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Reducing harm to patients from healthcare associated infections:

An Australian infection prevention and control model for acute hospitals

AUSTRALIAN COMMISSION ON SAFETY AND QUALITY IN HEALTHCARE

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Executive summary

In 2007, the Australian Commission on Safety and Quality in Health Care (ACSQHC) instigated a series of initiatives designed to improve patient safety in the prevention and control of healthcare associated infections (HAIs). These infections are the most common complication affecting patients in hospitals and have significant adverse effects on the health of patients as well as on hospital performance, management and costs.

Healthcare associated infections (HAIs) cause patients pain and suffering, and use up valuable health-care resources. These infections prolong hospital admissions, create more work for clinicians and can cause significant harm to patients, some of whom die as a result. Many of these infections are preventable. Each year in Australia there are about 200,000 HAIs. Spending on HAI surveillance can be a 'win–win' situation, because patient outcomes improve and health-care resources are made available for other uses.

Substantial collaboration with policy stakeholders and clinical experts was undertaken to identify the areas that would benefit from a national approach. The improvement of hospital capacity in preventing and controlling healthcare associated infections was identified as a priority. This was validated by a literature review of international infection prevention and control programs, and an assessment of associated local, jurisdictional and national programs.

The ability of a healthcare facility to significantly reduce the rate of infections has been demonstrated in the Australian [1,2,3] and overseas [4,5] studies. The literature findings indicate that hospitals with executive support and investment in infection prevention and control programs were able to substantially further reduce infection burden and maintain productive levels of output [6].

State and territory policy makers and clinical experts endorsed recommendations for the development of a generic model for infection prevention and control activity in Australian acute hospitals.

Model development

This report, *An Australian infection prevention and control model for acute hospitals*, is the culmination of 18 months of stakeholder consultation with the infection control community and state/territory policy makers. The report was sponsored by the ACSQHC HAI Implementation Advisory Committee, which includes clinical, academic, professional, research and government experts, and has representation from all states and territories.

The model described in this report is based on:

1. advice from the HAI Implementation Advisory Committee
2. a literature review of international infection control program models — *Literature Review of Infection Control Practitioners' Scope of Practice* (Appendix 1)
3. a national stakeholder consultation — *National Stakeholder Review of Australian Infection Control Programs: The Scope of Practice of the Infection Control Professional/ Practitioner/ Consultant* (Appendix 2).

The model

Patients admitted to Australian acute hospitals are provided with care across an often expansive continuum. The specific composition of that continuum is likely to vary between hospitals and for individual patients. A core principle implicit in this proposed model is that each hospital's standard of infection prevention and control will be consistent across each component of the continuum.

This report summarises the status of Australian infection control programs and proposes a standardised model for such programs. The Australian Infection Control model outlines essential activities and structures for governance, control assurance procedures, administrative and clinical buy-in in acute hospitals, regardless of hospital size.

Table 1 shows the recommended essential elements for all acute care hospital programs irrespective of hospital size. Table 2 shows the specific recommended and optional elements according to hospital size. Each Table contains three sections:

Section 1 Program management and governance

Section 2 Infection prevention and control

Section 3 Performance improvement and research.

It is important to note that the model is based on an assumption that non-outbreak conditions apply and recognises that there is a substantial and sustained need for additional resources in outbreak response and management situations.

Implementation of the model

The HAI Implementation Advisory Committee proposed this model to contribute to making Australian hospitals safer for healthcare patients and providers and to bring substantial and needed sustainable growth to the Australian infection control profession..

Moves to implement the model nationally are already in train with its incorporation into the National Safety and Quality Healthcare Standards for Infection Prevention and Control. This standard will be applied across all settings of care as part of the accreditation reforms approved in principle by Australian Health Ministers in 2008. Secondly, the model has informed the infection control programs/ clinical governance sections in the *National Infection Control Guidelines* [7].

The proposed model of Australian Infection Control Programs

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Introduction

Each year infections associated with health care occur in a large number of patients, making healthcare associated infection (HAI) the most common complication affecting patients in hospitals. These infections have a number of adverse effects for both patients and the hospital.

- For the patient:
  - The risk of life-long disabilities or even death
  - The possible need for stronger and more expensive medications, with the added risk of complications
  - Prolonged hospital stays.
- For the hospital:
  - Significant resource costs
  - The need for more comprehensive quarantine/isolation procedures
  - More work for healthcare staff (such as the use of laboratory tests and other tools to diagnose the infection)
  - Prolonged hospital stays, which increase the cost of admission, and reduce the beds available for new admissions.

However, at least half of HAIs are preventable and the ability of a healthcare facility to significantly reduce the rate of these adverse effects, for both patients and the hospital, has been repeatedly demonstrated.

Just as there is no single cause of healthcare associated infections, there is no single solution to the problems posed by them. In addition, infectious agents evolve and constantly present new challenges in healthcare environments. A major current concern is preventing the transmission of antimicrobial-resistant bacteria such as methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant enterococci (VRE) in healthcare facilities.

Successful infection control requires a range of strategies at different levels of the hospital and a collaborative approach among the corresponding areas of hospital management.

Recent publications have highlighted the benefits of large-scale infection prevention campaigns. These focus on hand hygiene [2,3], and 'bundled' approaches (a group of interventions that, when executed together, result in better outcomes than when implemented individually) [8,9], and address work commissioned and supported by the World Health Organization [10] and the United States Institute for Healthcare Improvement.[4, 11]

Publications from Australia [12,13], the United States [14] and the United Kingdom [15, 16] have identified the engagement of administrators and their support for changing organisational culture as being crucial to ongoing, sustained and lowered HAI burden. International experience suggests that hospitals with executive support and investment in infection control and prevention (IC) programs are able to substantially reduce HAI burden and maintain productive levels of output [17]. They are also better able to manage HAI risk and avoid many of the negative consequences of HAIs. Regulatory impact assessments conducted in the United Kingdom in 2006 has shown a 2:1 ratio of savings to annual expenditure invested in IC programs to prevent HAI [18].

Current issues with infection control in Australia

Australian hospitals have had formal programs in place to control and prevent HAIs since the early 1960s. However, the design of these programs has traditionally been devoid of any overarching framework, and the structure, function and impact of Australian IC programs remain inconsistent across the nation. Without such a framework, the ability of these programs to foster and support shared commitment to, engagement in and execution of infection prevention efforts by all clinicians, senior executives and infection control practitioners has been limited.

It is recognised that appropriately trained infection control professionals (ICPs) are integral to the success of implementing an infection control program but a lack of a definitive guide to the role and function of the ICP has limited infection prevention and control program capability.[19, 20, 21]

There is no minimum or standardised educational requirement to practice as an ICP, or to coordinate an organisational infection prevention and control program. The content of educational programs available to the Australian ICP is variable because there are no Australian infection control standards of practice available to guide course or professional development. Surveys and workshops of ICPs undertaken as part of the HAI program have shown that there is disparity in skills and resources between experienced and beginning ICPs and between larger metropolitan hospitals and rural centres.[1]

The scope of practice of the ICP has evolved in response to shifting models of health care and emerging infectious disease challenges. ICPs are involved in a range of core activities, including HAI surveillance, staff education, policy and procedure development, outbreak management and consultation [22]. Providing ICPs with suitable skills and resources is therefore critical to building infection prevention and control program capacity.

The lack of an overarching national framework together with the undefined role of the ICP reduces the effectiveness of IC programs in terms of local and, subsequently, national HAI prevention. Without a coordinated IC program, Australian patients are likely to continue to suffer increasingly complex and perhaps more frequently acquired HAIs, while hospitals will be burdened with even greater direct and indirect HAI-related costs — negatively impacting the hospital's ability to operate.

Australian initiatives related to infection control

A number of initiatives have attempted to address the problem of inconsistency between IC programs. However many of the previous efforts to guide and define program structure, and the role and function of the infection control professional, had been limited by the lack of buy-in by multiple stakeholders and key opinion leaders.

In 1974, The Australian Council on Healthcare Standards (ACHS) introduced its accreditation program, which required participating hospitals to appoint an infection control nurse to coordinate an infection surveillance and control program. ACHS has continued to require accredited hospitals to have formal programs for infection prevention and control.

In 2001, ACHS published *Fundamentals for Infection Control Services* which outlined specific elements of an ideal infection control and surveillance program.[23] It suggested specific activities that hospitals could undertake to identify, assess and control the risk of HAIs.

In 1997, the Australian Infection Control Association (AICA) addressed the deficiency of a national standard for ICPs through a system of credentialing whereby ICPs voluntarily submitted a portfolio for peer review. Successful accreditation occurred when a panel of AICA-appointed peers deemed the ICP's body of work as sufficient demonstration that the clinician had achieved a standard of competence in infection control practice equivalent to that of an accredited infection control course.[24, 25]

While the uptake of the AICA credentialing process has been slow, substantial increases in 2008 and 2009 followed widespread marketing of the process by AICA to its members.

1 http://www.safetyandquality.gov.au/internet/safety/publishing.nsf/Content/8ACDDE1B8F648482CA2573AF007BC2D4/$File/Issues%20ICP%20workshop%2026%20Sep%202007.pdf

A national approach to reducing healthcare associated infections in Australia

In 2006, the Australian Commission on Safety and Quality in Health Care (ACSQHC) was formed to lead and coordinate national improvements in safety and quality in health care. The focus of the ACSQHC is on areas of the health system where current and complex problems or community concerns could benefit from urgent national consideration and action to achieve a measurable reduction in healthcare associated infection [26].

The aim of the ACSQHC HAI program is to build on facility and jurisdictional initiatives by developing a national approach to reducing health care associated infection. The role of ACSQHC is to ensure that national coordination of comprehensive actions are undertaken by leaders and decision makers in both public and private health sectors. Five key initiatives — the National Surveillance System Project, National Infection Control Guidelines Project, Building Clinician Capacity Project and Antimicrobial Stewardship Project — have been developed to support the HAI program objectives.

Achievement of the ACSQHC's overall HAI program to reduce HAI infections is greatly dependent on the ability of ICPs to implement the recommended strategies of the five key initiatives listed above. Building clinician capacity and closing the gaps in skills by providing educational packages and toolkits will assist ICPs with the implementation of the overall HAI program at hospital level.

Initiation and development of the Australian Infection Control model

The Australian Infection Control model detailed in this report has been designed to promote an environment that maximises safety, quality and accountability in healthcare services and is part of the other initiatives designed by ACSQHC to prevent HAI in Australia.

The need to improve the capacity of hospitals to survey, prevent and control HAI has been validated by the two reviews published as appendices to this document:

- *Literature Review of the Infection Control Practitioners' Scope of Practice* (Appendix 1)
- *National Stakeholder Review of Australian Infection Control Programs: The Scope of Practice of the Infection Control Professional/ Practitioner/ Consultant* (Appendix 2).

The findings of the reviews confirmed that no single, ideal and valid program model for reducing HAI existed in Australia and that multi-level buy-in and well articulated systems of governance are required for IC program success. The recommendations of both reviews supported the development of a model outlining essential and recommended elements that should be adopted by every Australian inpatient setting.

Key points of the literature review

- Activities required for an effective infection control program should incorporate generic best practice principles. They should also define a raft of suggested possible infection control and surveillance program elements to incorporate at an organisational level depending on local need and capacity.
- A minimum and uniform basic platform of infection control and surveillance program activities should be engineered into every Australian inpatient setting.
- Appropriate governance, control assurance procedures, administrative and clinical buy-in are critical to success.
- Additional support and mentoring are required for regional, rural and remote infection control professionals.

Key points of the stakeholder review

- Support from the hospital executive is one of the key elements to a successful infection control and surveillance program, and limited executive support is seen as a weakness of an infection control and surveillance program.
- An infection prevention and control committee should have a clear mandate for its activities, which are explicitly outlined in terms of reference, and are supported within an effective governance structure.

In October 2008, a draft version of the model circulated for comment to the AICA membership provoked extensive and detailed critique, comment and suggested additions.[2] The AICA membership is considered to be the appropriate representative body of the Australian infection prevention and control community. Where practical, their comments were incorporated into this final version of the model. Agreement of 80% or greater was achieved in all areas (apart from Section 4 on education and experience).

The proposals in this report and the development of the model for IC programs evolved through discussion at the HAI Implementation Advisory Committee achieving consensus and endorsement in December 2008. Tables 1 and 2 were endorsed by the ACSQHC standing committees in January 2009.

The collaborative approach used in the development of this model is a unique attempt to build national infection control capacity. The collaborative approach has enabled early consideration of individual and group stakeholder concerns which will increase adoption and application of this model in Australian acute care hospital settings. Such engagement is critical for Australian hospitals to successfully develop realistic organisational HAI prevention goals and to allocate sufficient resources for HAI reporting, planning and interventions.

The proposed model

This report outlines the status of Australian IC programs and proposes a standardised model for such programs. The Australian Infection Control model recommends essential activities and structures for governance, control assurance procedures, administrative and clinical buy-in in acute hospitals, regardless of hospital size.

The model includes two key content areas:

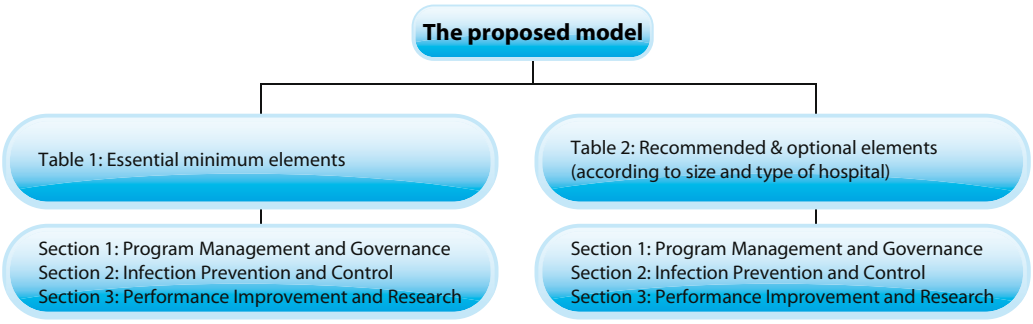
1. essential IC program minimum elements regardless of acute hospital size, acuity or patient mix (Table 1)
2. recommended and optional IC program elements according to acute hospital size and complexity (Table 2). The classification of hospitals is based on the mean number of beds associated with the classifications stipulated by the Australian Institute of Health and Welfare in their annual publication, *Australia's Health*.[3]

For each of these two areas, activities are classified under three Section headings (see Figure 1).

2 http://www.safetyandquality.gov.au/internet/safety/publishing.nsf/Content/8ACDDE1B8F648482CA2573AF007BC2D4/$File/Draft-for-AICA.pdf

3 http://www.aihw.gov.au/publications/index.cfm/title/10585

Figure 1 Organisation of the proposed model



In each section, recommendations for an appropriately staffed and resourced IC program include:

- practice(s) based on sound principles of epidemiology
- the role of healthcare workers and others
- partnerships that facilitate and support implementation of generic and specific infection prevention and control interventions
- mechanisms and processes to ensure implementation of and compliance with infection prevention and control interventions.

Note that acute hospitals exist in both public and private health sectors and provide services primarily to admitted patients with acute or temporary ailments. This model does not apply to non-inpatient settings including sub-acute, mental health, community-based settings, general practice, diagnostic radiology, clinical laboratories, specialist rooms, long-term or residential care or emergency response settings. It is also important to note that the model assumes that non-outbreak conditions apply as it recognises the sometimes substantial and sustained need for additional resources in outbreak response and management situations.

To determine a appropriate ratio of ICPs to bed numbers, international models from 11 published reports were reviewed. Local research and validation are required to determine the appropriate levels of staffing and resourcing of Australian IC programs given the magnitude of the professional, industrial, economic and practical implications involved. The model adopted by Health Canada is noted as an example of an international response to this question [27].

Executive support for the model

The literature and stakeholder reviews both showed that governance, control assurance procedures, administrative and clinical buy-in would be critical to the success of the model. Their recommendations included a call for clinical governance to 'reside at all levels of a hospital' and 'hospital commitment to IC through active executive participation and sponsorship'.

Governance

There are multiple layers within a hospital where clinical governance is a critical issue. The recommendations included in the stakeholder review form the basis of the proposed model and include:

- active executive involvement and support for the IC program at every level
- providing necessary resources and education for the IC program staff and for other staff to comply with IC program recommendations
- responsibility and accountability ranging from the level of individuals providing direct patient care, to the leadership and executive, including the local governing body where applicable and subsequently to appropriate bodies at individual state and territory and/or national level
- a governance structure that addresses the respective roles and contributions of specialist, consumer and community groups in relation to the IC program
- clarity of the specific role, function and activities of the ICP and IC committee
- adoption of various measures to maximise, monitor and evaluate clinician adherence to IC best practices and the ability to take appropriate remedial action in the event of breaches.

These recommendations require hospitals to take responsibility for IC program oversight and to ensure access to persons skilled and trained in infectious diseases, pathology, pharmacy, microbiology and epidemiology.

Formal structures at hospital level are required to facilitate and support internal and external reporting of IC program outcomes. Internal reporting should include the provision of data to the hospital's IC committee and where applicable to the risk management department, quality or patient safety committee, individual clinicians and the overall governing body. External reporting may include contribution to jurisdictional and nationally agreed datasets.

Vested authority

Best results are expected where all executive staff champion IC program initiatives and lead by embedding infection control principles into the culture of the organisation. This would include active participation by the executive in the IC program through IC committee membership, periodic review of IC program outcomes and importantly in assisting IC program staff to gain access to medical leaders.

A critical requirement of the model is that the chief executive empowers the ICPs and IC program team members with sufficient and well defined authority. This includes the ability to intervene and take appropriate immediate and remedial actions, to make recommendations in the event of infection prevention or control breaches, unexpected or unreasonable rates of HAI, or occupational infectious disease risk.

Conclusion

In Australia the widespread adoption of this infection control model will increase the ability of ICPs to engage and educate clinicians, managers and healthcare consumers to adopt a unified approach to the prevention of HAI. Together with other HAI initiatives it will provide ICPs with suitable skills and resources needed to build national ICP and IC program capacity, and to provide a suitable framework that enables hospitals to appoint appropriately qualified ICPs. The increased IC capacity derived from the adoption of the model, will decrease HAI incidence and improve outcomes for Australian patients and hospitals.

Table 1: An Australian infection prevention and control model for acute hospitals - Essential Minimum Elements

SECTION 1: Program Management and Governance

An Infection Control Practitioner/Professional (ICP) or multiple ICPs, depending on the hospital's size, case mix complexity and infection risk of populations serviced, are designated time, authority, physical and financial resources to coordinate the hospital's IC program.

The ICP:

- has skills, experience and qualifications relevant to their specific clinical setting and is able to develop, implement, coordinate and evaluate a hospital-wide IC program;
- is supported annually by the hospital with resources and time to maintain clinical and professional currency. This should include support for credentialing and/or further relevant post-graduate qualifications.

The hospital's Chief Executive Officer (CEO) or designated equivalent administrator:

- has a performance agreement which includes infection prevention and control outcomes as a key performance indicator;
- endorses the inclusion of specific articulated infection prevention and control roles, responsibilities and accountabilities for relevant personnel within the Hospital's Management Plan;
- attends and participates in each IC Committee meeting;
- ensures the ICP is resourced:
  - in terms of co-workers, information technology, access to up-to-date information, designated office/ work space and tools to meet relevant infection prevention-related legislative, regulatory and accreditation requirements;
  - to achieve negotiated healthcare associated infection (HAI) reduction targets and to perform the essential tasks outlined below.
  - ensures that the hospital's IC program includes involvement of a medical practitioner to support and play a leadership role in the IC program.
  - commits to the IC program vision, mission, priorities, targets and annual infection prevention plan with specific, measurable goals for HAI risk mitigation and reduction. These are outlined in an annual infection prevention and control business plan which the CEO or their designate and the ICP jointly develop.
  - supports an organisational culture that promotes individual responsibility for infection prevention and control among all staff and values the IC program contribution to the safety of patients, healthcare workers and others. This support includes ensuring IC program staffing levels AND including responsibility for infection prevention and control as a component of every staff member's job description.
- authorises the ICP to:

- implement IC program recommendations;
- intervene when clinical or other practices pose infection risks (e.g. halt building and construction activities, close units during outbreaks and guide patient placement for isolation or cohorting); and
- recommend remedial action when infection prevention and control measures are compromised or breached.

Management appraises the ICP's performance at least annually and individual professional development goals are negotiated, supported and opportunities provided.

A multi-disciplinary IC Committee reviews and guides the hospital's IC program, strategies and plans. Membership must include but not be limited to the CE/CEO as well as a medical practitioner. Meeting frequency depends on the hospital's size, case mix complexity and infection risk of populations serviced. The IC Committee activity is measured against negotiated annual performance goals as stipulated in the business plan.

The IC Committee has an organisational communication strategy to facilitate its day to day activities, required reporting activities and has the capability of being escalated in response to an incident.

National and/or state infection prevention and control policies relevant to the hospital are endorsed by the ICP Committee, implemented and compliance monitored. At a minimum these policies should form the basis of the hospital's ICP's directives which could be in either hard copy, electronic or other formats. Suggested topics to be addressed depending on hospital need include:

- Hand Hygiene;
- Standard and Transmission Based (previously Additional) Precautions (including Isolation) and Personal Protective Equipment;
- Aseptic technique and Prevention of Device-Related Infections and other HAIs (e.g. surgical site infections, catheter-related bloodstream infections, ventilator associated pneumonia and urinary tract infection);
- HAI Surveillance;
- Communicable Disease Post Exposure Management and Follow-up;
- Environmental cleaning and disinfection (in collaboration with Environmental Services);
- Reprocessing of re-usable equipment and supplies (in collaboration with Sterilising Services);
- Outbreak Management;
- Critical Incident Management and Investigation;
- Epidemiologically Significant Organisms (including MROs);
- Safe management of waste and sharps;
- Prevention and management of bloodborne pathogen exposure (in collaboration with Occupational Health & Safety);
- Surge capacity for novel respiratory and other communicable disease emergencies (in collaboration with Emergency Response Committees and Outbreak management Teams); and
- Construction/ refurbishment/ engineering.

Regular and ad-hoc communication processes must exist between the IC team and relevant public health authorities.

The hospital supports the ICP's attendance at relevant state or national professional organisation meetings by providing conference leave and funding workshop, conference or other professional development-related registration fees in accordance with Award conditions.

SECTION 2: Infection Prevention

The hospital has access to an accredited (e.g. NATA) laboratory and pharmacy staff systems, protocols and resources exist to:

- perform surveillance and auditing;
- implement the recommendations included in national and state guidelines;
- implement and participate in periodic intensive local, state, national or global HAI reduction campaigns including application of recommendations for HAI surveillance and reporting;
- provide education regarding infection prevention core principles to all new staff and to existing staff at least annually;
- ensure collaboration between the ICP and other stakeholders such as Infectious Disease and Pharmacy Departments to support antimicrobial stewardship;
- collaborate with product and device committees to assess the infection prevention implications of new devices, procedures and technologies;
- provide regular, meaningful feedback of HAI data to individual clinicians, specific specialty departments/units, quality improvement, senior management and others as stipulated in the annual IC program business plan; and
- provide advice and information to staff regarding new and emerging infectious disease threats and trends.
- Provide education related to specific and general HAI prevention to patients and families e.g. Brochures, pamphlets, face-to-face, information sheets.

SECTION 3: Performance Improvement and Research

The hospital supports:

- local research regarding specific cases of infection, outbreaks or preventative strategies; and
- adoption of relevant research findings that reduce or prevent HAIs.

Comprehensive and epidemiologically sound systems, protocols and resources exist to:

- actively manage all infection prevention components of accreditation;
- design, undertake and respond to results of periodic audits and formal reviews of relevant clinical practice and performance eg. Antibiotic utilisation, hand hygiene compliance;
- collaborate with Clinical Risk Departments and Executive staff to develop appropriate methods for rapid response, remediation, investigation and evaluation of infection prevention critical incidents (e.g. sterilisation failures); and
- provide basic, minimum infection control education to staff, healthcare workers and volunteers appropriate to their roles, risks and the services provided by the hospital.

Surveillance and HAI monitoring strategies are designed and driven accordingly to local activity, performance and epidemiologically significant organism trends.

Table 2: An Australian infection prevention and control model for acute hospitals - Recommended and Optional Elements.

LEVEL	LEVEL 1 E.g. Principal referral and specialist women's and children's hospitals	LEVEL 2 E.g. Large Hospital
Mean No. Beds	400	150
SECTION 1: Program Management/ Governance (Excludes Outreach Hospital in The Home Or Community Based Program Responsibilities	▪ IC team meets at least monthly with Senior Administration, Directors of ICU, Surgery and IC Committee to review performance against IC program goals. ▪ Infection Control Link/ Liaison Program is supported where it adds value. ▪ Consumer representation on the IC Committee is encouraged.	▪ IC team preferably meets monthly and definitely meets at least second monthly with Senior Administration, Directors of ICU, Surgery and IC Committee to review performance against IC program goals. ▪ Infection Control Link/ Liaison Program should be supported if it adds value.

LEVEL	LEVEL 1 E.g. Principal referral and specialist women's and children's hospitals	LEVEL 2 E.g. Large Hospital
SECTION 2: Infection Prevention	▪ National or state policies for HAI prevention in ICU, NICU, OR, Dialysis, Paediatric, Oncology, Dialysis, Day Surgery, Endoscopy and other Units are adopted as applicable. ▪ Routinely undertakes prospective outcome indicator measurement and may undertake additional process indicator measurement, signal surveillance or point prevalence surveillance. ▪ Contributes to large aggregate data collection systems as required. ▪ Has formal links with and receives regular reports from Catering, Occupational Health, Environmental Services and Facilities Design, and Engineering Departments (including input into all building and engineering projects).	▪ National or state policies for HAI prevention in ICU, NICU, OT, Dialysis, Paediatric, Oncology, Dialysis, Day Surgery, Endoscopy, and other Units are adopted as applicable. ▪ Routinely undertakes prospective outcome indicator measurement and may undertake process indicator measurement, signal surveillance or point prevalence surveillance. ▪ Contribute to large aggregate data collection systems. ▪ Has formal links with and receives regular reports from Catering, Occupational Health, Environmental Services and Facilities Design, and Engineering Departments (including input into all building and engineering projects).

LEVEL 3 **E.g. Medium Hospital**	LEVEL 4 **E.g. Small Hospital**	LEVEL 5 **E.g. Day Only Procedure Centre**
60	20	NA
▪ IC team meets at least quarterly with Senior Administration, Directors of ICU, Surgery and IC Committee or their equivalents to review performance against IC program goals.	▪ IC team meet at least quarterly with Administration, Medical Administration and IC Committee or their equivalents to review performance against IC program goals.	▪ IC team meets at least twice a year with Senior Administration, Practice Manager or their equivalents to review performance against IC program goals.

LEVEL 3 **E.g. Medium Hospital**	LEVEL 4 **E.g. Small Hospital**	LEVEL 5 **E.g. Day Only Procedure Centre**
▪ National or state policies for HAI prevention in Oncology, Dialysis, Day Surgery, Endoscopy and other Units are adopted as applicable. ▪ May exercise option to substitute prospective outcome indicator measurement for signal surveillance, process indicator measurement, or point prevalence surveillance. ▪ Has formal links with and receives reports from Catering, Occupational Health, Environmental Services and Facilities Design, and Engineering Departments (including input into all building and engineering projects) on an ad-hoc basis.	▪ May exercise option to substitute prospective outcome indicator measurement for signal surveillance, process indicator measurement, or point prevalence surveillance ▪ May exercise option to use external experts for ad-hoc consultation including with Catering, Occupational Health, Environmental Services and Facilities Design, and Engineering Departments (including input into all building and engineering projects).	▪ May exercise option to use external experts for ad-hoc consultation including with Catering, Occupational Health, Environmental Services and Facilities Design, and Engineering Departments (including input into all building and engineering projects).

LEVEL	LEVEL 1 **E.g. Principal referral and specialist women's and children's hospitals**	LEVEL 2 **E.g. Large Hospital**
SECTION 3: Performance Improvement/ Research	▪ Serves as quality improvement (QI) team member and collaborates with Quality Improvement Unit or equivalent to initiate QI special projects as needed ▪ Advanced QI processes (e.g. PDSA, SPC charts, Six Sigma and Lean Methodologies) are used where they add value. ▪ Outcomes of IC education are evaluated (e.g. through either pre/ post tests, compliance monitoring or observation of behaviour change). ▪ Proven targeted HAI prevention interventions are routinely implemented to reduce specific endemic and epidemic HAI rates.	▪ Consults to QI team and initiates QI special projects as needed ▪ May use advanced QI processes, where they add value. ▪ Proven targeted interventions are implemented as needed to decrease specific endemic and epidemic HAI rates.

