Acknowledgements

The VICNISS Coordinating Centre is fully funded by the Department of Health and we would like to thank the department for their ongoing support of this program. We would like to extend our thanks to the hospital executives and executive sponsors for their support. A special acknowledgment is extended to all infection control nurses and staff who participate in the surveillance program. Their ongoing support and commitment make this project successful, and this eighth annual report possible.

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March 2011 (1101018)
Director’s summary – the year in review

This report summarises data related to hospital associated infections (HAIs), their causative organisms, and compliance with infection prevention processes from all Victorian acute-care public hospitals in the 12 months from July 2009 to June 2010.

New activities undertaken by the VICNISS Coordinating Centre in this period include surveillance of *Staphylococcus aureus* bacteraemia (SAB) in all hospitals. SAB is of great importance due to associated morbidity, significant mortality and healthcare costs. Many such infections acquired in hospital are associated with intravenous line care, and these infections are frequently preventable. This is the first HAI data to be collected consistently in any Australian state. If international experience is followed, the data, and comparison of rates between hospitals, should drive interventions that lower infection rates.

In long-term renal dialysis patients, collection of surveillance data on line-associated bloodstream infections is now established in 44 dialysis centres. In 2010, the VICNISS surveillance software (SHiINe) was further refined and extended, and rolled out to more Victorian hospitals. The number of private hospitals participating in VICNISS increased in this period from six to nine.

The identification of hypervirulent *Clostridium difficile* infection (CDI) in a Melbourne hospital in early 2010 demonstrated Victoria faces the challenge of an important new healthcare pathogen. In North America, CDI is now of more importance than methicillin-resistant *S. aureus*. Hypervirulent strains of *Clostridium difficile* infection (CDI) have caused increased and significant mortality and morbidity throughout much of the developed world. Statewide surveillance of *Clostridium difficile* infection (CDI) was established to monitor the extent of both this infection and severe CDI disease, and to guide and evaluate the interventions required to control this.

The data on infection rates included in this report shows encouraging trends. Central line-associated bloodstream infections trended lower. Surgical site infection rates after hip and knee replacements in two risk categories, Caesarean sections in both major risk categories, hernia repairs, and colorectal surgery trended lower. For colorectal surgery, the centre has worked with one hospital to implement a bundle of evidence-based interventions in an effort to reduce surgical site infection rates. Some of the improvement in surgical site infection rates may be a result of improved compliance with guidelines for surgical antibiotic prophylaxis following surveillance and feedback.

Data on the pathogens causing infections informs empiric therapy and for surgical site infections may be relevant to the choice of surgical antibiotic prophylaxis. Enterococcus has emerged in the last two years as an important pathogen in central line-associated bloodstream infections in the intensive care units (ICUs) of large Victorian teaching hospitals, whilst methicillin-resistant *S. aureus* infections have become less frequent. *S. aureus* remains overwhelmingly the most important single pathogen in surgical site infections after cardiac surgery and is also an important cause of infection after colorectal surgery.

We thank again all participating hospitals, particularly the infection prevention consultants, for their ongoing contributions to the VICNISS program; and the Victorian Department of Health for its continuing support and funding.

Professor Mike Richards
Director, VICNISS Coordinating Centre
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Addressing high infection rates in Victoria</td>
<td>2</td>
</tr>
<tr>
<td>Developments over the past 12 months</td>
<td>3</td>
</tr>
<tr>
<td>Staphylococcus aureus bacteraemia (SAB) surveillance</td>
<td>3</td>
</tr>
<tr>
<td>Clostridium difficile infection (CDI) surveillance</td>
<td>3</td>
</tr>
<tr>
<td>SHIIiNe (Safer Hospitals Integrated Information Network) software</td>
<td>3</td>
</tr>
<tr>
<td>Private hospital surveillance</td>
<td>3</td>
</tr>
<tr>
<td>Results from surveillance</td>
<td>4</td>
</tr>
<tr>
<td>Intensive care unit (ICU) data</td>
<td>4</td>
</tr>
<tr>
<td>Surgical site infection (SSI) data</td>
<td>14</td>
</tr>
<tr>
<td>Outpatient haemodialysis infection events</td>
<td>33</td>
</tr>
<tr>
<td>Surgical antibiotic prophylaxis</td>
<td>36</td>
</tr>
<tr>
<td>Type 2 hospital data</td>
<td>47</td>
</tr>
<tr>
<td>Outcome (infection) indicators</td>
<td>59</td>
</tr>
<tr>
<td>Spreading the word about VICNISS</td>
<td>65</td>
</tr>
<tr>
<td>Recent publications</td>
<td>65</td>
</tr>
<tr>
<td>Glossary</td>
<td>67</td>
</tr>
<tr>
<td>Appendix A: VICNISS Coordinating Centre staff</td>
<td>69</td>
</tr>
</tbody>
</table>
Introduction

The VICNISS Coordinating Centre has now been operational for eight years. The centre was established by the Department of Health in 2002 to set up and coordinate standardised surveillance of HAIs in Victoria. Surveillance methodology is based on that developed at the Centers for Disease Control and Prevention in the United States, which is used in many parts of the world, including both North and South America, Canada, Japan, the United Kingdom and many countries in Europe.

As a result, Victoria now has ready access to quality data on HAIs, and comparisons of infection rates between hospitals – over time and with other jurisdictions – are possible. The centre now holds data on over 100,000 surgical procedures as well as eight years of data on rates and causative organisms for central line-associated bloodstream infections in intensive care units and neonatal units. Data are also collected on healthcare worker vaccinations, adverse events in haemodialysis outpatients, administration of antibiotics prior to surgery, peripheral venous catheter care and infections caused by antibiotic-resistant organisms.

There are two surveillance programs. Type 1 or larger hospitals submit data on surgical procedures and ICU infections. Type 2 or smaller hospitals submit data on serious and antibiotic resistant infections, and other related process measures such as peripheral catheter care and use of antibiotics prior to surgery.

