

**Evaluating environmental cleanliness in  
hospitals and other healthcare settings**  
**What are the most effective and efficient  
methods to use?**

## **Evaluating environmental cleanliness in hospitals and other healthcare settings**

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Tasmanian Infection Prevention and Control Unit (TIPCU)

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## Foreword

We believe that the environment plays an important part in infection prevention and control. For this reason, we consider the evaluation of environmental cleanliness to be an integral part of any infection prevention and control program.

Numerous studies in the literature discuss novel methodologies that assess both the extent of environmental contamination in the hospital environment and efficacy of cleaning. Methods of assessing environmental cleanliness can be broken down into two types: process evaluation, such as visual inspection and fluorescent gel application, and outcome evaluation, where cleanliness is measured using methods such as adenosine triphosphate (ATP) or microbial cultures. An important fact to remember, however, is that just because the environment may appear 'dirty', this does not necessarily mean it poses an increased risk of infection for patients. Conversely, an environment that appears 'clean' may harbour microorganisms that are potentially harmful.

The purpose of this review is to describe some of the main methodologies currently used in assessing environmental cleanliness as well as document current local, national and international practices. Following the completion of this report, we aim to bring together relevant and interested parties from across Tasmania to present the findings, identify options for potential future use within Tasmania, and have an open discussion around other issues regarding environmental cleaning and infection control within healthcare environments.

Our ultimate goal would be to see a standardised approach to evaluating environmental cleanliness within Tasmanian healthcare facilities. Although we are at the beginning of this journey, this report is the first step towards achieving this.

Brett Mitchell



Dr Alistair McGregor



# I. Overview

Authors: Brett Mitchell, Chris Ware

Healthcare associated infections (HAIs) have a major impact on our healthcare service and the population it serves. Large prevalence studies from several countries indicate that approximately 8 per cent of hospitalised patients will acquire an infection as a result of receiving healthcare (1, 2). Within Australia there are an estimated 200,000 cases of HAI occurring each year, which equates to around 2,300 cases within Tasmania (3).

HAIs affect the morbidity and mortality of patients and also result in adverse events such as prolonged length of stay in hospital. In addition to hospitals, HAIs affect patients in other healthcare settings such as long-term care facilities and general practice.

No single cause of, or quick fix for, the problem of HAIs exists at present. Evidence suggests that the issue needs to be tackled using a multi-faceted approach. Understanding the modes of transmission of infectious agents and applying basic principles to prevent infection are critical to reducing the occurrence of HAIs. Some fundamental requirements for preventing infection in healthcare environments are cleanliness of hands and the environment, the isolation of patients known or suspected of having easily transmissible or epidemiologically important pathogens, targeted screening and antimicrobial stewardship.

One key element in infection prevention is environmental cleaning. In December 2010, the Tasmanian Healthcare Associated Infection Advisory Group supported TIPCU to undertake a review of environmental hygiene practices in healthcare facilities. The objective of the present review is to assess current local, national and international practices and literature in relation to evaluation of environmental hygiene in healthcare environments.

## 2. The Importance of the Environment and HAI Prevention

Authors: Brett Mitchell, Dr Alistair McGregor, Chris Ware

A wide range of microorganisms can cause infections in a healthcare setting. To understand how the environment may play a part in the occurrence of infections, it is important to think beyond the endpoint—the infected patient. For example, persons colonised with microorganisms can contaminate the environment. In turn, these microorganisms can be transferred to other sites, most commonly by the hands of healthcare workers, patients and visitors. Microorganisms acquired from these sites may then be responsible for infection in other patients. In the past, the role of the inanimate hospital environment (e.g., surfaces and equipment) in the spread of HAIs has been regarded as controversial (4). However, a large body of evidence now supports the notion that the environment does play a part in microorganism transmission and subsequent infection.

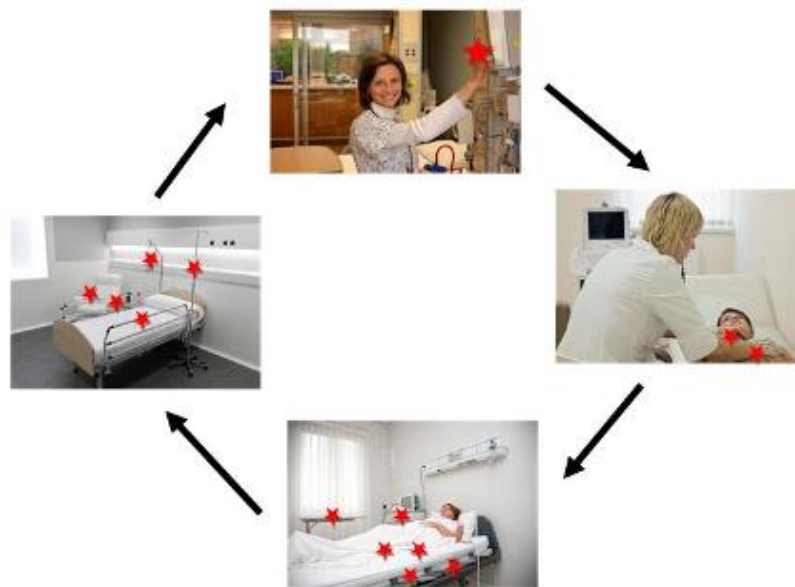
The potential for contamination of environmental surfaces to contribute to transmission of healthcare associated pathogens depends on a number of factors, including the:

- ability of pathogens to remain viable on a variety of environmental surfaces
- frequency with which organisms contaminate surfaces
- location of reservoirs
- handling frequency of surfaces and whether or not levels of contamination are sufficiently high to result in transmission to patients (5).

