6 Hospital-acquired infections

Key points

- Infections are the most common complication affecting hospital patients, and in many cases are preventable. A recent study estimated that Australia has 180 000 hospital-acquired infections annually and these occupy almost two million bed days.
- A simple comparison of infection rates across hospitals may not provide an accurate indication of the potential for performance improvements and associated benefits because:
  - the risk of infection depends on patient characteristics (such as age) and types of treatments provided (such as surgery), and these vary between hospitals
  - there are many different types of infections, with varying degrees of prevalence and potential harm.
- In order to take account of this diversity, it is common to limit comparisons to groups with a similar risk of infection (such as patients in intensive-care units) and distinguish infections by organism (such as *Staphylococcus aureus*) and body location (such as surgical sites). However, these methods do not remove all of the factors outside the control of a hospital that can cause its infection rate to differ from other establishments.
- A further problem is that Australia does not have a robust nationally-consistent data collection for comparing hospital-acquired infections. The currently available national data were not designed for cross-hospital comparisons, and may be affected by issues such as sample-selection bias and unaudited self-reporting.
- Data collected by state governments as part of their infection-surveillance programs suggest that private hospitals have lower infection rates than public hospitals. However, this result could be misleading because private hospitals generally treat patients who have a lower risk of infection, and the data do not fully control for this.
- Foreshadowed developments — such as performance reporting under the National Healthcare Agreement — will move Australia closer to a robust nationally-consistent data collection on hospital-acquired infections. However, there is scope for further reforms, such as including private hospitals in national reporting arrangements.
- The Australian Commission on Safety and Quality in Health Care is leading and coordinating initiatives that should improve the feasibility of future infection-rate comparisons.

The terms of reference ask the Commission to compare the rate of hospital-acquired infections in public and private hospitals, disaggregated by type of infection. This is an important indicator of service quality because infections are the most common complication affecting hospital patients, and in many cases are preventable. Hospital-acquired infections also place a significant burden on the health system, with an estimated 180 000 cases in Australia each year that occupy almost two million bed days (Graves, Halton and Robertus 2008).

In this chapter, the Commission identifies the key types of hospital-acquired infections; considers how infection rates should be compared between hospitals; undertakes a comparison between public and private hospitals using available data; and outlines developments to make future comparisons more feasible and robust.

6.1 Types of hospital-acquired infections

In 2008, the Australian Commission on Safety and Quality in Health Care (ACSQHC) published a detailed report on healthcare-associated infections (Cruickshank and Ferguson 2008). The study observed that, in order to make monitoring tractable, the approach has generally been to focus on infections of greatest concern, based on prevalence and/or harm to individual patients. The key types of infection are usually defined by organism, physical location and/or patient population:

- Organisms that have developed resistance to standard antibiotics — such as methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *enterococci* (VRE), and multiresistant gram-negative bacteria — are often the focus of reporting regimes because they have the greatest impacts on health systems in developed countries. Another organism that is gaining prominence is *Clostridium difficile*.[1]
- Physical locations of greatest concern, and hence often reported, are surgical sites and the bloodstream.
- Patient populations considered to have a high risk of acquiring and/or experiencing significant harm from an infection — such as newly-born infants and patients in intensive-care units (ICUs) — are also often a priority for monitoring programs.

The ACSQHC report recommended that all hospitals should monitor hospital-acquired infections because this, combined with timely feedback, has been proven to reduce infection rates. The report identified major deficiencies in

1 Further details about these organisms are provided in the following parts of section 6.1.

Australia's existing monitoring arrangements and recommended strengthened surveillance of high-priority organisms, locations and populations (detailed later in this chapter).

Issues associated with high-priority organisms, locations and populations are outlined below because they have implications for how infection rates should be compared across hospitals.

Infection organisms

Staphylococcus aureus

Staphylococcus aureus — sometimes termed golden staph — is a type of bacteria often found on the skin and in the nose with no apparent ill effects. People with this condition are said to be colonised (bacteria present, but not causing an infection). However, if *Staphylococcus aureus* enters the body through broken skin, such as surgical wounds, it can cause an infection and require treatment with antibiotics. *Staphylococcus aureus* is responsible for the largest proportion of healthcare-associated bacterial infections (Cruickshank and Ferguson 2008).