Hospitals receive quarterly reports on their infection rates and compliance with recommended practices and processes to reduce infections. These reports enable staff to be aware of their performance in comparison to others so they have the opportunity to introduce strategies and interventions to improve their performance.

The centre receives data from all acute-care public hospitals in Victoria and in 2009 began accepting data from private hospitals on a voluntary basis. This is an important step, since some private hospitals perform large numbers of surgical procedures, including cardiac bypass and joint replacement surgery. Capturing private hospital data means more accurate overall infection rates can be calculated for Victoria, and these hospitals are also able to assess their performance against the state data. Rates of infection in private and public hospitals can also be compared with the overall aim of identifying ways to reduce infection rates.

Data from VICNISS are now included in public hospital performance agreements with the Department of Health. Hospitals are required to participate in the state surveillance program and large hospitals are expected to meet selected benchmarks or levels of compliance.

At a national level, performance indicators are gradually being introduced for all states and territories, led by the Australian Commission for Safety and Quality in Hospital (HAI). To date, indicators have been developed for SAB and Clostridium difficile infection (CDI). VICNISS began collating data on SAB in all public hospitals in 2009, and will begin surveillance of hospital identified cases of CDI in October 2010.

The centre will continue to work with the department as new and emerging infections occur in Victoria, to ensure that these infections are monitored and appropriate action is taken to limit and control them. Victoria has a surveillance program that is comparable to any in the world and is constantly evolving to meet new challenges which are inevitable in hospital infections.
Addressing high infection rates in Victoria

Hospitals found to have higher than expected rates of infection are notified and encouraged to introduce strategies and interventions to reduce these.

Continuous surveillance and regular reporting is necessary for hospital (HAI) facilities to identify changes in infection rates, and to respond in a timely fashion to higher than expected infection rates. Extracts from some of the responses are included throughout this report.
Developments over the past 12 months

**Staphylococcus aureus** bacteraemia (SAB) surveillance

Healthcare-associated SAB rates are now a national indicator reported by all jurisdictions. While the VICNISS Coordinating Centre previously reported on these infections in intensive care units and small hospitals, statewide reporting commenced in Victoria in July 2009. The aim of this national initiative is that all jurisdictions record rates of less than 2.0 infections per 10,000 patient days by 2011–12.

**Clostridium difficile** infection (CDI) surveillance

CDI is the most common cause of healthcare-associated diarrhoea. The effects of the disease vary from mild diarrhoea to colitis, toxic megacolon and death. Antibiotics increase the risk of this disease. Since 2000 there has been an increase in international rates of CDI associated with several epidemic strains of the organism which are characterised by increased toxin production and increased virulence. CDI has thus been identified as a national surveillance indicator. Some of these strains have recently been identified in Victoria and statewide surveillance of hospital-identified cases of CDI will commence in October 2010.

**SHIINe (Safer Hospitals Integrated Information Network) software**

The SHIINe software continues to be rolled out to large public hospitals in Victoria. The software is designed to connect to patient, theatre and pathology databases to capture electronic data and make surveillance more efficient. A specialist software integration company has been engaged to install and integrate the software with the various hospital data systems. In the future, it is likely that certain infections will be identified automatically from pathology databases. The software will also allow hospitals to perform a variety of reports on their data at any time, including line listings, graphs and process control charts.

VICNISS is committed to developing software in line with national surveillance requirements. There are advantages to widespread use of the software as development and maintenance costs could be shared. Private hospitals in Victoria have shown interest in using the software, as have other jurisdictions in Australia. While installing and integrating the software in Victoria is the priority, it is hoped that the software will be widely shared in the future.

**Private hospital surveillance**

While VICNISS surveillance was established to collate data from public hospitals, private hospitals frequently expressed an interest in VICNISS surveillance activities. Funding was provided by the department to support private hospital participation. Nine large private hospitals now participate, submitting data on surgical procedures and intensive care infections. Smaller private hospitals will be invited to participate in the Type 2 program. The department and the centre look forward to continuing to work with the private hospital sector on this exciting and important initiative. Once the private hospitals surveillance program is fully established, VICNISS will be able to compare public and private hospital-associated infection rates.
Results from surveillance

Intensive care unit (ICU) data

Data are presented on central line-associated bloodstream infections (CLABSI). Central lines are catheters placed in a large vein in the neck, chest or groin and used to administer fluids and medication, obtain blood samples or take measurements. The infections reported here occurred in patients in ICUs who had central lines placed, and where the infections were considered to be associated with the central line. A high proportion of these infections are thought to be preventable with good practices and processes for central line insertion and care.

Only data since July 2008 are presented, as previous data are not comparable due to a change in the definition used for these infections. Only larger (Type 1) hospitals have ICUs. These hospitals are divided into two groups: those that are major teaching hospitals (A1 hospitals) and other hospitals. The two groups are separated because major teaching hospitals have been shown to have higher rates of infection.
Intensive care unit central line-associated bloodstream infections

Figure 1: Annual intensive care unit central line-associated bloodstream infection rates for A1 hospitals

Figure 1 displays the annual central line-associated bloodstream infection rates for A1 hospitals for the two financial years since 1 July 2008. The major impact of the change has been the reporting of fewer coagulase-negative Staphylococcal (CNS) infections. CNS is a bacteria commonly found on skin, and when found in blood samples is often a result of contamination of the sample during collection rather than a bloodstream infection. The previous definition was over-inclusive of CNS infections, potentially reporting episodes that represented contamination rather than true infection. While the updated definition may exclude some true bloodstream infections, it is a practical compromise to allow more consistent and simplified data collection. The overall effect has been to lower the infection rates. Similar effects have been observed internationally following implementation of the revised definition.

