

HAND HYGIENE NEW ZEALAND

RESOURCE KIT FOR MEDICAL PROFESSIONALS



CLEAN HANDS SAVE LIVES

www.handhygiene.org.nz



HEALTH QUALITY & SAFETY
COMMISSION NEW ZEALAND
Kupu Taurangi Hauora o Aotearoa

INFECTION PREVENTION & CONTROL

PUBLISHED IN APRIL 2014:

Hand Hygiene New Zealand

Ringa Horoia Aotearoa

Quality Department

Auckland District Health Board

Private Bag 92189

Victoria Street West

Auckland 1142

New Zealand

This document is also available on the Hand Hygiene New Zealand website:

www.handhygiene.org.nz

DISCLAIMER

Although every effort has been made to ensure that this guidance document is as accurate as possible, the authors will not be held responsible for any action arising out of its use. District Health Boards and other organisations or individuals involved in implementing a hand hygiene programme should also refer directly to other documents and evidence referred to in these guidelines and decide upon the approach that is most appropriate for their particular circumstances.

CONTENTS

Using quality improvement frameworks to guide hand hygiene improvement	5
The road to improving hand hygiene practice: prerequisites and principles	9
Hand hygiene and glove use	11
Frequently asked questions about hand hygiene	12
Hand hygiene in the healthcare setting: literature and studies.	15
References.	19

PURPOSE

Good hand hygiene practice by healthcare workers reduces healthcare associated infections and improves the quality and safety of patient care.

The following resource kit has been developed for hospital-based medical professionals to use to educate and drive hand hygiene improvement within their service.

The kit contains the rationale for using the World Health Organization's '5 Moments' approach to hand hygiene, information about encouraging a frontline ownership approach to improve hand hygiene, education materials on glove use, and a list of journal articles for further reading.

We hope you find this information useful for presentations, education, awareness, and driving improvement to protect patients from harm.

BACKGROUND

Hand Hygiene New Zealand (HHNZ) is a national quality improvement programme that aims to improve hand hygiene practice in New Zealand hospitals.

It is one of three components of the Health Quality & Safety Commission's Infection Prevention and Control programme, which aims to improve patient safety by reducing healthcare associated infections.

Auckland District Health Board delivers the HHNZ programme on behalf of the Commission.

USING QUALITY IMPROVEMENT FRAMEWORKS TO GUIDE HAND HYGIENE IMPROVEMENT

Improving hand hygiene practice is a complex process that not only requires changes to systems of care, but also changes in the beliefs and values of healthcare professionals¹ with respect to this practice. It is unsurprising, therefore, that any successful improvement framework must account for this complexity.

HHNZ draws on components from several quality improvement frameworks, including the broad World Health Organization (WHO) 5 moments multi-modal model, the Frontline Ownership model, and the Theory of Planned Behaviour²⁻⁴. Each of these is explained in turn.

THE WHO FRAMEWORK

The WHO multi-modal approach is the broad overarching framework used by HHNZ and district health boards (DHBs) to implement the national hand hygiene programme. This high-level approach has been adopted with great success internationally²⁻⁵.

It consists of three core components:

- 1 System change:** The placement of alcohol-based hand rub product at the point of care.
 - 2 Education:** Hand hygiene education plus reminders and promotion in the workplace.
 - 3 Measurement and feedback of hand hygiene performance.**
-

Measurement and feedback of each of these components must be accompanied by improvement cycles and initiatives. For example the Plan, Do, Study, Act (PDSA) cycle can be used as an improvement tool by DHBs (see next page.)

This process can be applied to each idea that is trialled to see if it leads to improvement on a small scale. Successful ideas can then be rolled out by DHBs more widely, continuing to test as they go.

The Model for Improvement: Developed by Associates in Process Improvement

WHAT ARE WE TRYING TO ACCOMPLISH?

HOW WILL WE KNOW THAT A CHANGE IS AN IMPROVEMENT?

WHAT CHANGES CAN WE MAKE THAT WILL RESULT IN IMPROVEMENT?



HANDY TIP:

The Institute of Healthcare Improvement has a range of useful information and resources to help you with each step of the improvement cycle, including a PDSA worksheet. Visit www.ihl.org/knowledge/Pages/HowtoImprove

AIMS: To make improvements you must first set aims. What do you want to achieve? Aims must be succinct but specific, time oriented, include numerical goals where possible (which assists with measurement planning) and send a clear message that the status quo must change. Aims should be carefully tracked (IHI, 2013, www.ihl.org/knowledge/Pages/HowtoImprove/ScienceofImprovementEstablishingMeasures.aspx).