LEVEL	LEVEL 1 **E.g. Principal referral and specialist women's and children's hospitals**	LEVEL 2 **E.g. Large Hospital**
SECTION 4: Other	▪ At least one FTE ICP has at least 5 years FTE IC program experience. ▪ Formal, structured mentoring (from either an internal or external experienced peer who hold AICA Credential or from peer with formal, post-graduate infection prevention qualification or equivalent) is available for all ICP with less than 2 years IC program experience ▪ All ICP with more than 2 years experience hold or are working towards an AICA credential or formal, post-graduate infection prevention qualification or equivalent.	▪ Preferable that at least one ICP has at least 3 years IC program experience ▪ Is provided with formal, structured mentoring (from either an internal or external experienced peer who holds AICA Credential or formal, post-graduate infection prevention qualification or equivalent) if ICP has less than 18 months IC program experience ▪ All ICP hold, intend to or are working towards AICA credential or formal, post-graduate infection prevention qualification or equivalent.

GLOSSARY/ LIST OF ABBREVIATIONS

AICA Australian Infection Control Association Inc
HAI Healthcare Infection Control
ICP Infection Control Professional/Practitioner/Consultant
IC Infection Control and Prevention

LEVEL 3 E.g. Medium Hospital	LEVEL 4 E.g. Small Hospital	LEVEL 5 E.g. Day Only Procedure Centre
▪ Initiates QI special projects as needed. ▪ Proven targeted interventions are implemented as possible to decrease the risk of specific HAIs.	▪ Initiates QI special projects as needed ▪ May implement proven targeted interventions to decrease the risk of specific HAIs.	▪ Initiates QI special projects as needed. ▪ May implement proven targeted interventions to decrease the risk of specific HAIs.

LEVEL 3 E.g. Medium Hospital	LEVEL 4 E.g. Small Hospital	LEVEL 5 E.g. Day Only Procedure Centre
▪ Preferable that at least one ICP has at least 18 months IC program experience. ▪ Can opt to receive formal, structured mentoring (from either an internal or external experienced peer who holds AICA Credential or from peer with formal, post-graduate infection prevention qualification or equivalent) if ICP has less than 1 years IC program experience . ▪ ICP is strongly encouraged to seek AICA credential or formal, post-graduate infection prevention qualification or equivalent	▪ ICP has option to seek AICA credential or or formal, post-graduate infection prevention qualification or equivalent ▪ Relationship is established between hospital and state/ national professional body to seek advice when required. ▪ Access to a credentialed ICP provider/ consultant is available if needed.	▪ ICP has option to seek AICA credential or formal, post-graduate infection prevention qualification or equivalent ▪ Relationship is established between hospital and state/ national professional body to seek advice when required. ▪ Access to a credentialed ICP provider/ consultant is available if needed.

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APPENDIX 1

Infection control practitioners' scope of practice literature review & review of Australian infection control programs

Executive summary

Authors: C Murphy, S Resnik

Health care associated infections (HAIs) cause substantial morbidity and mortality every year in the Australian health care setting. HAI reduction is a key goal of the Australian Commission on Safety and Quality in Health Care (ACSQHC). This goal is shared by all Australian jurisdictions and by relevant professional organisations.

For the past forty or so years Australia's approach to HAI measurement, prevention and control has been based on local infection control and surveillance programs. These programs are typically coordinated by an infection control practitioner. Despite the longevity of this model little is known about its structure, effectiveness or sustainability. There is a paucity of information about the current and ideal skills, education and resources of ICPs in health care settings.

This review involved reviewing recent literature in order to better understand the critical elements and structure of an ideal infection control and surveillance program, The ACSQHC recognises that ideal programs are critical to the long term success and sustainability of their proposed HAI initiatives.

This review notes wide variation in programs that are described from several different countries. Even within individual countries inconsistent structures and activities are reported. The literature fails to outline either an ideal program or reach consensus regarding the most appropriate skills, education and support for infection control professional.

In particular Australian reports are scarce. This presents multiple unanswered questions and opportunities for further research and investigation. Modern infection control and prevention programs all around the world appear to be loosely based on seminal work undertaken in the US in the late 1970s. Modern drivers impacting infection control programs are similar globally and largely include government lead initiatives and recommendations from formal professional bodies or self appointed groups of experts.

This review presents a snapshot of modern Australian infection control programs and identifies major factors that influence it. It also highlights areas that need improvement. Recommendations relating to those improvements are summarised in the following table. Most importantly this review reaffirms the inconvenient but inevitable previously made conclusions that no single, ideal and valid program model for reducing healthcare associated infections currently exists and that multi-level buy in and well articulated systems of governance are required for programmatic success. The role and function of the infection control professional require refinement yet in the interim this role appears to make a reasonable contribution to infection reduction activity and outcome.

Summary of key recommendations for ACSQHC activity

1. Activities required for an effective infection control program.	▪ The ACSQHC could use this review to: ◆ incorporate generic best practice principles and to define a raft of suggested possible IC program to incorporate at an organisational level depending on local need and capacity. ◆ recommend a minimum and uniform basic platform of IC program activities which should be engineered into every Australian inpatient setting
2. Skills / knowledge / expertise required to undertake these activities.	▪ The ACSQHC's best option for contributing to ICP workforce development and capacity building remains unclear.
3. Models (International and Australian) exist that fulfil an effective infection control program.	▪ Limited evidence makes it impractical for the ACSQHC to make definitive recommendations regarding effective models.
4. Critical success factors and limitations of successful infection control programs.	▪ Adaptation and implementation of elements such as governance, control assurance procedures, administrative and clinical buy-in may be prudent.
5. Infection control programs - sustainability and transferability.	▪ Transferability of some individual IC program elements such as surveillance, is likely sustainable rather than transferability of whole IC programs.
6. Gaps in the evidence base on the role of the Australian Infection Control Practitioner.	▪ Unlikely that any ACSQHC recommendations relating to this role can be substantiated through the literature. ▪ Multiple opportunities exist for either ACSQHC, its designates or relevant and interested researchers to contribute to the field.
7. Mentoring support programs for infection control practitioners.	The ACSQHC may wish to consider: ▪ the special needs for support and mentoring among regional, rural and remote ICPs ▪ how the current Australian workforce of experienced and qualified ICPs can be organised to develop and field test formal ICP mentoring to their less experienced peers.

Background and introduction

The Australian Commission on Safety and Quality in Health Care (the ACSQHC) recognises the importance of reducing HAIs as one of its priority programs. Major ACSQHC initiatives to date relating to this priority include specific recommendations regarding HAI surveillance and the development and implementation of a national hand hygiene initiative.

After extensive consultation with a wide range of stakeholders from the Australian infection control community and on the advice of its HAI Implementation Advisory Committee the ACSQHC acknowledges that achievement of its overall HAI program goal is almost entirely dependent on the capacity of (ICPs) to implement the Committee's recommended strategies.

Further, national surveys and workshops of ICPs undertaken by the ACSQHC have shown that there is disparity in skills and resources between experienced and beginning ICPs and between larger metropolitan hospitals and rural centres. Little information is available regarding the skills and resources of ICPs in the private sector, in aged care and in residential health care settings. To better understand the role and function of a contemporary Australian ICP the ACSQHC sponsored structured evidence based literature review of the scope of practice of health professionals who undertake infection control and prevention roles, including surveillance of HAIs in healthcare facilities. The ACSQHC required review of both local and international quantitative and qualitative literature published within the last five years.

This literature review will likely inform the development of educational resources and toolkits to enable Australian ICPs to implement effective infection control and surveillance programs (IC programs) and will also provide a general resource for those working on improving or researching in infection control.

Structure

A table including a summary of the methodology key points and classification of each reviewed publication used to respond to the research questions is included in this review as an appendix.

Research questions

1. What activities are required for an effective infection control program? (The focus should include inpatient healthcare facilities such as large metropolitan, district and regional / rural settings).
2. What skills / knowledge / expertise are required to undertake these activities (identified in question 1)
3. What models (International and Australian) exist that fulfil an effective infection control program including human and economic impact?
4. What are the critical success factors and limitations of successful infection control programs?
5. For which infection control programs is there evidence of sustainability and transferability?
6. What are the gaps in the evidence base on the role of the Australian Infection Control Practitioner?
7. What mentoring support programs for infection control practitioners exist? What are they? What are their strengths and weaknesses?

Method

Scope

This review was undertaken during July-September 2008. It included quantitative and/or qualitative peer-reviewed publications and other peer-reviewed and non-peer reviewed publications, opinions and reports published in English in the previous five years (2003-2008). Relevant seminal publications published earlier than 2003 and specific to Australian infection control were also reviewed.

Search strategy

Reviewers searched the AUSTRALIAN DIGITAL THESIS PROGRAM, CINAHL, Pre-CINAHL, Cochrane Library, ISI Web of Knowledge, Health Business Fulltext Elite, MEDITEXT, MEDLINE (PUBMED), OVID, PROQUEST and Google (Scholar) databases during this literature review.

Major search terms used included infection control and infection control practitioners, organization and administration. Hand searches were undertaken of the authors' professional library for relevant grey literature including policy, guideline or strategic directions.

Initially 113 pieces of peer-reviewed literature and conference abstracts were identified. The abstract or Executive summary of all references was screened for relevance to the specific issues addressed in the seven review questions and applicability to the Australian inpatient healthcare facilities including large metropolitan, district and regional or rural settings. Some publications were identified as being irrelevant or beyond the scope of the review and thus eliminated. Additional publications were identified from the reference lists of reviewed articles and included in the review. Twenty two pieces of grey literature were identified in the first search.

Where appropriate, the authors also used their comprehensive formal, informal and professional networks to identify and make contact with recognised national and international field experts, government and non-government professional associations and academic organisations for the purposes of general discussion regarding the role and scope of the infection control practitioner.

Assessment and categorisation

A slightly modified version of the simple classification system described and recently applied by Kings College London in their review of the impact of organisational and management factors on infection in British hospitals was used in this review. (Griffiths, Renz et al. 2008) The system attributed the following ratings to evidence according to the specified criteria.

- **SR+**: Systematic review of high-quality trials/ cohort studies (with risk adjustment) with a narrow confidence interval
- **SR**: Other systematic reviews
- **R**: Non-systematic reviews
- **RCT**: Randomised controlled trials
- **O+**: Observational study with good adjustment for risk and confounders
- **O**: Observational study without adjustment for risk/confounders and/or no report of sample size
- **Q**: qualitative studies
- **D**: descriptive studies
- **OP/EC**: opinion piece or expert commentary

Quality of the evidence and limitations

Given the inapplicability of performing randomised controlled trials in this field rigorous scientifically valid evidence is sparse. As well most of the published literature addressing IC programs is either studies of time management, expert opinion, outcome studies or reports from international settings. (Haas 2006)

Section 1: Activities required for an effective infection control program

This section includes a summary of the principal findings, issues and topics published in the literature relating to the key activities necessary for an IC program. The section starts with a retrospective review of the development of IC programs. Discussion of the more recent global and Australian trends and contemporary issues reported chronologically in the peer reviewed and grey literature follows. Readers should note that there is some overlap and interrelationships between literature relating to the activities required for an effective infection control program and that of next three sections addressing research questions 2, 3 and 4.

Peer reviewed literature

The Development of IC programs

In 1974, the Centers for Disease Control and Prevention (CDC) initiated the ten-year Study of the Efficacy of Nosocomial Infection Control (the SENIC Project)(Haley, Quade et al. 1980; Haley, Culver et al. 1985)

The SENIC study had three specific objectives. These objectives were to:

1. determine the extent of nosocomial infections in U.S.A hospitals;
2. report on the implementation of the new IC programs in U.S.A hospitals; and
3. establish whether the above programs were effective in reducing the risks of hospitalised patients acquiring nosocomial infections.

The SENIC study hypothesised that nosocomial infection rates could only be reduced if an IC program had four components which were:

1. surveillance;
2. control including policy development, education and review of clinical practice;
3. an infection control nurse to collect and analyse surveillance data in addition to having overall responsibility for co-ordinating the control program; and
4. active involvement of a physician or microbiologist in the program

The SENIC definition of surveillance activity included measurement of the infection rate, consideration of risk factors and provision of feedback to clinical staff. In contrast, control activities were those functions that were known to reduce the risk of infection including aseptic technique, appropriate cleaning, sterilisation and disinfection of used equipment and instruments.

The SENIC study was conducted in three stages. Phase 1, the Preliminary Screening Questionnaire, involved mailing a survey to 6586 U.S.A hospitals to establish to what extent they had adopted the above four components of an IC program. The response rate to Phase 1 was 86%. Results from this phase indicated that most (87%) of respondents had a systematic approach to collecting and analysing surveillance data. Most hospitals reported surveillance findings and 62% used their results to provide feedback and education to nursing staff. Results relating to control suggested that most hospitals had written policies for implementing specific patient-care practices although the proportion of hospitals monitoring compliance with recommended practices ranged from 56% to 80%. Less than half (42%) of the responding hospitals had an IC nurse that spent more than 20 hours per week exclusively on infection surveillance or control activities. Most (64%) responding hospitals had a physician or

microbiologist who had an interest in IC and served as head of the IC program. Few (16%) heads of IC programs were trained in either infectious diseases or microbiology. The time they allocated to IC was minimal.

From the study population of 6586 hospitals, the samples for Phase 2, the Hospital Interview Survey, and Phase 3, the Medical Records Survey, were selected. These hospitals were stratified according to number of beds and medical school affiliation, as investigators believed these two variables were the best predictors of nosocomial infection rates. Separate groups of CDC data collectors participated in Phases 2 and 3 so that both groups would be unaware of the other's data(Haley 1980).

Phase 2 of the SENIC study was known as the Hospital Interview Survey. Phase 2 involved dispatching a group of 58 trained interviewers to a sample of 433 hospitals. The interviewers, who were also CDC staff members, undertook standardised interviews, usually in pairs, during October 1976 and July 1977 to obtain specific information about the hospital's IC program. Data was obtained by interviewing twelve of the staff members in each hospital who were considered to have duties that would impact upon infection surveillance.

Areas examined during interview included:

- the characteristics and activity of the IC nurse, hospital epidemiologist and infection control committee (IC committee);
- the methods of surveillance and outbreak investigations;
- monitoring of the environment;
- isolation practices;
- infection control team's (ICT) relationship with administration and other hospital departments;
- nurses' reports of patient care;
- staff training in IC;
- methods employed to change staff IC behaviour;
- housekeeping and disinfection activities; and
- the role of the microbiology laboratory. (Haley 1980)

Phase 3, the Medical Records Survey, involved 338 sample hospitals. In each hospital, a randomly selected sample of medical records of approximately 500 patients admitted as adult general medical and surgical patients during 1970 and 500 of the same type of patients admitted during the period April 1975 to March 1976 was reviewed. The 1970 period was chosen as it reflected a time when hospitals most likely did not have an IC program in place. Phase 3 involved 169,518 patients in 1970 and 169,526 patients in 1975-1976. The CDC employed and managed medical record analysts who reviewed each record for specific demographic and clinical data relating to nosocomial urinary tract, surgical wounds, and pneumonia or bacteraemia infections. Investigators calculated the frequency of nosocomial infections and specific measures of the nosocomial infection rate using total admissions and the days of hospitalisation as denominators.

Phase 3 determined that the overall U.S.A nosocomial infection rate was 5.7 infections per 100 admissions to acute care facilities. The number of nosocomial infections in the U.S.A was calculated to be 2.1 million annually(Haley, Culver et al. 1985). In addition, Phase 3 estimated the actual number of infections that were being prevented in each hospital by the IC program and theorised the number that could be prevented if all hospitals had implemented those activities which had previously been demonstrated to be effective.

The results of the third phase of the SENIC study confirmed the original hypothesis that IC programs could reduce infection rates. Investigators reported that an effective IC program could reduce infections by 32%; however, to be this effective, the IC program required four specific components. Each component was necessary and these were (Haley, Culver et al. 1985):

1. organised surveillance and control activities;

2. a trained, physician with an interest in IC;
3. a full-time IC nurse for each 250 beds; and
4. a system for providing feedback of surgical infection rates to surgeons.

In addition to the above findings, SENIC investigators found that most hospitals lacked an effective IC program and therefore in 1975 only 6% of U.S.A nosocomial infections were actually being prevented(Haley, Culver et al. 1985).

Retrospectively, SENIC is considered to have directly impacted on five key areas of IC programs. The five areas were:

1. preservation of the role of IC in hospitals;
2. rekindling of interest in surveillance;
3. change to outcome orientation;
4. increases in physician training; and
5. use of multivariate analysis in clinical decision-making.

More than thirty five years later, the SENIC study is widely acknowledged in the United Stated and abroad as the scientific basis upon which modern IC programs are based. (Scheckler, Brimhall et al. 1998) SENIC confirmed the value of organised programs and in conjunction with the CDC's National Nosocomial Infection Surveillance System (NNIS), highlighted the contributions that epidemiologically sound surveillance makes to an IC program program.

SENIC's complex and expensive methodology precludes it being repeated yet almost every piece of literature published in the subsequent years, (including those in the previous five years examined as part of this literature review) addressing IC program elements and/or the role and function of the ICP draws upon the SENIC findings. It could be argued that infection prevention and control's greatest study has more recently been a critical factor in retarding the growth and restructure of certain IC programs. This is especially so in relation to ICP staffing ratios where the SENIC recommended ratio of one ICP per 250 beds is always the critical reference point. That is, any modern study reporting a lower ratio reports ICP staffing as inadequate.

The only major Australian study of activities required for an IC program was reported in 1999 and included details provided by 644 then members of the Australian Infection Control Association (AICA). (Murphy and McLaws 1999) The authors found that the typical Australian ICP worked in an acute, publicly funded organisation with less than 251 beds. These Australian ICPs had backgrounds in nursing and spent most of their time undertaking HAIs surveillance. This seminal Australian work also reported the lack of uniformity in IC program structure and function regardless of the type or location of setting in which an ICP was employed.

A study of 115 ICPs from just Queensland published a year later reported that ICPs were desirous of moving away from surveillance-based activity and adopting more strategic management approaches to their work including clinical monitoring and risk management. (Jones, Gardner et al. 2000)

No Australian and few international studies have examined possible differences in the organisation, roles and/or needs of rural and non-rural ICPs. Stevenson and colleagues reported a review of ICPs from small, rural hospitals in the west of the United States (US) finding that despite their ineligibility to participate in the CDC's NNIS system, almost every hospital IC program had adopted NNIS HAI surveillance methodologies. The proportions of time allocated to various traditional IC program activities reported by the study group were similar to those reported in Murphy's Australian study. Surveillance was again the activity for which ICPs allocated most of their time. (Stevenson, Murphy et al. 2004)

Developing valid and "ideal" IC programs models that can be applied by ICPs has been undertaken in several countries and regions in the years following SENIC. These efforts are generally driven by either the government of the day or by national coalitions of expert ICPs and hospital epidemiologists. SENIC's influence especially in regard to staffing and recommended activities resonates in almost every proposed model. In 2004 the Canadian Health Department developed such a model making

recommendations for hypothetical organisations in both the acute and long-term care sectors. (Health Canada 2004) Health Canada proposed staffing ratios of 3 full time equivalent (FTE) ICPs per 500 acute care beds and 1 FTE ICP per 150-250 long-term care beds. Recommended activities for both sectors included surveillance, education, outbreak management, policy development and occupational health.

The published literature clearly demonstrates the lack of homogeneity in IC programs within and between countries. Three related studies of Thai IC programs in provincial, regional and army hospitals demonstrate the substantial variations. (Jantarasri, Soparatana et al. 2005; Kananitaya, Senarat et al. 2005; Leela, Chittreecheur et al. 2005) ICPs in these settings typically performed surveillance, consultation, education, administration and quality assurance roles but less frequently met obligations for outbreak management and research activities which were part of the criteria set by the Thai government and against which their IC program was assessed for hospital accreditation purposes.

Very few published studies measure the quality, cost or effectiveness of IC programs. In a recent, novel, retrospective study of IC interventions over a seven year period Grant and Kim reviewed the nature of all IC consultations lasting longer than five minutes. They conclude that they were able to search and apply research to provide appropriate and customised responses. Further they assert that these responses potentially reduce HAI transmission especially if the ICP is permitted reasonable authority, resources, support and autonomy.

In a recent publication summarising strategic directions for its members, the US-based Association for Professionals in Infection Control and Epidemiology (APIC), proposed specific roles and attributes that will be critical for ICPs. These functions were proposed by a small group of US experts gathered in a 2-day think tank forum and have not been validated. They include a diverse and at times unrelated set of functions highlighting the expected trend for ICPs to become more business-like and strategic in their IC program planning and delivery. The authors do not suggest mechanisms for developing or test ICP competence with these skills and tasks nor do they recommend a process for validation or measurement of their effectiveness. (Murphy, Carrico et al. 2008) Like much of the recent literature relating to core activities at best they represent expert opinion or commentary. The authors suggest in no specific order that the main attributes and roles of ICPs functioning in ideal future IC and prevention systems will be:

- understanding of the infectious disease process;
- conducting surveillance to identify risk factors and cases;
- providing data management;
- translating data into usable information (analysis and reporting);
- investigating infection epidemics or clusters;
- facilitating interventions to prevent/control transmission of infectious agents;
- observing health care workers' compliance with proven infection prevention measures and providing feedback;
- leading and managing programs to prevent and control HAIs;
- developing policies and procedures;
- providing education and training;
- performing research and/or applying research findings to practice;
- conducting product evaluation and selection;
- ensuring the infection prevention and control aspects of occupational health and environmental safety programs;
- ensuring emergency preparedness planning and implementation;
- promoting process and performance improvement; and
- providing consultation.

Grey literature

There are limited pieces of grey literature relevant to Australia and published in the past five years that specifically relate to the activities necessary for an IC program. Most are either guidance documents from accreditation agencies or government reports or guidelines.

An early Australian document outlining specific elements of an ideal IC program was the *"Fundamental for Infection Control Services"* published in 2001 by the Australian Council on Healthcare Standards (ACHS). (The Australian Council on Healthcare Standards 2001) The ACHS Fundamentals document is a complex document written specifically to reflect the standards and criteria outlined in the second edition of the ACHS *EQuIP Guide* which was used by Australian hospitals seeking ACHS accreditation. The Fundamentals document did not specifically identify recommended IC program elements but rather suggested activities that could be undertaken to identify, assess and control HAI risk. These activities included HAI surveillance, reporting injuries, surveillance of the environment, equipping isolation units, managing outbreaks and recommending substitution, warning and protective mechanisms where HAI risks were unable to be eliminated. There is little formal or informal reference to the ACHS Fundamentals document in Australian infection control literature or network activity. It has not been updated despite subsequent versions of EQuIP Guides.

In 2002 the Victorian government published a comprehensive guideline defining the expected infrastructure and activities for effective prevention, monitoring and control of infection. (Acute Health - Quality and Care Continuity Branch Department of Human Services 2000) The guideline recommended the following as examples of activities to provide infection control service:

- development, implementation and review of policies, procedures and practice standards;
- ongoing education and education for all staff;
- provision of consultation;
- surveillance and investigation of HAIs, outbreaks and adverse events
- occupational health monitoring and programs;
- monitoring of antibiotic use, disinfectants, cleaning and instrument/ device reprocessing;
- meeting Accreditation requirements; and
- evaluating the effectiveness of the program.

It also recommended that an IC committee be in place with multi-disciplinary input and that the infection control service have sufficient resources and clear lines of responsibility including links with an infectious disease service. The IC team model is outlined including one ICP per 250 acute care beds. Whilst the efficiency of this program structure has not been measured it seems to include the major elements recommended in contemporary peer-reviewed literature and grey literature.

The long overlooked issue of clinical governance in relation to infection prevention was highlighted in the British government's landmark publication "*Winning Ways"* in 2003. (Department of Health 2003) "*Winning Ways"* recognised for the first time that support of senior administration and appropriate local infrastructure and systems were critical in improving the behaviours of clinical staff. This concept also underpins more recent peer-reviewed literature discussed elsewhere in this literature review. (Anderson, Kirkland et al. 2007; Perencevich, Stone et al. 2007; Murphy, Carrico et al. 2008)

A major Australian initiative was the release in 2004 of the national *Infection Control Guidelines for the Prevention of Transmission of Infectious Diseases in the Health Care Setting*. (Australian Government Department of Health and Ageing 2004) This document cited findings from the SENIC study that up to one-third of HAIs could potentially be eliminated if an effective IC program was in place. Further it recommended that those elements for the Australian healthcare setting were:

- an annual strategic business plan;
- a comprehensive infection control procedures and policy manual; and

- IC program management and coordination by a suitably qualified professional, either a nurse, microbiologist of infectious diseases physician.

In a generic prescription targeting infection prevention programs for countries with immature systems of infection control and prevention, the International Federation for Infection Control (IFIC) recommends the following program elements; a yearly work plan, an IC committee, an IC team, an IC Officer, an IC nurse, an IC Link Nurse system and an IC Manual. (Rasslan and Heeg 2007) The IFIC model includes and builds upon all of the previously cited IC program recommendations by also recommending antibiotic stewardship, participation in development of tender documents, supporting and participating in research and reviewing and assessing infection risks associated with new equipment and devices.

Since the early SENIC study, ICPs in the US have undertaken periodic large scale practice analyses to better understand the skills and knowledge required to practice as an ICP and for the purpose of defining exam content for the US IC certification process. The results of several practice analyses are discussed further in the Section 2 of this literature review. However, results of the most recent 2001 analysis informed the six specific content areas upon which the exam is based and which are considered collectively to define the range of activities necessary in a contemporary IC program. (Goldrick 2007; Nutty 2007) These are:

1. identification of infectious disease processes;
2. surveillance and epidemiologic investigation;
3. preventing/ controlling the transmission of infectious agents;
4. program management and communication;
5. education and research; and
6. infection control aspects of employee health.

The proposed US Joint Commission Hospital Accreditation Program expands even further on the other recommendations cited in the grey literature by including organisational preparation to respond to an influx of potentially infectious patients and provision of influenza vaccination to staff as assessable elements of performance. (The Joint Commission 2008) These recommendations reflect the increasing breadth, scope and complexity of modern IC programs.

Also in the US, the Government Accountability Office (GAO) has revised its conditions of participation for hospitals seeking reimbursement under the Centers for Medicare and Medicaid Services so that organizations designate a person responsible for developing and implementing policies designed to control transmission of infections and communicable disease. This Standard includes and assigns specific responsibilities for IC program oversight to the senior administrative staff of organisations. (United States Government Accountability Office 2008)

Additional and more recent directives from the United Kingdom (UK) government stipulate specific roles for Directors of Infection Prevention and Control which include increased participation in governance including production of an annual report on the state of HAIs. (General Health Protection - Department of Health 2008) Specifically this legislative based directive directs the IC program to:

- set objectives;
- identify priorities for action;
- provide indications that relevant policies designed to reduce HAIs have been implemented; and
- report annually the progress of the organisation against IC program objectives.

Summary and analysis

The peer-reviewed literature addressing activities required for an effective infection control program is scant. The recommendations it makes, other than in the seminal SENIC findings, remain largely untested. Their individual or collective value to modern inpatient IC program design and delivery is unknown. Regardless, both recent publications and the grey literature continue to recommend these original activities. In the absence of proven efficacy the literature in this area is almost entirely composed of either descriptive studies or expert commentary/ opinion pieces. These documents have been interpreted by the field as programmatic recipes and as such the approach to IC programs is non-homogenised within Australia and on a larger global scale. As seen in the US and the UK, high level political and organisational drivers inevitably influence program structures and goals. As well they often initiate administrative or financial support.

Interestingly, the few non-US or non-UK international reports such as those from Thailand and the IFIC recommendations (Chaisombat, Moongtui et al. 2005; Jantarasri, Soparatana et al. 2005; Kananitaya, Senarat et al. 2005; Rasslan and Heeg 2007) illustrate the trend for HAI organisational and program strategies for large, acute care hospitals to "filter" down to smaller institutions and, in countries with less mature IC program infrastructure, to larger institutions.

The major finding of this section of the literature review is that no one ideal IC program model has yet been defined. As such it is very unlikely that the ACSQHC's HAI activity will or should try to define such a model for Australia. Perhaps instead the ACSQHC may use this review to incorporate generic best practice principles and salient elements of other national directives to define a raft of suggested possible IC program activities that Australian IC teams and ICPS could incorporate at an organisational level depending on local need and capacity. Potentially, even more useful would be the ACSQHC recommending a minimum and uniform basic platform of IC program activities which should be engineered into every Australian inpatient setting.

Section 2:
Skills, knowledge and expertise required to undertake these activities

The key content of this section relates to skills, knowledge and expertise reported largely in descriptive studies or expert commentaries in the scientific literature. The section begins with an overview of findings from an early Australian study where these attributes were described among ICPs. It progresses to in-depth discussion of the reported trends from various US practice analyses and more recent qualifications offered to ICPs in the UK. Brief discussion regarding the role and preparation of the infection control doctor is also included as are recommendations from relevant grey literature. This section concludes with an outline of the most recent joint recommendation from APIC, Certification Board of Infection Control and Epidemiology (CBIC) and the Community and Hospital Infection Control Association of Canada (CHICA) which outlines key indicators representing the multiple skills required of an ICP.