The time that pathogens remain viable in the environment varies considerably and depends upon the particular characteristics of the organism. Research conducted by Colbeck (6) demonstrated that *Staphylococcus aureus*, the organism responsible for most HAIs in Australia, can remain virulent and capable of causing infection for at least 10 days after inoculation onto a dry surface.

The idea that microorganisms can survive for long periods in the environment has been supported by numerous studies (7, 8). Unless adequate cleaning is undertaken, microorganisms in the healthcare environment may contaminate hands or uplifting air currents and be subsequently deposited onto a patient or surfaces near a patient (9-13). Sites considered to be ‘hand-touch sites’ are of particular importance. Microorganisms do not discriminate between environmental sites and when they persist on sites that are likely to be touched regularly, there is a risk of onward transmission to patients via healthcare workers’ hands.

**Figure 1:** Transmission cycle demonstrating the role of the environment



Several studies have shown that persistence of microorganisms in the environment leads to an increased risk of acquiring an infection in a patient who is admitted to a room previously occupied by a patient colonised or infected with that particular organism (14, 15). Environmental contamination in conjunction with colonisation pressure (i.e., the proportion of patients colonised with an organism) is thought to play a role in transmission of microorganisms. This concept has been demonstrated to explain the transmission of organisms such as methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin resistant enterococcus (VRE) in the healthcare environment (16-19).

For *Clostridium difficile*, which is transmitted in a similar fashion to VRE, colonisation pressure or the proportion of other patients colonised with the same organism, and the environment are also thought to play important roles in transmission. This has been shown to be the case in a retrospective cohort and nested case control study of 36,000 admissions. Following multivariate logistic regression, the authors suggest that the more patients there are with *Clostridium difficile* infection on a hospital ward, the more likely it is that other patients will acquire the organism (20). Environmental contamination with spores is now well accepted as a risk factor for the acquisition of *Clostridium difficile*.

Microorganisms can be found on a large number of surfaces in the healthcare environment (21). Items in close proximity to the patient tend to be more heavily contaminated than those that are more remote. The greatest risk of acquiring microorganisms that result in infection has been suggested to arise from near-patient items such as bed rails and bedside tables, as contamination of these sites provides frequent opportunity for hands to touch and transfer organisms. Paradoxically, however, the thoroughness of cleaning appears sometimes to be oriented towards those sites that



are traditionally or aesthetically important, or physically easier to clean, rather than sites that have the most significant potential for harbouring and transmitting microbes (22).

**Figure 2:** Frequently touched objects in the patient environment



Published studies demonstrating the importance of cleaning in outbreak scenarios underscore the likely role that environmental contamination plays in the transmission of HAIs (23). Multiple studies have shown that enhanced cleaning significantly decreases environmental contamination by a range of HAI pathogens (21, 24-27). These studies, alongside the known role of colonisation pressure, demonstrate the potentially important role that the environment plays in infection transmission and prevention.

## 2.1 Summary

- The healthcare environment plays a role in transmission of microorganisms that may cause infection and therefore potentially has a role in prevention.
- Near-patient (frequently touched) objects are often contaminated with potentially pathogenic microorganisms and therefore pose the greatest risk for the transfer of pathogens.
- The risk of acquiring a specific organism is increased if a patient is admitted to a room previously occupied by a patient who had been colonised or infected with that organism.
- Environmental cleaning reduces environmental contamination thus can reduce the risk of transmission of infection.

### 3. Why Evaluate Environmental Cleanliness?

Authors: Brett Mitchell, Dr Alistair McGregor

A considerable international debate currently exists regarding the role of the environment in HAIs and the best way or ways to evaluate environmental cleanliness. The public has linked the visual appearance of a hospital with the risk of HAI but there is currently little evidence to support this view (28). The role of environmental cleaning has been acknowledged and promoted in published guidelines, with many government-sponsored documents prescribing some form of quality assurance audit or assessment. However gaps remain between what is outlined as best practice in these documents and what is actually occurring. In part, this is due to a lack of generally accepted scientific standards, which further confounds the ability to demonstrate an undisputed role for the environment in HAIs (29-32).

A number of reasons can be listed to show why evaluating environmental cleanliness (a form of surveillance) in a standardised format is warranted. These include:

- the need to evaluate the effectiveness of interventions
- to detect trends
- to provide a framework for performance management
- to provide reliable data to support quality improvement activities
- to ensure that staff in hospitals have relevant and useful information to inform their practice.