MEASUREMENT: To know whether your change is leading to the desired improvement you need to measure. The three key measures you need to consider are outcome measures, process measures and balancing measures. Measurement is a vital component of the improvement process. If you don't measure you won't know what impact your improvements are having on stakeholders, whether the stages of the process are working properly, whether the improvements are affecting another part of the process (IHI, 2013, www.ihl.org/knowledge/Pages/HowtoImprove/ScienceofImprovementEstablishingMeasures.aspx).

CHANGE CONCEPTS can help to inspire specific ideas for change that will lead to improvement. Change concepts are usually broad and should be combined with specific subject knowledge to determine whether they are applicable. The First Do No Harm website provides a useful list of change concepts on their website under 'resources'. www.firstdonoharm.org.nz

Langley GL, Nolan KM, Nolan TW, Norman CL, Provost LP. *The Improvement Guide: A Practical Approach to Enhancing Organizational Performance* (2nd edition). San Francisco: Jossey-Bass Publishers; 2009.

THE FRONTLINE OWNERSHIP (FLO) MODEL

The FLO model is based on the principle that solutions to problems will be more effective and resilient if frontline staff devise their own specific solutions rather than having standardised solutions imposed on them externally⁶.

A system or mode of delivery that works well in one clinical setting or in one particular service will not necessarily work equally well in others. For example, although it is clear that alcohol-based hand rub must be present at the point of care to achieve good hand hygiene practice, the optimal precise location or locations of the product may differ depending on the setting. Staff in some intensive care units, for example, found that good hand hygiene practice is facilitated by placing product at both ends of the patient bed.

Another principle of frontline ownership is to use “positive deviance”⁷. One aspect of this principle is to start by working with the willing. The idea is to begin by working with the early adopters and to work with those who come on board to reach the early and late majorities and eventually, those that are slower to adopt. Successes among the early adopters are then shared more widely among similar services/units that are slower to embrace change.

THE THEORY OF PLANNED BEHAVIOUR (TPB)

Within the FLO framework, one can also draw upon principles contained in the TPB to guide the strategic approach¹. Complex personal behaviours such as hand hygiene practice require individuals to deliberately and actively cultivate new personal habits and practices in their day-to-day work. Because of this requirement, improving

TAKE THE TIME TO READ:

Healthcare Papers: New Models for the New Healthcare, Vol 13, No 1. Frontline Ownership: Generating a Cure Mindset for Patient Safety. Zimmerman, B., Reason, P., Rykert, L., Gitterman, L., Christian, J., and Gardam, M. 2013.

This paper and subsequent commentaries from a number of authors provides an in-depth and inspiring look into improving a patient safety culture by encouraging frontline staff to innovate.

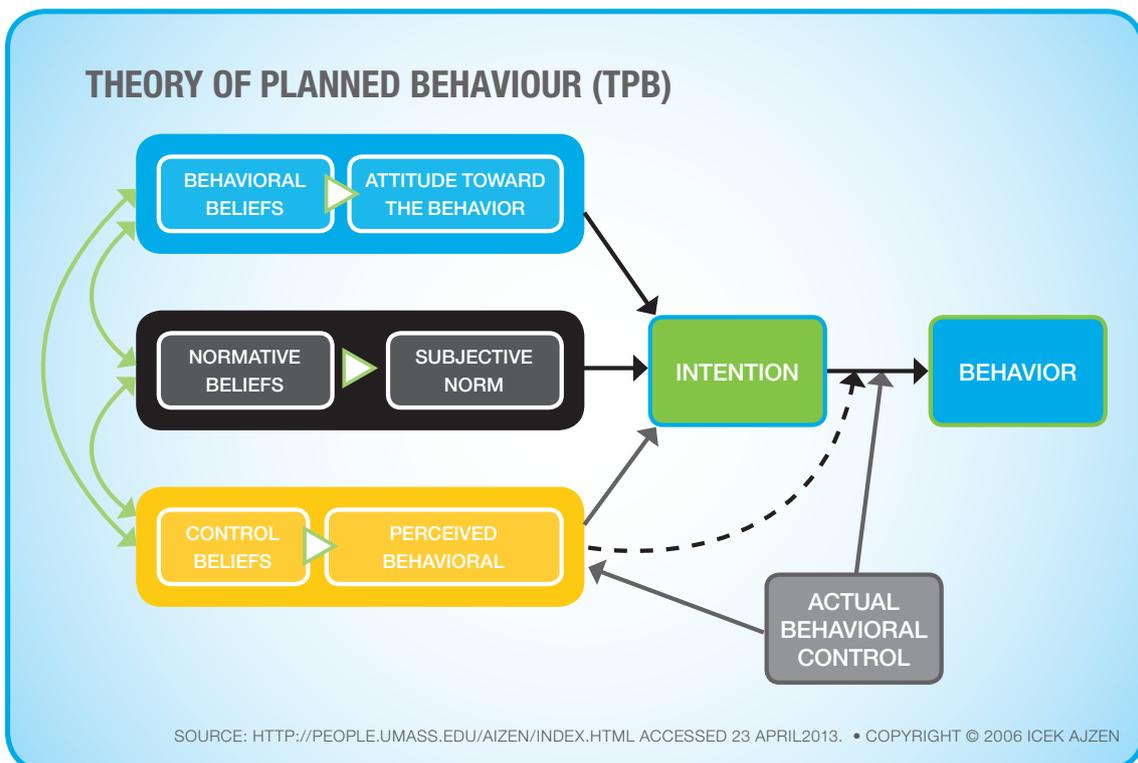
hand hygiene practice cannot be achieved by human factors engineering, such as optimising placement of product, alone.