Peer reviewed literature

The only comprehensive Australian study of ICPs' skills, knowledge and expertise was undertaken more than a decade ago. It included two reports of ICP skills and knowledge. The first included a description of ICPs self-reported level of competence and their view regarding the qualifications required for professional growth and sequential promotion from "novice" to "expert" ICP. (Murphy and McLaws 1999) The 630 contributing ICPs failed to demonstrate any consensus regarding qualifications at any level other than that which they perceived themselves to hold at the time of being studied. The authors contest that this finding demonstrates the limit and unclear pathway for ICP professional development in Australia as well as the difficulties associated with developing, testing and implementing a meaningful system of assessing ICP competence and/or skill.

The second report from this Australian study reported the extent to which ICPs possessed and used their skills and resources to promote evidence-based practice. It found that fewer than a quarter of all ICPs undertook IC research and of that group just over a quarter published their findings. (Murphy and McLaws 2000)

Publications from the US and the UK tend to dominate the more recent literature addressing ICPs' skills, knowledge and expertise. Similar to the findings reported in Section 1 this dominance can be linked with the practice analyses and ICP certification in the US and with high level government reform in the UK. In 2005 Perry published a retrospective review of the UK ICP's development. (Perry 2005) This review includes thoughtful discussion on how core competencies for ICPs have been used to prepare individual job descriptions, direct on the job learning and also for the development of curricula for specialist training and education programmes. Perry asserts that the IC nurse's functions currently remain largely unchanged from those recommended by the UK government in 1995 other than having expended in 2000 with the addition of core competencies recommended by the Infection Control Nurses Association. Respectively these include:

- identification and control of outbreaks;
- education of hospital staff in infection control procedures;
- preparation of policy documents and audit of implementation;
- formulation of an annual programme of work including surveillance;
- implementation of the annual programme;
- provision of an annual report to the chief executive;
- liaison with departments including occupational health and clinical teams;
- monitoring of hospital hygiene;
- advise on procedures for discharge and transfer of patients with infection or colonisation; and
- advise purchasing and plans for building works. (Department of Health and Public Service Laboratory Service 1995)
- specialist knowledge of microbiology, immunology, epidemiology practice to prevent and control infection and decontamination;
- evidence-based practice;
- teaching and learning;
- management and leadership; and
- clinical research. (Infection Control Nurses Association 2000)

Further Perry, like Murphy and colleagues, (Murphy, Carrico et al. 2008) recommends that ICPs upskill so as to develop more leadership rather than managerial skills and become more conversant with the language of business. King builds upon Perry's discussion of the recommended UK ICP core competencies and discusses how initial concerns that they would be used as tool to control ICPs has not eventuated but rather that they have been useful in ICP assessment for promotion and also as guidance for ICP education. (King 2005)

Goldrick provides an alternate view in her comprehensive review of the historical trends in ICP skill, education and competence requirements as demonstrated by repeated practice analyses. (Goldrick 2005) Table 1 reproduced from Goldrick's work demonstrates that substantial increases in ICP activity and essential skills since the initial findings of the SENIC study. The current six recommended practice areas are reflected in the CBIC examination content and importantly represent a 145% increase in ICP tasks today compared with the initial 1976 SENIC practice analysis. Goldrick makes several important points; notably that modern ICPs must have a comprehensive understanding of additional issues such as bio preparedness, and emerging infectious diseases. Additionally, restructure of US healthcare has brought ICPs additional responsibilities in non-acute care settings such as the community, ambulatory and day care centres.

Table 3: Evolution of infection control practice. Reproduced from Goldrick, (2005). (Goldrick 2005)

SENIC Project	CBIC practice analysis				
1976* **Practice dimensions: n=5 Number of tasks: N/A**	**1982[†] Practice dimensions: n=8 Number of tasks: 60**	**1987[‡] Practice dimensions: n=8 Number of tasks: 67**	**1992[§] Practice dimensions: n=5 Number of tasks: 95**	**1996[¶] Practice dimensions: n=5 Number of tasks: 127**	**2001[#] Practice dimensions: n=6 Number of tasks: 147**
Surveillance	Patient care practices	Patient care practices	Infectious process	Identification of infectious disease processes	Identification of infectious disease processes
Policy Development	Infectious diseases	Infectious diseases	Surveillance / Epidemiologic investigation	Surveillance / Epidemiologic investigation	Surveillance / Epidemiologic investigation
Training	Epidemology and statistics	Epidemology and statistics	Transmission of infection	Preventing / controlling transmission of infectious agensts	Preventing / controlling transmission of infectious agensts
Epidemic investigations	Microbiologic practices	Microbiologic practices	Mangement / communication	Program management / communication	Program management / communication
Consulting	Sterilization / disinfection	Sterilization / disinfection	Education	Education	Education and research
	Education	Education			Infection control aspects of employee health
	Employee health services	Employee health services			
	Management / communication	Management / communication			

SENIC Study on the Efficiency of Nosocomial Infection Control; CBC, Certification Board of Infection Control.

*Emore et al, 1980.

[†]Shannon et al, 1984.

[‡]Larson et al, 1988.

[§]Bjerke et al, 1993.

[¶]Turner et al, 1999.

[#]Goldrick et al, 2002.

Recent US political initiatives such as legislation of mandatory state-wide surveillance and reporting has impacted ICPs by requiring them to be competent in standardised surveillance methodology including analysis and reporting of results. In a descriptive study of workforce requirements in the state of Virginia Edmond and colleagues found that to comply with proposed state mandates for HAI surveillance, on average acute-care organisations would require at least 1.7 additional FTE ICPs. (Edmond, White-Russell et al. 2005) Government directives and initiatives can have substantial impact on both the type and volume of ICP's work and as such significantly influence the skill mix and competencies ICPs require to perform this work.

In 2006 Hunt and Hellsten published an interesting opinion piece describing the limited uptake by Australian ICPs of a credentialing process designed and administered by an expert Sub-Committee of the Australian Infection Control Association (AICA). (Hunt and Hellsten 2006) The authors argued that credentialing was a valuable way in which Australian ICPs could demonstrate their competence for their own benefit as well as that of their employer and customer. Details regarding the requirements of AICA credentialing are not specified in the literature but rather available only through direct application to the AICA.

The literature reports the availability of various educational offerings recommended for ICPs and ICDs in the UK. These include post-graduate certificate, post-graduate Diploma or Masters level qualifications. Some qualifications are also available through distance learning modules. (Cookson and Drasar 2006; Hay and Skinner 2006) Cookson and colleagues noted the need for course pre-requisites to take advanced prior learning into consideration. To this end the eligibility of candidates seeking entry to the UK-based Diploma of Hospital Infection Control is assessed according to previous qualifications, publications, presentations, involvement at hospital level, participation in policy development, association membership and infection control positions held as well as participation in national initiatives. Cookson notes that these criteria are designed to enable a wide range of candidates to access the course.

In addition to an increased understanding of business principles Perencevich argues that in order to gain administrative support and financial resources for their programs, ICPs and hospital epidemiologists must also understand and competently use economic arguments and justification including business case-analysis. (Perencevich, Stone et al. 2007)

Building upon her previous work regarding the US certification process in 2007 Goldrick published this White Paper to provide further rationale for certification and recertification. (Goldrick 2007) She asserted that the rapid changes in modern healthcare require ICPs to be competent and that certification demonstrates competences by testing appropriate ICP skills, abilities and knowledge. Further Goldrick suggests that it takes a minimum of two years for a beginner ICP to progress to a position of competence, hence the requirement of a minimum two-year practice pre-certification.

In their futuristic paper, discussed briefly in Section 1, Murphy and colleagues offer expert opinion regarding the principal skills, knowledge and attributes required in an ICP coordinating a future IC program. (Murphy, Carrico et al. 2008) Their list is detailed, diverse and comprehensive. It includes:

- advanced facilitation, group process, and teambuilding skills;
- real-time analytic skills, such as those needed to perform point-of-care root cause analysis;
- refined understanding of complex systems, systems thinking, and a systems approach to problem solving;
- the emergence of new leadership skills and identification of personnel who have these skills;
- reciprocal responsibility for the development, implementation, and evaluation of technologies;
- ability to collaborate with, negotiate with, and influence others at all levels of the organization;
- program management and communication skills, including the ability to "market" infection prevention to others;
- capability to strategically plan and execute action plans;
- development of virtual teams that take advantage of the skills and experience of those individuals who are not in the same organization or geographic area; and
- skill in conveying a simple message and garnering support from others.

Friedman and colleague's paper outlining professional and practice standards is the most recent publication addressing ICP skills. (Friedman, Curchoe et al. 2008) It is a consensus document based on the untested opinion of experts. The experts recommend achievement and maintenance of the US-based certification status as the most appropriate and comprehensive qualification for ICPs. Additionally they recommend that the ICP is knowledgeable and skilled in relation to the following multiple areas:

- epidemiology, including outbreak management;
- infectious diseases;
- microbiology;
- patient care practices;
- asepsis;
- disinfection/sterilisation;
- occupational health;
- facility planning/construction;
- emergency preparedness;
- learning/education principles;
- communication;
- product evaluation;
- information technology;
- program administration;
- legislative issues/policy making; and
- research.

Grey literature

In most Australian grey literature that includes a recommendation on ICP qualifications the recommendation is at best only a generic comment such as "a suitably qualified" ICP must coordinate the IC program. The meaning or requirements of "suitably qualified" are not specified. This is the case in documents published in Victoria, (Acute Health - Quality and Care Continuity Branch Department of Human Services 2000) and nationally. (Australian Government Department of Health and Ageing 2004) Interestingly the ACHS's 2001 resource tool, (The Australian Council on Healthcare Standards 2001) excludes any specific mention of an ICP. In more recent guidance however, ACHS stipulates that designated personnel with skills, training and experience be given responsibility for practical operation of the IC program in organisations seeking ACHS accreditation (The Australian Council on Healthcare Standards 2006).

The IFIC recommends that an IC team has a range of expertise that covers IC, medical microbiology, infectious diseases and nursing procedures. (Rasslan and Heeg 2007).

A comprehensive list of required competencies is recommended by the UK Department of Health in 2004 for Directors of Infection Prevention and Control. (Department of Health 2004) These competencies address administrative, business and clinical domains and include:

- strategic thinking and decision making;
- leadership;
- planning and delivery;
- resource management;
- change management;
- team-working and communication;
- managing relationships; corporate commitment;
- holding to account;
- practice experience in dealing with and managing infection control;
- management of the infected patient;
- decontamination; and
- antibiotic usage.

The second edition of the UK-based Infection Control Nurses Association competencies is comprehensive and widely used in the UK by IC nurses for purposes of self-assessment. Specifically, the ICNA's fifteen competencies guide assessment in four domains. They are detailed in the following table.

Table 4: Summary of ICNA core competencies reproduced from Infection Control Nurses Association *Core competencies for practitioners in infection prevention and control* 2004.

Domain One **Specialist Knowledge**

Area of Competence	Competency
Infection Prevention and Control Practice	The application of knowledge about infection practice to prevent and control infection in clinical and non-clinical areas
Decontamination	The application of the principles of cleaning, disinfection and sterilisation to promote safety
Microbiology	The application of microbiological knowledge to promote health through the prevention and control of infection and communicable disease
Immunology	The application of immunological knowledge to promote health through the prevention and control of infection and communicable disease
Immunisation and Vaccination	The application of the knowledge relating to the planning, practice and monitoring of immunisation and vaccination programmes
Epidemiology	The application of epidemiological knowledge to monitor and control infections and communicable diseases through the accurate interpretation of surveillance data
	The use of surveillance
Demographics in Health	The application of demographic knowledge to inform Infection Prevention and Control strategies

Domain Two **Healthcare Governance**

Area of Competence	Competency
Research and Development	Critical analysis of published literature related to Infection Prevention and Control
	The participation in research independently or collaboratively
Clinical Effectiveness	Using audit to monitor effectiveness
Patient and Public Involvement (PPI)	The use of communication skills to enhance patient and public involvement
Risk Management	The use of appropriate strategies and systems to identify and manage risk

Domain Three **Learning and Teaching**

Area of Competence	Competency
Personal and Professional Development	Development of own professional knowledge and skills through life long learning
Facilitating learning in others	Makes use of effective strategies to help others to learn about Infection Prevention and Control

Domain Four **Leadership and Management**

Area of Competence	Competency
Leads in the Development of a proactive infection prevention and control service	Leads work teams in the development of knowledge, ideas and work in infection prevention and control practice
Managing an Infection Prevention and Control Service	Uses a co-ordinated approach to ensure the service is managed effectively

Contrary to every other recommendation regarding skill, knowledge and competence published in either peer-reviewed or grey literature Standard IC01.01.01 of the proposed 2009 Joint Commission recommendations stipulates that an organisation identifies an individual with clinical authority over the IC program however, the Standard also suggests that if an appointed individual lacks expertise in infection prevention and control, that they consult with someone who does have such expertise. (The Joint Commission 2008)

Summary and analysis

Similar to the findings of Section 1, Section 2 details substantial variation in the recommended or preferred skills, attributes and knowledge required by an ICP to coordinate an effective IC program. Again published reports and recommendations are limited to the US, UK and a few Australian articles. The US trend remains solidly focussed in the exam-based certification process with exam content revised each five years subsequent to a large scale analysis of ICP practice. The UK recommendations are more recent having developed primarily in the last 5 or so years parallel with the major IC reforms of the UK national government. Additionally, the UK-based Infection Control Nurses' Association has defined practice through publication of their competencies which, although based on expert consensus and largely untested, allegedly assist ICPs in their own self-assessment process.

Different again, Australian ICPs have not to date embraced the method of credentialing offered by AICA although AICA has very recently undertaken campaigns to better promote this system and make it more available to members. Given the lack of clarity and unpredictability of the Australian infection control workforce in terms of supporting and participating in any process for formal achievement and recognition of a model of minimum qualification, experience or competence the ACSQHC's best option for contributing to ICP workforce development and capacity building is at this stage unclear.

Section 3:
International and Australian models of effective infection control programs including human and economic impact.

This section reviews scientific literature relating to infection control program models internationally and within Australia. The ACSQHC's intent in seeking a review of this literature was to better understand what makes an IC program effective and be familiar with models where those effects have been related to lower costs, better value for money or reduced human morbidity or mortality. The clinical infection control literature contains few rigorously-designed, randomised control trials that categorically demonstrate effectiveness of specific infection control interventions. (Haas 2006) Rather most of the clinical reports describe improved outcomes following multiple infection prevention interventions.

Despite extensive literature searching we were unable to identify any studies other than the SENIC study which were within the scope and criteria of this literature review. Most publications addressing large scale infection control programs described the typical national program based on an aggregate of detail from individual organisations. Alternatively some publications described one or a few (such as staffing, individual clinical improvement campaigns, introduction of a specific device or product) but not all specific elements that influence the effect of a program. Measurement of the costs and associated financial impact of an IC program is a relatively new concept to the field and as such very few publications do it well. No recent publications measure "whole of program" human or economic effect. (Roup, Roche et al. 2006; Anderson, Kirkland et al. 2007)

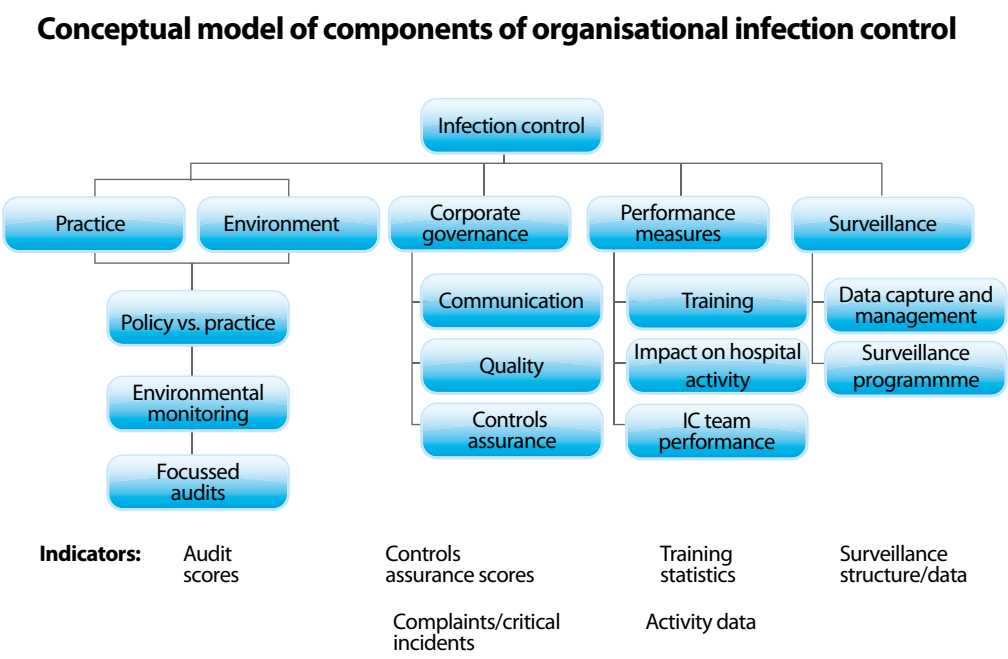
Within these constraints this Section is limited to a review of several national descriptions of a typical IC program and in particular a conceptualised ideal model proposed by investigators in the UK is presented.

Peer reviewed literature

In a 2003 expert commentary Reed and colleagues provided a superficial description of the organisation and interrelatedness of various components of Australian infection control. (Reed, Gorrie et al. 2003) They identify various government, non-government and professional bodies as being major drivers of change. Reed purports that organisations in the public and private sector essentially structure their IC programs in the same way. He also acknowledges that there are no well-recognised, minimum obligations or professional standards for IC programs in Australia. The paper concludes with a call for standardisation and nationalisation in two critical areas, national HAI surveillance and the provision of a federally funded reference laboratory.

In 2004 Watterson described a project where standardisation was also a key element in a 2-year effort to improve IC program services across three sites. (Watterson 2004) Watterson and colleagues developed indicators specific for assessing their programme. The indicators were diverse and comprehensive addressing the five pillars upon which the IC program program was based. These pillars and indicators are detailed in Figure 1 below. Although Watterson does not comment on the economic or human effectiveness of the cited model she suggests that the indicators were instrumental in gaining senior management commitment and agreement regarding IC program performance measures.

Figure 2: Conceptual model of components of organisation infection control reproduced from Waterson and colleagues. (Watterson 2004)



The UK IC program reforms have been well described in Sections 1 and 2. Spencer and Perry editorialise the role of the Director of Infection Control and acknowledge the clearly specified reporting lines, responsibilities and authorities of this position as being integral to each organisation's patient safety and HAI prevention achievements. (Spencer and Perry 2004)

The Flemish IC program model described by Gordts is of interest in that unlike most other models is based in a legal decree. (Gordts 2005) IC program staffing is set at minimum as detailed in Table 3 below and an organisation's IC committee has a legal obligation to perform specific functions including HAI surveillance and follow up as well as implementation of national guidelines. The effectiveness of this model is not reported.

In a large European study investigators report results of an assessment of the organisation, resources and elements of infection control programmes in 32 countries. Although the study most likely suffers from self selection bias it provides a good overview and demonstrates that more than three-quarters of participants had designated IC nurses with specific training in infection control. The majority of hospitals had link nurse programs, prepared formal annual objectives, performed surveillance and reported rates to an IC committee. (Struelens, Wagner et al. 2006)

In a large Korean study investigators assessed the status of IC programs in 85 acute care hospitals each with more than 300 beds. Every hospital had an IC committee and almost all had an ICP and an IC nurse. In 68% of Korean hospitals HAI surveillance was performed and of this 73% was targeted surveillance including ICUs. Surveillance accounted for almost half of the ICP's available time. (Oh, Chung et al. 2006)

Irish investigators reviewed IC programs in 66 acute care hospitals noting major gaps including insufficient IC professionals and IC doctors. Nearly all of the hospitals had an IC committee and less than 10% had a dedicated IC budget. Program efficacy was not measured. (Cunney, Humphreys et al. 2006)

A commentary published by Dutch experts describes recommendations of a small group of ICPs and medical microbiologists who attempted to reach consensus regarding ICP and medical microbiologist staffing requirements for Dutch IC programs. (van den Broek, Kluytmans et al. 2007) The group's results are included in the table below. Interestingly, the Report indicates that there was substantial variation among individual group member's recommendations regarding medical microbiology needs. Closer agreement existed around the ICP staffing requirements. Subsequent Dutch researchers describe recommendations in Holland since 2004 which have guided a national network to support and undertake prospective and prevalence HAI surveys. (Troelstra 2007) Investigators suggest that similar information is gathered with both methodologies and that prevalence surveillance of HAIs is substantially less time consuming.

In 2007 Talbot and colleagues reported results from a descriptive survey of 134 private hospitals all within the same large US hospital chain. (Talbot, Tejedor et al. 2007) Findings suggested that almost all hospitals undertook some form of HAI surveillance however there was significant variation in the reported resources, methodologies and reporting practices. Few hospitals reported information back to clinicians at the bedside despite long-end recommendations from the SENIC study which recognises this as being a very important component of an effective IC program.

A recent and thoughtful Korean report describes attempts by researchers in that country to measure the effect of IC programs on the overall HAI burden. (Oh, Cheong et al. 2007) Measurement involved use of weighted and modified indicators from the SENIC study and four new indices relating to healthcare workers, resources, hand hygiene systems and quality improvement. Investigators noted that most indices performed poorly and they question the extent to which IC programs have affected the HAI burden in Korea. In studying the Korean IC program workforce they noted that most ICPs spent the majority of their time on control activities such as teaching and policy development rather than monitoring performance through surveillance. They conclude that unless there is a Full Time Equivalent ICP surveillance is unable to be performed.

In 2007 Japanese researchers measured 5-year trends in IC program activities and volume in 7 acute care hospitals. They found that ICPs allocated most of their time to either meetings/ conference (20.3%) or provision of internal education and training (20.6%). There was substantial variation in IC program activities across the study sites.

Table 5: Reported IC program staffing levels in various countries

Country	Recommended or Median ICP Staffing	Other Recommended Staffing Levels	Reference
Belgium	2.5 FTE ICNs per 1000 beds and	1 FTE IC physician.	(Gordts 2005)
Europe	2.33 FTE ICNS per 1000 beds	0.94 FTE ICD per 1000 beds	(Struelens, Wagner et al. 2006)
Ireland	1 FTE ICP per 248 beds		(Cunney, Humphreys et al. 2006)
Holland	1 FTE ICP per 178 beds	1 FTE Microbiologist per 806 beds.	(van den Broek, Kluytmans et al. 2007)
Korea	1 FTE ICP per 550 beds		(Oh, Cheong et al. 2007)
USA	1 FTE ICP per 191 beds		(Talbot, Tejedor et al. 2007)
Japan	1 FTE ICP per 315 beds		(Hayashida, Imanaka et al. 2007)
USA (New York state)	1 FTE ICP per 150.4 beds		(Stricof 2005)
Europe	4.2 FTE ICPS per 1000 beds	1.8 FTE ICD per 1000 beds	(Voss 2005)
USA (Maryland)	1.6 FTE ICPs < 200 beds 2.0 FTE ICPS > 200 beds		(Roup, Roche et al. 2006)

Grey Literature

No additional grey literature other than that cited in interrelated sub sections of the previous sections measured IC program effectiveness. As such it is not described separately in this section.

Summary and analysis

Recent reports of Australian IC program structure and/ or effectiveness are missing from the literature which makes legitimate comparison with international trends difficult. However, review of the literature overwhelmingly demonstrates that valid, reliable and well defined IC program programs including recommended lines of accountability and responsibility are not described. Almost all of the reports cited in Section 3 are either descriptive, non-experimental studies or expert commentary. This deficiency hinders global and national growth and consolidation of the IC profession. It also limits the ability of individual IC committees coordinating IC programs on any scale to define, set and achieve specific HAI reduction targets.

Of interest are the attempts of several researchers in specific countries to describe the typical IC program within their country or region. The one consistently reported element appears to be that of ICP staffing levels which is curious given that the debate regarding the most appropriate level of ICP

staffing is contentious and largely unresolved. The range of values and denominators used to calculate reported ICP staffing ratios reflect this.

Given the paucity of evidence and even substantiative information on IC programS models or individual elements within an IC program it is unlikely that the ACSQHC or any of the individual Australian jurisdictions will be able to make justifiable recommendations regarding such models or elements within Australian healthcare delivery. The results of Section 3 reported above are potentially more meaningful when considered in conjunction with the results of the previous two sections.

Section 4: Critical success factors and limitations of successful infection control programs

Key issues considered in this section include training curricula, relationships between administrators and members of the IC team, the recent UK IC reforms and models of governance. Similar to Section 3 the paucity of high quality research in the area of critical success factors and limitations of successful infection control program requires careful interpretation of this section of the literature review. This is especially important given the overwhelming proportion of expert commentary or opinion pieces published about this topic.

Peer reviewed literature

Recent publications discuss in depth the critical importance of having administrative support and buy-in for IC programs. This buy-in includes but is not limited to provision of resources, role modelling and agreement on negotiated strategic targets. (Perencevich, Stone et al. 2007; Murphy, Carrico et al. 2008)

The only published study of Australian administrators and their views regarding IC programs and the role of the ICP was undertaken more than a decade ago. (Murphy and McLaws 2001) The study compared ICP and administrator viewpoints in Australia's most populated state regarding affirmative statements about IC programS and resources. The investigators demonstrated reluctance among administrators to appreciate IC program objectives, importance and resource requirements.

Additional limitations in Australian IC programs were raised in 2001 where Oleson suggested that the absence of clear, strong national IC leadership was causing ambiguity and lack of outcome focus. (Olesen 2001) Oleson recommended definition of the scope of Australian IC programs and exploration of the impact of IC programs on patient outcomes. Ironically, that work remains incomplete globally and nationally within Australia.

In the UK during 2003, a period of substantial IC program reform, Croxson and colleagues surveyed 176 IC nurses and 93 ICDs form 200 National Health Service institutions to study IC program organisation and funding. (Croxson, Allen et al. 2003) Overwhelmingly respondents reported failure of centralised mechanisms especially relating to funding allocation. As well some respondents reported ICPs having insufficient influence due to their non-central role in decision-making.

In 2004 two reports were published in regard to specific education for ICDs. (Cookson, Teare et al. 2004; Voss 2005) Cookson reported on the consensus recommendations of a small group of UK experts for each hospital to appoint a 1/3 FTE ICD. European concerns regarding the lack of designated specialised training and recognition for ICDs were reported by Voss and colleagues. They recommended a six-year post graduate qualification. This group also recommended 1.8 ICD, 4.2 ICPs and 3.3 other ICT workers per 1000 beds. (Voss 2005)

As reported in Section 2 few valid publications explore the performance of IC programs or IC departments. A systematic review undertaken in 2006 found just 12 reports none of which were published recently. (Haas 2006) Most of the reports related to time management, expert commentary, and reports of international models or studied other outcomes. Haas notes the absence of any valid recommendations regarding measuring IC program performance or cost effectiveness and urges the field to test the impact of IC staffing and programs on HAI rates.

In their futuristic report described in detail in previous sections of this review, Murphy and colleagues describe detailed organisation cultural changes that will critically impact the effectiveness of future IC programs. (Murphy, Carrico et al. 2008) These changes include acceptance that behaviours that increase infection are not tolerable, that preventing infections is everyone's' responsibility and that they will be held accountable for same. Murphy also asserts that empowerment, including the right and expectation to stop activity that may increase infection risk is important.

The issue of empowerment is further explored by Koteyko and Nerlich within the context of the UK "Modern Matrons" model. (Koteyko and Nerlich 2008) The "Modern Matrons" was implemented by the UK government and essentially shifted responsibility for environmental cleanliness back to the organisation's senior nurse. As well the "Modern Matron" is expected to have a high level of visibility at the clinical level in an effort to improve frontline clinician's compliance with basic IC tenets. Koteyko's study compared the documented role of the "Modern Matron" to their actual performance in 11 organisations. Findings suggest that competing interests have limited the "Modern Matron"'s ability to spend time on the wards. As well the lack of formal empowerment of the Matrons to change other's clinical behaviour(s) and the organisational culture has limited their ability to influence HAI prevention and/ or control.

In yet another recent piece of expert opinion, the authors reflect upon the increased demands for accountability, transparency and provision of rapid solutions faced by healthcare organisations. (Edmond and Eickhoff 2008) These authors are specifically sympathetic to the plight of hospital epidemiologists and recommend upskilling of all IC team members with a particular focus on implementing change and developing teamwork. They also recommend IC program review at least annually.

In a 2008 scoping review of 34 published articles researchers attempted to define the influences of management and organisational factors on inpatient HAIs. (Griffiths, Renz et al. 2008) Researchers recommended that strong leadership at the ward level and from administrators is critical in reducing HAIs. Clinical governance and training support are also important as is the need to target organisation-specific intrinsic risks.