## 4. Methods of Assessment

Authors: Chris Ware, Fiona Wilson, Saffron Brown

Studies are appearing in the literature describing novel methods for assessing both the efficacy of cleaning and the extent of environmental contamination in the hospital environment. Methods for assessing environmental cleanliness can be broken down into two types: process evaluation, where the cleaning process is monitored by visual inspection or using a fluorescent gel marker; or outcome evaluation, where cleanliness is evaluated with the use of ATP or microbial cultures (33).

This chapter will discuss these two methods for evaluating environmental cleanliness—monitoring the process and measuring the outcome.

### 4.1 Monitoring the cleaning process

#### 4.1.1 Visual inspection

The primary method for assessing the cleanliness of healthcare environments is visual inspection (33, 34). Visual inspection is generally undertaken by a healthcare professional, who carries out an inspection of surface areas for visible dirt, soiling or moisture. Commonly, environmental cleanliness audits are undertaken by environmental cleaning staff, and the effectiveness of these is intermittently assessed by healthcare professionals such as infection control staff or trained monitoring consultants (30, 31).

An increasing focus on methods for quantitative assessment of cleanliness in hospital environments has highlighted many of the shortcomings of visual assessment. We identified six quantitative studies that compared the performance of visual assessments with results from microbial swabbing or ATP assays in the healthcare environment (25, 35-39). In all six investigations, visual assessment was reported to perform poorly at identifying microbial load, typically passing between 17–93 per cent more surfaces as ‘clean’ than other assessment methods. These studies reiterate that a visual appraisal of cleanliness is not a proxy for decontamination.

While visual assessment of the cleanliness of a hospital ward, surface or item may satisfy aesthetic obligations, it cannot reliably assess the infection risk posed to patients (34). It is the cheapest and quickest of all methods described in this report however, requiring less training and fewer personnel than other methods. As a means of providing a measure of the efficacy of hospital cleaning and personnel performance, visual inspection has its merits: it is the only method that can quickly assess all surfaces for gross deficiencies in a hospital ward that may harbour pathogens.

### 4.1.2 Fluorescent gel

This method employs an invisible transparent gel that dries on surfaces following application and resists dry abrasion, but is easily removed with light abrasion after wetting. The gel is visible only under a UV lamp so the thoroughness of cleaning can be determined following cleaning by using a UV lamp to illuminate surfaces where the gel was applied. We identified five studies that have tested the thoroughness of routine hospital cleaning and the effect of cleaning interventions and that were able to demonstrate the thoroughness of cleaning administered by cleaning personnel using this method (22, 29, 40-43).

The fluorescent gel method readily demonstrates a lack of attention to those surfaces in the near-patient zone that routinely harbour high concentrations of bacteria and pathogens. Targeting objects and their subsequent evaluation following cleaning has been shown to take less than two minutes per room for each activity (40), permitting cleaning evaluation to be undertaken on a large scale. Furthermore a fluorescent gel application can provide a more standardised approach to process evaluation compared to visual inspection.

**Figure 2:** Examples of a fluorescent marker



Note: Pictures of the DAZO® Fluorescent Marking Gel and UV Light pen are used with permission from Ecolab®

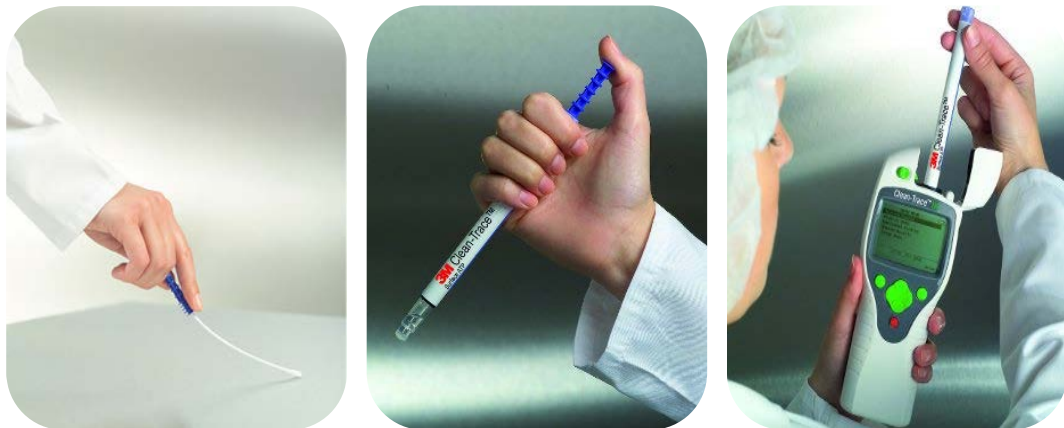
As with visual assessment of environmental cleanliness, which evaluates cleaning performance rather than environmental contamination *per se*, this method relies upon the assumption that improved cleaning procedures can reduce environmental sources of pathogens (44) and have a favourable impact on transmission (24). Addressing cleaning performance therefore remains a vital step in the initial evaluation of environmental cleaning and the use of a fluorescent marking system to monitor cleaning provides an effective method to accomplish this.