According to the TPB, personal behaviours such as hand hygiene are largely determined by three sets of beliefs and values⁸.

-
- 1 Beliefs about the value and importance of a practice** (to produce desirable consequences or to avoid undesirable ones). Thus it is insufficient just to be told what to do, people need to believe that it actually is the right thing to do. For many healthcare workers, this requires them to understand why a particular practice is worthwhile. With respect to hand hygiene, evidence suggests that emphasising the positive consequences of hand hygiene for patients is a message that resonates with healthcare workers.
-

2 Beliefs about how the practice is perceived by significant others. This refers to the individual's perception of the degree of social pressure on them to adhere to certain practices. It also refers to the way the individual perceives the attitudes of others to the behaviour in question. This kind of influence can work in both directions. Evidence suggests that among the different healthcare worker professions, the opinions of doctors are considered particularly important in determining social norms.

3 The individual's perceptions about their ability to control the behaviour. With respect to hand hygiene, this principle underscores the importance of having systems in place to ensure that adherence to best hand hygiene practice is practical and realistically achievable. This principle also underscores the relevance of the FLO model. If frontline staff have been directly involved in devising their own systems and refining them for their own needs, then perceptions about behavioural control are likely to be much higher than if a new system is externally imposed.



THE ROAD TO IMPROVING HAND HYGIENE PRACTICE: PREREQUISITES AND PRINCIPLES

Even when we are fully committed to changing our practices and habits, doing so can be challenging. Trying to change longstanding hand hygiene practices is no exception. Although there is no simple formula that guarantees success, there are a number of key principles and strategies that can help us, as well as a broad, prerequisite framework.

While applying the framework alone is unlikely to be sufficient, it does provide the necessary foundation on which culture change can occur.

The prerequisite framework for changing the system:

- 1 Make good hand hygiene practice as convenient and easy as possible:**
 - Alcohol-based hand rub should be strategically placed at the point of care for maximum ease and convenience of use.
 - Exactly what constitutes optimal placement will vary between clinical settings (see the [HHNZ Implementation Manual](#) in the resource library on the HHNZ website www.handhygiene.org.nz).
- 2 Ensure everyone knows when hand hygiene is required during patient care.** The recommended standard of hand hygiene recommended in healthcare settings is far more stringent than it was in the past.

Hand hygiene is required not only before and after patient contact but also before and after any kind of procedure (including contact with a wound dressing or any kind of invasive device.)

Encourage staff to undertake [HHNZ's online hand hygiene learning package](#). There is a package specifically for medical staff. Access it at www.handhygiene.org.nz via the education centre.

3 Ensure that best practice hand hygiene recommendations are incorporated into organisational policy.

4 Ensure that suitable information is readily available to explain why such stringent standards of hand hygiene have been recommended.

This is particularly important for doctors who (rightly) tend to be skeptical of practices that can't be justified without good evidence or at least a compelling rationale.