Staphylococcus aureus is usually spread by direct skin contact (typically via hands) with a person who is infected or colonised, or through contact with shared items, such as towels and shared surfaces like door handles, taps and benches.

A distinction is often made between methicillin-sensitive *Staphylococcus aureus* (MSSA) and MRSA.[2] In most Australian hospitals, MSSA remains a more common cause of healthcare-acquired infections, and is likely to have a larger impact on the health system than MRSA (Christiansen et al. 2008). However, MRSA is not uncommon and can be more serious for individual patients because it has developed resistance to many antibiotics.

MRSA was traditionally associated with hospital admissions. However, in recent years community-acquired MRSA — involving people who have not recently been hospitalised or had a medical procedure — has been a growing problem (Nimmo et al. 2006). MRSA infections in the community are usually manifested as skin infections, such as pimples and boils, and occur in otherwise healthy people (SA Department of Health 2008).

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2 Resistance to methicillin is traditionally used as an indicator of antibiotic resistance because it used to be the drug of choice for treating *Staphylococcus aureus* infections. MRSA can be subdivided into organisms that are multiresistant (resistant to multiple antibiotics) and not multiresistant (only resistant to methicillin).

Research undertaken for the ACSQHC found that MRSA infections were the second-most costly adverse event per patient (after post-procedure endocrine and metabolic disorders), adding an extra $19 892 to the cost of an episode of care (based on 2005-06 data for Victoria and 2006-07 data for Queensland) (Jackson, Ngheim, Rowell, Jorm and Wakefield 2009). The next most costly adverse event was *Clostridium difficile* that caused enterocolitis (inflammation of the colon and small intestine), costing $19 745 per episode.

Clostridium difficile

Clostridium difficile is an anaerobic toxin-producing bacterium that has an ability to form spores, which enable it to survive in the environment for extended periods of time (Thomas and Riley 2003). The organism usually causes diarrhoea and is the most common cause of healthcare-associated gastrointestinal infection (TIPCU 2009). A new virulent strain emerging in North America and Europe has led to epidemics and extensive mortality (Cruickshank and Ferguson 2008).

The main risk factor for *Clostridium difficile* colonisation and infection is prior exposure to antibiotics, possibly because antibiotics disrupt the normal balance of bacteria and other micro-organisms in the gut, allowing *Clostridium difficile* to spread (Thomas and Riley 2003).

Most cases of *Clostridium difficile* occur in hospitals or long-term care facilities. Transmission usually occurs through shared equipment, a contaminated environment or the hands of healthcare workers. The organism can be readily cultured from inanimate environmental sources such as beds, cupboards, floors and walls, as well as from the hands of healthcare workers caring for patients with a *Clostridium difficile* infection. The impact of *Clostridium difficile* on the health-care system is considerable, with patients requiring additional infection-control precautions and specific treatment, and can spend an extra 1 to 3 weeks in hospital (McGregor, Riley and Van Gessel 2008).

The ACSQHC has recommended that surveillance systems for *Clostridium difficile* be established nationally (Cruickshank and Ferguson 2008; TIPCU 2009).

Vancomycin-resistant enterococci

Vancomycin is an antibiotic used to treat infections caused by *enterococci*, which are bacteria normally residing in the bowel without causing any illness. However, *enterococci* can invade other parts of the body and cause an infection. The most common sites of enterococcal infection are the urinary tract, wounds, blood and heart lining (SA Department of Health 2009b).

Some *enterococci* have become resistant to vancomycin. These vancomycin-resistant *enterococci* (VRE) infections are harder to treat because of their antibiotic resistance. VRE infections are dangerous for people with a weakened immune system, but most recover with appropriate antibiotic treatment. However, the cost of containing VRE outbreaks in health facilities can be considerable. A 2003 outbreak in a large WA teaching hospital was brought under control over a three-month period at a cost of $2.7 million (Christiansen et al. 2004).