Grey Literature

Grey literature outlining infection control programs is well described in Sections 1 and 2 above. These examples are mainly directives such as policy or guideline documents. They do not include measurement or interpretation of IC programS success or limitations. Accordingly, they are not described separately in this section.

Summary and analysis

This section considered publications addressing factors associated with IC program success and limitations. It highlighted the general decentralisation of IC programs and the fragmented decision making associated with many IC-related issues. This results in ICPs and advocates of IC programs such as the UK "Modern Matron"s having limited influence on changing clinician behaviours or organisational culture.

The literature reviewed in this section reinforces a key conclusion of Section 1, which is that there is no agreement between researchers and/or experts regarding the best or most effective way to organise or coordinate IC programs, manage their funding or deliver their services.

The UK model promulgated by the government as part of their major IC reforms supports responsibility for infection control within clinical governance and control assurance procedures framework. This is a contemporary model that has some acceptance but its contribution to IC program success is mainly untested.

The most recent literature reiterates the critical importance of administrative support and clinical buy-in. It also recognises buy-in and support beginning at the ward level as critical factors for successful IC programs.

Whilst this Section is unable to present the ACSQHC with an idealised model it does provide some interesting elements which may be of interest to the ACSQHC and its stakeholders. It is the authors' understanding that few have been formally adopted on a wide scale in Australia, and to date there are no reports of their effectiveness in Australian IC programs. Consideration, adaptation and implementation of some such elements by Australian IC teams may be prudent.

Section 5: Sustainable and transferable Infection control programs

The fifth question to be answered by this literature review seeks identification of IC programs that could transferable to the ACSQHC's audience and sustainable within the Australian context. As stated previously there are limited historic reports and none recently describing critical elements of an IC program that have been tested in real-time settings. Rather there are scant reports of specific elements that may be useful in the Australian setting and additionally there are a few components which are often cited in the literature as adding value rather than effectiveness, to the IC program. Largely this value is perceived not economic, morbidity or mortality-related or consistent with specific outcome goals or measurements.

This section discusses these components and elements. The nature of grey literature precludes its relevance and contribution to this section.

Peer reviewed literature

Section 7 will explore the concept of IC liaisons or link nurses in greater depth however this component of IC programs appears to have been widely and successfully implemented in several different regions of the world. Recently Simpkins reports the use of liaisons in an integrated health care system in the US and acknowledges the value of liaisons in assisting implementation and monitoring of specific IC practices as well as attracting potential ICPs to the specialty. (Simpkins, D'Alena et al. 2006)

In 2007 Pellowe comprehensively reviewed the major elements of the UK IC reforms. (Pellowe 2007) She outlines the intent of these reforms including endorsement of active surveillance, reduction of reservoirs and improved IC program management and organization. The report recognises that cultural change, enabling and use of networks were critical elements. These appear to be both sustainable and transferable across healthcare settings in the UK. Their sustainability has been assisted by the development of multiple generic tools that are available to hospitals to assist in their implementation.

To assess the doable element of a proposed IC program Herwarldt and colleagues undertook an assessment of the capacity of IC programs in Iowa prior to the introduction of mandatory public reporting. (Herwaldt, Appelgate et al. 2007) They reported that existing resources and organisational structures were insufficient to meet the demands of collecting and contributing mandatory data. As well they cite substantial variation in applied surveillance methodologies as limiting the utility and accurateness of publicly reported HAI data.

Sieber proposes the inclusion of a re-designed link nurse program into IC programs. The re-design should involve integration of patient safety and quality components including but not limited to risk management, performance management, environmental health and safety as well as occupational health. (Sieber 2008)

Although futuristic, Murphy's proposed ideal IC program system of the future contains specific elements that may ultimately prove to be transferable. (Murphy, Carrico et al. 2008)They are novel and expand the traditional IC program scope, potential reach and impact. Their sustainability is also unknown. The complete list includes:

- infection prevention is integrated into every health care worker's job description;
- rewards and incentives are provided for preventing infections;

- prevention is designed into the ideal patient room;
- infection prevention education is standardized for all health care workers;
- the APIC broadens links to educators and other health care associations to partner on eliminating HAIs;
- performance improvement is a major aspect of the ICP's job description;
- "touchless" patient care technologies and alert/messaging systems are designed with infection prevention in mind;
- infection prevention functions and behaviours are standardized across health care settings;
- prevention strategies are "pulled" from the front-line health care workers when needed; and
- the emphasis on infection prevention is unified and organized in partnership with industry.

Summary and analysis

In the absence of efficacy data in terms of HAI reduction it is difficult if not impossible to identify IC programs which are truly sustainable. In the literature reviewed thus far in Sections 1-5 some elements appear consistent over time, notably HAI surveillance and monitoring. As the scope and range of tasks expected of an IC program increase considerably over time their sustainability is brought into question. Sustainability and transferability are even less clear given the fact that most IC programs are reactive (politically or disease motivated) rather than proactive. Few have demonstrated sustainability.

A key way in which IC program element transferability appears to be occurring is by filtering from large acute care settings all the way to small, non-inpatient settings. This is not specifically addressed in this review due to limitations of scope. There are other examples of IC program filtering at national levels and adaptation internationally. The widespread use of NNIS definitions detailed in Section 1 and the IC link or liaison program are two such examples.

The literature reviewed in this section demonstrates that some transferability of individual IC program elements is likely sustainable rather than transferability of whole IC programs.

Section 6: Gaps in the evidence base on the role of the Australian Infection Control Practitioner

Given that the only comprehensive review of Australian ICPs was undertaken more than 10 years ago there are substantial gaps in the literature relating to Australian ICPs. (Murphy and McLaws 1999; Murphy and McLaws 1999; Murphy and McLaws 1999; Murphy and McLaws 2000; Murphy and McLaws 2001) Subsequent reports have been scant and most are descriptive studies or expert commentary.

Peer reviewed literature

The only relevant Australian article published in peer-reviewed literature recently is that of Hobbs. (Hobbs 2007) Hobbs reports the results of a 2-day workshop in which a small group of Victorian ICPs participated in a facilitated brainstorm exercise. The workshop produced a proposed curriculum for ICP training based on duty areas reported by participants. These duty areas approximate to parts of the ICP's role. They include:

1. administrative duties;
2. policy and procedure development;
3. minimise transmission risks;
4. surveillance coordination;
5. adverse event management;

6. outbreak management;
7. immunisation;
8. education;
9. professional development activities; and
10. provision of expert advice.

Summary and analysis

There are no experimental studies, nor recent reports of Australia ICP activity, education, reporting structure, relationships with management, competencies or contribution to IC program effectiveness. This is not unique to the Australian ICP context although given the relatively small numbers of Australian ICPs compared to other countries with mature IC programs it is perhaps equally if not more important that these gaps be rectified.

The Australian IC community lacks valid and reliable evidence upon which to support claims for recommended staffing levels. As discussed in previous Sections other than the SENIC study all other staffing ratios have been determined by either panels of alleged experts or by comparing results of country-specific staffing surveys to the original SENIC 1 FTE ICP per 250 beds ratio. Without opportunity to demonstrate the impact of alternate ICP staffing levels in Australia, it is unlikely that administrators would support anticipated increases. (Murphy and McLaws 2001)

Two very obvious gaps in the evidence relating to the role of the Australian are comparisons between the activities, roles, expectations and influence of the inexperienced and advanced ICP. There is an absence of material reporting appropriate systems, tasks and education for entry-level ICPs.

Similarly there are no published reports on formal mentoring systems used by Australian ICPs at any stage of their IC career. Reviewers were also unable to locate any studies describing the specific role of an Australian ICP working in a non-acute setting. As well a comparison of ICP's roles in the Australian public and private sectors has not been performed.

Other gaps in Australian ICP evidence include:

- no Australian studies on the proportion of HAIs that are preventable with various levels of ICP staffing or skill mix;
- scant economic analysis and/or studies of the cost benefit of employing ICPs with varying experience, skill or qualifications;
- comparisons of rural/ remote and metropolitan ICPs;
- obstacles to standardising/ nationalising ICP basic and advanced education including competency, credentialing or certification; and
- no description on the drivers for Australian ICPs to seek or reject credentialing or certification.

Given the scarcity of studies examining the role of Australian ICP there are two main implications for the ACSQHC. Firstly, it is unlikely that any ACSQHC recommendations relating to this role can be substantiated through the literature. Secondly, this situation presents multiple opportunities for either ACSQHC, its designates or relevant and interested researchers to contribute to the field.

Section 7:
Mentoring, support programs for infection control practitioners and their strengths and weaknesses

This final section of the review describes the major findings and recommendations of the very few publications that deal with support for ICPs. Among these publications none describe support or mentoring for competent or advanced ICPs. Almost all relate to infection liaison or link nurse programs

which are an uncomplicated form of quasi-mentoring programs for potential ICPs. A few describe support for rural or remote ICPs.

No examples of ICP mentoring programs were identified in the grey literature.

Peer reviewed literature

The first Australian peer-reviewed report to address the needs of rural and remote ICPs was published by Geary in 2003. (Geary, Allworth et al. 2003) Geary described results of a survey, scoping group and focus groups conducted to inform development of a zonal model for implementation in Central Queensland. Geary's work demonstrated the fragmented approach to IC program in this region and identified resources and infrastructure that participants believed would improve their IC programs. These included improved networking and communication opportunities as well as IC management plans and better technology. Geary conceptualised a zonal model that included a designated zonal Coordinator to standardise IC program practice and provide support throughout the region.

An initiative designed to support the rural and remote ICP communication has been more recently reported by South Australian researchers. (Dusmohamed, Wilkinson et al. 2006) The article reports methods used to assess rural and remote IC programs and engage local IC providers in a centralised communication model. The IC programs were noted to be ad-hoc and uncoordinated with ICPs reporting insufficient time and competing roles. Participants embraced the centralised model which included regular regional network meetings and development of standardised policies and strategies.

Dawson, Vaughan, Cooper and Barnes each report their experiences implementing and supporting an IC link/ liaison program. Dawson reports positive experiences with the link nurses and acknowledges them as a valuable resource to observe and affect behavioural change among their ward level peers. The need to support link nurses through the provision or specific training and management support is also detailed. The issue of identifying link nurse education needs and development is further explored by Vaughan. Vaughan recommends the use of a practice portfolio for link nurses to assist and direct their individual learning. (Dawson 2003; Cooper 2004; Vaughan and Randle 2005; Barnes, Nennig et al. 2007)

In a descriptive account Cooper details how link nurses participating in interventions from the conceptual to delivery stages improve their enthusiasm for the project and also increases their IC knowledge.

Summary and analysis

Not surprisingly the literature relating to ICP support programs is scant and primarily descriptive. It is limited to a few reports of link/ liaison nurses programs which appear to add value and provide additional exposure for ICPs. Additionally, these programs may improve ownership of HAI risk at ward level and also function as potential pipeline for new ICPs to enter the profession. It is important to note that specific training and support is required by link nurses.

The other group of ICPs identified as needing specific support are those working in regional, rural and remote Australia. The unique Australian geography presents specific challenges which remain largely unexplored and unresolved.

There would most likely be value in the ACSQHC considering the special needs for support and mentoring among these two special groups. The ACSQHC may also wish to consider how the current Australian workforce of experienced and qualified ICPs can be organised to develop and field test formal ICP mentoring to their less experienced peers.

Summary of literature included in this review

Assessment and categorisation system for evidence grading

SR+:	Systematic review of high-quality trials/ cohort studies (with risk adjustment) with a narrow confidence interval	**O**:	Observational study without adjustment for risk/confounders and/or no report of sample size
SR:	Other systematic reviews	**Q**:	Qualitative studies
R:	Non-systematic reviews	**D**:	Descriptive studies
RCT:	Randomised controlled trials	**OP/EC**:	Opinion piece or expert commentary
O+:	Observational study with good adjustment for risk and confounders		

Literature addressing question 1

(Carrico, Rebmann et al. In press)

Research purpose: To identify fundamental infection prevention core competencies that must be mastered by each healthcare worker.

Method: Literature review, synthesis, use of expert Panel and Delphi process survey.

Sample size: 24 experts as members of Delphi Panel

Risk adjustment/ confounders controlled for: No

Confidence interval: N/A

Findings: Produced set of 8 competencies suitable for testing and eventual use in defining curriculum content for healthcare workers.

- Describe the role of microorganisms in disease
- Describe how microorganisms are transmitted in healthcare settings**.**
- Demonstrate standard and transmission-based precautions for all patient contact in healthcare settings
- Describe occupational health practices that protect the healthcare worker from acquiring infection.
- Describe occupational health practices that prevent the healthcare worker from transmitting infection to a patient.
- Demonstrate ability to problem-solve and apply knowledge to recognize, contain, and prevent infection transmission.
- Describe the importance of healthcare preparedness for natural or man-made infectious disease disasters.

Evidence grading: Q

(Curchoe, Fabrey et al. 2008)

Research purpose: To identify current practices among infection control professionals in the USA.

Method: E-mail survey.

Sample size: 1304 responses

Risk adjustment/ confounders controlled for: No

Confidence interval: N/A

Findings: No difference was noted in knowledge content and relevance to ICPs with 2 years experience and 7 or more years of experience thus concluded that advanced practice examination is not necessary.

The authors identified 6 major content areas for ICPs.

1. identification of infectious disease processes,
2. surveillance and epidemiologic investigation,
3. infection prevention and control,
4. program management and communication,
5. education and research; and
6. infection control aspects of employee health.

Evidence grading: D

(Murphy, Carrico et al. 2008)

Research purpose: To detail proposed elements of idealised future state and systems for infection prevention.

Method: Think tank-like process.

Sample size: Not stated.

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings:

Primary attributes and roles of ICPs:

- Understanding of the infectious disease process
- Conducting surveillance to identify risk factors and cases
- Providing data management
- Translating data into usable information (analysis and reporting)
- Investigating infection epidemics or clusters
- Facilitating interventions to prevent/control transmission of infectious agents
- Observing health care workers' compliance with proven infection
- prevention measures and providing feedback
- Leading and managing programs to prevent and control HAIs
- Developing policies and procedures
- Providing education and training
- Performing research and/or applying research findings to practice
- Conducting product evaluation and selection

- Ensuring the infection prevention and control aspects of occupational health and environmental safety programs
- Ensuring emergency preparedness planning and implementation
- Promoting process and performance improvement
- Providing consultation

Evidence grading: OP/ EC

(Grant and Kim 2007)

Research purpose: To explore measurement of infection control consultation.

Method: A 7-year retrospective observational study of all consultations > 5 minutes duration.

Sample size: 770 infection control consultations.

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: ICP has to be able to provide accurate and customised responses to consultations which involve searching and applying research.

Suggests that if a program is adequately resourced it becomes ingrained if given authority, support and autonomy to affect change.

With dedicated resources the ICP is able to provide increased shorter consultations which should strengthen the program's ability to reduce transmission opportunities.

Evidence grading: O+

(Chaisombat, Moongtui et al. 2005)

Research purpose: To study the roles of infection control nurses in Thai Army hospitals.

Method: Semi-structured interviews of IC nurses from 6 hospitals seeking accreditation.

Sample size: 11 IC nurses from 6 hospitals

Risk adjustment/ confounders controlled for: No

Confidence interval: Not stated

Findings: All ICPs performed administration, education, surveillance, personnel health, consultation and quality improvement in IC. No capacity for outbreak investigation and research.

Evidence grading D

(Jantarasri, Soparatana et al. 2005)

Research purpose: To evaluate the roles of IC nurses in hospital development and accreditation and describe problems and obstacles.

Method: Interview and survey.

Sample size: 148 IC nurses

Risk adjustment/ confounders controlled for: No

Confidence interval: Not stated

Findings: 95% of respondents had a Bachelor's degree. The five tasks they performed were:

1. describing nosocomial infection definition

2. surveillance
3. analysis of surveillance data
4. presenting information to the IC committee
5. using reported information for planning purposes

Only 10.4% performed a research role. Lack of knowledge, time and resources were cited as impediments to research.

86% of respondents worked part time.

Evidence grading: D

(Kananitaya, Senarat et al. 2005)

Research purpose: To evaluate the role of Thai IC nurses in regional hospitals.

Method: Interview and survey.

Sample size: 16 IC nurses

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: IC practice consistent with accreditation requirements but missing or insufficient for staff health, HAI surveillance and research.

Evidence grading: D

- Small sample size limits research significance.

(Kirchner, Stover et al. 2005)

Research purpose: To discuss challenges and benefits of implementing a standardised model for infection prevention and control across a multi-hospital system

Method: Not stated

Sample size: 14 hospitals

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Model consistent with state requirements was introduced and provided a minimum outline of what should be included in each IC program.

Paper does not evaluate impact or discuss elements.

Evidence grading: Q

(Leela, Chittreecheur et al. 2005)

Research purpose: To study IC nurse roles in provincial hospitals.

Method: Semi-structured interviews

Sample size: 11 IC nurses from 9 hospitals.

Risk adjustment/ confounders controlled for: No

Confidence interval: Not stated

Findings: Only 25% of IC nurses worked fulltime. Every hospital IC nurse performed all 8 roles set by the Department of Nursing of the Ministry of Health other than research and investigation of epidemic nosocomial infection which were performed by just over half of the IC nurses surveyed.

Evidence grading: D

(Health Canada 2004)

Research purpose: To develop a recommended and "validated" model for Canadian Infection Prevention and Control programs

Method: Iterative process involving recommendations by 3 expert sub-groups regarding key components and estimated resources in acute care. Long term care and community care.

Sample size: 27 experts

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Recommended components for the distinct settings were:

Acute care for a hypothetical 500 bed hospital - education, surveillance, outbreak management, policy development, communicable disease, occupational health, and program support.

Staffing ratio – 673 ICP days a year, 3FTEs per 500 beds.

Long-term care for a hypothetical 150-25o bed facility – surveillance, outbreak management, education, policy development & implementation, occupational health, resident health.

Staffing ratio – 1 FTE ICP per 150-250 beds.

Evidence grading: OP/EC

(Stevenson, Murphy et al. 2004)

Research purpose: To describe IC structure and resources in small rural hospitals in four Western US states.

Method: Written survey for self-completion

Sample size: 77 rural US hospitals with < 150 beds.

Risk adjustment/ confounders controlled for: Not stated.

Confidence interval: No

Findings: Almost all hospitals had an ICP who spent a median of 10 hours a week on IC activities. Median ICP staffing ration was 0.63 FTE ICPs per 100 occupied beds. Most performed other activities. Major activities in rank order of frequency were surveillance and data

management, 30%; developing policies and procedures,

15%; outbreak control, 12.5%; education and

training, 18%; employee health, 20%. Less than 10% of ICPs were certified. Almost half of the hospitals employed a designated IC physician. Most hospitals used CDC Definitions despite being too small to participate in NNIS system. Almost all hospitals did hospital wide surveillance. In rank order other HAIs surveyed were staff bloodborne virus exposures, SSIs, UTIs, MRSA, VRE and VAP.

Evidence grading: D

(Jones, Gardner et al. 2000)

Research purpose: To gain a context-based description of the scope of practice of IC and to identify the relationship between actual practice and perceptions of best practice by ICPs.

Method: Mailed descriptive survey using a questionnaire.

Sample size: 115 members of Queensland IC Association

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: ICPs reported need for broader range of activities include strategic management, clinical monitoring and risk management, more environmental evaluation and more professional development. Suggestive of a move away from surveillance towards strategic management.

ICP's role is expanding, surveillance remains an important component. Focus on infection control is moving beyond the large, acute care setting

Evidence grading: D

(Murphy and McLaws 1999)

Research purpose: To investigate the role, function and attributes of Australians performing as ICPs

Method: Mailed survey

Sample size: 644 AICA members

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: The typical Australian ICP works in a public acute-care facility with fewer than 251 beds, has 6 years experience in the field, and has completed hospital-based nursing training. Surveillance was the activity that consumed most of the ICPs' time. The majority of ICPs had responsibilities in addition to infection control, and although they considered management to be supportive, additional clerical support was identified as an area for program improvement.

Evidence grading: D

Literature addressing question 2

(Friedman, Curchoe et al. 2008)

Research purpose: To define standards suitable for a range of practice settings and propose indicators for evaluating ICP competency.

Method: Not described

Sample size: N/A

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: recommend the following as key areas for ICP's to have knowledge and skill:

- epidemiology, including outbreak management;
- infectious diseases;
- microbiology;
- patient care practices;

- asepsis;
- disinfection/sterilization;
- occupational health;
- facility planning/construction;
- emergency preparedness;
- learning/education principles;
- communication;
- product evaluation;
- information technology;
- program administration;
- legislative issues/policy making; and
- research.

Evidence grading: OP/EC

(Murphy, Carrico et al. 2008)

Research purpose: To detail proposed elements of idealised future state and systems for infection prevention.

Method: Think tank-like process.

Sample size: Not stated.

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Key knowledge base, skills and attributes required of future ICPs include:

- Advanced facilitation, group process, and teambuilding skills
- Real-time analytic skills, such as those needed to perform point-of-care root cause analysis
- Refined understanding of complex systems, systems thinking, and a systems approach to problem solving
- The emergence of new leadership skills and identification of personnel who have these skills
- Reciprocal responsibility for the development, implementation, and evaluation of technologies
- Ability to collaborate with, negotiate with, and influence others at all levels of the organization
- Program management and communication skills, including the ability to "market" infection prevention to others
- Capability to strategically plan and execute action plans
- Development of virtual teams that take advantage of the skills and experience of those individuals who are not in the same organization or geographic area
- Skill in conveying a simple message and garnering support from others.

Evidence grading: OP/ EC

(Goldrick 2007)

Research purpose: To provide a rationale for certification and re-certification.

Method: N/A

Sample size: N/A

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Extensive systemic change, increased need for competency and accountability requires ICPs to be competent. Certification demonstrates knowledge and skills for the specialty. Novice progresses to competent after 2 years, therefore certification only possible after 2 years of practice. ICP tasks have increased from 60 in 1982 to 147 in 2001. Certification an indicator of commitment to continual improvement.

Evidence grading: OP/EC

(Memish, Soule et al. 2007)

Research purpose: Discussion of global value of certification.

Method: Expert opinion.

Sample size: N/A

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Certified ICPs reported to be more aware of evidence and adept at applying it. CBIC only global certification agency. Modern ICP must stay current understand changes in healthcare and subsequent risks. Joint Commission International requires experience, training or certification. Practice standards have to be relevant.

Evidence grading: OP/ EC

(Perencevich, Stone et al. 2007)

Research purpose: Evidence-based guideline to assist hospital epidemiologists to understand and use economic analyses to justify the need for and benefits of effective infection control interventions and programs..

Method: Not stated

Sample size: N/A

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Many programs lack economic expertise to compete financial analysis. Recommend stepwise or randomised rolling out of an intervention to measure impact in control environment. Recommended steps are:

1. Frame the problem and develop A hypothesis about potential solutions
2. Meet administrators
3. Determine the annual cost
4. Determine avoidable costs through reduced HAI rates
5. Determine local costs associated with HAI
6. Calculate the financial impact
7. Include additional financial or health benefits

8. Make the case for your business case
9. Prospectively collect cost and outcome data once the program is in effect

Use local administrative data or literature (adjusted for inflation) to calculate attributable cost.

Optimal decisions about programs must incorporate economic impact of specific interventions.

Literature is lacking in high-quality studies (randomised control trials) to support efficacy and cost-effectiveness of specific interventions. Many have methodological weaknesses that bias the cost-effectiveness.

ICPs must be able to undertake business-case analysis for justification or for QI purposes. Expect that attributable cost estimates of HAIs and value of interventions will be needed for clinical decision making and for development of guidelines or other allocations.

Evidence grading: OP/ EC

(Cookson and Drasar 2006)

Research purpose: To outline changes to the eligibility for Diploma of Hospital Infection Control

Method: N/A

Sample size: N/A

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Initial criteria for Advanced Prior Learning excluded skilled and competent ICPs and doctors despite many years of standing.

Important that a wide range of candidates have the opportunity for involvement.

Eligibility revised to include consideration of:

- Knowledge (based on qualifications publications, presentations)
- Skill – involvement at hospital level, evidence review, association membership, policy development
- Post held and experience – Full-time or part-time position and involvement in national schemes
- Personal factors (not described)

Evidence grading: OP/EC

(Hay and Skinner 2006)

Research purpose: To describe alternate qualification to Diploma in Infection Control.

Method: Report

Sample size: N/A

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Outlines availability of Masters degree aimed at either infection control doctors or nurses. Involves multiple modules and candidates can exit at 3 levels – post graduate certificate, post-graduate diploma or Masters.

Available for online delivery and individual modules can be taken as continuing professional development.

Also details availability of distance-learning Master of Science in medical device decontamination.

Evidence grading: OP/ EC

(Hunt and Hellsten 2006)

Research purpose: Report on revision of Australian credentialing process.

Method: N/A

Sample size: N/A

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Credentialing first available 2000, uptake minimal. Revision of process and reoffered in 2006 as a system of points accrued based on prior knowledge, experience and qualifications.

Australian Infection Control Association considers credentialing as an option to demonstrate competence for benefit of individual ICPs, employing organisations and consumers of healthcare.

Evidence grading:

(Edmond, White-Russell et al. 2005)

Research purpose: Assess the size of IC workforce, estimate additional personnel needed to implement hospital-wide surveillance and evaluate current HAI surveillance methodologies.

Method: 1-page questionnaire mailed to IC Department of every acute care hospital in Virginia.

Sample size: 74 hospitals.

Risk adjustment/ confounders controlled for: No

Confidence interval: Mean only stated.

Findings: Every hospital did SSI surveillance, almost half surveyed CA-BSI in ICUs, 40% monitored VAP and most surveyed epidemiologically important MROs. Only 14% of hospitals had > 1 ICP and at 86% of hospitals they had additional major responsibilities.

Estimated that mean number of additional ICPs for hospital-wide surveillance would be 1.7 (0-8) which would cost additional $USD 115 million.

Evidence grading D

(Goldrick 2005)

Research purpose: Not stated.

Method: Historic account.

Sample size: N/A

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: 2001 Practice analysis identified six major practice areas:

1. identification of infectious disease processes,
2. surveillance/ epidemiologic investigation,
3. prevention/ controlling transmission of infectious agents,
4. program management/ communication,
5. education and research; and
6. infection control aspects of employee health.

Respondents' qualifications were RNs (80%0, degree or advanced degree (73%), certification (84%)

Between 1976-2001 IC tasks increased 145% including emergency preparedness, biological warfare and pandemic preparedness/ emerging diseases. As well trend towards ICPs having responsibility for additional non-acute care settings.

Cites HICPAC publication that no evidence that public reporting prevents or controls HAIs.

Evidence grading OP/EC

(King 2005)

Research purpose: Discussion on United Kingdom IC core competencies.

Method: N/A

Sample size: N/A

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: 2nd edition of competencies published in 2004 by ICN Association. The UK competencies for infection control are:

- The application of knowledge about infection practice to prevent and control infection in clinical and non-clinical areas
- The application of the principles of cleaning, disinfection and sterilisation to promote safety
- The application of microbiological knowledge to promote health through the prevention and control of infection and communicable disease
- The application of immunological knowledge to promote health through the prevention and control of infection and communicable disease
- The application of the knowledge relating to the planning, practice and monitoring of immunisation and vaccination programmes
- The application of epidemiological knowledge to monitor and control infections and communicable diseases through the accurate interpretation of surveillance data
- The use of surveillance
- The application of demographic knowledge to inform Infection Prevention and Control strategies
- Critical analysis of published literature related to Infection Prevention and Control
- The participation in research independently or collaboratively
- Using audit to monitor effectiveness
- The use of communication skills to enhance patient and public involvement
- The use of appropriate strategies and systems to identify and manage risk
- Development of own professional knowledge and skills through life long learning
- Makes use of effective strategies to help others to learn about Infection Prevention and Control
- Leads work teams in the development of knowledge, ideas and work in infection prevention and control practice
- Uses a co-ordinated approach to ensure the service is managed effectively

Initial concern that competencies may be used to control IC nurses, these have been useful for regarding and also as a training model for novice IC nurses.

Evidence grading OP/EC

(Perry 2005)

Research purpose: Not stated, a descriptive study of IC nurse development and future.

Method: N/A

Sample size: N/A

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Discusses how core competencies have been useful for individual job descriptions, work-based learning and development of specialist training programmes.

Introduces the concept of "modern matrons" who have key responsibilities for standards of cleanliness and implementing evidence-based guidelines. In some organisations these roles are linked.

The 1995 role is still applicable and includes:

Identification and control of outbreaks

- Education of hospital staff in infection control procedures
- Preparation of policy documents and audit of implementation
- Formulation of an annual programme of work including surveillance
- Implementation of the annual programme
- Provision of an annual report to the chief executive
- Liaison with departments including occupational health and clinical teams
- Monitoring of hospital hygiene
- Advise on procedures for discharge and transfer of
- patients with infection or colonisation
- Advise purchasing and plans for building works.

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- Involvement in contracting, engineering and estate issues
- Decontamination of equipment and
- Responding to litigation and complaints.