While endless efforts to convince or persuade particular healthcare workers of the importance of hand hygiene are unlikely to be productive, information must be provided and available on request for those who consider this to be of high importance.

5 Regularly measure and feedback data on hand hygiene performance to key stakeholders.

Key principles for changing the culture:

1 Work on the principle that the best people to work out the details of how to improve their own hand hygiene practice are healthcare workers themselves. This is the principle behind frontline ownership. Rather than external experts telling healthcare workers exactly how to make it happen, individuals, services, and organisations are given a broad framework to work within and then encouraged to innovate, experiment, and to find out what specific approaches work best for them in their particular setting. Examples of areas where there is room for a whole variety of approaches include:

- Refinement and optimisation of precise placement of alcohol-based hand rub within the patient space.
- Development and application of systems to ensure that empty or absent product dispensers are replaced promptly and reliably.
- Approaches to ensuring that all staff receive basic hand hygiene education.
- Development and application of specific tools and approaches for delivering basic education.
- Development and application of reminder systems.
- Development of approaches to presenting and feeding back hand hygiene performance data.

- Development and implementation of patient engagement programmes (see the [HHNZ Patient Participation Guidelines](#) in the resource library on the HHNZ website www.handhygiene.org.nz).
- Development and application of frameworks and systems for incentivising good practice and/or establishing mutual accountability.

2 Approaches and innovations that result in success can then be showcased to others who may then choose to experiment with the approach in their own particular setting and to adapt it further if necessary.

3 Understand the need for patience, consistency, and persistence! Establishing new hand hygiene habits and cultural norms does not occur overnight. The focus should be on making progress in the right direction. Eventually a “tipping point” is likely to be reached, at which time ensuring good practice will seem less like swimming upstream and more like going with the flow.

HAND HYGIENE AND GLOVE USE

Incorrect glove use remains a barrier to good hand hygiene practice among healthcare workers. There are many times when wearing gloves during patient care is important for self-protection, but wearing gloves does not remove the need for hand hygiene.

Hand hygiene must be performed when appropriate regardless of glove use. Gloves should only be used by healthcare workers to protect themselves against blood, body fluids, and toxic agents, or for contact precautions and where indicated by DHB policy.

DID YOU KNOW?

- Using sterile or non-sterile gloves does not replace the need for cleaning your hands.
- Hand hygiene must be performed when appropriate regardless of the indications for glove use.
- Evidence shows that microorganism transmission can occur from and to the wearer's hands via tiny holes in gloves.
- Gloves should only be worn when indicated according to standard and contact precautions; otherwise they become a risk for microorganism transmission and therefore a potential risk for patient harm.

TIPS FOR GREAT HAND HYGIENE WHEN GLOVES ARE REQUIRED:

- Clean your hands before getting gloves out of a glove box. Putting unsanitised hands into a glove box may contaminate remaining gloves.
- Always clean hands before putting gloves on. When donning gloves unsanitised hands can contaminate the outside of the gloves (even with gloves from 'cuff first' boxes).
- Always clean hands when removing gloves. Removing gloves may contaminate your hands with 'splash back'. It is very difficult to remove gloves without some residual hand, finger, or wrist contamination.
- Always remove gloves to perform hand hygiene when an indication occurs while wearing gloves. Many moments are missed through inappropriate continuous glove wearing.
- Gloves should be removed for hand cleaning. Alcohol-based hand rub should not be applied to the outside of gloves.
- Actively consider whether gloves are required for the task, rather than routinely wearing them if they are not indicated.

FREQUENTLY ASKED QUESTIONS ABOUT HAND HYGIENE

The following FAQs are those HHNZ frequently receive from medical professionals.

1 Is there any good published evidence that hand hygiene benefits patients?

Over the last 30 years, many studies have shown temporal associations between improved hand hygiene practice and significant (and in many cases substantial) reductions in rates of hospital transmission of MRSA, rates of MRSA bloodstream infections, and overall rates of healthcare associated infections.

While it is true that some of these studies have methodological weaknesses and limitations, the underlying clinical rationale for improving hand hygiene practice, and the consistency with which beneficial outcomes have been reported, is compelling. For those that wish to read more in depth information, a list of key references is provided at the end of this document.

2 Why do we recommend five different moments for hand hygiene? Why isn't it sufficient to simply perform hand hygiene between patients?