It is encouraging that the rate of infections has reduced between 2008–09 and 2009–10, although with only two years of data this cannot be seen as a statistical trend.
Figure 2 depicts the frequency of causative organisms in ICU central line-associated bloodstream infections in A1 hospitals. The reduction in reporting of infections attributed to CNS following the definition change (as discussed above) can be clearly seen in this figure. There has also been a decrease over time in infections attributed to *Staphylococcus aureus*, whereas the proportion of infections caused by enterococci, while still relatively infrequent, appears to be increasing. Vancomycin-resistant enterococci are prevalent in many developed countries, contributing to the burden of ICU bloodstream infections.

Please note ‘n’ represents the number of infections where organism data were provided. Although organism data are usually supplied they are not available for every infection, therefore ‘n’ is not necessarily equal to the total number of infections represented by the rates displayed in Figure 1.
'In response we have reviewed the cases, discussed the findings, and reviewed our policies on central venous and arterial line management. We are happy that there are no changes required to our line policies and procedures, and that ongoing education of staff, and surveillance through VICNISS is warranted.'

'The reports from VICNISS, the discussion that followed this latest report, and our involvement is considered worthwhile by all clinicians in the ICU.'

Figure 3: Annual intensive care unit central line-associated bloodstream infection rates for other hospitals

Figure 3 shows rates of infection in these intensive care units are lower than for A1 hospitals as previously mentioned. Rates in these hospitals are also lower since the new definition was implemented.
‘In addition, we have allocated a project officer for 12 hours per fortnight to increase awareness of CLABSIs and to continue educating staff.’

‘We established a working group involving key stakeholders to develop hospital-wide CVC insertion, care and maintenance policies to reflect change in practice.’

‘All staff changing dressings or accessing CVCs to use aseptic techniques as per gold standard.’

‘Staff involved in the insertion of CVCs to complete a formal CVC credentialing program.’
Figure 4 represents the annual frequency of causative organisms in other hospitals (larger but less specialised hospitals) ICU central line-associated bloodstream infections. These hospitals generally have fewer infections to report and hence the number of infections for which we have organism data is relatively small. As in A1 ICUs, there has been a decrease in reporting of infections due to coagulase-negative staphylococci. Infections attributed to enterococci species are also occurring in these hospitals and may also be on the increase.

Note that ‘n’ represents the number of infections with available organism data. Not all hospitals submit organism data, hence ‘n’ may not equal the total number of infections represented by the rates displayed in Figure 1.

‘CVC risk management tool to be trialled in ICU for all CVC insertions to ensure that CVC bundle is followed. This will also provide a means of ongoing auditing of compliance and identify specific gaps or issues that can then be addressed.’
Neonatal intensive care unit (NICU) data

Babies in neonatal intensive care are extremely vulnerable and prone to infection. The rates reported here are infections which occurred in babies in neonatal units which were thought to be associated with insertion of either a central or peripheral line. Peripheral lines are catheters inserted into a peripheral vein (usually in a limb) and, like central lines, they are used to deliver fluids and medications. The rates are reported separately as rates are expected to be higher for central lines.

Infection rates are calculated separately for different birthweight categories as smaller babies are more likely to contract infections. Babies are thus divided into less than 750 grams, 751–1000 grams, 1001–1500 grams, 1501–2500 grams and greater than 2500 grams depending on their weight at birth.

Figure 5: Neonatal intensive care unit central line-associated bloodstream infection rates: 1 July 2008–30 June 2009

Figure 5 displays the central line-associated bloodstream infection rates for neonatal ICUs in Victoria. This figure represents data submitted from four hospitals with neonatal ICUs. These rates have particularly wide confidence intervals reflecting the small pool of data available to calculate infection rates.
Figure 6: Neonatal intensive care unit peripheral-line-associated bloodstream infection rates: 1 July 2008–30 June 2009

Figure 6 displays the peripheral-line-associated BSI in neonatal ICUs. Once again, rates are stratified by birthweight, and these rates represent data from four hospitals.
Figure 7: Frequency of causative organisms in neonatal care unit central line-associated bloodstream infections

Figure 7 shows the causative organisms associated with central line bloodstream infections in neonatal units for all birthweights combined. The same definition change was applied to these infections as to the adult ICU bloodstream infections and the decrease in CNS infections can also be observed here.
Figure 8: Frequency of causative organisms in neonatal care unit peripheral line-associated bloodstream infections

Figure 8 shows the annual frequency of causative organisms in neonatal peripheral line-associated bloodstream infections for all birthweights combined.

Similar to the HAIs, the actual number of infections is very small, particularly since the change in definition that has potentially decreased over-reporting of CNS infections.
Surgical site infection (SSI) data

In the following section, rates of infection following various types of surgery are presented. Patients undergoing different types of surgery have different risks of acquiring an infection. For example, surgery where an implant is used (such as knee replacement) has a higher risk than some other types of surgery. For this reason, rates are reported for each type of surgery. In addition, some individual patients will be at greater risk than others having the same type of surgery. To account for some of these differences in risk, patients undergoing surgery are allocated to risk categories depending on their risk of acquiring an infection. A major determinant of risk is the patient’s general state of health, and also the type and length of the surgery. A patient in risk category 0 is expected to have less risk of a SSI than a patient in risk category 1 (and so on). This is illustrated by the higher rates of infection in the higher risk categories in the graphs below. Not all data are presented here. For example, almost no patients undergoing coronary artery bypass grafts fall into risk category 0, given that they are generally older and have heart disease which is the reason for their surgery.

Infections are classified as superficial, deep or organ space. Superficial infections are generally less serious and can often be successfully treated with antibiotics alone. However, deep or organ space infections often require rehospitalisation, and sometimes reoperation.

The following figure presents deep and organ space infection rates only.
Figure 9 displays the annual coronary artery bypass graft deep and organ space SSI rates since 2003. Six public hospitals perform this type of surgery in Victoria and all hospitals have submitted data for this procedure since the end of 2002. In January 2009 two private hospitals began contributing to this dataset. The number at the bottom of the figure (‘n’) represents the number of patients in the risk category for that year.