VRE infections are typically spread by physical contact with faeces, or skin or objects that have been contaminated with VRE. This includes contact with contaminated hands, hospital equipment, bathroom taps and door handles. Hand washing is one of the best ways to prevent the spread of VRE. Regular cleaning of frequently-touched surfaces is also important because VRE can survive in the environment for a long time (SA Department of Health 2009b).

VRE colonisation of patients is more common than infection. It is estimated that for every patient detected as having VRE, there will be at least ten others in an institution who are colonised. Colonised patients and their immediate physical environment act as reservoirs for the ongoing transmission of VRE within hospitals (Mascinie and Bonten 2005; TIPCU 2009).

Multiresistant gram-negative bacteria

Gram-negative bacteria are a group of organisms that can be identified by using a 'gram-staining' test. These bacteria are of concern because they can have a highly-transmissible resistance to antibiotics (Christiansen et al. 2008).

Mortality rates of up to 100 per cent can occur from gram-negative bacteria infections if the bacteria are resistant to multiple antibiotics (that is, multiresistant gram-negative bacteria) and are not treated with an antibiotic that is active against the organism. The risk of experiencing a multiresistant gram-negative bacteria infection is greater for people admitted to a teaching hospital, treated in an ICU, having other medical conditions, being treated with a central intravenous line or urinary catheter, having a longer stay in hospital, and being previously treated with antibiotics (Christiansen et al. 2008).

Infection locations

Surgical-site infections

Surgical-site infections (SSIs) result from a range of organisms. Skin flora — such as *Staphylococcus aureus* and coagulase-negative staphylococci — are most often responsible for SSIs that follow 'clean procedures'. SSIs from 'contaminated procedures' can be associated with polymicrobial infection and flora normally found in the viscus that is opened, such as gram-negative infections following rectal surgery. The range of organisms causing SSIs is also influenced by the choice and timing of prophylactic antibiotics prior to surgery (Bull et al. 2008).

SSIs can be difficult to monitor because more than 50 per cent become apparent after discharge from hospital, and any associated readmission may not be to the establishment where the surgery occurred. For example, SSIs can occur up to four weeks after deep-incisional surgery, and up to 12 months after joint-replacement surgery (HQCC 2009).

The risk of experiencing an SSI, and the associated adverse impacts, differ between surgical procedures and according to patient characteristics. For example, Bull et al. (2008) noted that infection rates tend to be low for major-joint prosthesis replacements, but the consequences of infection are significant. The patient may require further surgery, removal of the prosthetic joint, replacement with another joint, and months of intravenous antibiotic therapy, followed by oral antibiotic therapy. In other procedures, such as caesarean sections, infection rates tend to be much higher, but the consequences are less severe and may not even require readmission to a hospital.

The ACSQHC recommended routine local surveillance of SSIs, including coronary artery bypass graft surgery, major-joint prosthesis insertion, and other procedures that have higher-than-expected SSI rates at the local level (Cruickshank and Ferguson 2008).

Bloodstream infections

Bloodstream infections (BSIs) occur when the blood contains bacteria (in which case the infection is termed a bacteraemia) or fungi (fungaemia). Collignon et al. (2008, p. 53) noted that BSIs can have significant adverse impacts:

> Studies in Australia document that 17–29 per cent of patients with hospital-acquired BSIs die while still in hospital. Patients who develop BSIs are also more likely to suffer complications during their hospital stay that result in a longer hospital stay and an increased cost of hospitalisation.

Staphylococcus aureus bacteraemia (SAB) is the most common type of healthcare-associated BSI (Collignon et al. 2008). SAB cases are detected when *Staphylococcus aureus* is isolated in a blood culture. An often-cited study by Collignon et al. (2005) estimated that Australia has around 7000 SAB cases per year. The authors concluded that approximately one-half of all SAB cases were hospital acquired, and a further one-sixth were linked to healthcare procedures in other settings. The remaining one-third were deemed to be community-acquired BSIs.

MSSA strains are responsible for the largest share of hospital-acquired SAB cases, but MRSA incidence is significant. Collignon et al. (2005) estimated that MRSA accounted for around 40 per cent of Australian hospital-onset episodes of SAB. Overseas evidence indicates that the median death rate for MSSA SAB infections is 25 per cent, and for MRSA SAB infections is 34 per cent (Cosgrove et al. 2003).