Preventing transmission from one patient to another is not the only rationale for hand hygiene. Hand hygiene also helps individual patients by reducing contamination of anatomical sites vulnerable to becoming infected (such as invasive devices and surgical wounds.) For this reason, hand hygiene is necessary not only before patient contact but also before any procedure.

A secondary reason for hand hygiene is to protect the healthcare worker. This accounts for the additional recommendations to perform hand hygiene

after patient contact and after a procedure. The fifth “moment” and perhaps the most controversial, requires hand hygiene after contact with the patient’s environment. This is recommended because we know that the patient’s immediate environment becomes contaminated with many of the same pathogenic organisms found on the patient themselves.

3 Why is there so much focus on hand hygiene rather than cleaning of medical equipment used between patients such as stethoscopes?

There is no doubt that medical equipment such as stethoscopes can spread pathogenic organisms between patients but it is important to keep this risk in perspective. Whereas only a tiny fraction of all instances of contact between healthcare workers and patients involve stethoscopes, almost all involve the hands of healthcare workers. Moreover, stethoscopes and other medical equipment are less likely than the hands of healthcare workers to come into contact with anatomical sites vulnerable to infection (such as surgical wounds and intravenous lines.)

Yes, stethoscopes should absolutely be cleaned with alcohol between patients, but the primary focus currently placed on hand hygiene is justified.

4 Is alcohol-based hand rub as effective as soap and water?

When the hands are not visibly soiled, alcohol-based hand rub has been shown to be more effective than soap and water against the vast majority of pathogenic micro-organisms encountered in the healthcare setting.

From a practical standpoint, alcohol-based hand rub has the advantage of being quicker and more convenient to apply at the point of care, thus making more frequent use feasible. Moreover, alcohol-based hand rub is better tolerated than repeated washing with soap and water because they contain moisturising agents and have less of a drying effect on the hands.

5 What is the primary rationale for advocating such stringent hand hygiene practice in the hospital setting?

Resistance to antimicrobial agents is increasing at an alarming rate worldwide. Few new antimicrobial agents are in the development pipeline. Many resistant organisms spread in hospitals and the hands of healthcare workers often play an important role in this process. As healthcare associated infections become more and more difficult to treat, the stakes of infections occurring become proportionately higher. For this reason, healthcare workers are being forced to shift their focus from treatment of infections to preventing them in the first place.

One way to reduce infection risk is to optimise hand hygiene practice. It is against this background that adopting stringent standards of hand hygiene (such as the WHO 5 moments) is a critically important measure in modern hospitals. Moreover, multiple studies have shown that improvements in adherence to these recommendations have been associated with reduced infection rates.

6 Auditing hand hygiene according to the 5 moments seem unfair. It seems almost impossible to get 100%. Isn't this setting healthcare workers up for failure?

It is true that there are limitations to the WHO 5 moment recommendations and auditing tool, but to drive improvements in practice it is necessary to apply some kind of general set of best practice recommendations.

In the real clinical setting, compliance rates in excess of 85% are very difficult to attain due to both the practical realities of clinical interactions in some settings as well as the intrinsic limitations of the auditing system. In general however, it is generally accepted that consistent compliance rates of over 75% reflect a sufficiently high standard of practice to provide a safe clinical environment for our patients.

7 In certain clinical settings such as intensive care units, applying the 5 moments of hand hygiene is practically impossible when undertaking certain complicated procedures. How can we get around this?

Yes there are exceptional procedures (such as induction during anaesthesia) where it may be practically impossible to strictly adhere to the 5 moments of hand hygiene, but overall, these exceptions comprise a miniscule proportion of all occasions when hand hygiene is indicated.

The 5 moments are a generic set of recommendations intended for general application across the full spectrum of clinical settings and thus inevitably have limitations in some instances. However, our focus should always be on the overwhelming majority of instances where appropriate hand hygiene is entirely possible, and within our ability to consistently perform.

8 Is it reasonable to use non-sterile gloves as an alternative to hand hygiene?

The primary rationale for the use of non-sterile gloves is to protect the healthcare worker rather than the patient. During the course of clinical care, gloved hands become contaminated in the same way that ungloved hands do.

Importantly, wearing gloves instead of performing normal hand hygiene during the care of a single patient may actually increase risk to that patient by increasing the risk of transferring pathogens from one anatomical site to another and thus increasing the risk of inoculating sites vulnerable to infection (such as surgical wounds and intravenous cannulae.)