These infections (deep and organ space), as well as being more serious for patients, are considered the most reliable for investigating time trends or performing comparisons as they rarely go undetected – patients are usually readmitted to hospital. The rates in risk category 2 are higher, as would be expected, as these patients are considered to be at greater risk of infection. While there may be no trends in these rates that would be considered statistically significant, the rates in risk category 1 (into which most patients fall) may be falling.
Figure 10 displays the annual colorectal surgery SSI rates since 2003. This procedure is classified as ‘dirty’ surgery and, as expected, higher rates of infection are seen than for clean surgery such as joint replacements. Any surgery that involves opening the gastrointestinal tract carries a higher risk of infection.

These data include superficial SSIs as well as deep and organ space. Once again rates may be showing a decreasing trend in the risk category into which most patients fall. Although this trend is not statistically significant, it is encouraging – particularly since VICNISS has been working with one of the major data contributors to reduce their rates of SSIs following colon surgery. Nine hospitals have submitted data for this procedure.
‘Our action plan includes discussion with surgical staff, review of antibiotic prophylaxis and ongoing close monitoring.’

‘We have recently rewritten our intraoperative antibiotic protocol and there is a great deal of attention being paid to surgical technique... Over the subsequent quarter we have seen an overall infection rate of two per cent and we will continue to monitor the situation very carefully.’
Figure 11 displays the Caesarean section SSI rates since 2003. The rates for both risk categories appear to be trending downwards. Most Caesarean patients fall into risk category 1, being younger and less likely to have chronic illnesses compared with patients undergoing surgery for heart conditions or joint replacements.

The hospitals contributing data have also changed in different years (more so than for other procedures), and those years with a more substantial number of procedures (‘n’ represents the number of procedures) would be expected to give a clearer picture of the infection rate. Twenty-eight hospitals have submitted data for this procedure including several private hospitals that began submitting data in 2009.
‘Analysis of infected patients included: type of infection, causative organism, consultant surgeon, operating theatre used and patient BMI.’

‘In consultation with the attending physician, the histories of all patients with Caesarean infections have been reviewed. The attending physician will liaise with residents concerned re diagnosis of wound infections and ensure patient management is overseen by a registrar.’
Figure 12: Annual deep and organ space surgical site infection rates by risk category following hip replacement

Figure 12 displays the hip replacement surgery deep and organ space SSI rates since 2003. There has been a marked decrease in infection rates in risk category 0 and there may be a slight downward trend in risk category 1. Note that there is an even spread of patients across these two risk categories. Twenty-five hospitals have submitted data for this procedure, including several private hospitals that began submitting data in 2009.
Figure 13 displays the knee replacement surgery deep and organ space SSI rates since 2003. Most patients fall into risk categories 0 and 1, which appear to exhibit an overall downward trend. Twenty-five hospitals have submitted data for this procedure including several private hospitals that began submitting data in 2009.
Figure 14 displays the SSI rates for hernia repair since 2003. The only risk category with sufficient data to report is risk category 0, as shown here. Eleven hospitals have submitted data for this procedure including mostly smaller (type 2) hospitals. The rates look to have fallen significantly over the time of surveillance, although the numbers of procedures are relatively small in the later years. Interestingly, this procedure has been one where large improvements in administration of antibiotics prior to surgery (antibiotic prophylaxis) have been seen.
'Triclosan one per cent pre-op wash introduced which has replaced betadine solution; change in antibiotic regime for selected at risk patients in consultation with infectious diseases physician; ongoing education campaign targeting the five moments for hand hygiene; regular meetings between the infection control consultant, theatre unit manager and nursing staff to discuss interventions and case list; VICNISS reports and progress on the above interventions are further discussed at the monthly infection control meeting.'
Figure 15 displays the SSI rates for abdominal hysterectomy since 2003. The only risk category with sufficient data to report is risk category 0, as shown here. Ten hospitals have submitted data for this procedure. The number of procedures are low, and this is reflected in the wide confidence intervals surrounding these rates. Larger sample sizes provide better estimates of rates (see Appendix C).

‘My recommendation for action is to immediately change skin antiseptic solutions to two-per-cent alcoholic clorhexidine for all surgical cases, change post-operative antibiotic use as per new antibiotic guidelines and for the unit to monitor their compliance with the surgical best practice document.’
Surgical site infection (SSI) pathogens

The following figures depict the relative proportions of infections caused by various organisms for the different types of SSIs.

Figure 16: Annual frequency of causative organisms following coronary artery bypass graft

Figure 16 shows the frequency of causative organisms in SSIs following coronary artery bypass graft surgery. *Staphylococcus aureus* remains the most commonly reported pathogen in these infections over the entire time period. The mix of aerobic Gram-negative pathogens has changed, with fewer *Acinetobacter* infections reflecting a general reduction of this pathogen in major Victorian public hospitals in recent years. *Serratia*, *Enterobacter*, and *Pseudomonas* infections are among Gram-negative infections reported in the past three years, and awareness of this may help guide choice of surgical antibiotic prophylaxis.

Note that ‘n’ represents the number of infections with organism data, including superficial infections. Hence ‘n’ does not equal the total number of infections represented by the rates displayed in Figure 9.
Figure 17 shows the frequency of pathogens responsible for SSIs following colorectal surgery. Staphylococcus aureus remains the most frequently reported pathogen. More detailed studies suggest that methicillin-resistant *Staphylococcus aureus* contribute a substantial proportion of these infections. Gram-negative and other bacteria that make up bowel flora are more frequently identified as a cause for infections than in orthopaedic and cardiovascular ‘clean’ surgical procedures, where the surgical site is remote from the gut.