Most healthcare-related SAB cases are attributed to intravascular catheters. SAB rates are therefore important markers of intravenous catheter management and the effectiveness of hand hygiene within a hospital or institution. Catheter-associated BSIs are a particular problem in intensive-care patients and immunocompromised patients who depend on artificial vascular access.

BSIs used to be mainly acquired during hospitalisation, but this situation is changing as increasing numbers of people are managed at home with intravascular catheters, have medical procedures performed as outpatients, or are discharged early from hospitals with percutaneous (through-the-skin) invasive medical devices in place.

The ACSQHC recommended mandatory reporting by hospitals of SAB BSIs, central-line associated BSIs in ICUs, and haemodialysis-access-associated BSIs (Cruickshank and Ferguson 2008).

Patient populations

As noted above, certain populations are more likely to acquire a particular type of infection. For example, *Staphylococcus aureus* is a greater concern for those who have undergone major surgery. Other patient populations that are often the focus of infection indicators are newly-born infants and ICU patients. They have a relatively high risk of acquiring an infection and experiencing significant harm, including possibly death. The ACSQHC recommended routine monitoring of bacterial sepsis for babies during the first week of life (Cruickshank and Ferguson 2008).

6.2 How should infection rates be measured and compared?

The measurement and comparison of infection rates is not straightforward. A hospital could have a relatively high infection rate simply because its workload is concentrated on services and patients with a high risk of infection. It is also desirable to take account of heterogeneity between different infection organisms and their location in the body. A hospital could have the same rate of total infections as its peers, but the infection organisms and locations could be far more serious.

Data presented in earlier chapters show that the types of services provided and patients treated can differ markedly between hospitals, both within and between the public and private sectors. It therefore follows that a comparison of infection rates in public and private hospitals could encounter difficulties in separating the effects of casemix differences from genuine differences in the performance of hospitals in reducing and managing the rate of infections. The difficulty of the task was noted by several study participants:

> Meaningful comparison of rates of HAIs [hospital-acquired infections] will be difficult, and needs to test whether there are fundamental differences between the public and private hospital casemix. (ACSQHC, sub. 24, p. 5)
>
> While hospital-acquired infections are an important indicator of quality they must be compiled and assessed carefully lest they mislead. Some common problems include comparing hospitals with significantly different casemix, considering so many infection indicators that any analysis is too granular and drawing conclusions that are not statistically robust. On top of this there [is] what is potentially the most confounding influence of all — is the relevant data complete and accurate? (Australian Health Service Alliance, sub. 1, p. 6)

A significant amount of work has been done overseas to implement methodologies that enable hospitals to compare their infection rates from one period to the next, and against best practice in other hospitals. This has been prompted by research that shows that the monitoring of hospital-acquired infections, combined with a prevention program that uses the data to drive improvements, can lead to lower infection rates (Clezy et al. 2008).

The US National Nosocomial Infections Surveillance (NNIS) system, which began in 1970, has played a leading role in establishing methodologies for comparable infection rates. The methods developed by the NNIS have underpinned surveillance programs in many other countries. Advanced national surveillance programs now exist in countries such as the Netherlands, Belgium, Brazil, Canada, Denmark, France, Germany, Norway, Sweden and the United Kingdom. Participation in the

NNIS has been shown to have significantly reduced BSIs, SSIs, urinary-tract infections and pneumonia in ICU patients in the United States. In Europe, studies have found that German and Dutch infection surveillance programs have led to reductions of 24–57 per cent for SSIs and 20–29 per cent for ICU infections (Clezy et al. 2008).

Australia has yet to implement a national surveillance regime for hospital-acquired infections, but studies of infection monitoring in individual hospitals and states have confirmed that monitoring can reduce infections (Collignon et al. 2006). In addition, multi-hospital surveillance regimes do exist in varying forms within individual Australian jurisdictions, and these are in part based on NNIS methodologies (detailed in section 6.3).