Anticipated required skills are:

- Leadership not management
- Conversant with language of business
- Increased productivity and expectation of success

Evidence grading: OP/EC

(Murphy and McLaws 2000)

Research purpose: To establish a profile including the extent to which ICPs used skills and resources to promote evidence-based IC.

Method: Mailed survey

Sample size: 630 AICA members

Risk adjustment/ confounders controlled for: Partial

Confidence interval: Yes

Findings: Research relating to infection control was undertaken by 21.5% (135/628) of the sample, and 27.6% (37/134) of this group published their research findings

Evidence grading: D

(Murphy and McLaws 1999)

Research purpose: To describe the perception of competence held by ICP and qualifications they consider necessary for progression.

Method: Mailed survey

Sample size: 630 AICA members

Risk adjustment/ confounders controlled for: Partial

Confidence interval: Yes

Findings: Overwhelming lack of consensus between ICPs regarding qualifications required at levels expert to novice other than their own level. The pathway for career progression is limited and assessment impractical.

Evidence grading: D

Literature addressing question 3

(Hayashida, Imanaka et al. 2007)

Research purpose: measurement of hospital-wide patient safety and infection control activities and volume 5-year trends.

Method: Interviewed patient safety and infection control program leaders to define scope of practice. Developed a questionnaire based on the scope and distributed it to these staff as a survey for self completion.

Sample size: 7 acute Japanese hospitals.

Risk adjustment/ confounders controlled for: No

Confidence interval: No

Findings: Scope and relevant proportion of infection control time per 100 beds was meetings and conferences (20.3%), internal review and walk rounds (10.1%), internal education and training (20.6%), external education and training (11%), standard manual development (3.4%), infection surveillance (15.9%) and others (18.8%)

The range of infection control annual activity was 3,025-12,196 person hours or 1,141 hours per 100 beds, 613 per 100 staff.

Infection control activities varied across sites

ICP ratio was one per 315 beds which is lower than other published studies.

Evidence grading: O

(Oh, Cheong et al. 2007)

Research purpose: To develop new evaluation indices of infection control to evaluate Korean infection surveillance and control programs.

Method: Questionnaire-based survey of Korean acute general hospitals with > 300 beds. Used weighted SENIC indices plus four new evaluation indices to assess infection control programs. These

included healthcare workers index, resource index, hand hygiene index and quality improvement index.

Sample size: 164 hospitals.

Risk adjustment/ confounders controlled for: Multiple regression analysis

Confidence interval: Standard deviation & inter-quartile range.

Findings: The mean number of beds for 1 FTE ICP was 550. the indices were reliable and valid Hospital epidemiologists and ICPs are not well trained and spend most time on control activities (teaching/ policy) rather than surveillance which could reduce HAIs. Low scores call into questions whether Korean ISCPs have affected HAI burden in Korea. Unable to determine impact of ISCPs on HAIs. As ICPs were more highly educated less reliance/ use of epidemiologists. Surveillance unable to e performed unless there is a full-time ICP.

Evidence grading: O+

(Talbot, Tejedor et al. 2007)

Research purpose: To assess infection control practices in a large national cohort.

Method: Survey on enrolment to a national collaborative to reduce ventilator associated pneumonia and central line related bloodstream infections in ICUs. Included survey of infection control program.

Sample size: 134 private hospitals.

Risk adjustment/ confounders controlled for: No

Confidence interval: No

Findings: surveillance routinely performed in most facilities. A single ICP per mean of 191 beds, 20 being ICU beds. 55% of hospitals had a certified ICP.

Substantial differences in surveillance practice, resources, data collection methods and reporting processes. Infrequent reporting of data to clinicians at the bedside.

Evidence grading: D

(Troelstra 2007)

Research purpose: To describe how Dutch infection control programs are organized.

Method: Description.

Sample size:N/A

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Independent expert advisory body has recommended 1 ICP per 250 beds and 1 FTE medical microbiologists per 1000 beds. Since 2004 hospitals advised to perform surveillance. National network promotes and supports prospective and prevalence surveys. Prevalence surveys considered less time consuming for similar information.

Evidence grading: OP/ EC

(van den Broek, Kluytmans et al. 2007)

Research purpose: To determine the needs for ICPs and medical microbiologists in Dutch hospitals.

Method: Group discussion and iterative scoring based on model hospital with 1370 beds, 280 000 nursing days, 39 000 admissions and 40 ICU beds. Considered that 1 ICP worked 1632 hrs per year.

Sample size: 16 ICPs and 10 medical microbiologists.

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Mean times for ICP activity 242.1 hrs/ week and 53.8 hrs/ week for medical microbiologist. The model hospital required ratio of ICPs of 1 per 178 beds and one microbiologist per 806 beds. This is also 1 FTE ICP per 5065 admission or 36 364 nursing days. 1 medical microbiologist per 22 941 admission, 164 706 nursing days.

Substantial variation 25% regarding medical microbiologist needs whereas for ICPs variation range was 10%.

Evidence grading: OP/ EC

(Cunney, Humphreys et al. 2006)

Research purpose: Comprehensive survey to determine current resources for infection control, antibiotic stewardship and occupational health services in Irish acute care hospitals.

Method: Survey which had been distributed to Chief Executive Officers.

Sample size: 66 acute care hospitals.

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Median 0.6 FTE consultant microbiologist in each hospital with onsite consultation (47%). Mean ratio of one ICP for every 222 acute care beds. The overall ratio for all beds was one ICP per 248 beds. Almost all hospitals (85%) had an infection control committee.

Fewer than 10% had a dedicated infection control budget yet ¾ provided funding support for continuing education and attendance at meetings.

Conclude that there are major gaps in resources and facilities including insufficient ICPs and infection control doctors. 15% of hospitals did not have ICPs.

Support centralisation of infection control activities. Consider the absence of global consensus on minimum necessary resources as a handicap limiting lobbying of national authorities.

Evidence grading: D

(Moroz and Ward 2006)

Research purpose: Describe project implementing Infection Control Liaisons.

Method: Abstract

Sample size: 1 community-based health system

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Volunteer infection control liaisons serve at the frontline of the organisation and drive the infection control program. Roles include writing publications, crafting policies, research, provide education and participate in surveillance and quality activities.

Evidence grading: OP/ EC

(Oh, Chung et al. 2006)

Research purpose: To assess the status of infection surveillance and control programs in Korea and analyse trends.

Method: Nationwide mail survey sent to infection control nurse in each acute care hospitals with > 300 beds between June-October 2003.

Sample size: 85 hospitals.

Risk adjustment/ confounders controlled for: No

Confidence interval: Not stated.

Findings: Every hospital had an infection control committee. 98% had an infection control nurse and 86% had an infection control doctor. 60% of hospitals had part time infection control nurse only. The nurses were highly educated (37% masters, 11% doctorate) .68% of hospitals performed surveillance and this accounted for almost half of their time. Targeted surveillance was performed by 73% and 88% targeted ICUs.

Essential activities were surveillance, investigations, teaching, environmental monitoring, employee health and policies development and review.

Infection control doctors spent little time on infection control other than as a consultant. They mainly provided patient care.

The mean number of beds per hospital was 638 and most hospitals had only 1 ICP of which > 50% were part-time spending approximately a quarter of their time on infection control.

Evidence grading: D

(Tsan, Hojlo et al. 2006)

Research purpose: Survey to assess the capacity and current practices of infection control and surveillance programs.

Method: 10-question survey developed by experts and converted to a web-based survey and distributed.

Sample size: 130 nursing homes.

Risk adjustment/ confounders controlled for: No

Confidence interval: No

Findings: The median number of hours per week was 12. ICPs were highly qualified, 48% had PhD, 21% had a Masters and more than a quarter had bachelor degree. 89% used CDC definitions for surveillance, others used modified "McGreer" or "McGreer" definitions. Targeted surveillance was used most frequently for specific infections (86%) and specific organisms (82%). In rank order the most frequent infections surveyed were UTI, LRT, URT, skin and soft tissue, BSI primary, BSI secondary, GIT, SSI and eye.

Evidence grading: Descriptive

(Struelens, Wagner et al. 2006)

Research purpose: To assess the organisation, resources and elements of infection control programmes in hospitals in Europe.

Method: Survey composed in English and completed by self selected sample of participants who had accepted invitations mailed from a professional membership directory.

Sample size: 169-acute care hospitals from 32 countries

Risk adjustment/ confounders controlled for: No

Confidence interval: No

Findings: Almost all hospitals had infection control committees. 79% of hospitals had infection control nurses who were specifically trained in infection control. Median ratio was 2.33 infection control nurses/ 1000 beds Median IC Doctor ration was 0.94/1000 beds. This is insufficient compared to SENIC and Canadian recommendations.

Almost half of the hospitals had link/ liaison nurses. Almost ¾ had formal annual objectives and progress reports which in two thirds of hospitals were reviewed by senior management. 75% undertook surveillance and 66% reported regularly to the infection control committee. Problems implementing policies were reported by most hospitals.

Self selection biases this sample and gives over representation of teaching hospitals.

Evidence grading: D

(Gordts 2005)

Research purpose: Not stated.

Method: N/A

Sample size: N/A

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Belgium law decrees minimum requirement of 2.5 FTE IC nurses per 1000 beds and 1 FTE IC physician.

Since 2002 Belgian hospitals are organised by 9 regions which includes all hospitals in the same province, this facilitates synergistic projects and work practices.

Since 2004 the IC committee has a legal responsibility to:

- Develop, implement and monitor organisation-wide strategy for standard and isolation precautions;
- Survey HAIs
- Develop and implement outbreak management
- Follow up logistics relating to IC
- Implement national IC guidelines
- Contribute to and exchange with regional platforms

Staffing recommendations need to consider beds, strategic objectives, organisational complexity and patient mix.

Evidence grading OP/EC

(Quattrin, Pecile et al. 2004)

Research purpose: To report existence and activity of Italian IC nurses in national Health System hospitals.

Method: Structured questionnaire completed by hospital health directors.

Sample size: 463 hospital health directors

Risk adjustment/ confounders controlled for: No

Confidence interval: Not stated

Findings: More than half of the hospitals had an IC nurse but less than a quarter had a FTE IC nurse. Almost half of the hospitals spent > 7 infection control hrs a week per 100 beds.

In rank order the tasks most frequently under taken by IC nurses were nosocomial infection surveillance, health care personnel education, waste management, outsourcing contracts management, hospital infection control study groups management, application of law concern prevention risk on the job, environmental hygiene, sterilization guidelines/protocols definition, secretary activity, consultations on hospital infection control problem, data management and other activities. Some of these tasks are not related to infection control.

Non-homogeneous approach to IC. Authors call for establishing specific targets and related budgets. Vocational training is the norm.

Evidence grading D

(Spencer and Perry 2004)

Research purpose: Editorial commentary

Method: N/A

Sample size: N/A

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Outlines key UK government initiative including an action area relating to Management and Organization.

This involves designation of a Director of Infection Prevention and Control responsible for:

- oversee local control of infection policies and their implementation;
- be responsible for the infection control team within the healthcare organization;
- report directly to the Chief Executive and the Board and not through any other officer;
- have the authority to challenge inappropriate hygiene practices as well as antibiotic prescribing decisions;
- assess the impact of all existing and new policies and plans on infection and make recommendations for change;
- be an integral member of the organization's clinical governance and patient safety teams and structures; and
- produce an annual report on the state of healthcare-associated infection in the organization(s) for which he/she is responsible and release it publicly.

Evidence grading: OP/EC

(Watterson 2004)

Research purpose: Description of a 2-year project to improve infection control within a UK Trust

Method: Service was reviewed and indicators were developed at a stakeholder workshop and IC team expanded.

Sample size: 1 NHS trust including facilities over 3 sites

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Under the Controls Assurances Standard on Infection Control there are 16 criteria one of which requires development of key indicators.

This trust assessed and revised their IC program and held a stakeholder workshop to develop appropriate indicators to assess their program. Developed a five pillar model (practice, environment, corporate governance, performance measurement and surveillance).

Also reduced size of IC committee and frequency of meetings. IC team was expanded and liaisons with specific "modern matrons" implemented.

Using the indicators assisted harnessing commitment of senior management and agreement on performance measures.

Evidence grading: D

(Reed, Gorrie et al. 2003)

Research purpose: Describes the organisation of infection control in Australian.

Method: Commentary

Sample size: N/A

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Identifies major drivers as state governments, NMHRC, Australian Council for safety and Quality in Healthcare, AICA and Standards Australia.

Suggests that in public hospitals the IC committee oversees the IC programme, monitoring HAIs and developing policy. Essentially same structure in private hospitals. No accepted minimum standards or professional criteria for ICPs.

Recommends move from state to national initiatives in two areas – national surveillance and centralised, federally funded reference laboratory.

Evidence grading: D

Literature addressing question 4

(Roup, Roche et al. 2006; Anderson, Kirkland et al. 2007)

Research purpose: Estimate the cost of HAIs in a network of community hospitals.

Method: Literature review of published HAI cost estimates and survey of 28 hospitals.

Sample size: 28 community hospitals in the US.

Risk adjustment/ confounders controlled for: Partial control.

Confidence interval: Inter-quartile range reported.

Findings: The annual budget of most IC programs substantially less than the total cost to the hospital per year for HAIs. Median cost of HAIs was 4.6 times the budget for prevention and 8.5 times the amount per hospital paid to ICPs.

Economics of HAIs needed as a metric.

Literature reports citing usefulness of various prevention efforts is scant and reports of sustainability even less frequent. Need for much more additional research to explore the potential return on investment for infection prevention.

Evidence grading: O+

(Griffiths, Renz et al. 2008)

Research purpose: To define organisational and management influences on infection control in inpatient settings.

Method: Scoping review of published direct evidence.

Sample size: Review of 34 articles

Risk adjustment/ confounders controlled for: N/A

Confidence interval: SR

Findings: To effectively reduce healthcare associated infections leadership is needed at ward level and by administration. Support for training, review and clinical governance is also necessary. Actions should target identifiable organisational risk factors.

Evidence grading: OP/EC

(Edmond and Eickhoff 2008)

Research purpose: Discussion of trends and influences on infection control programs.

Method: N/A

Sample size: N/A

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Suggest that hospitals are facing greater levels of accountability, transparency and expectation that solutions will be rapid.

Hospitals need to target all pathogens and specific local problems rather than succumb to external mandates. There is increased demand for hospital epidemiologists and insufficient time allocated.

ICPS should upskill in teamwork development and implementation of interventions.

Annual review of IC resources is necessary.

Evidence grading: OP/EC

(Koteyko and Nerlich 2008)

Research purpose: To identify problems challenging the British model of "modern matrons" and their ability to prevent and control infections.

Method: Compared and contrasted the documented policies regarding the role and semi structured interviews.

Sample size: 11 policies and 11 semi structured interviews.

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Modern matrons were given some empowerment but were still not empowered to change clinical behaviours of other professionals and/or the organisational culture.

Competing interests limited the modern matron's visibility on the wards (a major Research purpose of the model).

Significant challenge is finding balance between managerial and clinical tasks, interpersonal skills and authority over financial resources.

Evidence grading: Q

(Murphy, Carrico et al. 2008)

Research purpose: To detail proposed elements of idealised future state and systems for infection prevention.

Method: Think tank-like process.

Sample size: Not stated.

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Organisations need to accept:

- clear guiding principle that no patient should experience a preventable infection;
- behaviours that increase infection are not tolerated & every infection or near-miss should be investigated;
- Everyone recognises their accountability and responsibility to prevent HAIs;
- Compliance and adherence is expected
- CEOs clearly articulate expectations, set metrics for achieving goals and ensure adequate resources
- Empowerment includes being able to stop activity that may increase infection risk
- Transparency promotes rapid problem solving

Local learning includes:

- Real time infection surveillance and access to information;
- Clear, concise, understandable and usable measures;
- IC included in educational curricula and competency-based training of all HCWs

Evidence grading: OP/ EC

(Haas 2006)

Research purpose: To explore the state of the science for performance measurement of IC departments.

Method: Literature review of strategies used to measure infection control department characteristics and performance.

Sample size: 12 articles

Risk adjustment/ confounders controlled for: Inclusion criteria specified.

Confidence interval: N/A

Findings: Papers were time management studies, expert opinion, outcome studies or reports of international models.

Time management studies poor and reported ICPs working at 130% capacity. Need to include a process variable that measured the impact of IC activities.

Delphi study recommended 1 ICP per initial 100 beds after which needs changed. Two consensus statements were general and lacked recommendation on measurement of the performance or effectiveness of IC programs or their cost-effectiveness.

NNIS study from 2000 that in more than 200 hospitals surveyed the median ICP was one per 115 beds, 96% had at least 1 ICP per 250 beds.

Study of Western regional hospitals reported 1.56 for every 250 beds with almost half of the hospitals having a paid physician working on infection control. This was important as it studied differences in rural hospitals.

Need for updated studies testing the relationship between infection rates and staffing levels/ responsibilities.

Evidence grading: R

(Roup, Roche et al. 2006)

Research purpose: To determine current resources and practices to identify potential assistance that the Health Department may offer.

Method: Self administered questionnaire sent to all inpatient facilities in Maryland.

Sample size: 27 acute care facilities, 247 long-term care facilities and 11 speciality organisations.

Risk adjustment/ confounders controlled for: No

Confidence interval: No

Findings: Vast differences in ICP staffing, for <200 beds level was 1.6 FTE, > 200 beds had mean of 2.0 FTEs which was strongly correlated with acute care beds. In LTCF with 25-550 beds mean ICP was 0.3 FTE. ACHS had ICPs reporting to quality improvement programs whereas in LTCF most reported to nursing. Most ICPs had responsibility for activities outside of their facility but within the system. All speciality and acute care hospitals had at least one ICP who basic training whereas only 8% of ICPs in LTCF had training.

Evidence grading: D

(Stricof 2005)

Research purpose: Report on surveys of IC program resources and responsibilities in New York state in 1999 and 2004.

Method: Mailed survey to IC in all acute care hospitals.

Sample size: 1999 N=202 and 2004 N=167

Risk adjustment/ confounders controlled for: No

Confidence interval: Not stated

Findings: ICP ratio was 1 per 195 beds in 1999 and 1 per 150.5 in 2004. In 2004 most (32%) IC programs were integrated into quality assurance programs. Specific responsibilities included employee health, central supply, staff education, risk management, emergency preparedness and quality assurance. Bloodstream infections were the most frequently surveyed HAI, followed by surgical site infections, pneumonias and urinary tract infections.

Evidence grading: D

(Voss 2005)

Research purpose: To gather information on curricula for IC physicians.

Method: Questionnaire survey of countries in European Society of Clinical Microbiology and Infectious Diseases Study Group on Nosocomial Infections.

Sample size: 12

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Discusses the absence of formal training and speciality recognition for IC doctors in Europe especially.

The standard average for IC physicians and IC nurses from 12 European countries (Australia, Belgium, Switzerland, Germany, Spain, UK, France, Hungary, The Netherlands, Poland, Serbi-Monte-negro and Turkey) was 1.2 IC physicians and 3.4 ICPs per 1000 beds. Participants requested increases for an ideal IC team to be 1.8 IC doctors, 4.2 ICPs and 3.3 other workers per 1000 beds.

Proposes a 6-year post graduate medical training for IC doctors and mandatory continuing education or post-graduate study for doctors and nurses in the field.

Evidence grading: D

(Cookson, Teare et al. 2004)

Research purpose: Report of a workshop convened to propose a job description for an infection control doctor.

Method: Workshop and facilitated discussion.

Sample size: Not reported

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings:

Currently recommend 1/3 FTE ICD per hospital, recommended that the position account to the Chief Executive in regard to agreed target and Medical Directors. Agreement that infection control budgets need to be reviewed and are required.

Focus not on targets but specific deliverables from education, surveillance, audit and risk management activities.

Evidence grading: OP/EC

(Croxson, Allen et al. 2003)

Research purpose: Report of nationwide survey of United Kingdom ICPs regarding organisation and funding of IC programs.

Method: National postal survey of all IC nurses and ICDs in English NHS hospital trusts.

Sample size: 176 IC nurses and 93 ICDs from 200 institutions.

Risk adjustment/ confounders controlled for: No

Confidence interval: Not stated

Findings: Less than 50% of respondents had separate IT held budget. Few respondents felt that the IC committee functioned well to help secure funding for IC. Centralised mechanisms had largely failed. In some institutions ICPs are not given central role in decision making and therefore have limited influence.

Suggestion that improving organisation and practice of IC can reduce rates between 15-30%

Evidence grading: D

(Olesen 2001)

Research purpose: Discussion regarding the importance of Australia adopting a clinical governance framework for IC.

Method: N/A

Sample size: N/A

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Observes that national leadership is lacking and unclear leading to ambiguity. Identifies that as non-members of the clinical care team, ICPs often have little influence on health practices. Call for programs to be targeted and outcome focussed. Requirement that scope of programs be defined and interrelationships between programme and patient outcomes explored.

Evidence grading: OP/EC

(Murphy and McLaws 2001)

Research purpose: Describe administrators and clinicians responses to affirmative statements regarding the role of the ICP.

Method: mailed survey for self completion.

Sample size: 349 clinicians and 238 administrators.

Risk adjustment/ confounders controlled for:

Confidence interval: Yes

Findings: More clinicians than administrators agreed that an effective IC program required a trained hospital epidemiologist in addition to an ICP and one ICP per 250 beds.

Administrators were reluctant to fully appreciate or understand the objectives and importance of IC programs. Significant disagreement between clinicians and administrators regarding infrastructure and reluctance to agree where additional spending was required.

Evidence grading: D

Literature addressing question 5

(McGuckin, Shubin et al. 2008)

Research purpose: To determine if nurses and ICPs know of and take responsibility for developing, implementing and monitoring protocols for evidence-based care.

Method: Electronic survey of 1776 ICPs and 1178 nurses attending their respective annual professional meeting in 2004-2005.

Sample size: 453 respondents.

Risk adjustment/ confounders controlled for: No

Confidence interval: Not stated

Findings: Conclude that the clinical impact of basic nursing practices needs to be understood in relation to measurement/ benchmarking and cost savings. CEOs and administrators need to be educated about this relationship.

Recommends better partnership between clinicians/ IC and administration and greater ownership of respective responsibilities.

Evidence grading: D

(Murphy, Carrico et al. 2008)

Research purpose: To detail proposed elements of idealised future state and systems for infection prevention.

Method: Think tank-like process.

Sample size: Not stated.

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: The ideal IP system includes the following components:

- Infection prevention is integrated into every health care worker's job description.
- Rewards and incentives are provided for preventing infections.
- Prevention is designed into the ideal patient room.
- Infection prevention education is standardized for all health care workers.
- The APIC broadens links to educators and other health care associations to partner on eliminating HAIs.
- Performance improvement is a major aspect of the ICP's job description.
- "Touchless" patient care technologies and alert/messaging systems are designed with infection prevention in mind.
- Infection prevention functions and behaviours are standardized across health care settings.

- Prevention strategies are "pulled" from the front-line health care workers when needed.
- The emphasis on infection prevention is unified and organized in partnership with industry.

Evidence grading: OP/ EC

(Sieber 2008)

Research purpose: To describe the integration of Patient Safety and Quality components into a traditional Infection Control Liaison Program.

Method: Report

Sample size: 1 hospital

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Redesign of Infection Control Liaison Program to include Risk Management, Patient Safety, Quality Improvement, Performance Measurement, Medical Staff

Services, Environmental Health and Safety, and Occupational Health increased the range of information that could be distributed and increased participation in the program.

Evidence grading: OP/ EC

(Herwaldt, Appelgate et al. 2007)

Research purpose: To assess current responsibilities and resources of ICPs in Iowa.

Method: Initial 28-question survey distributed at state-wide infection control meeting for immediate self completion. Subsequent targeted phone survey about infection control resources at critical access hospitals.

Sample size: 104 acute care hospitals (Survey 1) and 67 critical access hospitals (Phone Survey 2).

Risk adjustment/ confounders controlled for: No

Confidence interval: No, range only.

Findings: Survey 1: ICPs had mean 9 years experience. Less than 30% were certified. Almost all used CDC surveillance definitions. Smaller facilities did whole of hospital surveillance as size increased trend towards targeted surveillance. Responses to what would make job easier were surveillance software (29.5%), more time or staff (20%), education or access to educational resources (17%) and electronic medical records (9%).

Survey 2: ICPs had a mean of 9.7 years experience and < 10% were certified.

Substantial variation in surveillance methods and extent so mandatory public reporting may not provide meaningful data.

Evidence grading: D

(Pellowe 2007)

Research purpose: To review the United Kingdom's national response to HAIs.

Method: Review of key government initiatives.

Sample size: N/A

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: 2003 UK government endorsed active surveillance and investigation, reducing reservoirs and management and organization. 2004 publication of epic evidence-based Guidelines based on systematic review of all current government guidelines. Realisation that implementation equally important thus developed Clinical Government Support Team programme from 2003-2005 to make organizational differences involving multi disciplinary teams. Initiatives included cultural change, enabling and use of networks.

2007 provision of e-learning modules. 2006 also mandated Healthcare Commission to act as a "watchdog", annual appraisal and award performance ratings. Managers been directed to ensure that effective prevention and control is embedded into everyday practice and applied consistently. Core set of 12 policies must be in place. Multiple tools in place to assist hospitals to meet the demands of the Code.

Evidence grading: OP/EC

(Simpkins, D'Alena et al. 2006)

Research purpose: Describe local liaison program

Method: Project report

Sample size: Two facilities in an integrated health care system.

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Liaisons became IC resources for their areas. Liaisons also assisted by identifying barriers to successful implementation of IC practices and enhanced leadership to overcome same. Several ICPs indicated an interest in a career in infection control.

Evidence grading: D

Literature addressing question 6

(Hobbs 2007)

Research purpose: To investigate the scope of practice of Victorian ICPs.

Method: 2-day workshop where 12 "expert" ICPs brainstormed to develop a curriculum - DACUM technique.

Sample size: 12 "expert" ICPs

Risk adjustment/ confounders controlled for: No

Confidence interval: N/A

Findings: Substantial variation in workplace titles and reporting lines. Ten identified duty areas were:

1. Administrative duties
2. Policy and procedure development

3. Minimise transmission risks
4. Surveillance coordination
5. Adverse event management
6. Outbreak management
7. Immunisation
8. Education
9. Professional development activities
10. Provision of expert advice

Authors also report a matrix of knowledge, skills and behaviours consistent with national nursing organization's model.

Reporting lines are problematic both upwards (due to lack of understanding by line manager of ICP's role and scope) and downwards to and from liaison nurses.

Evidence grading: D

Literature addressing question 7

(Barnes, Nennig et al. 2007)

Research purpose: To report the development of a standard infection prevention and control preceptor program.

Method: Report.

Sample size: N/A

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Expanding role of ICP, high vacancy rate and limited experienced staff required the development of a standardised internal training program for preceptors. The program lead to reduced vacancy rates.

Evidence grading: OP/EC

(Dusmohamed, Wilkinson et al. 2006)

Research purpose: To summarise the approach used to develop a communication model for infection control in rural and remote health services in South Australia.

Method: Use of various enquiry methods (interviews, field visits, and forum) by South Australia Health Department to investigate and work with local stakeholders to explore possibility of implementing a centralised model for infection control communication.

Sample size: 1 Project Coordinator and senior administrators from 7 rural regions.

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Hospital infection control programs were "ad-hoc", uncoordinated, performed in isolation and without links to metropolitan services or peers.

ICPs had insufficient time allocated for infection control and often performed multiple roles in addition to infection control.

Interviewees supported regular meetings of a regional network and recognised how it would assist standardised regional surveillance, policy development, networking and strategic planning.

Evidence grading: D

(Vaughan and Randle 2005)

Research purpose: Not stated

Method: N/A

Sample size: N/A

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Link nurse not an IC nurse substitute and should only undertake specific duties. Critical to success of their role is identifying their educational needs and development. A portfolio of practice and learning assists their learning and acts as a tool to explore areas of concern.

Evidence grading: OP/EC

(Cooper 2004; Cooper 2004)

Research purpose: To identify if using an action research approach led to improvements in clinical practice.

Method: Participants applied to join the link nurse program. 20 participated in reviews and audits of hand hygiene related processes and reported quarterly to the IC nurse.

Sample size: 20 link nurses.

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Improvements in processes were noted. Link nurses felt ownership of clinical level infection control. Knowledge and confidence of link nurses improved. Competing workload demands was problematic.

Evidence grading: Q

(Dawson 2003)

Research purpose: Discuss link nurses

Method: N/A

Sample size: N/A

Risk adjustment/ confounders controlled for: N/A

Confidence interval: N/A

Findings: Link Nurses are well placed at ward level to observe and influence colleague's practice. They are a valuable resource as they raise IC profile and improve communication, teaching and potentially research. Links require a specific training programme. Problems include overwhelming clinical workload and need for sustained management support. Link nurses may not also have appropriate authority.

Evidence grading: OP/EC

(Geary, Allworth et al. 2003)

Research purpose: Report of infection control scoping and model implementation in Central zone of Queensland.