Note that ‘n’ represents the number of infections with organism data, including superficial infections. Hence ‘n’ does not equal the total number of infections represented by the rates displayed in Figure 10.
‘At our health service we used the results of the VICNISS data in 2005, 2007 and 2009–10 to raise the alarm about best practice in the operating suite and the relevant ward for this particular procedure group.

The initial response from surgeons was that their patients are sicker than those in the other Victorian hospitals and it made sense that these patients were more likely to develop infections. This conversation then enabled the surgeons to be informed about the risk stratification process and that the process had been validated and used extensively overseas for about 20 years.

The surgeons were concerned that if the wound infections are not deep then there is little that they can do, that is the infection is not related to the operating suite. However, in recent times for two quarters a superficial infection rate of 40 per cent has been identified. We used this to justify a rigorous campaign of hand hygiene practices that included medical staff examining patients in the ward and looking at realistic ways of reducing the potential risk of infection.’
Figure 18 displays the frequency of causative organisms in SSIs following hip arthroplasty. The most frequently reported organism was *Staphylococcus aureus*, although an increasing proportion of infections caused by Gram-negative organisms has been observed in recent years. This may have implications for antibiotic prophylaxis. Note that ‘n’ represents the number of infections with organism data, including superficial infections. Hence ‘n’ does not equal the total number of infections represented by the rates displayed in Figure 12.
Figure 19 displays the frequency of causative organisms in SSIs following knee replacement. Again, the most frequently reported organism was *Staphylococcus aureus*, and this has remained constant during the entire period. Note that ‘n’ represents the number of infections with organism data, including superficial infections. Hence ‘n’ does not equal the total number of infections represented by the rates displayed in Figure 13.
Figure 20: Annual frequency of causative organisms following Caesarean section

Figure 20 displays the frequency of causative organisms in SSIs following Caesarean section. Again, the most commonly reported organism was *Staphylococcus aureus*, and this has remained constant during the entire period.

Note that ‘n’ represents the number of infections with organism data, including superficial infections. Hence ‘n’ does not equal the total number of infections represented by the rates displayed in Figure 11.
‘We used the results of the VICNISS report from 2005 to initiate discussion, involvement and changes in practice to improve the surgical site infection rate, which was statistically significant when compared to the state aggregate. A new head of unit was appointed and a collaborative multidisciplinary team was established. Accountability for the results of the data rested with the head of that unit, the operating suite and the ward where patients were accommodated. The health service chief executive and the clinical directors took overall responsibility for initiating discussions about the results and to finding ways to improve the outcome for patients. The infection control team are seen as experts who are consulted for advice, that may include interpretation of the data, advice about new initiatives and how best practice would be recognised.’
**Staphylococcus aureus bacteraemia (SAB)**

Health-care-associated bloodstream infections are a significant cause of mortality and contribute to increased length of hospitalisation and associated healthcare costs. *Staphylococcus aureus* bacteraemia (SAB) infections are the most common cause of health-care-associated bloodstream infections. Many of these infections are related to a healthcare procedure (for example, the presence of a venous catheter), and are therefore preventable.

SAB rates are now reported nationally by all jurisdictions. Patients most at risk of contracting these infections are patients in acute care, or patients having regular haemodialysis or other invasive treatment such as chemotherapy.

Rates reported here are calculated using occupied bed days as the denominator, including the hospital bed days accrued by patients most at risk for SAB infection.

Data collection commenced in June 2009 so the rates reported below are for first two quarters of data collection.

**Figure 21: Victorian SAB infection rates for the first two quarters of data collection**
Outpatient haemodialysis infection events

The outpatient haemodialysis surveillance module has been updated and expanded to include both type 1 and type 2 hospitals. This was done in consultation with stakeholders including renal physicians and networks, and haemodialysis nurses. Like all of the type 1 VICNISS modules, it is based on the Centers for Disease Control and Prevention (CDC) National Health and Safety Network (NHSN), United States surveillance program.

Participating centres report on hospitalisations, antimicrobial starts, vancomycin starts, positive blood cultures, access-associated bloodstream infections, local access infections and vascular access infections in outpatients undergoing haemodialysis. Reports are stratified by the type of access and the denominator used is patient months by type of access. Rates are reported per 100 patient months.

Rates for the two financial years since the start of surveillance on 1 July 2008 are reported below. The total number of contributing dialysis centres is 47. The figures below are based on the type of access that the patient has in place.

Figure 22a: Rates of infection related events for patients with arteriovenous fistulas

There has been an apparent reduction in antibiotic and vancomycin starts for these patients over the two years although local and vascular access infection rates have increased. With only two years of data it is difficult to draw any conclusions from these data.
Figure 22b: Rates of infection-related events for patients with arteriovenous grafts
Rates of most infection-related events have increased for patients with arteriovenous grafts between 2008–09 and 2009–10, while they have decreased slightly for patients with permanent central lines. Once again there are not enough data to draw any conclusions. Overall, rates of dialysis-related infection events are significantly lower than those reported through the NHSN dialysis network in the United States on which this program is based.
Surgical antibiotic prophylaxis

Giving a dose of antibiotic prior to surgical procedures has been shown to be effective in reducing infections following many types of surgery. However, to be effective, the type of antibiotic must be suitable, and it must be administered at an optimal time to allow it to be present in the patient’s tissues when the surgical incision is made.

Antibiotic data collected by VICNISS are assessed against the Therapeutic guidelines antibiotic version 13 (2006) and the guidelines from the National Surgical Infection Prevention Project in the United States. Three measures are assessed: the choice of antibiotic, the time at which the antibiotic is administered and the duration for which the antibiotic is administered. Antibiotics should be chosen according to recommendations, administered at the appropriate time and discontinued within 24 hours of surgery. Results for the first two measures are shown here.

The data shown below are overall results for public hospitals in Victoria. Type 1 and type 2 hospital data are shown separately. Type 1 hospitals generally perform a larger number of surgical procedures and would also perform more complex surgeries.