The ACSQHC (sub. 24) stressed that it is desirable to use a statistical technique that accounts for risk differences when comparing infection rates across hospitals. A common way of doing this is to subdivide infections data into groups with a similar risk of infection, and only compare infection rates within those groups. Such groups could be defined by patient characteristics, procedure and/or type of hospital. The ACSQHC (sub. 24) suggested that such groupings would preferably be defined by patient population characteristics (including procedure profile), but should at least be defined by the peer groups (identified by scale and services provided) used for national reporting on public hospitals (detailed in AIHW 2009a). However, the ACSQHC noted that the peer group classification system would need to be revised because it does not currently include private hospitals.

A popular approach for grouping SSIs with similar risks is to stratify the data using a risk index developed by the US National Healthcare Safety Network (NHSN) (formerly the NNIS) (box 6.1). However, some recent studies have found that the NHSN/NNIS risk index does not always provide an accurate measure of risk (including studies of Victorian and Queensland infections by Friedman et al. 2007 and Clements et al. 2007 respectively). This has caused some SSI monitoring programs to use a modified version of the NHSN/NNIS methodology, including those in Queensland and Victoria (CHRISP 2003; Victorian Department of Human Services 2008a).

Box 6.1 **NHSN/NNIS risk index for SSIs**

The NHSN/NNIS (National Healthcare Safety Network/ National Nosocomial Infections Surveillance System) risk index is widely used internationally, including in Australia, to enable the comparison of groups with similar risks of experiencing an SSI. The risk index is calculated by summing scores for three characteristics:

- physical status
- length of surgery
- wound class.

The resulting index has four possible values — zero, one, two or three — with a higher value indicating there is a greater risk of having an SSI. The scoring system for each characteristic is outlined below.

ASA classification of physical status

The physical status of patients undergoing general anaesthesia is categorised using a system developed by the American Society of Anaesthesiology (ASA). Patients categorised under the ASA system as having severe systemic disease, or being moribund and not expected to survive without the operation, are given a score of one for physical status. Other patients are given a physical-status score of zero.

Length of surgery

If the surgery has a longer duration than 75 per cent of comparable procedures, based on a database of past procedures, then a score of one is assigned for length of surgery. Other patients are given a length-of-surgery score of zero.

Wound class

If the surgical team classifies a surgical wound as being 'contaminated' or 'dirty infected', using a classification system adapted from guidelines developed by the US Centres for Disease Control and Prevention, then a score of one is assigned for wound class. Other patients are given a wound-class score of zero.

Source: CHRISP (2003); Cruickshank and Ferguson (2008); WA Department of Health (2008).

The WA Government's infection-surveillance unit cautioned that the NHSN/NNIS risk index does not control for all risk differences between public and private hospitals:

> … there are almost certainly key patient-risk factors that are not incorporated into this [NHSN/NNIS risk stratification] method, and that systematically differ between patients having surgery at private and public hospitals.
>
> For example, diabetic control, obesity and cigarette smoking are among known risk factors for SSIs that are not modifiable by hospitals and are not specifically incorporated into NHSN risk stratification. (Health Care Associated Infection Unit, Communicable Disease Control Directorate, Department of Health WA, sub. 38, p. 4)

Another factor that is not controlled for in the NHSN/NNIS risk index is the volume of each procedure performed by a hospital. Units performing more joint replacements have lower infection rates for the same patient risk group (Dailey, Van Geesel and Peterson 2009; Katz et al. 2001). However, NSW Health (sub. DR64) suggested that 'SSI is not related to volume but is clearly related to the frequency and application of best practice "bundles" of care'.

Another method for dealing with risk differences is the Standardised Infection Ratio (SIR). This is calculated as the number of observed infections divided by the number of expected infections. Expected infections can be based on an historical database of infection rates across multiple hospitals that is stratified into different risk groups (such as procedures). The usefulness of the SIR depends on the relevance and accuracy of that benchmark data. An SIR of more than one indicates that there are more infections than expected, and a SIR less than one indicates fewer infections than expected.

6.3 Available evidence on hospital-acquired infections

National data

The Commission identified two potential sources of national data on hospital-acquired infections that cover both public and private hospitals:

- the Clinical Indicator Program (CIP), which is managed by the Australian Council on Healthcare Standards (ACHS)
- the National Hospital Morbidity Database (NHMD), which is managed by the Australian Institute of Health and Welfare (AIHW).