Method: Survey and scoping exercise as well as focus groups.

Sample size: 17 health service districts (12 regional/ rural and five metropolitan)

Risk adjustment/ confounders controlled for:

Confidence interval: N/A

Findings: IC responsibilities and practices were diverse as were the types of qualifications of staff performing IC role. Links between aligned services were poor. Participants identified a range of processes and resources that they perceived would improve their programs including communication for outbreaks, signal surveillance, IC management plans and better networking, professional development and better information technology especially for rural and remote areas. Suggested matrix included development or a zonal coordinator role to standardise practice and support collaboration across the zone.

Evidence grading: D

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Appendix 2

A national stakeholder review of Australian infection control programs:

The scope of practice of the infection control professional

Executive summary

Authors: Jo Tropea, Caroline Brand & Carol Roberts

Infection prevention and control is an integral part of all health care, for the quality of patient care and for the protection of staff, patients and visitors, from communicable diseases. Infection prevention and control (IC) programs have been shown to effectively reduce infection rates, and the infection control professional (ICP) is a key component to the success of implementing the IC program.[1]

This national stakeholder review describes Australian hospital IC programs and models of care in relation to: the corporate and clinical governance structures, policies and procedures, reporting mechanisms, staffing and resources, dimensions and scope of practice of the infection control professional (ICP), and relationships with government and other external agencies. A number of recommendations based on the findings of this review have also been made.

Summary of key findings

Governance

- Strategic governance of IC programs is not consistent between or within the jurisdictions, and tends to vary depending on the hospital size.
- The support from the hospital executive is one of the key elements to a successful IC program, and limited executive support is seen as a weakness of an IC program.
- Hospital executive support includes resourcing of IC programs. However, a number of IC program staff identified resource allocation to their programs as being deficient.

IC program team

- Inadequate infection control staffing levels and resources, including laboratory resources, is perceived as a major barrier to IC programs.
- IC programs utilise numerous strategies to engage hospital staff in infection prevention and control. Lack of clinician buy-in was reported as a major barrier to successful IC programs.
- There is limited research being conducted by IC programs. Adequate resources to support and facilitate research in infection control are needed.
- A number of data management issues were raised including duplication of data, and data entry tools not being as user friendly or practical to use as they could be.

ICP scope of practice

- The scope of practice of the ICP has evolved in response to shifting models of health care and emerging infectious disease challenges. ICPs are involved in core activities including health care associated infections (HAI) surveillance, staff education, policy and procedure development, outbreak management and consultation.
- ICPs in both the public and private hospital sector may be involved in additional tasks and activities such as staff immunisation and product purchasing. The number and type of tasks varies and, apart from liaising with community services, does not seem to be dependent on the location or size of the hospital.
- Based on shifting models of care from acute to community based health care, there is an increasing need for the ICP scope of practice to recognise community based practice. It will require preparation both educationally and professionally to pursue the management of infection across the hospital-community interface.

Education and training of the ICP

- A range of education programs in academic institutions are currently available for nurses seeking or establishing a career in infection control in Australia.
- The content of educational programs available to the ICP is variable because there are no Australian infection control standards of practice available to guide course or professional development.

Role of government

- The role of the jurisdictional governments in infection control is similar across the states and territories. However there are small differences in their governance structures and services they facilitate.
- Regulation is the only role of the state governments within the private hospital sector.
- There is no consistency of what is reported to each of the jurisdictional governments. There are currently no infection control indicators reported at a national level.

Recommendations

Governance

- Clinical governance should reside at all levels of a hospital and the hospital should ensure commitment to IC through active executive participation and sponsorship.
- The clinical governance framework for IC programs should consider governance, including responsibility and accountability from the point of care up to the hospital executive, (and the Board) and to jurisdictional and national government bodies.
- The clinical governance structure of the IC program should consider all relevant stakeholders, in particular; pathology services, expert clinical groups, community partners and consumers.
- An IC committee should have a clear mandate for its activities which are explicitly outlined in terms of reference and are supported within an effective governance structure.
- There needs to be a review of clinical governance to support greater adherence of individual clinicians to IC policies and procedures. This should consider components of the clinical governance framework, including credentialing, support strategies, performance assessment, monitoring as well as remedial response processes.

Infection control program components

- The model of IC program should be informed by the size and complexity of the healthcare organisation and its community partners, and assessed needs and priorities.
- IC programs require a risk management plan that includes management of infection outbreaks.
- An IC program requires a funding model that supports the specified program activity domains and resources necessary to implement and sustain these activities.
- Hospitals should support IC programs with staff dedicated to infection control and adequate access to expertise in infectious diseases, microbiology and pathology services and epidemiological methods.
- Hospitals should provide structural resources to support the ICP including effective data collection, analysis and reporting systems.

ICP scope of practice

- The scope of practice of the ICP should be outlined within a job description that includes the common and required elements of HAI surveillance, outbreak management, education, IC policy and procedure development and consultancy; and is flexible to meet the needs and priorities of the hospital.

Education and training of the ICP

- The scope of practice of the ICP should reflect the education and training of the ICP in relation to expected roles and responsibilities.
- It is recommended that there be a national approach to developing curricula for infection control post graduate courses.

Background and Introduction

Healthcare associated infections (HAI) are common and can be serious, with an estimated incidence of around 10% of all hospital admissions.[2] The impact of HAI is significant with increased morbidity and mortality, and increased heath care utilisation often resulting.

The HAI program has been recognised by the Australian Commission on Safety and Quality in Health Care (ACSQHC) as one of its priority programs. The aim of the HAI program is to develop a national approach to HAI including strategies for ensuring practices are sustained and the development of an agreed national plan for HAI prevention and control. This national stakeholder review is part of the HAI program, and may be used in conjunction with the recently conducted literature review to inform the development of educational resources and toolkits to enable ICPs and hospitals to implement effective IC programs. It may also be used to further inform national and international quality improvement and research work in infection control.

The aim of this national review of hospital infection prevention and control (IC) programs and models of care is to assess:

- Governance and leadership
- Structural components of the IC program
    - Reporting mechanisms
    - Policies and procedures
- The role of the infection control team including the ICP (ICP) and IC coordinator
    - Scope of practice of the ICP
    - Mentoring support programs for the ICP
    - Education and training programs for the ICP
- The role of hospital executive and management in infection control
- The role of government in infection control
- Strengths/enablers and weaknesses/limitations of the IC programs
- Similarities and differences across Australian metropolitan, regional and rural hospitals; and the public and private hospital sector.

Jurisdictional governments have corporate responsibility to ensure their hospitals achieve established minimum standards of practice and meet all legislative requirements in relation to infection control. Clinical governance is a framework, consistent with corporate strategic directions, defined as "a systematic and integrated approach to assurance and review of clinical responsibility and accountability that improves quality and safety resulting in optimal patients outcomes" (Western Australia Health Department).

Infection prevention and control programs are made up of structural components which are embedded within a corporate and clinical governance framework. This report describes the IC program governance structures that occur both internally and externally to the organisation, including the roles, responsibilities and relationships of these components. See Figure 1.

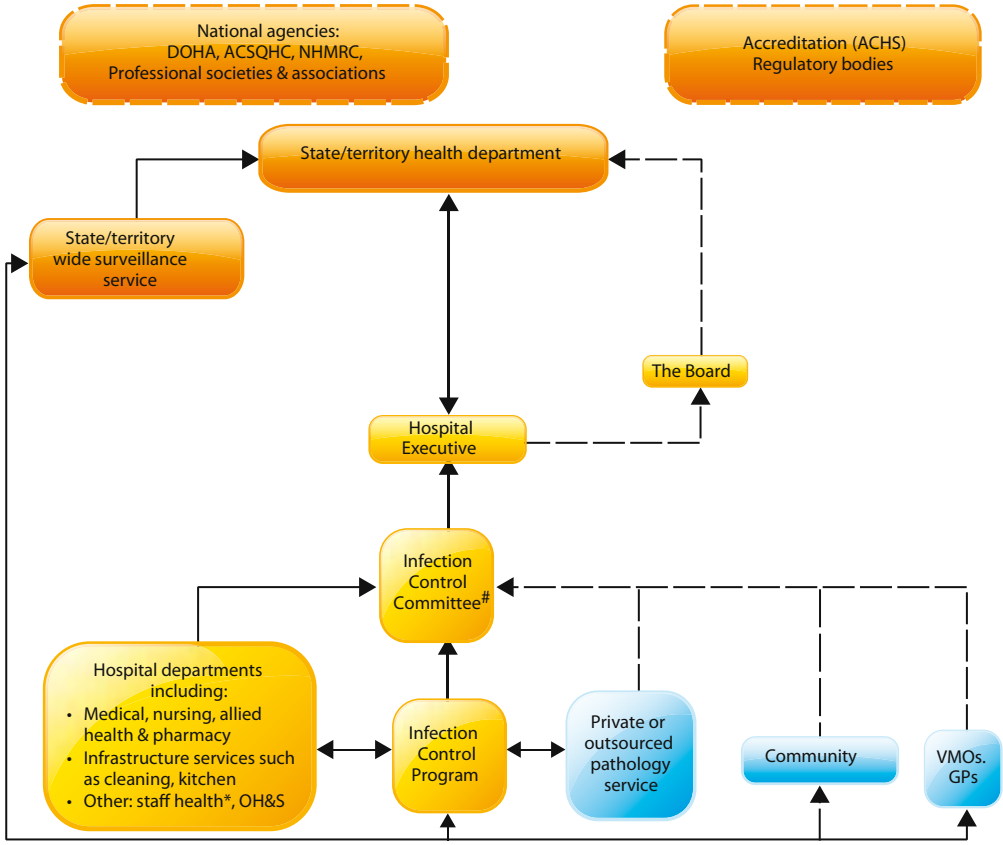
This report describes hospital IC programs in relation to the following:

- Governance
  - Hospital executive
  - IC program where it sits
  - IC management systems (IC committee)
  - Policies and procedures
- IC program components
  - Staffing
  - ICP scope of practice
- Support services and resources
  - People and expertise
  - Structural resources
  - Education and training
  - Mentoring and ICP networks
- Relationships
  - Other internal relationships - hospital staff
  - Jurisdiction government
  - Other external agencies and community

Caveat

This review involved key informant interviews with 37 participants representing various levels of the public and private hospital sectors. This stakeholder review did not include hospitals which do not have an IC program in place. The findings and recommendations have been structured to present issues likely to be generalisable to other Australian hospital settings, but implementation would need to consider contextual issues with more detail. It should therefore be read with caution and not as a representation of all Australian public and private hospitals.

Figure 3 – Hospital infection control program governance structures, internal and external relationships



Or alternative system of management

* Staff health may be part of the IC program

Methods

A systematic approach was undertaken, consisting of several distinct stages including the following activities:

- Collaborative work with the expert advisory group (EAG)
  - Finalised the constitution of the EAG consisting of individuals with clinical care and research expertise in health care associated infection control
  - Scoped the work plan: delineate project activities in detail including survey design and development, identifying key stakeholders, and finalise the expert advisory group consultation process
  - Identified key stakeholders
  - Developed structured interview templates
- Conducted the key informant interviews (KII)
- Analysis of KII findings
  - Summarise key points and issues
  - Developed recommendations

Expert Advisory Group (EAG)

The Clinical Epidemiology and Health Service Evaluation Unit (CEHSEU) project team worked in collaboration with a multidisciplinary EAG throughout the duration of the project. The EAG consisted of 8 members with clinical and research expertise in infection control, prevention, infectious diseases, epidemiology and microbiology. The metropolitan, regional and remote hospital sector was also represented on the EAG. *Details of CEHSEU project team and EAG membership provided in Appendix 1.*

As part of the project, 3 EAG meetings were held and regular email correspondence between the project team and the EAG took place.

Identify key stakeholders

Stakeholders to participate in the KII were identified by the CEHSEU project team in collaboration with the EAG and the ACSQHC HAI Implementation Advisory Committee.

We aimed to have approximately 30 key stakeholders participate in the KII, with representation from all Australian jurisdictions. Potential participants included representatives from:

- Jurisdictional health departments
- Hospital executives
- Management/directors of infection control services
- Infection control coordinators
- ICPs
- Peak bodies

} From metropolitan, regional and rural hospitals

The sample was a purposeful selection of hospitals with the aim of representing at least one metropolitan and regional or rural public hospital from each jurisdiction. The sample was also one of convenience due to the timelines of the project. We utilised our EAG and the state and territory health department representatives to direct us to hospital IC programs. For private hospitals we contacted the Australian Private Hospitals Association (APHA) and contacted private infection control consultants that were recommended by the expert advisory group (EAG) or the ACSQHC HAI implementation Advisory Committee.

Develop templates for Key Informant Interviews

A peer reviewed literature search and web based search of peak international infection control groups was conducted to identify whether a questionnaire(s) exists that could be utilised or modified for the purposes of this project. We were unable to identify a questionnaire that fulfilled the review objectives, and therefore developed three interview templates which varied depending on the target group:

- Jurisdictional government health department level
- Facility level – executive and management role
- Facility level – ICP and coordinator role

Each interview template consisted of questions relating to the following domains:

- Corporate and clinical governance, leadership and culture
- Policies and procedures
- Information management and reporting
- ICP scope of practice

Questions pertaining to the strengths and weaknesses (barriers and enablers) of IC programs for each of the above domains; and whether a formal evaluation had been conducted were also included in the review. *See Appendix 2 for details.*

Conduct the Key Informant Interviews

Emails were sent to potential participants along with a letter of invitation which outlined the objectives of the KII. Follow up emails and phone calls were made to those who did not respond. Appointments for interview were made with those who accepted the invitation to participate. Where potential participants were unavailable or declined the invitation for interview, they were asked to recommend a colleague. An excel spreadsheet was used to track communications with potential KII participants.

Key informant interviews were conducted either face to face or by telephone by experienced CEHSEU staff. These methods were selected rather than paper/electronic based survey methods due to the short response time.

All interviewees were sent an outline of the questions for the interview prior to the KII. KII were recorded, and transcribed. Summaries of interviews were sent back to participants for ratification.

Analyse findings from Key Informant Interviews

Notes from the KII and recording transcribes were analysed. Findings were then summarised, and presented to the EAG for review and feedback. Recommendations were developed in collaboration with the EAG.

Education programs for ICPs

To identify educational programs in infection control we contacted nursing boards in each state & territory, searched Australian university websites, and asked all ICPs involved in the key informant interviews.

Nursing boards from all states and territories replied that they only have information on course providers and content where the course leads to initial registration as a Division 1 or 2 Registered Nurse.

Results

Infection control program governance

Clinical governance refers to the framework through which hospitals are accountable for ensuring that rigorous systems are established so health care safety and quality is monitored and supported, evaluated and continuously improved.[3]

There was general consensus that the clinical governance framework for IC programs should have policies and procedures, defined job descriptions for IC program staff, supports required for the role, and well defined communication strategies with clear lines of reporting and feedback. It should integrate with other organisational frameworks such as the quality and safety framework and the occupational health and safety framework.

This stakeholder review explored governance within each hospital as well as the governance structures up to the state and territory level health departments. This section will discuss the governance structures of the IC program within a hospital – to where IC programs report and through whom.

This review found that strategic governance of hospital IC programs varies, and this variation tends to be related to the size of the hospital.

- Larger organisations which have a clinical director of the IC program tend to be accountable to an executive sponsor such as the Director of Clinical Governance, General Manager, Executive Director Division of Medicine or Quality and Safety.
- In all other hospitals, the IC coordinator tends to report directly to nursing executive.

This review found the strategic governance of infection control was inconsistent between and within the jurisdictions. This was raised as an issue:

> *"Have asked NSW Health to define where IC should sit in an area health service (AHS) eg should IC be under clinical governance or pathology. This differs depending on the AHS…need standardisation desperately across the state."*

Operational management of IC programs also differs. It can be an executive nursing position; or the clinical director of ID, microbiology, or pathology. Some generalisations were found based on the size of the hospital and on the services available:

- In larger public hospitals, IC programs tend to sit operationally under the pathology unit and/or infectious diseases unit.
- ICPs tend to be nurses and therefore also have professional nursing reporting lines to an executive of nursing.
- Regional and rural hospitals and private hospitals tend to be managed by the Director of Nursing (DON, part of executive) who is also the key senior support to the ICP.

Summary

- Strategic governance of IC programs is not consistent between or within the jurisdictions, and tends to vary depending on the hospital size.
- IC programs in most large public hospitals report to the executive director of clinical governance, division of medicine, quality and safety or the general manager. In other hospitals (public and private) they tend to report to the nursing executive.
- IC programs in large public hospitals tend to be operationally managed by pathology, microbiology or infectious diseases departments.
- In other public hospitals and private hospitals, IC programs tend to be operationally managed by a nursing or medical executive.

Hospital executive

One of the essential elements for the management of an IC program is the support of the hospital executive.[4] The recent UK review into organisation and management factors on infection control in hospitals reported "Organisational mechanisms for supporting training, appraisal and clinical governance are significant determinants of effective practice and successful change…and that more attention must be paid to the environmental, behavioural and organisational contexts in which care is delivered. Recent enquiries into infection outbreaks in England have highlighted failures of management and leadership at all levels in relation to infection control…but wider aspects of organisation and management of care have not been widely considered."

Those executives interviewed perceived their role as the following:

- Sponsorship and resourcing
- Taking a broader organisational perspective whilst being aware of statewide and community issues
- Key governance role
- Provide knowledge (not IC expertise)
- Deal with external aspects of IC eg patient complaints, media, health department
- Chair IC committee

Executive directors of nursing in smaller (regional/rural) facilities reported additional roles including:

- Support IC committee internally, seek advice
- Provide feedback from regional executive groups
- Ensure appropriate policies and procedures are in place to provide structure for the IC committee

The interviews with IC staff revealed that executive support is seen to be a key factor in not only receiving adequate funding and resources, but for successful implementation of infection control and buy-in within the organisation.

> *"Rapid response within executive to mobilise resources, close wards etc if there is an outbreak"*
>
> *"Current area executive is very supportive of patient safety issues (strength of the program)."*
>
> *"IC programs do well if they have good executive support."*
>
> *"Strongly committed CEO who actively supports the IC program. Works well because the CEO has a personal commitment."*
>
> *"We have executive support all along; they listen to us (strength of the program)."*
>
> *"Good executive support. (I can) talk to executive at any time, all sites, open door policy."*
>
> *"(Strength of the program) close relationship with clinical governance."*

A number of those interviewed raised concerns regarding the lack of executive support for the program.

> *"A number of recommendations (were) forwarded to the chief executive who (in response) has given limited support to increasing staffing"*
>
> *"Greater executive support is needed – expected to do more and more with little resources. Tend to focus IC resources on outbreak management and surveillance which means education of staff misses out."*
>
> *"(Weakness of the program) limited executive support."*
>
> *"Difficult to have influence on executive re resourcing…see data as performance measures"*
>
> *"Executive don't support in terms of (enough) resources, allow us to do what we can."*
>
> *"Where there are barriers with senior medical clinicians, (ICPs) not empowered or supported by hospital executive to deal with non compliance or issues arising."*

Summary

- The support from the hospital executive is one of the key elements to a successful IC program.
- Limited executive support is seen as a weakness of an IC program.
- Hospital executive support includes resourcing of IC programs. However, a number of IC program staff identified resource allocation to their programs as being deficient.

Infection control management (IC committee)

This stakeholder review found that almost all IC programs report to an IC committee. Where IC committees were not in place, an alternative system of management was utilised. The IC committee or system of management serves to undertake various governance functions.

Infection control management (from the national guidelines)[5]

Each health care establishment or region/district should have a committee or system of management that is responsible for the development, oversight and evaluation of the IC program.

Infection control management should reflect the spectrum of clinical services and administrative arrangements of the health care establishment so that policy decisions take account of implementation issues.

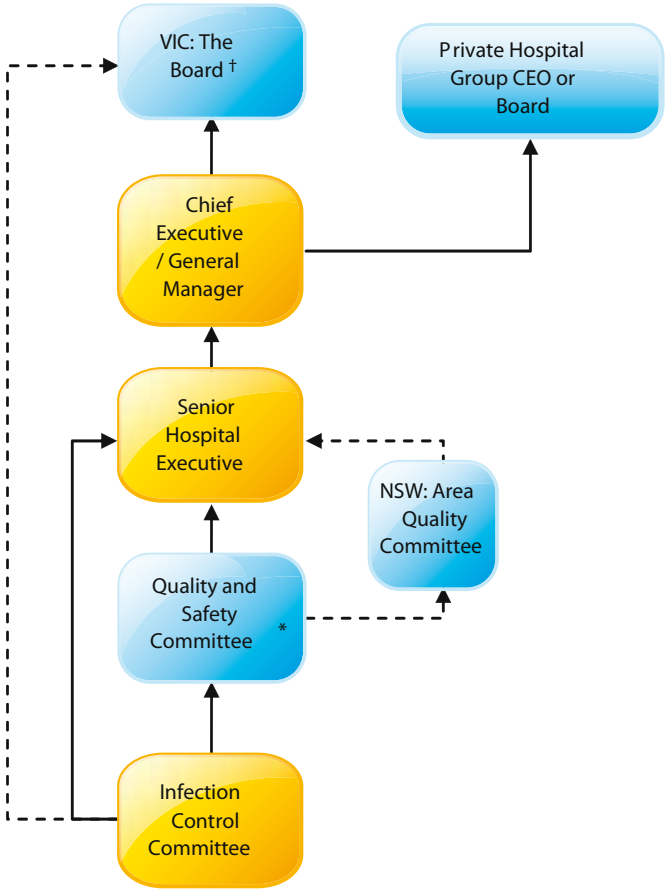
The IC committee structures described by those involved in this stakeholder review were generally based on the structure outlined in Figure 2.

- There is some variation in the clinical and corporate governance structure between the jurisdictions, and the private and public hospital sectors. Those structures common to all IC committee structures are highlighted in bold.
- In Victoria there is variation as to how the IC committee report to the Board. The IC committee may directly report to the Board, or report through to the Board via a Board committee, or through the CE.
- Private hospital IC committees generally report directly to the hospital executive, through to the CE and the Board.

This national stakeholder review found where IC committees are in place:

- Membership is multidisciplinary and tends to include: IC program staff; and representation from the hospital executive, nursing, medical, pathology services, pharmacy, theatre and sterilising services (CSSD), and facilities management (cleaning, food, waste management, engineering)
- May also include: ID physician if on site; quality and safety unit rep; allied health rep; other specialist services eg orthopaedic surgery, cardiac, dialysis, ICU; staff health service; population health.
- Membership usually includes representation from all sites (where organisation/network covers more than one site); and may represent all ward areas.
- Regional hospitals may also include a general practitioner (GP) representative and community health centre representative.
- No direct consumer representation but may report through to other committees which have consumer rep eg Consumer Advisory Committee; Quality and Safety committee.
- Chair (varies) may be from executive eg Executive director of clinical governance, CEO, directors of nursing or medical services; or the IC program clinical director from pathology or infectious diseases.
- Responsible to (varies) – DOMS, Executive Director of Clinical Governance, DON.
- Report to (varies) – directly to CEO, Board, or via other committees such as Clinical Practice and Safety Committee, Quality and Patient Safety committee, or sub committees of the Board, Clinical Governance Committee.
- Tend to be held monthly or bimonthly, all have documented terms of reference.
- Generally is network/organisation based and in NSW there are separate area health service based IC committees.

Figure 4: The infection control committee and governance structures of the infection control program#



† Reporting may occur via a sub committee of the Board.

* Or the clinical governance committee or clinical practice and safety committee.

At the time of this review Queensland Health was undergoing a restructure, and governance structures were unclear.

The IC committee is the main internal reporting mechanism, and IC programs report through the committee to the hospital executive. A number of barriers regarding the role of the IC committee were identified but most found the committee a useful forum for reporting IC issues to a broad range of hospital staff.

> *"We previously had a dysfunctional IC committee, nothing would ever get done…did a review and streamlined it with executive approval…now have people on the committee who can make decisions and enable some of the actions. It's now answerable directly to executive and governance structures are in place."*
>
> *"Committees don't make recommendations for executive to act upon. Limited effectiveness especially at area level."*
>
> *"The committee is a rubber stamping exercise rather than a discussion forum."*
>
> *"Committees not effective…can't authorise anything."*

A few interviews also revealed that one of the limitations is the duplication of IC data being reported to a number of committees.

> *"Overlap of two committees."*
>
> *"I report to 13 committees…reporting repetitively."*

IC committees or alternative systems of management can be a mechanism to engage clinical staff. Private hospitals and regional and rural facilities can have some difficulty engaging visiting medical officers (VMOs), and have used the IC committee to assist with this.

> *"Good clinical buy in from surgery. A representative from orthopaedic surgery sits on the IC committee and has an interest in IC."*
>
> *"The chair of the IC committee is a VMO, this is a voluntary unpaid position. Strategic committee with input from others eg pharmacy, purchasing manager etc to assist in influencing VMOs."*
>
> *"GPs don't come to day time meetings, only available after hours."*

Although consumer participation in quality and safety improvement can enhance and guide the hospital program,[6] the review found that very few of the IC programs sought consumer input, including consumer representation on the IC committee.

Summary

- The IC committee (or alternative system of management) serves a number of governance functions and is the main IC program reporting mechanism. It is the main conduit for information flow about IC issues to clinicians and hospital executives.
- Respondents perceived variable effectiveness of the IC committee, which may relate to the authority invested in the committee to ensure implementation of organisational policy and streamlining of communication flow.
- This review found that IC committees do not have consumer representation. The role of the consumer within IC programs has not been considered.

Infection control policies and procedures

All hospitals involved in this national review have IC policies and procedures in place, which are available to all staff electronically via the intranet. Very few facilities have hard copies available, most have withdrawn them.

IC policies and procedures tend to be based on the national guidelines, Australian Infection Control Association (AICA) standards, Centers for Disease Control and Prevention guidelines (USA), Australian standards, and in response to emerging infections.

Infection control policies and procedures are developed by the infection control staff in collaboration with the IC committee, and in consultation with other stakeholders and end users. They are ratified and endorsed by the IC committee and signed off or sponsored by the hospital executive.

Hospital IC policies and procedures reflect state and territory IC policies and guidelines. There were some minor differences between the jurisdictions including: hospitals in the ACT have ACT-wide IC policy and procedure manual; and NSW Health develops policy directives, areas modify them to suit local policies and procedures.

The ICP is responsible for updating the policies and procedures. Some hospitals have an automated reminder system. Others review their policies and procedures on an annual, biannual or triennial basis.

There is variation in the system used to coordinate, authorise and regularly review the policies and procedures but most facilities use a centralised process. The Quality improvement committee, Clinical practice improvement unit (NSW Health area function), Policy and procedure committee, Clinical

governance unit, or Quality and Safety unit may oversee, and coordinate the policy and procedure reviews.

Compliance of some of the policies and procedures are monitored by performing observational audits eg HH compliance, IV audits. These tend to be performed by the ICP or link nurse/champions from the clinical area in targeted high risk areas. Issues were raised regarding the limited ability of the ICP to monitor compliance of policies and procedures. Some of the issues raised are highlighted in the text below:

> *"No auditing in place for monitoring compliance to policies apart from HH…no resources."*
>
> *"Being monitored in part …some of which was being undertaken by the link nurses. Need resources to continue"*

Other limitations or areas requiring further development were also discussed by some of the participants in this review:

> *"Combined policies and procedures incorporating the community would be of benefit."*
>
> *"Currently policy and procedure review is an issue as we put all policies up through many committees."*
>
> *"We have an IC manual with over 700 policies and procedures!"*

Summary

- All participating hospitals have policies and procedures for infection prevention and control. They are generally available electronically to allow updating and to ensure the latest versions are being utilised by staff.
- IC policy and procedure development is undertaken by the ICP in collaboration with stakeholders and end users and an IC committee, but streamlining of these processes is variable.
- Some monitoring of IC policy and procedure compliance takes place in most hospitals, but is often limited by the resources available to conduct the compliance audits.

Infection control program team

Staffing of IC programs varied and was mainly dependent on the size of the hospital.

- IC programs tend to have an IC coordinator (NUM equivalent) who oversees the day to day running of the program. They are the lead person for the IC team (ICPs and nurses) and have a post graduate qualification in infection control.
- In addition to the IC coordinator, some programs (dependent on size) also have IC clinical nurse consultant (CNC) or clinical nurse specialist, who may or may not have a post graduate qualification in infection control.
- Some smaller, rural and regional hospitals may not have an IC coordinator but an IC CNC, Nurse unit manager (NUM) or Deputy DON who has an IC portfolio. They often have other hospital roles.
- Similarly in private hospitals depending on size, they may have an IC coordinator, or IC CNC.

Larger organisations tend to have a clinical director and the IC program is a service that is part of the division of microbiology, pathology or infectious diseases.

Nursing awards and terminology varies between the jurisdictions. We have therefore used terminology that is used in most jurisdictions.