## 4.2 Measuring the outcome of cleaning

### 4.2.1 ATP bioluminescence

The measurement of ATP is the first of two methods commonly employed for specific sampling of the bioburden in the hospital environment. ATP is the basic energy component molecule of all plant and animal cells and is in all microorganisms and organic residues. Sampling a surface for ATP measures the amount of organic soil, including microorganisms, on that surface. The method uses a specialised swab to sample a standardised area. The swabs are placed in a detection device that uses the firefly enzyme and substrate luciferase and luciferan, respectively, to catalyse a reaction with ATP. Light output from the reaction is proportional to the amount of ATP present, and can be measured with a luminometer (measured in relative light units, or RLUs). While considerable variation can occur in the readouts (14, 45, 46) and in the sensitivity (47) of commercially available systems, very low readings are typically associated with low aerobic colony counts (ACC) on surfaces(48).

**Figure 3:** Example of an ATP bioluminescence system



Note: Pictures of the 3M® Clean-Trace™ system are used with permission from FOSS®

ATP measurement has been used to evaluate cleanliness of food preparation surfaces for over 30 years (33, 35). The measurement of ATP is increasingly being used in a number of studies of hospital surface contamination where ATP is typically measured in addition to microbial swabbing, either to evaluate cleaning performance or to test the success of a cleaning intervention (25-27, 35, 36, 38, 39, 48, 49).

The benefits of using ATP measurements to evaluate hospital cleanliness are, broadly, three-fold:

1. Results of residual surface ATP can be delivered within 20 seconds of sampling (38).
2. The ease of use of ATP measurement systems and the substantially reduced level of training required to use the system provides an additional suite of benefits, including compelling educational strategies (39).
3. Benchmarking is a benefit of using ATP to evaluate cleanliness.

Efforts to establish a basis from which to assess surface hygiene have resulted in proposals for ATP standards (34-36, 49). However, difficulties emerge when benchmarking differing ATP systems, as ATP results with one system may not necessarily be comparable to those generated by a different system. These differences could be corrected by producing a 'calibration curve' for a variety of known clean and dirty surfaces prior to sampling (39).

Limitations of the use of ATP measurement systems are found in both the propensity of systems to produce false positives, and in the ability of the system to produce accurate results on all surfaces. ATP measurements provide a quantification of all organic material collected from a swab, including viable bacteria, but also including non-viable bacteria and non-microbial organic debris such as food and liquids such as milk, blood or urine (36). Thus, any ATP result may represent the ratio of these or other ATP-producing organisms. However, means are available for distinguishing the ratio of microbial to non-microbial components of an ATP measurement by enzymatic removal of non-bacterial ATP before the assay. Studies that have done this calculated that 33 per cent of the ATP load was attributable to microbial organisms (35, 50).

Nevertheless, the viability and identification of microbes (typically bacteria) in these examples still remains unknown. For this reason, ATP measurements have a low sensitivity and specificity in detecting bacteria, with one example finding that using an ATP measurement system had a sensitivity and specificity of just 57 per cent (49), which could be considered to be too great a margin of error to justify stringent monitoring using this method alone. The capacity for ATP measurement systems to produce accurate results can also be compromised by factors such as residual detergents or disinfectants including sodium hypochlorite, (51, 52), surfaces in poor condition (35), plasticisers found in microfibre cloths or ammonium compounds found in laundry products (53). These factors may all either increase or decrease ATP readings (33).

#### **4.2.2 Microbial methods**

Microbial methods for evaluating environmental cleaning have long been used to evaluate surface contamination and have been the principal methods employed in hospitals to assess surface cleanliness (54). Through the late 1950s and 1960s, microbiological culturing was common practice as part of ongoing hospital monitoring programs (33) and accordingly, colony counts, Rodac plate counts, and quantitative air sampling were all routinely performed on the hospital environment and even inanimate objects (54). In hospitals today, microbial evaluation typically targets a range of surfaces within wards, equipment, or work stations and involves the use of swabs or dipslides to culture organisms in order to gain a standardised ACC and/or to detect the presence of specific bacteria. This type of investigation is generally only recommended as part of an outbreak investigation, as a component of research, or as part of policy or process evaluation (31, 55).

Microbiological evaluation of hospital surfaces provides the most accurate indication of infection risk of all the methods discussed because it can detect and identify viable bacteria and fungi. Reasons for not advocating microbiological evaluations in all situations centre on the time and resources required to process conventional microbiological cultures. The time taken to enumerate ACCs or

identify pathogens may be at least two days, and specific expertise as well as microbiology laboratory access are required. In 2004, Dancer proposed two microbiological standards for assessing environmental hygiene; namely, the presence of an indicator organism or the breaching of a quantitative ACC. The details of these methods are summarised in Appendix I.