These sources are discussed below.

ACHS Clinical Indicators Program

The CIP collects a large number clinical indicators from hospitals, including 47 of which measure healthcare-associated infections linked to specific procedures.[3] These are grouped into five broad categories:

- SSIs (18 indicators)

[3] Health care-associated infections are measured by 47 out of 49 indicators collected under the ACHS Infection Control Indicators Version 3 (two indicators measure staff exposure to blood and bodily fluids, which may not necessarily result in an infection).

- central-line associated BSIs (14 indicators)
- BSIs associated with dialysis (5 indicators)
- neonatal infections (6 indicators)
- MRSA cases (4 indicators).

Published data for these indicators suggest that infection rates rarely differ between the public and private hospital systems. In 2007 (the latest published data), only four of the 47 CIP indicators of healthcare-associated infections had a statistically significant difference between public and private hospitals (table 6.1).[4] In the few cases where such differences were evident, the data suggest that the private sector consistently outperformed the public sector. However, this could be misleading because the CIP is not designed to monitor the relative performance of the public and private sectors. It is a service offered to individual healthcare providers to help them improve their service quality (ACHS, sub. 13). As a result, the CIP data have a number of limitations:

- participation in the CIP is voluntary, and so the sample may not be representative of either the public or private sectors (sample-selection bias)
- the number of reporting hospitals is often small, and so sample sizes may not be sufficient to reach robust conclusions about the relative performance of a particular sector
- hospitals self-report data without external validation, and have the option of only reporting indicators of interest to them
- there is no risk adjustment to reflect differences in patient characteristics.[5]

For 2007 (the latest published data), a total of 284 hospitals reported infection-control indicators to the ACHS.[6] But CIP participants are not obliged to report every indicator because some may not be relevant to services provided by their organisation. As a result, individual infection-control indicators were based on

4 This was also the case in 2006 (based on data published in ACHS 2007) and in 2008 (based on unpublished data the ACHS provided to the Commission).

5 The CIP indicators do to some extent stratify the data according to risk, since in many cases the indicators are specific to a certain type of procedure/treatment and/or whether an infection occurred in an ICU.

6 The ACHS (sub. 13) advised that its (yet to be published) 2008 infections data will be based on responses from 292 hospitals, with 128 of these in the public sector and 164 in the private sector.

samples that ranged from 1 to 142 hospitals in 2007, with the median sample being only 13 hospitals (ACHS 2008).[7]

Table 6.1 **ACHS infection indicators that differed between public and private hospitals, 2007[a]**

		Infection rate[b]		*No. of reporting hospitals*	
Indicator no. and description[c]	*Units*	*Public*	*Private*	*Public*	*Private*
1.2 Deep incisional SSI in hip prosthesis procedures[d]	per 100 procedures	0.99	0.63	38	96
1.17 Superficial incisional SSI in abdominal hysterectomy	per 100 procedures	2.02	0.94	16	37
5.2 ICU-associated new MRSA healthcare-associated infections in a nonsterile site	per 10 000 ICU overnight occupied bed days	16.70	7.18	25	23
5.4 Non ICU-associated new MRSA inpatient healthcare-associated infections in a nonsterile site	per 10 000 non-ICU overnight occupied bed days	2.77	1.11	68	59

[a] The ACHS identified an indicator as differing between the public and private sectors if public/private status explained at least 10 per cent of the variation in sampled infection rates, and statistical testing showed that the probability of a difference between public and private rates was at least 95 per cent. However, as noted in the main text, the data may not be suitable for public-private comparisons due to sample-selection bias, small sample sizes, self-reporting, and no risk adjustment to reflect differences in patient characteristics. [b] Mean infection rates after applying the shrinkage estimation method to the data. [c] The following abbreviations are used: ICU (intensive-care unit); MRSA (methicillin-resistant *Staphylococcus aureus*); and SSI (surgical-site infection). [d] The ACHS (sub. 13) advised that unpublished data for 2008 showed that indicator 1.2 was 0.68 per 100 procedures for private hospitals and 1.02 for public hospitals.

Source: ACHS (2008).

