sup> A collective responsibility is necessary to improve patient outcomes; it cannot be left to individuals alone to bring about change in practice.

The Health Quality & Safety Commission is now leading the Infection Prevention and Control projects which are aimed at improving hand hygiene, reducing central line-associated bacteraemia and developing a national surgical site surveillance programme. Change management requires leadership to champion the process and to make sure that progress stays on track. It is important to ensure that the necessary resources, support and training are available to bring about the change in practice. The

Commission's role is to oversee the delivery of the projects and to work along side the teams delivering the individual projects.

The ADHB programme is ongoing; as with any change process we have been monitoring the progress along the way. This review has allowed us to take stock of how far we have come, to assess what worked and what did not work, and going forward, what is needed to sustain the programme long term. Achieving a sustained improvement in hand hygiene compliance by healthcare workers will require a long term commitment at a national level and the highest levels of clinical and managerial leadership.

**Competing interests:** None declared.

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