While microbiological methods can produce results with high specificity, sampling techniques have varied sensitivity and often under-sample a surface, thereby hindering accurate assessments of surface contamination and study comparability. Briefly, swabs, dipslides, sampling sponges, and settle plates may all be used to sample surfaces, and the choice of sampling method will affect the final ACC measurements. Dipslides have been evaluated as having superior sensitivity and consistency, particularly for dry surfaces, while swabs will not always pick up bacteria present on surfaces, and can retain bacteria within the swab bud itself (56-58). Finally, an airborne component of infection risk may also exist in a ward and can often be overlooked in studies. Settle plates and air samplers have been used to measure airborne contamination caused by floor mopping (45) and bed making (59), as well as routine cleaning (60).

## 5. Summary of Audit Methodologies

Authors: Chris Ware, Fiona Wilson, Saffron Brown

A review of the literature demonstrates that benefits and limitations exist for all methods of environmental cleaning evaluation. These are summarised in Table I. Methods that evaluate cleaning performance are useful in assessing adherence to cleaning protocols, whereas methods that sample bioburden provide a more relevant indication of infection risk. Risk is more accurately related to hand touch frequency and level of surface contamination with specific pathogens, in combination with routes of transmission (36). Fast, reproducible, and reliable methods are needed for environmental cleaning evaluation in order to predict timely clinical risk.

**Table I:** Summary of methodologies

	<b>Advantages</b>	<b>Disadvantages</b>
<b>Assessing Performance</b>		
Visual inspection	Can be used for large areas (wards, rooms) Can be done with minimal training Benchmarking possible Simple and inexpensive	Subjective Does not assess bioburden Does not correlate with bioburden Can be confounded by clutter, fabric deficits and odours
Fluorescent gel	Quick Provides immediate feedback on performance Minimal training required Objective Benchmarking possible Relatively inexpensive	Does not assess bioburden Could be labour intensive as surfaces must be marked before cleaning and checked post cleaning
<b>Assessing Outcome</b>		
ATP bioluminescence	Quick Provides immediate feedback Minimal training required Objective	Expensive Low sensitivity and specificity No current standardisation of tests Variable benchmarks Technology constantly changing
Microbial cultures	High sensitivity and specificity Objective Provides direct indication of the presence of whatever pathogen is isolated May suggest environmental reservoir(s) and/or source of outbreak	Expensive Prolonged time for results Requires accessible laboratory resources and trained personnel for interpreting results Not supported for routine use by local and international guidelines Few laboratories NATA accredited to perform these tests Requires standardised benchmark to assess infection risk

Note: Disadvantages of all of these methods includes requiring feedback to cleaners, the fact that they may lose impact over time and that they need to be linked with formal performance indicators.



## 6. Local, National and International Practices

Authors: Fiona Wilson, Saffron Brown, Chris Ware

As part of the review of environmental hygiene practices in healthcare facilities, the TIPCU engaged with local and national stakeholders and posed a number of questions regarding assessment of environmental cleanliness within their healthcare facilities. Both national and international guidelines were reviewed in regard to recommendations made about assessing environmental cleanliness.

### 6.1 Tasmanian practices

#### 6.1.1 Methods

Each of the Area Health Services were contacted by TIPCU, which requested help in identifying the key stakeholders in their acute hospitals, such as the heads of environmental services and infection control staff, and sought permission to discuss evaluation of environmental cleanliness with these hospitals.

The TIPCU staff engaged with both environmental services staff and infection prevention and control units at Royal Hobart Hospital, Launceston General Hospital, Mersey Community Hospital and North West Regional Hospital. At these meetings, set questions were asked of the stakeholders regarding their practices (see Appendix 2). Interviews were also held with Infection Control representatives from the rural hospitals.

#### 6.1.2 Findings

All of the larger acute hospitals surveyed use visual assessment as the primary method of assessing environmental cleanliness. These audits are generally performed by the Environmental or Hotel Services staff, with the exception of one hospital, where Infection Control staff undertake the assessments.

Two hospitals audit both clinical and non-clinical areas, while the other two hospitals audit clinical areas only. The frequency of auditing environmental cleanliness also varies between hospitals, with one auditing all areas daily, one performing five audits per week, one doing two audits per week on a rotating basis, and one doing audits depending on the results of the previous audit.

Only one hospital regularly uses any other methodologies for assessing cleanliness. This hospital undertakes environmental swabbing as a measurement of the effectiveness of environmental hygiene and disinfection following the discharge of patients with MRSA or VRE. This protocol is not used for assessing routine cleaning of the hospital environment.

The environmental cleaning assessments that occur within the four large acute public Tasmanian hospitals are contained in a supplement to this report.

No routine, standardised cleaning assessments appear to occur within the rural hospitals.