In addition, Clezy et al. (2008) claimed that the methods used to collect the CIP indicators could vary widely between facilities because they are not precisely specified, and there is limited training on applying indicator definitions and on best-practice methods for detecting infections.

National Hospital Morbidity Database

The National Hospital Morbidity Database (NHMD) contains patient-level data from almost all hospitals in Australia on diagnoses, procedures and external causes of injury. It is compiled by the AIHW from data supplied by state and territory

[7] Excluding the two infection-control indicators that measure staff exposure to blood and bodily fluids, which were based on samples of 198 and 202 hospitals respectively.

health authorities. The Australia Health Insurance Association (AHIA, sub. DR58) encouraged the Commission to use data from the NHMD as a source of information on hospital-acquired infections. However, the AIHW advised that NHMD data from 2007-08 and previous years cannot reliably identify whether a health condition arose during care. These data have not been used by the Commission for reporting on hospital-acquired infections.

For 2008-09, the NHMD coding standards were revised to include a 'condition-onset flag' that identifies whether a health condition arose during an episode of care (Australian Government Department of Health and Ageing, sub. 32).[8] This, in combination with codes for specific infection organisms and locations, could be used to identify different types of hospital-acquired infections, such as VRE urinary-tract infections.

However, the AIHW advised the Commission that infections data from the 2008-09 NHMD will not be available until after this study is completed. Similar data were, however, obtained from the Victorian Government, which has for many years required hospitals to identify conditions that arose during an episode of care. These data are detailed in appendix F, and were used in the Commission's analysis of state-level data below.

State-level data

Given the limitations of national infections data, the Commission decided to also draw on evidence collected by state governments. Government monitoring of hospital-acquired infections is largely undertaken by state governments, reflecting their role as providers of public hospitals and regulators of private hospitals.

Details about the data collected by individual jurisdictions and what they show about infection rates in public and private hospitals are provided in appendix F. In summary, the data are not collected and reported on a nationally-consistent basis, but public and private hospitals are included in most cases (the exceptions are New South Wales and the Northern Territory). However, government infection surveillance programs in Victoria, Queensland and Tasmania only began collecting information from private hospitals recently, and so limited data are available. The Commission was able to obtain additional data for Victoria, derived from that state's morbidity database. Western Australia has the most transparent reporting of results for public and private hospitals, and provided the most comprehensive data from its surveillance regime for this study.

8 NHMD data are coded according to the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM).

The different collection and reporting methods across jurisdictions mean that it is not possible to construct national estimates of hospital-acquired infections from state-level data, or to generally compare across jurisdictions. Nevertheless, the data show a consistent pattern within jurisdictions — for a given type of infection, private hospitals have a lower rate of hospital-acquired infection than public hospitals. However, this result could be misleading because private hospitals generally treat patients who have a lower risk of infection, and the data do not fully control for this. The pattern evident in the state-level data should therefore be interpreted with caution.

It is also evident from the state-level data that infection rates can vary over time. This could be due to a range of factors, including the occurrence of a pandemic and a change in adherence to infection-control procedures in hospitals.

FINDING 6.1

Australia does not have a robust nationally-consistent data collection on hospital-acquired infections. The limited available evidence suggests that private hospitals have lower infection rates than public hospitals, but this result could be misleading because private hospitals generally treat patients who have a lower risk of infection. A more definitive finding will require the development of data collections that enable risk differences between hospitals to be distinguished from genuine differences in performance.

6.4 Developments to improve future comparisons

It is evident from the preceding analysis that Australia's inconsistent and sometimes less-than-comprehensive approaches to monitoring hospital-acquired infections hinders comparisons across hospitals. This is of concern, given that studies have shown that monitoring and benchmarking, combined with a prevention program that uses the data to drive improvements, can reduce the rate of infections. Consumers Health Forum of Australia (sub. DR59) shared this concern, advocating mandatory reporting of hospital-acquired infections and calling for infection data to be made available to consumers.