Individual hospitals have shown remarkable improvements in this area. For example, one hospital has improved from 56 to 83 per cent the proportion of patients being given suitable antibiotics for Caesarean sections and another hospital has improved from 82 to 97 per cent the proportion of patients being given suitable antibiotics for cardiac surgery. For colon surgery, another hospital improved from 42 to 85 per cent. These improvements are often a result of infection control consultants using the data to demonstrate deficiencies to key staff in the hospital and to work with clinical and administrative staff to bring about changes in practice.
Measure 1: Choice of antibiotics

Figures 23a–e: Surgical antibiotic prophylaxis: choice of antibiotics

Figure 23a: Cardiac surgery
23b: Orthopaedic surgery (hip and knee replacements)

- Unknown
- Inadequate
- Optimal/adequate

Financial year

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<td>2008-09</td>
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<td>10%</td>
<td>90%</td>
</tr>
<tr>
<td>2009-10</td>
<td></td>
<td>10%</td>
<td>90%</td>
</tr>
</tbody>
</table>
23c: Colon surgery

- Unknown
- Inadequate
- Optimal/adequate

Financial year:
- 2003-04
- 2004-05
- 2005-06
- 2006-07
- 2007-08
- 2008-09
- 2009-10
23d: Caesarean sections

- Unknown
- Inadequate
- Optimal/adequate

Financial year
- 2003–04
- 2004–05
- 2005–06
- 2006–07
- 2007–08
- 2008–09
- 2009–10
23e: Abdominal Hysterectomy

Financial year

- Unknown
- Inadequate
- Optimal/adequate
Measure 2: Timing of administration of antibiotics

Figures 24a–d show the percentage of patients who received prophylactic antibiotics at the appropriate time before surgery. Improvements have been observed. In the early years documentation was incomplete (for example, inadequately recorded time at which peri-operative antibiotics were administered). While this is still a problem at some hospitals, both documentation of times and the appropriateness of the timing have shown improvements. Again, data for hysterectomies have not improved and the explanation for this is not clear.

Figures 24a–d: Surgical antibiotic prophylaxis: timing of antibiotics

24a: Cardiac surgery
‘The health service takes this result very seriously and has been engaged in an awareness campaign with our surgeons over a number of months now. This has resulted in some improvement as noted in your letter. We have also introduced the surgical safety checklist which is being rolled out across the whole health service over the next twelve months. As part of this process the surgical profile at the hospital will change with increased emphasis on antibiotic prophylaxis. Compliance with the checklist will be regularly monitored.’
24b: Orthopaedic surgery (hip and knee replacements)

![Bar chart showing the percentage of orthopaedic surgery procedures concordant with guidelines from 2003-04 to 2009-10.

- Unknown
- Not concordant
- Concordant with guidelines

Financial year:
- 2003-04
- 2004-05
- 2005-06
- 2006-07
- 2007-08
- 2008-09
- 2009-10

Percentages are not explicitly shown in the image, but the chart visually represents the data.
24c: Colon surgery

- Unknown
- Not concordant
- Concordant with guidelines

Financial year

- 2003-04
- 2004-05
- 2005-06
- 2006-07
- 2007-08
- 2008-09
- 2009-10
24d: Abdominal Hysterectomy

Financial year

- Unknown
- Not concordant
- Concordant with guidelines
Type 2 hospital data

Process indicators

Peripheral venous catheter (PVC) use

The aim of this process indicator surveillance module is to help reduce the infection risk associated with the use of PVCs. This module is based on recommendations outlined in the *Guidelines for the prevention of intravascular catheter-related infections* from the Centers for Disease Control and Prevention (2002).

**Figure 25a:** Percentage of PVCs where daily inspection was documented, 1 January 2005 to 30 June 2010

It is recommended that PVCs be inspected daily and that this inspection be documented in the patient’s notes. The above figure represents the proportion of PVCs where both inspection and documentation occurred.
‘A review has been undertaken in infection practices in this area (PVC use) and the following action plan has been developed to address this threshold failure. Nursing staff have been educated on documentation requirements, a compulsory training day was undertaken, spot documentation checks have commenced and alterations will be made to Clinical Management Plan and Clinical Pathways.’
In general, PVCs should be removed or replaced within 96 hours. Figure 25b shows compliance with removal/replacement of PVCs within 96 hours (January 2005 to June 2010). Compliance with this process measure appears to be variable, possibly related to a variable number of participating centres – in 2010 there were 23 hospitals contributing data compared with only six in 2005. Individual hospital improvements cannot therefore be illustrated in this figure.
Surgical antibiotic prophylaxis (type 2)
Smaller hospitals performing surgery should also comply with national recommendations for use of antibiotics prior to surgery. The figures below show the compliance rates for smaller hospitals with choice of antibiotic, timing of the first dose and also duration (antibiotics should not generally be continued for longer than 24 hours following surgery as this increases the chances of bacteria developing antibiotic resistance).
Figures 26a–c: Surgical antibiotic prophylaxis compliance with guidelines: choice of antibiotics appropriate

26a: Orthopaedic surgery (hip and knee replacement)
26b: Hernia repair

Financial year

- Unknown
- Inadequate
- Adequate
26c: Caesarean section

- Unknown
- Inadequate
- Adequate

Financial year

- 2003–04
- 2004–05
- 2005–06
- 2006–07
- 2007–08
- 2008–09
- 2009–10
Figures 27a–b: Surgical antibiotic prophylaxis compliance with guidelines: timing of antibiotics appropriate

27a: Orthopaedic surgery (hip and knee replacements)
27b: Hernia repair

- Unknown
- Not concordant
- Concordant with guidelines

Financial year:
- 2003–04
- 2004–05
- 2005–06
- 2006–07
- 2007–08
- 2008–09
- 2009–10
Figures 28a–c: Surgical antibiotic prophylaxis compliance with guidelines: duration of antibiotics appropriate

28a: Orthopaedic surgery (hip and knee replacements)
Figure 28b: Hernia repair

Financial year

- Unknown
- Not concordant
- Concordant with guidelines
Figure 28c: Caesarean section

- Unknown
- Not concordant
- Concordant with guidelines

Financial year
- 2004–05
- 2005–06
- 2006–07
- 2007–08
- 2008–09
- 2009–10
Outcome (infection) indicators

**Methicillin-resistant Staphylococcus aureus (MRSA) infection**

This report provides an aggregate rate of MRSA infections for all type 2 hospitals. Infection rates are stratified according to the time the infection was detected; that is, within 48 hours or after 48 hours. This was based on the assumption that those identified within 48 hours are not considered to have been acquired within the hospital reporting the infection.