## **6.2 Australian jurisdictional practices**

### **6.2.1 Methods**

Information regarding environmental cleaning assessments within healthcare facilities across Australian jurisdictions was sought from the Infection Control departments within the State Health Departments and/or via State and Territory Health Department websites. Questions included whether cleaning was audited or assessed, the methodologies used, what training was undertaken, frequency and sites of assessment, and whether there were documented cleaning protocols.

### **6.2.2 Findings**

Canberra Hospital (Australian Capital Territory) uses an external cleaning company that uses the Victorian Health audit tool (see below). The Victorian audit tool audits environmental cleanliness via visual inspection. The cleaning company has its own policy and procedures but these were heavily guided by the Canberra Hospital. Auditing is performed weekly in clinical areas and wards are selected randomly. Risk assessment of all functional areas is carried out and the frequency of auditing and acceptable quality level or score is based on this risk categorisation. Data are either recorded electronically, directly onto a database, or manually via a paper-based system that is entered onto the database at a later date.

Within Queensland public hospitals, cleaning is performed and assessed based on the Queensland Health Cleaning Services, Policies, Standards and Operational Guidelines 2011 (personal correspondence, F. Fullerton, Centre for Healthcare Related Infection Surveillance and Prevention (CHRSP), June 2011, January 2012). Environmental cleanliness of both clinical and non-clinical areas is assessed using a similar risk assessment framework to that used by Victoria and the ACT, where environmental cleanliness is audited visually while the frequency of auditing and acceptable quality level or score is based on an initial risk categorisation of functional areas. Queensland Health does not recommend routine sampling of the environment as this is not deemed cost effective nor supported by the literature. Environmental sampling is only recommended when conducting research, during an outbreak investigation to identify an epidemiological link between environmental sampling results and clinical isolates, or for quality assurance purposes.

New South Wales does not have a statewide environmental cleaning assessment program in place, but the HAI Environmental Hygiene Working Party is in the process of developing a future strategy in regard to monitoring. The release of the new Environmental Cleaning Policy and the accompanying Environmental Cleaning Standard Operating Procedures (ECSOP) is expected to occur during 2012. The ECSOP are meant to provide step-by-step guidance for undertaking environmental cleaning in healthcare and will replace the 1996 'Cleaning Services Standards, Guides and Policy for NSW Health Facilities' which currently provides a framework for an effective and efficient cleaning service that meets the needs of all users of hospital facilities. The Standards have been framed to reflect the basic minimum policy standards, which must be adhered to, guidelines based on a 'best practice' methodology and a quality assurance program that will provide for an ongoing monitoring process. This new policy will outline standards for environmental cleaning within all NSW public healthcare facilities to ensure that facilities are clean and safe in order to reduce the incidence of HAIs and will replace the section on environmental cleaning in the current Infection Control Policy PD2007-036 (61). At present, PD2007-036 requires healthcare organisations to have personnel responsible for the implementation, management and evaluation of their cleaning service, as well as a means for evaluating the quality of their cleaning practice. While there may not be a standard audit tool or methodology, cleaning services are monitored and evaluated at a hospital level. Development of a standard audit tool for use in NSW public healthcare facilities is expected to be a component of the implementation strategy for the new policy.

In the Northern Territory there is no state-wide cleaning assessment program in place. At the Royal Darwin Hospital visual environmental assessments are performed biannually by Infection Control personnel as part of the Infection Control Compliance Audits. No environmental swabbing occurs as the microbiology laboratory does not process these swabs.

South Australia does not have a standardised state-wide cleaning and auditing program in place but cleaning services are regularly monitored and evaluated at a hospital level. These evaluations occur across a large number of SA public hospitals and a variety of assessment tools are used including visual assessment, the 'White Glove Method' and environmental swabbing. The frequency of use of these methodologies varies, with visual assessment being the most common and frequent method of assessment. The assessments are done predominantly via internal audits with some facilities also having external assessments performed.

There is a current project that is developing cleaning standards for healthcare facilities across the state and, once approved, the plan is then to move into the implementation phase. The proposal is that hospitals will perform regular internal audits using a standardised tool that SA Health will develop, plus have external audits done using an existing SA Health audit team. Auditors will be suitably qualified to conduct cleaning audits against the standard.

Victoria has a comprehensive cleaning assessment program across all Victorian public hospitals named the 'Cleaning Standards for Victorian Health Facilities 2011' (62). These standards, which have been in place since 2000 with a major review in 2007, outline what the outcomes should be for

cleaning within healthcare facilities and have been designed to simplify the visual assessment of environmental cleaning. To summarise, surfaces, articles, items or fixtures that must be cleaned are known as elements. There are 15 of these, grouped under four major headings. All areas and rooms where cleaning is assessed are known as functional areas, and these are risk stratified into four risk categories. These categories range from A—very high risk (areas such as Intensive Care Units), to B—high risk (general wards), to C—moderate risk (rehabilitation ward) and down to D—low risk (non-clinical areas). The acceptable quality level or score for each element and functional area is based on the risk category. Auditing is a continuous process, and the number of rooms that are visually assessed within a functional area is based on the risk category. For example, functional areas A and B must have at least 50 per cent of rooms audited every month, while functional area C only requires 50 per cent of the rooms audited at least quarterly. A pass or fail is reported for each question related to each room element and all of the various elements within each functional area are cross-referenced and weighted. Data are recorded on a hand held device, with direct entry onto a database.