Additional staffing for some hospitals IC program includes:

- Administrative support

- One hospital also has a Director of Nursing Infection Control
- One hospital had an infection control scientist (microbiologist) who produces reports, control charts and assists in data collection and organisation of IC course.
- Clinical nurse for auditing, hand hygiene, blood stream who may or may not associated with a ward.
- Link or liaison nurses – ward staff with IC role usually for education, auditing; coordinated by IC program (see Link nurse section for details)
- Hand hygiene champions
- One service has infection prevention team leaders which are made up of ward staff from each of the region's facilities (mainly nursing but others invited)

The Australian ICP is most often has a nursing background. All ICPs involved in this review had a clinical background in nursing. This is consistent with the findings from a survey recently conducted by the ACSQHC in collaboration with AICA, and previous work conducted by Murphy and McLaws in 1999.[7, 8]

5.1 Staffing levels

Staffing requirements for acute hospital IC programs has been discussed in the literature for over twenty years. Staffing levels have been described as a ratio of ICP staff per occupied beds and these numbers have varied. Some recent examples of staffing ratios include those recommended in the Australian national guidelines of 1.5 ICPs to 200 acute care beds, and similarly in Canada the ratio of 3 full time equivalent ICPs for every 500 beds in acute care settings has been proposed. While others argue that the ratio should be based on the scope and complexity of the IC program not just bed numbers.[9]

This stakeholder review found that most hospitals (public and private) employ an ICP but their level of experience and training varied. The staffing levels varied between and within jurisdictions; and the IC staffing levels tend to be determined at the hospital level. All IC staff had dedicated office space.

One large tertiary hospital had recently undergone a review resulting in an increase in IC program staffing. Infection control link or liaison nurse programs were in place or were in the process of being set up in a number of facilities to help reduce the workload of the ICPs.

Many ICPs indicated that the IC program had low staffing levels for the increasing workload and demands of the program; and finding staff with the experience and qualifications for infection control role was an issue.

> *"Weakness of the IC program includes the limited resources, funding and time…would like another IC staff member."*
>
> *"(We have) Difficulty finding project staff with infection control expertise."*
>
> *"Funding for resources, time, staff (is a program weakness)."*
>
> *"In the smaller facilities the deputy directors of nursing have infection control written into their position description; however they are not skilled to be dedicated to infection control…no infection control qualifications and little infection control experience."*
>
> *"…more resources within units needed such as link nurses."*
>
> *"I think reporting will become mandatory and we'll need additional resources."*
>
> *"There is a lack of a weekend service…no structure in place."*
>
> *"Qualified person to do the IC job…tends to be learned on the job in regional and rural areas…"*
>
> *"(We) work after hours...there is no clear structure in place for extra service provision"*

"Difficult to get extra funding and resources in private system…no IT support, or ID/ microbiology resources readily available."

Summary

- Most hospitals employ dedicated infection control staff.
- Most hospitals whether metropolitan, regional/rural, public or private, have an IC coordinator or IC clinical nurse consultant who manages the day to day running of the IC program.
- In small hospitals, the ICP is often a nurse with multiple roles, and with fewer infection control qualifications.
- There is perceived increasing IC workload for which current staffing levels and resources are inadequate. Inadequate IC staffing levels and resources is perceived as a major barrier to IC programs.
- There is perceived inadequate rostering to meet the needs of the IC program, such as lack of weekend IC staffing.
- There is a lack of consistency in designation of level of IC training required for the ICP role between jurisdictions, and a lack of consistency in jurisdictional definitions of (IC) nursing roles and awards.

5.2 Dimensions and scope of infection control practice

The dimensions of infection control practice were first outlined in the United States in the SENIC project[1] in the mid 1970s, and the first infection control analysis conducted by the Certification Board of Infection Control in 1982. Since then the scope of practice of the ICP has evolved from one that covered 8 practice dimensions with 60 tasks to 6 practice dimensions involving 147 tasks.[9]

In Australia, recent work by the Victorian Infection Control Professionals Association (VICPA) defined 8 key domains (outlined below) of IC practice, with 21 capabilities made up of 84 competency statements. They also describe 4 levels of specialty practice from novice/advanced beginner, competent, proficient to expert.[10]

From the VICPA paper the following 8 key domains of practice of the ICP (together with their knowledge and skills) were identified:

- Perform administrative duties
- Develop policy and procedures
- Minimise infection transmission risks
- Coordinate surveillance activities
- Manage outbreaks
- Undertake educational activities
- Provide expert advice
- Continuing professional development

This stakeholder review found that all ICPs interviewed undertake surveillance activities, staff education through inservices and orientation programs, manage outbreaks, develop policy and procedures, and provide consultancy.

When asked to describe their role as infection control coordinator or professional, many discussed infection control practice dimensions and activities they perform; while others described their role in the broader context of what they provide to the hospital.

"Education…surveillance, response to infectious disease exposures and outbreaks…developing, reviewing procedures, guidelines and standards."

"…coordinate and develop the IC program across the region which covers 12 hospitals."

"Coordinator who manages infection control."

"To provide advice, help executive understand impact…Facilitate learning in others"

"Not a clinical role but a consultant role – following a business consultant model that looks at the expert adding value…providing a supportive role not at a clinical level but at the consultative level."

A number of additional activities were described by the ICPs interviewed including:

- Monitoring or conducting observational audits such as hand hygiene compliance, IV or cleaning audits. These are generally coordinated by or reported to the ICP but data collection may be done by other departments. In some instances they are performed by the ICP. One ICP was also involved in assessing compliance with screening (VRE, MRSA) in high risk areas; hand plating was conducted by one ICP.
- Staff immunisation and health
- Occupational exposure management and counselling following needle stick injury
- Follow up on biohazards
- Community education and public health liaison
- Antibiotic surveillance
- Legionella control – work with facilities management
- Involved in medical sundries, product purchasing
- Provide advice to smaller or rural hospitals; support satellite regions out of town
- Workplace training assessment
- Inspect building renovations, advise on building works

Hospitals in the regional and remote settings have a greater role in liaising with the community. A number of larger hospitals, metropolitan or regional, also provide an advisory role to smaller hospitals or satellite services. Some examples from the review dialogue are listed below:

"We provide education to community services such as child care centres, disability services."

"Provide community education with brochures."

"Run education sessions to community groups as requested."

"Support satellite regions out of town. A resource, provide advice to GPs etc."

"Provide advice to smaller or rural hospitals and GPs."

Historically HAI are acquired in hospital, but community origin HAI and post discharge management of HAI is increasing. This has lead to an increasing need for the ICP to manage infection outside of hospitals. They are now being asked to manage infection across the hospital-community interface, with more and more community partners seeking assistance and advice from the hospital based ICP. However currently there is a fragmented approach to managing infection across the community-hospital interface.

"In Australia we are only just beginning to realise the importance of community interface and ability to prevent spread of infection."

"Now we need to look at how to broaden the ICP principles of clinical practice to manage the community-hospital interface. This is the future for the scope of practice of the ICP."

In small facilities, HAI surveillance is not the main infection control activity but more time is spent on the education and consultancy role.

"Surveillance is a minor role in remote locations."

A number of issues were raised, predominantly around time constraints and performing tasks outside of IC program scope. The findings also highlighted the lack of research being undertaken by ICPs.

> *"Staff immunisation, I don't see this as our job but at the moment it is."*
>
> *"Looking at outsourcing immunisation to occupational health and safety staff health nurse."*
>
> *"Audit program is expanding. Where there is good performance of IC audits in specific clinical units…Less need for input from us, allows us to allocate resources where there is greater need."*
>
> *"(Scope of practice) forever changing, from data collection and education to anything related to infection control."*
>
> *"No research, no time or resources."*

The recent paper by APIC/CHICA-Canada has research as one of the practice standards of infection prevention, control and epidemiology.[11] Similarly, other international papers that describe the scope of practice of the ICP have clinical research included as a core competence.[9, 12] However it is not included as one of the competencies in the VICPA paper. In Australia, there is a need for a culture that promotes research in infection control, and an environment which supports, encourages and facilitates clinical research.

Summary

- The scope of practice of the ICP has evolved in response to shifting models of health care and emerging infectious disease challenges.
- All ICPs are involved in core activities including HAI surveillance, staff education, policy and procedure development, outbreak management and consultation.
- ICPs in both the public and private hospital sector may be involved in additional tasks and activities such as staff immunisation, product purchasing. The number and type of tasks varies and, apart from liaising with community services, does not seem to be dependent on the location or size of the hospital.
- Regional and rural hospital IC programs tend to have a greater role in providing information and services to the community.
- Based on shifting models of care from acute to community based health care, there is an increasing need for the ICP scope of practice to recognise community based practice. We need to prepare, educationally and professionally to pursue the management of infection across the hospital-community interface.
- There is limited research being conducted by IC programs. Adequate resources to support and facilitate research in infection control are needed.

Support services and resources

6.1 Pathology services

Infection control programs work closely with pathology and microbiology services. As mentioned above, the review found IC programs sit operationally under the pathology services in most of the larger tertiary hospitals. We also found pathology services are generally outsourced in private hospitals and hospitals other than the major tertiary hospitals. Most IC committees of large metropolitan and larger regional public and private hospitals have a pathology representative as a member. Where the pathology service is outsourced, the IC committee is less likely to have a pathology representative.

There have been recent changes in South Australia with the establishment of a single statewide pathology service for public hospitals and to service approximately half of the private sector.

Although the review did not explore the relationship of IC programs and pathology services in depth, the importance of this relationship was raised by a number of those involved in the review.

> *"Placement of infection control under pathology works well – crucial for IC, infectious diseases and microbiology to work together closely."*
>
> *"Communication is important...issue when private labs are sent things and I don't hear back from them."*
>
> *"We went from having a hospital based pathology service to a regional service and now a private pathology service. IC issues in the community are no longer communicated back to the hospital service."*

Concerns were raised regarding hospital administrators and funding providers not understanding the relationship between the IC program and pathology services.

> *"There has to be recognition that laboratory services are needed for IC services but they are often seen as two separate services with the laboratory service being seen as a diagnostic service and IC service is separate."*
>
> *"Administrators see the function of the lab as a diagnostic service – not part of the IC service."*
>
> *"…support for expanding the pathology services to cope with screening is really important. NSW provided very little in extra funding to support their MRO policy"*
>
> *"Our lab runs flat chat and could do with some more staffing, in particular a full time person to run an MRO screening bench."*

Where private or outsourced laboratories are used issues around communication and service provision were also commented on. Some hospitals use multiple laboratories and this can create problems or additional work for the ICP.

> *"They don't see themselves as part of our health service. If I have a microbiology question I can't phone the private service, they will only answer questions related to a sample I've sent. I have to call a large metropolitan hospital with a public pathology service."*
>
> *"The (external) pathology service is contacted by clinical staff, and they tend to leave our guys out of the loop…outside the larger hospitals, everything is harder."*
>
> *"They are invited to be part of our IC committee but do not come along."*
>
> *"(Private hospitals) often have more than one pathology company outsourced; are protective of their data; ICPs may have to pull data manually from more than one data source."*

6.2 Infectious diseases specialist

Infectious disease (ID) specialists can assist the ICP, and provide expert knowledge and skills in aspects of infectious disease diagnosis, management and epidemiology.

This stakeholder review found that IC programs tend to liaise with ID specialists on an as needs basis unless from a hospital which has ID physicians on site where there are more regular and formalised meetings.

A number of IC programs from large public hospitals, have ID specialists as the program's clinical director – these groups have closer working relationships. Other large tertiary hospitals tend to have ID specialists on site, and the IC program staff meet with them on a formal and regular basis. Good rapport and relationships between the regional/rural hospitals and the larger metropolitan hospitals with ID specialists was also reported by several ICPs. There are also informal interstate relationships between ID services and some of the hospital IC programs.

> *"We (ICPs) meet with ID registrar weekly to ensure communication lines are open"*
>
> *"We meet regularly with ID physicians to discuss staph bacteraemia data."*
>
> *"ICP meets weekly with ID physicians through ICU…discuss ICU patients, other patients seen by ID physicians on a referral basis."*
>
> *"Weekly IC ward rounds of ICU with ICP, clinical director of IC, NUM, ID physician, ID pharmacist…"*
>
> *"IC program attend clinical audit meetings with ID specialists…we consult with VIDS and get guidance from VIDS as needed."*
>
> *"(From remote Queensland service) I contact Melbourne or Brisbane hospital ID specialists."*

6.3 Facilities management

Facilities management are usually represented on the hospital's IC committee, and IC programs have good working relationships with facilities management which cover:

- Food services
- Cleaning services
- Laundry and linen services
- Engineering
- Waste management

This stakeholder review found that many of the ICPs provide additional education and training to cleaning and food services. Cleaning services tend to conduct their own audits and the ICP may monitor the audit findings. A number of hospitals offer facilities management staff additional education and training which has financial incentives attached. One of the IC programs involved in this review has a dedicated IC cleaning team.

> *"Patient Services Assistants (PSAs) and cleaning groups have regular IC training - 6 sessions twice yearly."*
>
> *"For management of MROs we have dedicated IC cleaning team…discharge cleaning for patients under precautions. They are paid higher(rates) than other cleaners."*
>
> *"IC program has a close working relationship with environmental services."*

Summary

- IC programs work closely with pathology services, infectious diseases specialists and facilities management.
- Pathology services are needed for IC programs. Increasing demands on laboratory services to support the infection control and prevention program (eg VRE screening swabs) and the need for additional resources are often not being met or recognised by administrators and funding providers.

6.4 Structural resources

6.4.1 Information management – data collection, analysis and feedback

This national review found that ICPs coordinate, collect, analyse and provide feedback on the HAI surveillance data. In smaller hospitals the data management tends to be done solely by the ICP. A number of IC programs from the larger hospitals have administrative support to assist with data entry; or IC liaison staff, or other clinical staff (HH champion, infection prevention team) may also be involved in some data collection. Some of the data collection systems are automated or linked in with laboratory systems.

Some of the data analysis is also done by the state/territory wide surveillance services eg VICNISS, CHRISP. A number of participants mentioned that both Queensland and Victoria have more mature centralised surveillance systems. Queensland use statewide software (one system) which is linked to the hospital administrative databases. The next version will also link in with pathology and theatre data modules.

Feedback on surveillance data tends to occur via the IC committee, or is given directly to wards if there are particular issues. Other feedback mechanisms such as monthly clinical unit reports, newsletters, information on intranet etc are also utilised.

A number of limitations and enablers regarding the practicality and usability of the information management systems were raised.

> *"Could be more streamlined at state level…issue with data reported back from NSW Health being delayed."*
>
> *"Communications with ground staff regarding feedback of surveillance data needs improving."*
>
> *"Double data entry issue."*
>
> *"Poorly resourced state apparatus for data collection, validation."*
>
> *"Northern Territory IT systems are not compatible…unable to create graphs. IT system is problematic. System of collating is outdated, requires manual sorting…time consuming and not validated with microbiology data. No administrative support."*
>
> *"There is a lot of IC data that is not being tapped into."*
>
> *"The HISWA data entry tool could be improved – more user friendly for data entry."*
>
> *"Clerical assistance available to most…previously done by ICP now seen as a waste of skills."*
>
> *"Direct access to pathology system…daily downloads."*

6.4.2 Use of incident reporting systems

Incident reporting systems enable health care workers to report and document patient safety incidents. This stakeholder review found that incident reporting systems are used by some hospitals to report infection control issues. There was mixed feedback regarding the usefulness of incident reporting systems, and there was no indication from participants that the information is being used to better understand patient safety incidents. Some of the comments are listed below:

"Staff use the incident reporting system to report issues related to equipment shortage, failures etc and now moving to report surgical site infections."

"Riskman is used and if an issue is found we write to ask for an explanation…expect reply in one week."

"Ad hoc reporting by staff."

"Our service is not integrated into the process…get some information from the system but aren't always involved."

"Infection isn't considered a serious or high risk event unless it leads to a death."

"Incident reports are not always timely getting to me."

"It's an issue that reporting (of infections) is not mandatory."

Summary

- Information management is generally performed by the ICP. Some of the larger hospital programs have administrative support to assist with data entry.
- A number of data management issues were raised including duplication of data, data entry tools not being as user friendly or as practical to use as they could be. Pathology reports are available automatically to some IC programs, but others have to manually pull the data from the pathology system.
- There needs to be further assessment of how incident reporting systems can be more effectively used to support IC programs.

6.5 Education and training

The national guidelines recommend "...each health care establishment should employ an ICP with an appropriate education to practice in that setting." This stakeholder review did not assess the level of education and training of ICPs in depth, but a number of those participants interviewed raised this as an issue for the profession.

"Qualified person to do the job but it is unclear what that qualification is. It is not defined."

"Tends to be learnt on the job in regional and rural areas, even though there is evidence to show that a qualified ICP can reduce HAI."

"Training needs a broader organisational perspective."

"There needs to be standardisation of training of ICPs."

"There is a lack of a scholarship specifically for infection control."

AICA recommends certificated credentialing of ICPs.[13] This is a self-regulatory process to determine and acknowledge that an individual has demonstrated prescribed competence of the relevant specialist nursing role.

The process of credentialing designates specialist or advanced expertise; informs consumers; establishes a national standard; promotes career advancement; identifies a community of experts; contributes to qualifications for independent practice; enhances the quality of care provided; and assists employers to manage risk.

Credentialing (referred to as certification in the USA) of the ICP has been discussed in the literature, but is limited to USA and UK based papers and very few Australian papers. The literature and feedback

from AICA representatives inform us that the uptake of the credentialing process in Australia has been limited. This stakeholder review did not assess these issues in detail.

As part of this stakeholder review, we looked at what education programs in academic institutions are currently available for nurses seeking or establishing a career in infection control in Australia. Table 1 gives a brief outline of the courses available by state/territory.

Currently there is no minimum or standardised educational requirement to practice as an ICP, or to coordinate an organisational IC program. The content of educational programs available to the ICP is variable because there are no Australian infection control standards of practice available to guide course or professional development.

Not all jurisdictions offer courses through their universities. However a number of courses are available by distance education. A variety of post graduate courses are available through universities ranging from a 5 day course offering a certificate of attendance, to a 1 year full time Graduate Certificate in Nursing Science (Infection Control) course. Other courses include a 3 day introduction to Infection Control course with open entry, and Infection Control and sterilisation courses. Several hospitals also run short courses, some in conjunction with universities e.g. Princess Alexandra Hospital, Qld offers a 2 week program which allows credits to the Griffith University Graduate Certificate course.

Many universities offer a Masters degree in Nursing, Health Sciences, Nursing by Research or Advanced Practice where the amount of infection control content varies and is up to the individual to choose those elements as electives.

Table 6: Brief outline of infection control courses by jurisdiction

Jurisdiction	Educational facility	Course
ACT	Canberra Institute of Technology	Training program in IC for office practice – one semester
NSW	Sydney hospital & Sydney Eye hospital	Post registration nursing course in IC - 26 weeks
	NSW College of Nursing	Introduction to IC - 1 day IC in aged care facilities – 2 days
	Macquarie University	Graduate Diploma in IC
	Charles Sturt University	Masters in Health Science Masters in Nursing Research
Queensland	Griffith University	Graduate Certificate in IC Master of Advanced Practice (infection control and prevention)
	James Cook University	Postgraduate Certificate of IC – 0.5 year FT
	Princess Alexandra hospital	IC course – 2 weeks

Jurisdiction	Educational facility	Course
SA	The University of Adelaide	Graduate Diploma in Nursing Science (IC nursing) -1 year FT Graduate Certificate in Nursing Science (IC) - 1 year FT
	Flinders University	IC course - 5 day IC update - 1 day
	Women's & Children's hospital	Link Nurse course -2 day Link nurse refresher -1 day
Victoria	Mayfield Education Centre	Introduction to IC -3 days Certificate in IC & Sterilisation - 30 on-site days + 195hrs non-contact learning over 10 months Certificate in IC in Long term care facilities -14 days+ 146hrs non contact learning + 2 day practicum at RMIT
WA	Charles Gairdner hospital	Graduate certificate in IC – 0.5 year
	Royal Perth hospital	IC short course - 8 separate hours
	Curtin University	Graduate Certificate IC - 1 semester Graduate Diploma IC - 2 semesters Master of IC -3 semesters
	Hands-on Infection Control (private company)	Range of education & training options from 1 hour to full day for a variety of settings covering a range of topics.

Findings from interviews with IC coordinators show that most ICPs at the coordinator level have a post graduate qualification in infection control. Many stated that this would be an essential element of expertise for the IC coordinator. Most ICPs were aware of the courses available throughout the different states.

A number of reports, including the VICPA competencies paper, include ongoing professional development as a domain of care or area of competence for the ICP.[10, 14] Several of the ICPs interviewed described use of IC resources and professional development activities through the professional associations and state based government services.

"CHRISP is a wonderful support, information source."

"VICNISS has online education."

"Professional development is very important, either formal education or networking."

"This hospital mandates that both ICPs go to the national AICA conference."

Summary

- A range of education programs in academic institutions are currently available for nurses seeking or establishing a career in infection control in Australia.
- The content of educational programs available to the ICP is variable because there are no Australian infection control standards of practice available to guide course or professional development.

6.6 Mentoring and ICP networks

This stakeholder review found there are no formal mentoring programs in place for Australian ICPs. A number of ICPs interviewed reported that they provide mentoring to external people such as less experienced staff.

Many ICPs described the networking and support forums available through AICA and the AICA state and territory affiliated associations, as well as region based forums. Use of other informal networks and contacts with ICPs were also reported. There tends to be greater networking in regional and rural settings. Some examples were reported during the stakeholder interviews including:

> *"Northern Territory ICPs meet face to face annually – funded by NT health."*
>
> *"South Australian Nosocomial Infection Taskforce (SANIT) forum for mentoring - works well but can become too big and discussions can be disorganised."*
>
> *"WA Country Health IC network monthly teleconference."*
>
> *"Bimonthly Gippsland RICPRAC (Victorian rural infection control practice group) meeting."*
>
> *"Important for us in Tasmania to tap into other networks such as AICA, TICA."*

AICA is the peak national body representing the interests of the specialist practice of infection control within Australia. AICA represents the collaboration between the State and Territory infection control associations in Australia.

AICA seeks to support those engaged in the specialist practice of infection control as well as the broader health care community in relation to infection control by acting as an information broker to its members. As a voluntary not-for-profit association AICA serves as an important vehicle for clinician lead change.

Relationships

7.1 Other internal relationships – hospital staff

As outlined in the literature, strong leadership at the ward level and from administrators is critical in achieving clinician buy-in and reducing HAIs.

The literature and the review's findings show there are issues around organisational culture and clinician behaviour which can impact on the success of an IC program. A number of ICPs discussed their lack of empowerment and limited influence to change clinician behaviour.

In addition to having a multidisciplinary IC committee with representation from hospital clinical and non clinical areas, IC programs seek to engage staff using a number of strategies including:

- Providing infection prevention and control education;
- Reporting infection control data directly to staff;
- Providing infection prevention and control information and data on the intranet or via hospital wide newsletters;
- Coordinating or facilitating a link nurse/health care worker program; and
- Other initiatives such as having IC representative or IC prevention teams from each ward/area.

To raise awareness of the service and to provide basic IC education, IC programs are involved in the hospital orientation program. IC programs tend to provide additional education sessions and inservices, although the frequency and participation is variable.

IC programs often report infection rates and infection control issues directly to doctors and the teams, some also send annual reports to each of the hospital divisions, and some have regular IC reports available on the intranet.

7.1.1 Link nurse

The infection control link (or liaison) nurse acts as a link between their own clinical area and the infection control team.[15] The role of infection control link nurse is to:

- Raise awareness about infection control and prevention issues
- Support the compliance of infection control practice
- Provide a communication link into clinical and non-clinical areas

In the UK a national review of the infection control link nurse role, found that "departments consider they are effective when there is a relatively stable workforce, the hospital is on a small number of sites, nurses have recognised authority, and they are allocated time to attend meetings and training sessions."[15] From the review, a number of Australian hospitals have a link nurse program in place. However there were mixed responses regarding the success of the program. The following outlines responses from a number of participants about the role of the link nurses, and some of the enablers and barriers identified:

> *"(the link nurse) provides advice, coordination of service at the coal face, when on duty or as link nurse."*
>
> *"Liaison nurses on wards assist with buy-in but variable."*
>
> *"Works well in some areas where they are well supported…works well with enthusiastic personalities…but is fragmented in most."*
>
> *"Purpose of link nurse education program is to leverage infection control assistance and also create engagement"*
>
> *"Link nurses didn't work – too busy on wards, staff turnover was a problem"*

"Link nurses in all facilities but variably supported"

"Liaison group …very good initiative as couldn't get any more resources."

"We provide incentives for the liaison group and award prizes such as book vouchers for the nurse with the highest activity based points."

"We looked at the difference between 2 wards (snap shot audit without notice) – one with and one without link nurses, and found 15% greater compliance on the link nurse ward."

"The link nurse training was organised by the state health department. I have good support from senior ward management and the IC program. It is a rewarding and fulfilling role…helping patients not get infections."

"Difficulty at times when on link day to not help out with usual ward activities when staff are very busy."

A number of other strategies have been developed to assist with increasing hospital staff buy-in, and raise awareness of infection control and prevention issues. For example, a regional area ICP has developed infection prevention teams (multidisciplinary team) for each healthcare facility or multi purpose site to facilitate:

- Information sharing
- Effective communication
- Recognition and use of existing site expertise
- Local capacity building

7.1.2 Barriers to hospital staff engagement in infection control

Although a number of strategies are in place to facilitate engagement of hospital staff in infection control, several ICPs and clinical directors raised the lack of buy-in as a limitation of their IC program. In hospitals where medical staff and other non clinical staff are not directly employed by the hospital, this is an even greater challenge.

"Challenging to get doctors – surgeons and medical practitioners – involved, even though we ask them to be on committees (private hospital)."

"Medical buy in is poor, system of communication with medical staff is poor."

"Contracted cleaners and food services (are invited to but) don't have to attend orientation (private hospital)."

"Visiting medical officers (VMOs) are not employed by the (private) hospital, and more difficult to ensure compliance with recommendations and Australian standards."

"Challenge with engaging formally with medical staff, for example, no orientation, no planned regular education, communication with medical officers. Poor buy-in."

A number of enablers were suggested with the focus being around mandatory training:

"We want infection prevention and control to be like the fire drill, you have to sign off every year eg hand washing, correct aseptic technique."

"Not everyone goes to orientation but it will be mandatory soon."

"Grand round presentation which had good response (from medical staff)."

"Sent letters out to all VMOs about hand hygiene rub with good response. Usage rates improved by 92% in March-August 2008 over 2007 levels."

"IC nurse manager attends monthly nurse unit manager meetings – high profile on wards."

Summary

- IC programs utilise numerous strategies to engage hospital staff in infection prevention and control.
- Link nurse programs have been implemented in a number of hospitals with mixed success. Having allocated time to perform link duties, strong ward leadership, incentives, stable staffing and choosing a link nurse with an interest in infection control were reported enablers.
- Lack of clinician buy-in was reported as a major barrier to successful infection control programs.

7.2 Relationship with government

We interviewed representatives from all state and territory health departments except the Northern Territory.

The role of the jurisdictional funding providers is:

- To articulate funding, policy and direction for public hospitals
- Regulation and licensing of private hospitals (federal government's role in ACT and NT)
- To provide expert advise (often in collaboration with an expert advisory committee)
- To support hospitals in a state-wide approach
- To monitor communicable diseases in public health domain – reporting and compliance

The branch, unit or division that is responsible for public hospital infection control varies among the jurisdictions however the role and governance structures are similar. As outlined in Table 2, IC comes under the safety and quality, the public health, acute care or the communicable diseases branch. Although we did not specifically ask about barriers and enablers regarding where in the government department hospital infection control sits, it was raised as an issue by one of the review's participants.

> *"IC has moved from infectious diseases to quality branch. OK in some respects but misses out on the epidemiological expertise from Communicable Diseases Control (CDC) branch, and also enables CDC to dodge the issue of spreading community MRSA infections that impact on health care."*

Within the health departments a number of internal lines of communication exist some examples are given below. However, most lack formal communications for example in the format of a regular meeting.

- In Victoria the Statewide quality branch liaise closely with the Public health branch;
- In Western Australia, the Office of safety and quality in health care and the Centre for communicable disease control directorate have a complimentary working relationship.
- In South Australia meetings between the Communicable diseases control branch and Public health are informal but frequent
- In NSW the Quality and Safety branch has a close working relationship with the Public health branch.

Most jurisdictions have (or plan to have) an expert advisory committee to provide strategic direction in relation to infection control and prevention (see Table 2). These committees are multidisciplinary and include representation from metropolitan, regional and rural hospital settings, as well as pathology services and private hospitals. The Tasmanian infection control reference group also has primary care representation.

Other infection control networking groups with department based secretariat or departmental representation are run in a number of jurisdictions. They are predominantly a networking forum and have been outlined in section 6.6.