Non-sterile glove use should thus generally be limited to procedures or occasions where there is a significant risk to the healthcare worker of exposure to blood or body fluids. Moreover, even under these circumstances, hand hygiene in accordance with the 5 moments can generally still be performed and should always be performed immediately before and after donning gloves.

HAND HYGIENE IN THE HEALTHCARE SETTING: LITERATURE AND STUDIES

The categorised lists of published papers below are intended to be a helpful set of examples rather than an exhaustive list.

1 Original studies in healthcare settings investigating the relationship between changes in hand hygiene practice and infectious outcomes

- Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. *Lancet* 2000; 356:1307-12
- Reduction in nosocomial infection with improved hand hygiene in intensive care units of a tertiary care hospital in Argentina. *Am J Infect Control* 2005; 33:392-7
- Efficacy of an alcohol/chlorhexidine hand hygiene program in a hospital with high rates of nosocomial methicillin-resistant *S. aureus* (MRSA) infection. *Med J. Aust* 2005; 183:509-14
- Reduction in hospitalwide incidence of infection or colonisation with methicillin-resistant *S. aureus* with use of antimicrobial hand hygiene gel and statistical process control charts. *Infect Control Hosp Epidemiol* 2007; 28:837-44
- Significant reductions in methicillin-resistant *S. aureus* bacteraemia and clinical isolates associated with a multisite hand hygiene culture-change program and subsequent successful statewide roll-out. *Med J. Aust* 2008; 188:633-40
- Prospective, controlled, cross-over trial of alcohol based hand gel in critical care units. *Infect Control Hosp Epidemiol* 2008; 29:8-15
- Clustered randomized controlled trial of a hand hygiene intervention involving pocket-sized containers of alcohol based hand rub for the control of infections in long term care facilities. *Infect Control Hosp Epidemiol* 2011; 32:67-76
- Outcomes from the first two years of the Australian National Hand Hygiene Initiative *Med J. Aust* 2011; 195:615-9
- Evaluation of the national Clean Your Hands campaign to reduce *S. aureus* bacteraemia and *C. difficile* infections in hospitals in England and Wales by improved hand hygiene: four year, prospective, ecological interrupted time series study. *BMJ* 2012; 344:e3005
- Impact of a hand hygiene educational programme on hospital acquired infections in medical wards. *Clin Microbiol Infect* 2012; 18: 1212-8

-
- Implementing and sustaining a hand hygiene culture change programme at Auckland District Health Board. *NZ Med J* 2012; 125:75-85
 - Impact of a hospital-wide hand hygiene initiative on healthcare-associated infections: results of an interrupted time series. *BMJ Qual Saf* 2012; 21:1019-26
 - Interventions to reduce colonization and transmission of antimicrobial-resistant bacteria in intensive care units: an interrupted time series and cluster randomized trial. *Lancet Infect Dis* 2014; 14:31-9
-

2 Original studies investigating contamination of healthcare worker hands with healthcare-associated pathogens

- Gram negative bacilli as non transient flora on the hands of hospital personnel. *J Clin Microbiol* 1987; 25:488-90
 - High frequency of yeast carriage on hands of hospital personnel *J Clin Microbiol* 1994; 32:2299-300
 - Bacterial contamination of the hands of hospital staff during routine patient care *Arch Intern Med* 1999; 159:821-6
 - Effectiveness of gloves in the prevention of hand carriage of vancomycin-resistant Enterococcus species by health care workers after patient care. *Clin Infect Dis* 2001; 32:826-9
 - Impact of ring wearing on hand contamination and comparison of hand hygiene agents in a hospital. *Clin Infect Dis* 2003;36:1383-90
 - Dynamics of bacterial hand contamination during routine neonatal care. *Infect Control Hosp Epidemiol* 2004; 25:192-7
 - Acquisition of nosocomial pathogens on hands after contact with environmental surfaces near hospitalized patients *Infect Control Hosp Epidemiol* 2004; 25:164-7
 - Molecular epidemiology of gram negative bacilli from infected neonates and health care workers hands in neonatal intensive care units. *Clin Infect Dis* 2004;38:1682-7
 - Risk of hand or glove contamination after contact with patients colonized with vancomycin-resistant Enterococcus or the colonized patient's environment *Infect Control Hosp Epidemiol* 2008; 29:149-54
 - Hand contamination of anaesthesia providers is an important risk factor for intraoperative bacterial transmission *Anesth Analg* 2011; 112:98-105
-

3 Papers discussing hand hygiene recommendations and implementation of programmes using the WHO 5 moments for hand hygiene