All hospitals must submit the results of two internal audits and one external audit to the Health Department and this data is de-identified, benchmarked and published. Internal audits are performed by trained hospital staff from various departments and the external audits are done by a qualified Victorian Cleaning Standards Auditor. The results of the external audit contribute to Victorian health services performance monitoring framework.

Western Australia does not have a state-wide program in place but within metropolitan hospitals, cleaning services are monitored and evaluated at a hospital level. For example, the Royal Perth Hospital audits environmental cleaning and they use the United Kingdom standards of visual inspection for assessment.

The WA Country Health Service (WACHS), which covers all health services outside of the Perth metropolitan region, has recently standardised their cleaning procedures, including the assessment of environmental cleanliness. The auditing system and process is similar to the one used in Victoria with risk assessments of all functional areas and the frequency of auditing and scores being based on the risk category of the functional area. Cleanliness will be assessed visually and will be scored as either 'Acceptable' or 'Unacceptable'. There are no specific definitions of these two terms.

## **6.3 Summary**

- The most commonly used method for assessing environmental cleaning within Australian healthcare facilities is visual assessment. No jurisdictions routinely use any alternative methodologies such as fluorescent markers, ATP bioluminescence or microbial counts for assessing environmental cleanliness.
- Even though all jurisdictions use visual assessment, the methods and programs used vary.

## **7. Local and International Guidelines**

### **Australian guidelines**

Routine environmental sampling is not recommended as part of the National Health and Medical Research Council guidelines owing to the limitations of the methods currently used worldwide. Thus, cleaning audits are mainly carried out via visual assessment. A role for environmental sampling may be considered in the management of a specific situation (31).

### **United Kingdom: National Health Service**

The Patient Environment Action Team (PEAT) is a self-assessment framework developed in 2000 for use in all hospitals with more than 10 beds. This benchmarking tool enables hospitals to perform an annual assessment of non-clinical services such as food, environmental cleanliness, hospital access, signage, infection control and issues surrounding privacy and dignity. The cleanliness of both the hospital environment and clinical and non-clinical equipment is visually assessed. The results of the annual audit can then be benchmarked with the aim of improving non-clinical services. Each year, a proportion of PEAT assessments are validated by an independent member (63).

### **United States of America: Centers for Disease Control**

The Guidelines for Environmental Infection Control in Health-Care Facilities do not outline any specific methodology for assessing environmental cleanliness, but they do recommend limiting microbiological sampling for use in quality assurance purposes, epidemiological investigations or for research purposes (55).

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### **Other jurisdictions**

#### **Australian Capital Territory**

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# Appendix I: Suggested Standards for Microbial Sampling of the Healthcare Environment

The first standard was the presence of an indicator organism. These organisms included *Staphylococcus aureus* (including MRSA), *Clostridium difficile*, VRE and various Gram-negative bacilli, with the proposed standard being <1 cfu/cm<sup>2</sup>.

The second standard, ACC, was based on an internationally agreed figure used within the food industry. The suggested standard was <5cfu/cm<sup>2</sup> for 'hand contact surfaces'.

Counts above the proposed standards could be used to assess the quality of the cleaning processes used. Indicators of this type provide a level of accuracy where other methods of cleaning evaluation cannot (34).

## Appendix 2: Interview Questions

### 1. Current practices in evaluating environmental cleanliness in Tasmanian acute public hospitals

Do you work/liaise with environmental services around cleaning?
Who do you work/liaise with in environmental services?
Do you provide feedback to cleaning staff about their performance (if they are observed)?
Do you have a budget allocation for measuring environmental cleanliness in your facility?
Is evaluation of environmental cleanliness part of your annual quality plan?

### 2. Assessing the efficacy of cleaning

Do you undertake cleanliness audits to assess the performance of cleaning?
Do you use a definition of 'clean'?
Do you use a checklist of surfaces?
Are visual audits undertaken?
Are internal visual audits conducted by a staff member who has appropriate knowledge/training?
Are external visual audits undertaken from a member of a trained organisation?
Do you use ATP Bioluminescence to sample bioburden in the environment?
Have you made any correlations between assessment scores and infection rates?

### 3. Assessing the microbial load of a surface

Do you use undertake environmental swabbing?
How often is environmental swabbing undertaken?
Do you/have you undertaken pre- and post-intervention assessment of cleaning?
Do you use swabs to sample surfaces?
Do you use dipslides to sample surfaces?
Do you use sampling sponges to sample surfaces?
Do you use settle plates to sample surfaces?
Please list the environmental sites/surfaces that you test.