Table 7: Differences in jurisdictional hospital infection control governance and services

Jurisdiction	Department responsible for hospital infection control	Expert advisory group	Surveillance service
Australian Capital Territory	Patient safety and quality unit	ACT-wide reference group#	-
New South Wales	Quality and safety	HAI advisory group	HAI*
Northern Territory	Acute care division	-	Send data to RDH IC DON
Queensland	Communicable diseases branch	CHRISP expert advisory group# (CEAG, formerly ICEAGE)	CHRISP
South Australia	Communicable disease control branch	Establishing	Infection control service
Tasmania	Public health unit, Population health	Tasmanian IC reference group	TIPCU*
Victoria	Statewide quality branch	VACIC	VICNISS
Western Australia	Communicable disease control directorate (HAI unit)	HICWA expert advisory group	HISWA

* Recently started service in stage of development.

At time of review group was not running.

7.2.1 State and territory wide infection control and HAI surveillance services

Most jurisdictions have a state or territory wide infection control centre that provides a centralised surveillance service. Although the focus is on infection control in public hospitals, private hospitals are (or will be) invited to contribute to most of the surveillance programs.

Their primary role is to coordinate healthcare associated infection surveillance systems for public (and private) hospitals, and provide support to implement surveillance activities.

Other roles include:

- Education, training and support
- Leadership, coordination of IC strategies
- Policy development or advisory capacity for policy development
- Emergency planning
- Provide an important networking/communicative role

Some differences across the jurisdictions:

- Participation in surveillance programs is voluntary for all jurisdictions except NSW.
- NSW Health and TIPCU (Tasmania) are in the early stages of surveillance work.
- TIPCU hospital surveillance data is validated against pathology reports.
- ACT Health do not have a surveillance centre but receive ACHS clinical indicator data from public hospitals.
- NT has a system in place to collect and aggregate the surveillance data for presentation to district managers and NT Health.
- CHRISP is a statewide service which is part of the Southern Area Health Service, Queensland Health and reports to the Senior Director, Communicable Diseases Branch. CHRISP has two missions as it is both an implementer and an enabler of evidence-based and clinical led business practice change. At the time of the review a restructure of Queensland Health was occurring.
- VICNISS model in Victoria is based on the US Centers for Disease Control and Prevention program called the National Nosocomial Infection Surveillance system (now called the National Healthcare Safety Network). Private hospitals have recently been invited to submit their data. There is joint executive sponsorship with Victorian Department of Human Services and Melbourne Health.
- HISWA is the Western Australia statewide surveillance program managed by the HAI Unit at Communicable Disease Control directorate, and supported by the Office of Safety and Quality in Health Care. Both public and private hospitals are involved.
- The Communicable Disease Control branch of SA Health collect and aggregate HAI surveillance data and antibiotic utilisation data from both public and private hospitals.

From jurisdictional representatives, the following issues were raised in this stakeholder review:

> *"Difficulty getting solid data re infection rates – differing interpretation on collection methods, definitions of denominators…flaw in the system."*
>
> *"Poorly resourced state apparatus for data collection, validation, variable practice in surveillance."*

7.2.2 Other government reporting mechanisms

There is currently no inter-jurisdictional or national accountability. However, the Australian Health Care Agreements (AHCA) is currently in the process of negotiating the inclusion of two national indicators that relate to infection control.

Some jurisdictions have additional mandatory reporting of HAI indicators, including:

- NSW Health mandatory reporting of 8 indicators. These are a subset of the ACHS clinical indicator program, and are only required to be reported by public hospitals.
- Mandatory reporting of key HAI clinical indicators to WA health. These indicators are reviewed by HICWA. All WA public hospitals and licensed private healthcare facilities providing services for public patients are required to implement clinical indicators.
- MRSA is a notifiable disease in WA.
- SA health is in the process of developing mandatory reporting indicators.
- KPIs for Country Health SA include education and training (attendance), MRSA, surgical site infections, AB surveillance which is jointly collected and reported with drug and therapeutics committee.
- VRE is a notifiable disease in Tasmania.
- Health Quality and Complaints Commission (HQCC) in Queensland collect mandatory data on surgical safety and optional data on hand hygiene standards from both public and private hospitals.

- Victoria use their statewide public hospital compliance of the infection control data submission to VICNISS as a key performance indicator. (and is now linked to performance agreement (payments) for larger hospitals).
- A system is being developed in Victoria requiring all hospitals to submit data on all bloodstream infections. The data will be used to as a key performance indicator with the MRSA isolate rates for HH program.

As discussed in the information management section of this report, duplication of reporting and issues regarding data collection mechanisms eg needing to manually pull data, variability in data interpretation, and the inability to look at rates and respond in real time were some of the limitations of the external reporting mechanisms raised.

Summary

- The role of the jurisdictional governments in infection control is similar across the states and territories. However there are small differences in their governance structures and services they facilitate.
- Regulation is the only role of the state governments within the private hospital sector.
- There is no consistency of what is reported to each of the jurisdictional governments.
- There are currently no infection control indicators reported at a national level, but planning is underway with the Australian Health Care Agreements.

7.3 Relationships with other external agencies

Links with community services, regional and jurisdictional based networking groups, external pathology services and external ID expertise have been detailed in previous sections of this report.

This stakeholder review found that several of the participating IC programs had additional relationships with agencies outside of their hospital, including:

- Voluntary reporting of *Staphylococcus aureus* blood stream infection to ANZCOSS;
- Benchmarking with like hospitals - for example the Royal Hobart Hospital and The Canberra Hospital benchmark some of their HAI surveillance rates;
- Participation in the ACHS clinical indicator program which includes some infection control indicators.

Differences between types of hospitals

8.1 Private hospitals

A number of differences between public and private hospital IC programs have been described in this stakeholder review. The main differences are outlined below.

Regulation is the state governments' only role within the private hospital sector. This role is different to that of the public hospital sector where the state and territory governments articulate funding, government policy and direction, and monitor HAI rates.

Private hospital licensing requirements include infection control minimum standards. Infection control is also integral to private organisations achieving accreditation. Whereas, there are no jurisdictional minimum standards for infection control in the public hospital sector.

Private hospitals are invited to participate in some of the jurisdictional-level surveillance services. Where this has occurred, good buy-in and a strong willingness to be involved were reported in this review.

Private hospitals may have more than one pathology company outsourced, and the ICP may have to pull data manually from a number of databases. Cleaning and food services are contracted in the private sector. Staff from these services are encouraged to attend orientation but do not have to.

In private hospitals VMOs are not employed by the hospital which may make it more difficult to ensure compliance with recommendations, guidelines and Australian standards. It is challenging to get VMOs involved in IC committees as the positions are voluntary and often unpaid. Similar issues were raised in smaller hospitals and regional and rural hospitals with VMOs and GPs.

8.2 Rural and remote hospitals

Several differences in the rural and remote hospital IC programs were also reported in this stakeholder review.

Staff retention and recruitment issues were raised. In some areas it is not only difficult to fill some of the ICP positions, but there is also high turnover of other hospital staff making the role of the ICP in provision of IC education to hospital staff, and the recruitment and training of positions such as link nurses increasingly difficult.

Access to local expertise is also limited. Rural, remote and some regional areas do not have access to microbiology or ID physician expertise. This stakeholder review found that ICPs have good networks and connections in place. ICPs in rural and remote settings tend to work in isolation and generally seek advice from metropolitan services, or other larger regional hospitals and form strong networks with other like programs. The ICP in the small hospitals need to be competent in IC knowledge or know how to find expert information in infection control.

Most of the regional, rural and remote hospital ICPs raised the issue of there being a shortage of qualified IC staff. They have difficulty finding replacements or back up for leave, and reported a lack of succession planning.

In addition, a number of regional and rural ICPs reported having a greater role within their hospital. For example they may take on a clinical workload because there are no agency staff in their settings. As mentioned in section 5.2, outside of the metropolitan settings, ICPs tend to have broader communications with the community.

Limitations

There were a number of limitations with this stakeholder review, namely:

1. Limited access to jurisdictional and executive representatives. Within the timelines not all contacted respondents were able to provide an interview time and others cancelled at short notice. Unfortunately, the Northern Territory health department is not represented in this stakeholder review, and we were unable to interview hospital executives representing all of the jurisdictions. Private hospitals are not well represented in this review.
2. Limited number of stakeholder interviews. This review involved key informant interviews with 37 participants representing various levels of the public and private health care sectors. Our sample of stakeholders was one of convenience not a random sample. We also only interviewed hospitals that have an IC program in place. It should therefore be read with caution and not as a representation of all Australian public and private hospitals.
3. At the time of this stakeholder review, Queensland Health was undergoing a restructure. Their corporate and clinical governance structures were unclear.

Recommendations

Governance

Clinical governance should reside at all levels of a hospital and the hospital should ensure commitment to IC through active executive participation and sponsorship.

The clinical governance framework for IC programs should consider governance, including responsibility and accountability from the point of care up to the hospital executive, (and the Board) and to jurisdictional and national government bodies.

The clinical governance structure of the IC program should consider all relevant stakeholders, in particular; pathology services, expert clinical groups, community partners and consumers.

An IC committee should have a clear mandate for its activities which are explicitly outlined in terms of reference and are supported within an effective governance structure.

There needs to be a review of clinical governance to support greater adherence of individual clinicians to IC policies and procedures. This should consider components of the clinical governance framework, including credentialing, support strategies, performance assessment, monitoring as well as remedial response processes.

Infection control program components

The model of IC program should be informed by the size and complexity of the healthcare organisation and its community partners, and assessed needs and priorities.

IC programs require a risk management plan that includes management of infection outbreaks.

An IC program requires a funding model that supports the specified program activity domains and resources necessary to implement and sustain these activities.

Hospitals should support IC programs with staff dedicated to infection control and adequate access to expertise in infectious diseases, microbiology and pathology services and epidemiological methods.

Hospitals should provide structural resources to support the ICP including effective data collection, analysis and reporting systems.

ICP scope of practice

The scope of practice of the ICP should be outlined within a job description that includes the common and required elements of HAI surveillance, outbreak management, education, IC policy and procedure development and consultancy; and is flexible to meet the needs and priorities of the hospital.

Education and training of the ICP

The scope of practice of the ICP should reflect the education and training of the ICP in relation to expected roles and responsibilities.

It is recommended that there be a national approach to developing curricula for infection control post graduate courses.

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Key informant interview questions

Jurisdictional level

The following are the key areas we are interested in reviewing:

1. What is the role of the jurisdictional government in infection control (IC) within public and private hospitals?
2. How is infection control structured within the divisions of the jurisdictional health department?
3. What are the reporting mechanisms for infection control and prevention staff at the jurisdictional level?
4. How is infection control funded?
5. What infection control programs are currently in place in the jurisdictions for public and private hospitals?
6. What is the scope of practice of the Australian IC practitioner?

Facility level – executive and management role

The following are the key areas we are interested in reviewing:

7. What is the role of hospital executive in infection control?
8. What are the reporting mechanisms and regulations for infection control and prevention at the facility level?
9. What is the structure of the infection control program and how does the model fit within the organisation
10. Are there outstanding issues that need to be addressed?
11. What is the scope of practice of the Australian infection control professional?

Facility level – ICP role

The following are the key areas we are interested in reviewing:

12. What infection control program is currently in place in the facility?
13. How is governance of HAI addressed at the facility level?
14. What are the reporting mechanisms for infection control and prevention staff at the facility level?
15. What infection control policies and procedures are in place at the facility level?
16. How is information managed regarding data collection, analysis and feedback?
17. What is the scope of practice of the Australian ICP?
18. What mentoring support programs for ICP exist?
19. What education programs in academic institutions are currently available for nurses seeking or establishing a career in infection control in Australia?

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Appendix 3

Victorian infection control competencies

Introduction

Author: Louise Hobbs

Competency standards are an essential tool for defining and articulating a speciality practice, developing education curriculum, and guiding professional development. They inform the public, workplace, and individuals what level of practice is required to ensure the provision of a safe and effective service.

Whilst competency standards have been developed for other nursing speciality areas, there is not currently a recognised set for the Infection Control Professional (ICP).

ICPs in Victoria have, on a number of occasions, raised concerns to the Victorian Infection Control Professionals Association (VICPA) executive around professional development, career and pay structure, educational and staffing requirements. It was recognised that in order to address some, if not all of these issues, the investigation into the scope of practice and the development of competency standards for the Victorian ICP was required.

These competency standards were developed based on the outcome of a series of workshops that were held and attended by invited recognised Victorian experts in infection control. The method chosen to develop the standards included the following steps:

- Identify experts in the Victorian ICP field
- Hold a workshop to define the scope of practice of the ICP (knowledge and skills required and the key activities in their role within the workplace)
- Conduct a survey to validate the activities within the broader infection control community
- Hold two, two-day workshops to develop quality statements for each activity

The basis for using each of the steps above and their subsequent outcomes will now be discussed in further detail.

Workshop 1: Defining the Scope of Practice

The method chosen to identify and define the scope of practice for the Victorian Infection Control Professional was the DACUM (developing a curriculum) technique. This methodology is primarily used to develop education curricula, hence the acronym DACUM, but it has also been used successfully to develop standards of practice [6, 8, 13]. Twelve experts, selected by VICPA, attended a workshop where a series of brainstorming techniques were used to identify:

- Domains of practice (duties)
- Capabilities (tasks)
- Skills
- Knowledge, and
- Attributes required to work successfully within the speciality of infection control [9].

The workshop outcomes were validated by surveying the VICPA membership. The survey requested members to identify the importance and frequency in which these tasks were undertaken. The results were analysed using a RASCH item response model, which validated that the majority of the identified duties (domains) and tasks (capabilities) all tapped into the same construct. The outlying capabilities identified by the survey, those that did not fit into the scope of practice construct, were clarified and modified during the competency development phase and are reflected in the final scope of practice document [10].

Outcomes and Recommendations

1. The National Specialisation Framework for Nursing and Midwifery, based on the National Nursing Organisation (NNO) criteria for specialities in nursing, identify six criteria that a speciality requires to meet before it is accepted as a nursing speciality. The first of these criteria require a speciality to define their scope of practice within the context of its knowledge, skills, and population or area of activity which is based on a core body of nursing knowledge [11, 12]. The first workshop was able to capture and validate the speciality skills, knowledge and workplace behaviours of the ICP and that these build on an underlying core body of nursing knowledge. This meets one of the fundamental criteria required of a nursing speciality.

Eight key domains of practice of the ICP together with their identified knowledge and skills were the identified outcomes of the workshop and survey:

- Perform Administrative Duties
- Develop Policy and Procedures
- Minimise Infection Transmission Risks
- Co-ordinate Surveillance Activities
- Manage Outbreaks
- Undertake Educational Activities
- Provide Expert Advice
- Continuing Professional Development

2. The following recommendations were also generated from the workshop: · ICPs standardise their workplace title to Clinical Nurse Consultant in line with the Victorian Workplace Agreement (15). A structured career path within this framework is developed.

Workshops 2&3: Competency Development

The domains of practice and capabilities identified within the scope of practice workshop were used to guide the development of the competency statements. Two, two day workshops were undertaken and using a series of brainstorming techniques quality statements were developed for each of the capabilities for each of the eight domains.

Outcomes and Recommendations

The overall process produced the following outcomes and recommendations:

1. The outcome of this process revealed four levels of practice. The workshop participants agreed that nurses entering into the speciality of infection control would not be junior nurses and would require at least two to three years of clinical experience before moving into the speciality. The first level would be considered to describe the practice of a Novice/ Advanced Beginner, the next Competent, the third Proficient and the fourth Expert.
2. The process identified three areas where an ICP could be undertaking a clinical assessment and therapeutic role beyond the defined competencies:

    - Co-ordinating an immunisation program,
    - Co-ordinating blood and body fluid exposures
    - Develop a management plan for a HCW with occupational dermatitis

    In each of these cases the workshop participants agreed that if an ICP was practicing beyond the developed competencies they would be expanding their scope of practice. This would require the individual nurses to meet the educational and practice requirements as outlined in the following documents:

- Nurses Board of Victoria, Guidelines: Scope of Nursing & Midwifery Practice (2007) [14].
- Australian Nursing and Midwifery Council, National Competency Standards for the Nurse Practitioner (2006) [5].

3. The competency statements can be used to guide the development of an infection control education curriculum that will meet the needs of the Victorian infection control workforce.
4. To establish a mentor program that will identify a group of experts who are willing to provide opportunities for sharing skills and experiences to assist other ICPs to develop and meet their personal and work related goals and build their networks.

How to read the document

These competency standards recognise that specialist practice requires advanced knowledge and skills in the field of infection control. Therefore the purpose of the competency standards is to provide a best practice framework to guide the continuum of learning and development for nurses working in the field of infection control.

In defining the scope of practice of the ICP it was identified that the skills, knowledge and workplace behaviours build on an underlying core body of nursing knowledge and practice. The ICP is first and foremost a registered nurse and therefore should comply with the Australian Nursing & Midwifery Council (ANMC) National Competency Standards for Registered Nurses and The Australian Nursing Federations (ANF) Competency Standards for the Advanced Nurse [2, 3]. The competency standards in this document must be read in conjunction with these other publications.

Domain 1: Perform administrative duties
Capability 1.1: Infection control program
1.1.1. Implement and monitor an infection control program which is supported by an operational (strategic) and business plan which meets the needs of the organisation.
1.1.2. Evaluate the program annually and initiate improvements where appropriate taking into consideration internal data trends, international, national, local and best practice changes.
1.1.3. Provide evidence to meet accreditation requirements.
1.1.4. Incorporate financial and resource implications in reports, program planning and projects.
1.1.5. Perform general office duties to support infection control activities.
1.1.6. Maintain a system to manage records and resources.
1.1.7. Manage information systems to facilitate communication throughout the organisation.
Capability 1.2: Coordinate meetings
1.2.1. Participate as a member of the infection control committee.
1.2.2. Participate in meetings and provide best practice advice and recommend changes based on clinical and economic outcomes.
1.2.3. Initiate meetings when required and monitor outcomes through action-oriented minutes.
Capability 1.3: Participate in infection control projects
1.3.1. Develop and implement infection control improvement projects which are guided by evidence based best practice reviews.
1.3.2. Participate in infection control research projects as resources allow.
Capability 1.4: Conduct literature review
1.4.1. Develop specific questions to guide literature review.
1.4.2. Perform a literature search using appropriate search engines.
1.4.3. Critically review and evaluate the evidence based on literature appraisal guidelines.
1.4.4. Translate and modify information to apply to healthcare service.

Domain 2: Provide expert advice
Capability 2.1: Provide expert advice
2.1.1. Source and critically evaluate information to guide response to a query.
2.1.2. Apply risk management, epidemiological principles, knowledge of related legislation, standards and guidelines and current literature when providing advice.
2.1.3. Incorporate adult learning principles and techniques to stimulate behaviour change when required.
2.1.4. Establish links and liaise with external and interdepartmental experts (i.e. microbiology, infectious disease physicians) and external bodies.
2.1.5. Works collaboratively within a multi disciplinary team.

Domain 3: Develop policy and procedures
Capability 3.1: Write policy and procedures
3.1.1. Write/review policy and procedures according to organisational guidelines.
3.1.2. Identify and seek key stakeholder opinion when writing /reviewing policy and procedures.
3.1.3. Inform stakeholders of new/revised policies and procedures.
3.1.4. Incorporate review of literature, standards, guidelines and legislation within the development/review of policy and procedures.
3.1.5. Interpret and apply guidelines, standards, legislation and current literature to the organisation setting.

Domain 4: Minimise infection transmission risks
Capability 4.1: Manage clinical infection transmission risks
4.1.1. Respond appropriately to notification of a significant organism and/or clinical presentation.
4.1.2. Recognise notifiable organisms and implement required procedures.
4.1.3. Perform HCW/ client infection transmission risk assessment.
4.1.4. Will initiate laboratory tests and/or medical review in the absence of information.
4.1.5. Act as a resource to interpret pathology test results and apply them to clinical situation.
4.1.6. Develop an intervention management plan based on epidemiological principles and immunisation knowledge.
4.1.7. Monitor and modify management plan in response to changes in clinical signs / symptoms and / or laboratory results.
4.1.8. Evaluate the level of risk of transmission of infection of a product based on cleaning, disinfection and sterilising principles and relevant standards.
4.1.9. Assess environmental for risk of infection transmission in response to identified risks or clinically significant results.
Capability 4.2: Auditing and monitoring
4.2.1. Implement an auditing and monitoring program based on organisational policy and procedures and infection control related standards, guidelines and legislation.
4.2.2. Communicate audit results to stakeholders and prioritise recommendations for improvement based on a risk assessment framework.
4.2.3. Implement appropriate dust management strategies based on a construction risk assessment framework developed from best practice guidelines.
Capability 4.3: Contingency planning
4.3.1. Participate as a member of a working group to investigate an infection control adverse event.
4.3.2. Develop contingency plans in response to emerging communicable infections, bioterrorism and multi-resistant organisms based on published guidelines.

Domain 5: Co-ordinate surveillance activities
Capability 5.1: Surveillance program
5.1.1. Will implement a surveillance program to meet health care service demographics.
5.1.2. Prioritise surveillance activities to target high risk areas and work within allocated resources.
5.1.3. Review and modify program based on organisational trends, international, national, local and best practices.
Capability 5.2: Data management
5.2.1. Collect data following required methodologies and data collection tools.
5.2.2. Manage data using a computer system.
5.2.3. Implement procedures to ensure data collection complete and accurate before entering into a database.
5.2.4. Implement a data collection process which links with other existing data sources where possible.
Capability 5.3: Data analysis
5.3.1. Analyse data using basic statistical tests.
5.3.2. Recognise the need to seek assistance from statistician and or epidemiologist to analyse data.
5.3.3. Able to interpret statistical reports and compare organisations results to appropriate benchmarks to assess performance.
5.3.4. Based on pre determined monitoring levels will recognise an adverse trend or cluster of infections.
5.3.5. Following an established communication strategy will inform required personnel of adverse trend or cluster
Capability 5.4: Investigate data anomalies
5.4.1. Undertake an investigation of adverse trends based on epidemiology principles and evidence based review outcomes.
5.4.2. Engage key stakeholders to participate in a quality improvement process to investigate cause(s) of adverse trend.
5.4.3. Will assist to develop and incorporate a change management process to facilitate behaviour changes required to support the implementation of identified practice changes.

5.4.4. Monitor effectiveness of implemented changes through ongoing surveillance activities.
Capability 5.5: Generate a report
5.5.1. Write a report, which will explain data trends and recommendations of opportunities for improvement based on best practice, standards and guidelines.
5.5.2. Disseminate report through a predetermined communication strategy.

Domain 6: Manage outbreaks
Capability 6.1: Assess scale of problem
6.1.1. Recognise an adverse trend or cluster of infections and following set procedures will confirm outbreak.
6.1.2. Develop a case definition based on presenting signs and symptoms and available laboratory data.
6.1.3. Use a case definition tool to identify causative organism and mode of transmission by interpreting clinical and laboratory data against case definition.
6.1.4. List cases and contacts documenting infection transmission risk factors based on epidemiology principles and immunisation knowledge.
6.1.5. Organise pathology tests and/or medical review to obtain information to determine new cases.
6.1.6. Check that notifiable organisms have been reported to appropriate external agency.
6.1.7. Infer scale of problem from reviewing information presented as a timeline and/or epidemiological curve.
Capability 6.2: Develop management plan
6.2.1. Develop management plan based on best practice principles and in consultation with key stakeholders.
6.2.2. Engage key stakeholders to implement management plan utilising change management strategies.
6.2.3. Work with appropriate personnel internally and externally to implement a process to contact HCW/clients ensuring adherence to privacy and other relevant policies.
6.2.4. Monitor management plan by evaluating new case presentation trends based on epidemiological principles.

6.2.5. Evaluate and modify management plan as required based on collective input from multidisciplinary management team.
Capability 6.3: Communication strategy
6.3.1. Develop a timely communication strategy to inform and update key personnel and all healthcare workers as required.
Capability 6.4: Expert resource
6.4.1. Determine and recommend HCW re-deployment leave.
6.4.2. Provide education based on epidemiology of outbreak, appropriate precautions and notification process.
6.4.3. Troubleshoot and provide just in time advice in response to complex issues.
6.4.4. Provide appropriate written material to support communication strategies and education program.
Capability 6.5: Generate a report
6.5.1. Generate a report that includes overview of outbreak, investigation, action taken, outcomes and recommendations supported by best practice, standards and guidelines.
6.5.2. Justify recommendations with financial, clinical outcome and resource arguments implicating consequences of not undertaking improvement recommendations.

Domain 7: Undertake education activities
Capability 7.1: Education program
7.1.1. Design an education program based on organisational needs and best practice guidelines.
7.1.2. Respond to educational requests from a wide range of organisational and community groups.
7.1.3. Develop an education strategy in response to an emerging or unexpected issue.
Capability 7.2: Prepare education material
7.2.1. Develop lecture content based on adult learning principles supported by a variety of educational aides.
7.2.2. Present a complex infection control topic and have the ability to expand on prepared content as required.
7.2.3. Evaluate session by asking participants to complete an evaluation tool and incorporate feedback to improve future sessions.

Domain 8: Continuing professional development
Capability 8.1: Maintain currency of practice
8.1.1. Attend training and education sessions such as conferences, workshops and study days.
8.1.2. Read professional literature.
8.1.3. Member of professional organisation.
Capability 8.2: Leadership
8.2.1. Share experiences and interests through publication and presentation of work.
8.2.2. Provides mentoring and support for other ICPs. 8.2.3. Network with peers.

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Abbreviations and acronyms

Abbreviations

ACHS ..... Australian Council on Healthcare Standards

ACSQHC ..... Australian Commission on Safety and Quality in Health Care

AICA ..... Australian Infection Control Association

ANZCOSS ..... Australia New Zealand Co-Operative on Outcomes in Staphylococcus Sepsis

APHA ..... Australian Private Hospital Association

APIC ..... Association for Professionals in Infection Control and Epidemiology (USA)

CDC ..... Communicable Disease Control

CE ..... Chief Executive

CEHSEU ..... Clinical Epidemiology & Health Service Evaluation Unit

CEO ..... Chief Executive Officer

CHICA-Canada ..... Community and Hospital Infection Control Association-Canada

CHRISP ..... Centre for Healthcare Related Infection Surveillance & Prevention

CN ..... Clinical Nurse

CNC ..... Clinical Nurse Consultant

CPI ..... Clinical Practice Improvement

CSSD ..... Central Sterilising Service Department

DON ..... Director of Nursing

DOMS ..... Director of Medical Service

EAG ..... Expert Advisory Group

GP ..... General Practitioner

HAI ..... Healthcare associated infection

HISWA ..... Healthcare Associated Infection Surveillance Western Australia

HICWA ..... Healthcare Associated Infection Council of Western Australia

IC ..... Infection Prevention and Control

ICP ..... Infection control practitioner/ professional

ICU ..... Intensive care unit

ID ..... Infectious disease

KII ..... Key Informant Interview

KPI ..... Key Performance Indicator

MRO ..... Multiresistant Organism

MRSA ..... Methicillin Resistant Staphylococcus Aureus

NUM ..... Nurse Unit Manager

RMIT.....Royal Melbourne Institute of Technology

SANIT.....South Australian Network of Infection Control Team

SENIC.....Study of the Efficacy of Nosocomial Infection Control

TIPCU.....Tasmanian Infection Prevention and Control Unit

VICNISS.....Victorian Hospital Acquired Infection Surveillance System

VICPA.....Victorian Infection Control Professionals Association

VMO.....Visiting Medical Officer

VRE.....Vancomycin Resistant Enterococci

Glossary

Acute hospitals	Public and private hospitals providing services mainly to admitted patients with acute or temporary ailments.
Epidemiology	The study of factors that have an impact on disease in the human community. Often used in the control of health problems.
Health care associated infection	Infections acquires as a direct or indirect result of health care.
Indicator	A key statistic chosen to describe (indicate) a situation concisely, help assess progress and performance, and act as a guide to decision making.
Infection control or infection control measures	Infection control aims to prevent the spread of pathogens between people in a health-care setting. Examples of infection control measures include hand washing, protective clothing, isolation procedures and audits of compliance with hygiene measures.
Infection	The invasion and reproduction of pathogenic (disease-causing) organisms inside the body. This can cause tissue injury and progress to disease.
Infection control	Infection control aims to prevent the spread of pathogens between people in a health-care setting.
Infection control practitioners/ professionals	Adopted initially in the U.S.A. in 1972 during the formation of the Association for Practitioners in Infection Control. In Australia, often used interchangeably with the term infection control nurse.
Infection control and surveillance (prevention) programs	An organised program that includes surveillance, control measures and formal infection control policy.
Inpatient	A patient who visits a health-care facility for diagnosis or treatment and stays in the hospital for at least one night.
Outbreak	A classification used in epidemiology to describe a small, localised group of people infected with a disease.
Surveillance	Disease surveillance is an epidemiological practice by which the spread of disease is monitored in order to establish patterns of progression. The main role of disease surveillance is to predict, observe and minimise the harm caused by outbreak, epidemic and pandemic situations, as well as increase our knowledge as to what factors might contribute to such circumstances.

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