The problems with existing monitoring arrangements prompted the recent ACSQHC study of healthcare-associated infections to recommend nationally-consistent approaches, including strengthened surveillance for:

- BSIs classified as being SAB, central-line associated in ICUs, and haemodialysis-access associated

- SSIs, including those linked to coronary artery bypass graft surgery, major-joint prosthesis insertion, and other procedures that have higher-than-expected SSI rates at the local level
- bacterial sepsis in the first week of life, including meningitis (Cruickshank and Ferguson 2008).

Some progress has been made in this regard. In December 2008, the Australian Health Ministers' Conference (AHMC) decided that all public hospitals will have to report two infection indicators — SAB BSIs and *Clostridium difficile* — on a nationally-consistent basis (ACSQHC, sub. 24). In November 2009, AHMC included SAB BSIs and *Clostridium difficile* in a national set of safety and quality indicators (DOHA, sub. DR 69, p. 9). Reporting of these two indicators is being facilitated by the ACSQHC, which is also considering other infection indicators at the request of the AHMC. The states and territories have implemented, or are in the process of implementing, the required surveillance and reporting arrangements.

Health Ministers also noted at their December 2008 meeting that hand hygiene is a key element in the prevention of hospital-acquired infections. They therefore supported a National Hand Hygiene Initiative, which commenced in early 2009 and is managed by Hand Hygiene Australia with oversight by the ACSQHC. The Ministers called for nationally-consistent measurement of hand hygiene compliance using approaches facilitated by the ACSQHC. The Royal Australasian College of Surgeons supported consistent reporting of hand hygiene and infection rates:

> The College has a longstanding interest in hospital-based infections, infection control, the use of antibiotics, approaches to hand hygiene and the impact of these on individual patient care. Substantial work over the past decade has again highlighted the importance of systemwide approaches to hand hygiene and its impact on key infections like MRSA bacteraemias and surgical-site infections. The College would certainly support the introduction of nationwide reporting on some of these key measures. To our knowledge, however, there is no current methodology for this at the individual state and territory level for public or private hospitals. (sub. 30, p. 3)

The Health Care Associated Infection Unit, Communicable Disease Control Directorate, Department of Health WA (sub. 38) noted that process indicators — such as hand-hygiene compliance rates, compliance with surgical antibiotic prophylaxis, influenza staff vaccination rates and central-line insertion and care protocols — have the advantage that they do not need to be adjusted for patient-risk factors.

States and territories will also have to report indicators for some hospital-acquired infections in public hospitals under the National Healthcare Agreement (NHA). The

Australian Government Department of Health and Ageing advised that a performance benchmark had been set under the NHA for SAB BSIs:

> Sound comparisons between the public and private sectors on the basis of hospital-acquired infections is necessary with a clear need to set benchmarks and identify best practice. One of the performance benchmarks adopted under the NHA is that the rate of *Staphylococcus aureus* (including MRSA) bacteraemia be no more than 2.0 per 10 000 occupied bed days for acute care public hospitals by 2011-12 in each state and territory. (sub. 32, p. 21)

This has strengthened the acceptance by jurisdictions of nationally-consistent definitions for SAB BSIs under the abovementioned AHMC decision.

While the abovementioned developments are welcome, more actions will be needed to establish a comprehensive and nationally-consistent approach to infection monitoring. For example, private hospitals are not subject to the recent AHMC decision and NHA reporting requirements. The ACSQHC also noted the need for further reforms and recommended:

- the eventual incorporation of private hospitals in national health care reporting, such as those currently managed through National Health Information Agreements
- the development of national hospital peer groupings which include and classify private hospitals
- the national development of standard measures of safety and quality which are applied across all Australian hospitals
- the promotion of routine review of safety and quality indicators by all hospitals in Australia. (sub. 24, p. 10)

The Productivity Commission supports the above recommendations made by the ACSQHC, which was established to lead and coordinate national improvements in the safety and quality of health care.

FINDING 6.2

Foreshadowed developments, such as performance reporting under the National Healthcare Agreement, will move Australia closer to a robust nationally-consistent data collection on hospital-acquired infections. However, more actions will be required to enable meaningful infection-rate comparisons between public and private hospitals. An important step in this regard would be to include private hospitals in national reporting arrangements. The Australian Commission on Safety and Quality in Health Care is leading and coordinating initiatives that should improve the feasibility of future comparisons.