Rates are expressed as the number of MRSA infections per 10,000 occupied bed days.

**Figure 29: Annual MRSA infection rates for type 2 hospitals by time of infection relative to time of admission**

![Graph showing MRSA infection rates](image-url)

Figure 29 illustrates a much lower detection of MRSA in patients after 48 hours of hospital admission compared with detection of MRSA in the first 48 hours of admission. Infections that develop after 48 hours are considered to be “hospital acquired” as the patient did not have the infection on admission to hospital. This figure demonstrates a low rate of acquisition of MRSA in type 2 hospitals, and suggests that much of the MRSA detected is a result of patients acquiring MRSA elsewhere prior to admission. These infections may be health-care-acquired at another facility or community-acquired.
Laboratory-confirmed bloodstream infections (greater than 48 hours)

This report provides an aggregate rate of primary laboratory-confirmed bloodstream infections (LC-BSIs) for all type 2 hospitals. For this module only hospital-acquired infections are now reported; that is, those that occur 48 hours or more after admission to hospital. This was based on the assumption that those identified within 48 hours are not considered to have been acquired at the reporting hospital site.

Rates are expressed as the number of primary LC-BSIs per 10,000 acute occupied bed days.

Figure 30: Annual rates of laboratory-confirmed bloodstream infection in type 2 hospitals detected 48 hours or more after admission

Figure 30 illustrates the very low rates of LC-BSIs in type 2 hospitals. The rate is known to increase with the size of the hospital (data not shown), which may reflect increased complexity of patient mix and higher risk of BSI in larger hospitals. While the annual rate remains very low, there is some evidence that the rate has increased in recent years.
Occupational exposures

This report provides an aggregate rate of parenteral and non-parenteral occupational exposures involving acute patient sources.

Parenteral exposure is defined as the piercing of skin with a contaminated sharp instrument. Contaminated sharp instruments are defined as any contaminated object that can penetrate the skin including, but not limited to, needles, scalpels, broken glass, broken capillary tubes and exposed ends of dental wires.

An exposure is classified as non-parenteral when blood or other potentially infectious material makes contact with the eye, mouth, other mucous membrane or non-intact skin contact.

Infection rates are calculated by dividing the number of occupational exposures by the number of acute occupied bed days, and multiplying by 10,000. Therefore, the rate is expressed as the number of occupational exposures per 10,000 acute occupied bed days.

**Figure 31: Annual rates of occupational exposures by exposure type for type 2 hospitals**
Healthcare worker influenza vaccination report

The National Health and Medical Research Committee (NHMRC) recommends that all healthcare workers involved in direct patient care should be vaccinated. As part of the annual provision of influenza vaccine for Victorian healthcare workers in public acute-care hospitals by the department, each hospital is asked to report to VICNISS the overall vaccination uptake rate and the uptake rate for specific staff groupings. Not all hospitals are able to report for the different staff groups; table 1 shows the results for those hospitals that were able to provide these data.

Table 1: Proportion of staff known to be immunised by major and minor staff groups, 2005 to 2008

<table>
<thead>
<tr>
<th>Year</th>
<th>Medical</th>
<th>Nursing</th>
<th>Allied health</th>
<th>Other</th>
<th>Non-clinical</th>
<th>Laboratory</th>
<th>Emergency department staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>Number of staff</td>
<td>5410</td>
<td>19412</td>
<td>4529</td>
<td>7239</td>
<td>5529</td>
<td>740</td>
</tr>
<tr>
<td></td>
<td>Proportion vaccinated</td>
<td>29.7</td>
<td>35.7</td>
<td>46</td>
<td>50.8</td>
<td>37.4</td>
<td>41.6</td>
</tr>
<tr>
<td>2006</td>
<td>Number of staff</td>
<td>7733</td>
<td>26566</td>
<td>6018</td>
<td>5566</td>
<td>11485</td>
<td>1021</td>
</tr>
<tr>
<td></td>
<td>Proportion vaccinated</td>
<td>31.8</td>
<td>39.2</td>
<td>38.4</td>
<td>51.3</td>
<td>46.7</td>
<td>52.2</td>
</tr>
<tr>
<td>2007</td>
<td>Number of staff</td>
<td>7984</td>
<td>24832</td>
<td>6683</td>
<td>6301</td>
<td>9533</td>
<td>1389</td>
</tr>
<tr>
<td></td>
<td>Proportion vaccinated</td>
<td>34.1</td>
<td>42.9</td>
<td>47.4</td>
<td>51.2</td>
<td>47.2</td>
<td>42.6</td>
</tr>
<tr>
<td>2008</td>
<td>Number of staff</td>
<td>9980</td>
<td>34434</td>
<td>10110</td>
<td>10724</td>
<td>10931</td>
<td>1829</td>
</tr>
<tr>
<td></td>
<td>Proportion vaccinated</td>
<td>37.1</td>
<td>44.2</td>
<td>49.3</td>
<td>55</td>
<td>46.7</td>
<td>50.4</td>
</tr>
<tr>
<td>2009</td>
<td>Number of staff</td>
<td>6453</td>
<td>25728</td>
<td>5730</td>
<td>9945</td>
<td>9691</td>
<td>1363</td>
</tr>
<tr>
<td></td>
<td>Proportion vaccinated</td>
<td>44.8</td>
<td>50.3</td>
<td>61.5</td>
<td>57.8</td>
<td>43.9</td>
<td>58.4</td>
</tr>
</tbody>
</table>
Figure 32a: Overall percentage of staff immunised 2005 to 2009
An increase in the total proportion of staff vaccinated against seasonal influenza has been observed over the four-year period of data collection. Most importantly, there has been a significant increase in the proportion of medical, nursing and allied health staff vaccinated. These clinical staff groups are usually involved in direct patient care.
Spreading the word about VICNISS

VICNISS Coordinating Centre staff have presented at a number of local, national and international conferences and had articles published in peer-reviewed journals.