- Guideline for hand hygiene in healthcare settings. *MMWR* 2002; 51:1-45
- 'My five moments for hand hygiene': A user centred design approach to understand, train, monitor and support hand hygiene. *J Hosp Infect* 2007; 67:9-21
- The WHO Clean Care is Safer Care programme: Field testing to enhance sustainability and spread of hand hygiene improvements *J Infect Pub Health* 2008; 1:4-10
- The World Health Organization hand hygiene observation method *Am J Infect Control* 2009; 37:827-34
- Global implementation of WHO's multimodal strategy for improvement of hand hygiene: a quasi experimental study. *Lancet Infect Dis* 2013; 13:843-51

4 Original studies investigating behavioural factors affecting hand hygiene practice in the healthcare setting

- Influence of role models and hospital design on hand hygiene of health care workers. *Emerg Infect Dis* 2003; 9:217-223
- Hand hygiene posters: motivators or mixed messages? *J Hosp Infect* 2005; 60:218-225
- Why healthcare workers don't wash their hands: A behavioural explanation. *Infect Control Hosp Epidemiol* 2006; 27:484-492
- System failure versus personal accountability: The case for clean hands *N Engl J Med* 2006; 355:121-3
- Inverse correlation between level of professional education and rate of handwashing compliance in a teaching hospital *Infect Control Hosp Epidemiol* 2008; 29:534-8
- A qualitative exploration of reasons for poor hand hygiene among hospital healthcare workers: Lack of positive role models and of convincing evidence that hand hygiene prevents cross-infection *Infect Control Hosp Epidemiol* 2009; 30:415-9
- It's not all about me: Motivating hand hygiene among health care professionals by focusing on patients *Psychol Sci* 2011; 22:1494-9
- The Feedback Intervention Trial (FIT)-improving hand hygiene compliance in UK healthcare workers: A stepped wedge cluster randomised controlled trial *PLOS One* 2012; 7:e41617

-
- Delivering the infection control message: a communication challenge. *J Hosp Infect* 2012; 80:224-8
 - Explaining the effects of two different strategies for promoting hand hygiene in hospital nurses: a process evaluation alongside a cluster randomised trial. *Implementation Science* 2013; 8:41
 - Hand hygiene compliance: the elephant in the room. *Healthcare Infection* 2013; 18:86-9
-

5 Assorted review papers relevant to hand hygiene in the healthcare setting

- An integrative review of the current evidence on the relationship between hand hygiene interventions and the incidence of health care-associated infection *Am J Infect Control* 2008;36:333-48
 - Role of hand hygiene in healthcare-associated infection prevention *J Hosp Infect* 2009; 73:305-15
 - Evidence-based model for hand transmission during patient care and the role of improved practices *Lancet Infect Dis* 2006; 6:641-52
 - 'My five moments for hand hygiene': A user centred design approach to understand, train, monitor and support hand hygiene. *J Hosp Infect* 2007; 67:9-21
 - Behavioural considerations for hand hygiene practices: the basic building blocks *J Hosp Infect* 2007; 65:1-8
 - Hand hygiene posters: selling the message *J Hosp Infect* 2005; 59:77-82
 - A systematic review of hand hygiene improvement strategies: a behavioural approach *Implementation Science* 2012; 7:92.
-

REFERENCES

1. Behavioural considerations for hand hygiene practices: the basic building blocks *J Hosp Infect* 2007; 65:1-8
 2. The WHO Clean Care is Safer Care programme: Field testing to enhance sustainability and spread of hand hygiene improvements *J Infect Pub Health* 2008; 1:4-10
 3. Healthcare culture and the challenge of preventing healthcare associated infections. *Healthcare quarterly* 2010; 13:116-120
 4. Why healthcare workers don't wash their hands: A behavioural explanation. *Infect Control Hosp Epidemiol* 2006; 27:484-492
 5. Global implementation of WHO's multimodal strategy for improvement of hand hygiene: a quasi experimental study. *Lancet Infect Dis* 2013; 13:843-51
 6. Front-Line Ownership: generating a cure mindset for patient safety. *Health care papers* 2013; 13:6-22
 7. A multicenter study using positive deviance for improving hand hygiene compliance. *Am J Infect Control* 2013; 41:984-8
 8. The theory of planned behaviour. *Organizational Behaviour and Human Decision Processes* 1991; 50:179-211
-