#### **4. Monitoring cleaning personnel performance**

Do you have written cleaning protocols?
Do your protocols specify how to clean?
Do your protocols specify who performs what tasks?
Do you check whether staff adhere to established cleaning protocols?
If yes, do you directly observe the staff cleaning practices? For example, are the specified sites cleaned by the staff member and if yes, who actually does the monitoring?
Do you then mark surfaces as either 'cleaned' or 'uncleaned'?

**5. What are the current environmental hygiene issues faced by your facility?**

**6. Would you like to see a standardised tool in Tasmania regarding assessment of cleanliness?**

## Appendix 3: Interstate Cleaning Assessment Methodology

	NSW	ACT	QLD	NT	WA	SA	VIC
<b>Information source</b>	Via telephone June 2011 and via email January 2012	Via telephone June 2011	Via email June 2011 and January 2012	Via telephone June 2011 and via email January 2012	Via telephone and email January 2012	Via email June 2011 and February 2012	Via Health Department Victoria website June 2011 and email January 2012
<b>Is cleaning audited</b>	No current state-wide program in place (as of Jan 2012) but the release of the new Environmental Cleaning Policy and accompanying Environmental Cleaning Standard Operating Procedures (ECSOP) expected during 2012 will provide step-by-step guidance and standards for undertaking environmental cleaning, including assessments, in public healthcare facilities across NSW	Yes—have external cleaning company who use TOPCAT (Victorian Health audit tool)	Yes—environmental cleaning is performed and compliance monitored as per <i>Queensland Health-Cleaning Services, Policies, Standards and Operational Guidelines 2011</i>	No state-wide program in place. Cleaning assessments are carried out at Royal Darwin Hospital	No standardised state-wide program in place.  Metropolitan hospitals monitor and evaluate cleaning services at a hospital level.  WA Country Health (WACHS) has recently standardised their cleaning procedures including auditing	No standardised state-wide program in place.  Most hospitals monitor and evaluate cleaning services at a hospital level.  Plan to have hospitals perform regular standardised internal audits using a tool SA Health will develop	Yes. Across all Victorian public Hospitals as per the ' <i>Cleaning Standards for Victorian Health Facilities, 2011</i> ' (first published 2000)
<b>Visual assessment</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Method of auditing</b>	No standard audit tool or methodology currently. Cleaning services are monitored and evaluated at a hospital level	Data recorded either direct onto electronic tool (TOPCAT) with direct entry onto database (Environmental Services staff) or manually via paper based system (Infection Control)	Data recorded either manually (paper based) or direct onto electronic tool.  'Pass' or 'Fail' reported for each question related to each room element	Data recorded manually (paper based)	WACHS—Risk assessments of all functional areas with auditing frequency and acceptable quality level (score) based on the risk categorisation. Cleanliness assessed as either 'Acceptable' or 'Unacceptable'	No standard audit tool or methodology currently. Cleaning services are monitored and evaluated at a hospital level, using in-house developed tools, or by contractor as part of agreement	Risk assessments of all functional areas with auditing frequency and acceptable quality level (score) based on the risk categorisation.  'Pass' or 'Fail' reported for each question related to each room element
<b>Who performs audits</b>	Personnel designated at local hospital level	Infection Control, Cleaning Supervisors and Facilities Management	Operational Service Managers and/or Infection Control	Infection Control personnel	Hotel Services	Personnel designated at local hospital level	Internal audits—hospital staff from various departments who have a good knowledge of the Standards

	NSW	ACT	QLD	NT	WA	SA	VIC
							External audits—a qualified Victorian Cleaning Standards Auditor
<b>Auditor training</b>	Not currently	No	Not stated	No	No standardised training	Not currently but standardised training will be considered for state-wide program	Yes
<b>Areas audited</b>	Clinical areas	Clinical areas	All clinical and non-clinical areas	Clinical areas	WACHS—all clinical and non-clinical areas	All clinical and non-clinical areas	All clinical and non-clinical areas
<b>Frequency of auditing</b>	Dependent on local hospital	Weekly	Dependent on area: Very high risk—monthly High risk—monthly Moderate risk—bi-monthly Low risk—quarterly	Biannual	WACHS—Continuous internal auditing with number of rooms audited dependant on functional area with annual external audit	Varies between hospitals, but at least annually in most	Continuous internal auditing with number of rooms audited dependent on functional area. Annual external audit. Results submitted to Health Department: Internal audits—two per annum External audits—annual
<b>Other tools used</b>	No	No	No	No	No	Yes—microbiological swabbing (not encouraged), White Glove Method	No
<b>Documented cleaning protocols</b>	Yes— <i>Cleaning Service Standards, Guidelines and Policy for NSW Health Facilities (1996)</i> and <i>Infection Control Policy Directive (PD2007 036)</i>	Yes—the cleaning company has its own policy and procedures	Yes— <i>Queensland Health-Cleaning Services, Policies, Standards and Operational Guidelines 2011</i>	In progress	WACHS: Yes—standardised cleaning protocols recently developed	Yes—at hospital level	Yes— <i>Cleaning Standards for Victorian Health Facilities, 2011</i>