Below is a list of recent papers and presentations originating from VICNISS.

Recent publications


## Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Antibiotic prophylaxis</strong></td>
<td>Use of antibiotics prior to surgery to prevent infections at the surgical site</td>
</tr>
<tr>
<td><strong>ASA score</strong></td>
<td>American Society of Anesthesiology score – designed to assess the patient’s physical status. Ranges from 1 for a healthy patient to 5 for a patient who is not expected to survive 24 hours post-surgery.</td>
</tr>
<tr>
<td><strong>Bloodstream infection</strong></td>
<td>Presence of live pathogens in the blood, causing an infection</td>
</tr>
<tr>
<td><strong>CDC</strong></td>
<td>Centers for Disease Control and Prevention (United States)</td>
</tr>
<tr>
<td><strong>Central line</strong></td>
<td>A catheter (tube) that is passed through a vein to end up in the thoracic (chest) portion of the vena cava (the large vein returning blood to the heart) or in the right atrium of the heart</td>
</tr>
<tr>
<td><strong>Central line-associated bloodstream infection</strong></td>
<td>A bloodstream infection thought to have been caused by the presence of a central line</td>
</tr>
<tr>
<td><strong>Coronary artery bypass graft surgery</strong></td>
<td>A surgical procedure that creates new pathways around blocked or narrowed arteries to allow blood to reach the heart muscle again</td>
</tr>
<tr>
<td><strong>Device days</strong></td>
<td>The number of days for which an intravenous catheter or ventilator has been present in a patient</td>
</tr>
<tr>
<td><strong>Hospital-acquired infection or nosocomial infection</strong></td>
<td>Any infection that occurs during or after hospitalisation that was not present or incubating at the time of the patient’s admission</td>
</tr>
<tr>
<td><strong>Infection</strong></td>
<td>Invasion of pathogenic micro-organisms in a bodily part or tissue that may produce tissue injury and progress to disease</td>
</tr>
<tr>
<td><strong>Intensive care unit</strong></td>
<td>A hospital unit that usually treats very sick patients. Patients in intensive care units are at a higher risk of developing infections.</td>
</tr>
<tr>
<td><strong>Methicillin-resistant <em>Staphylococcus aureus</em></strong></td>
<td>A methicillin (antibiotic) resistant strain of <em>Staphylococcus aureus</em></td>
</tr>
<tr>
<td><strong>Neonatal</strong></td>
<td>A baby within the first four weeks of birth</td>
</tr>
<tr>
<td><strong>NHSN</strong></td>
<td>The National Hospital (HAI) Safety Network (NHSN) is a surveillance system that integrates patient and hospital (HAI) personnel safety surveillance systems managed by the Division of Hospital (HAI) Quality Promotion (DHQP) at CDC.</td>
</tr>
<tr>
<td><strong>Occupied bed days (OBD)</strong></td>
<td>Number of days a patient is admitted to a hospital bed</td>
</tr>
<tr>
<td><strong>Outcome indicator</strong></td>
<td>An indicator that measures an outcome (for example, infection rate)</td>
</tr>
<tr>
<td><strong>Pathogen</strong></td>
<td>An agent of disease. The term pathogen is used most commonly to refer to infectious organisms such as bacteria, viruses and fungi.</td>
</tr>
<tr>
<td><strong>Peripheral line</strong></td>
<td>An intravenous (IV) catheter inserted into a vein, usually in the arm</td>
</tr>
<tr>
<td><strong>Peripheral-line-associated bloodstream infection</strong></td>
<td>A bloodstream infection thought to have been caused by the presence of a peripheral line</td>
</tr>
<tr>
<td><strong>Process indicator</strong></td>
<td>Infection-related process, for example, compliance with hand hygiene</td>
</tr>
<tr>
<td><strong>Risk index</strong></td>
<td>A means of stratifying patients according to their risk of infection. This then allows appropriate comparison of infection rates.</td>
</tr>
<tr>
<td><strong>Surgical site infection (SSI)</strong></td>
<td>An infection at the site of an operation (usually an incision) that is caused by the operation</td>
</tr>
<tr>
<td><strong>Surveillance</strong></td>
<td>The ongoing systematic collection, analysis and interpretation of data</td>
</tr>
<tr>
<td><strong>VICNISS Advisory Committee</strong></td>
<td>A committee providing stakeholder advice to the VICNISS Coordinating Centre on the implementation, development and deliverables of the VICNISS program</td>
</tr>
</tbody>
</table>
Appendix A: VICNISS Coordinating Centre staff

Associate Professor Michael Richards MD, MB, BS, FRACP, Director
Clinton Dunkley BN, Operational Director
Dr Ann Bull PhD, M.App.Epid., Epidemiologist
Simon Burrell, Database Manager
Noleen Bennett RN, MPH, CNC Infection Control
Jennifer Bradford RN, CNC Infection Control
Judy Brett BN, RM, CNC Infection Control
Dr Leon Worth, MB, BS, FRACP, Infectious Diseases Physician
Ling Wang, .NET/SQL Programmer
Kylie Berry, Administrative Officer
Tom Aitken, Data Entry/Administrative Officer
Megan Hardwick, Data Entry/Administrative Assistant