Australian Commission on **Safety and Quality** in Health Care

Infection prevention and control risk assessment

Integrating the hierarchy of controls

Introduction

A key component of effective infection prevention and control (IPC) is the early identification and management of infection risks. This begins with healthcare organisation and frontline healthcare workers (HCWs) recognising potential infection hazards and assessing the risk they pose within a particular setting. This resource provides practical guidance on undertaking IPC risk assessments and applying the hierarchy of controls in healthcare settings. The resource can be used by frontline HCWs to guide IPC decision-making at the point of care and by healthcare organisations to strengthen IPC systems and processes.

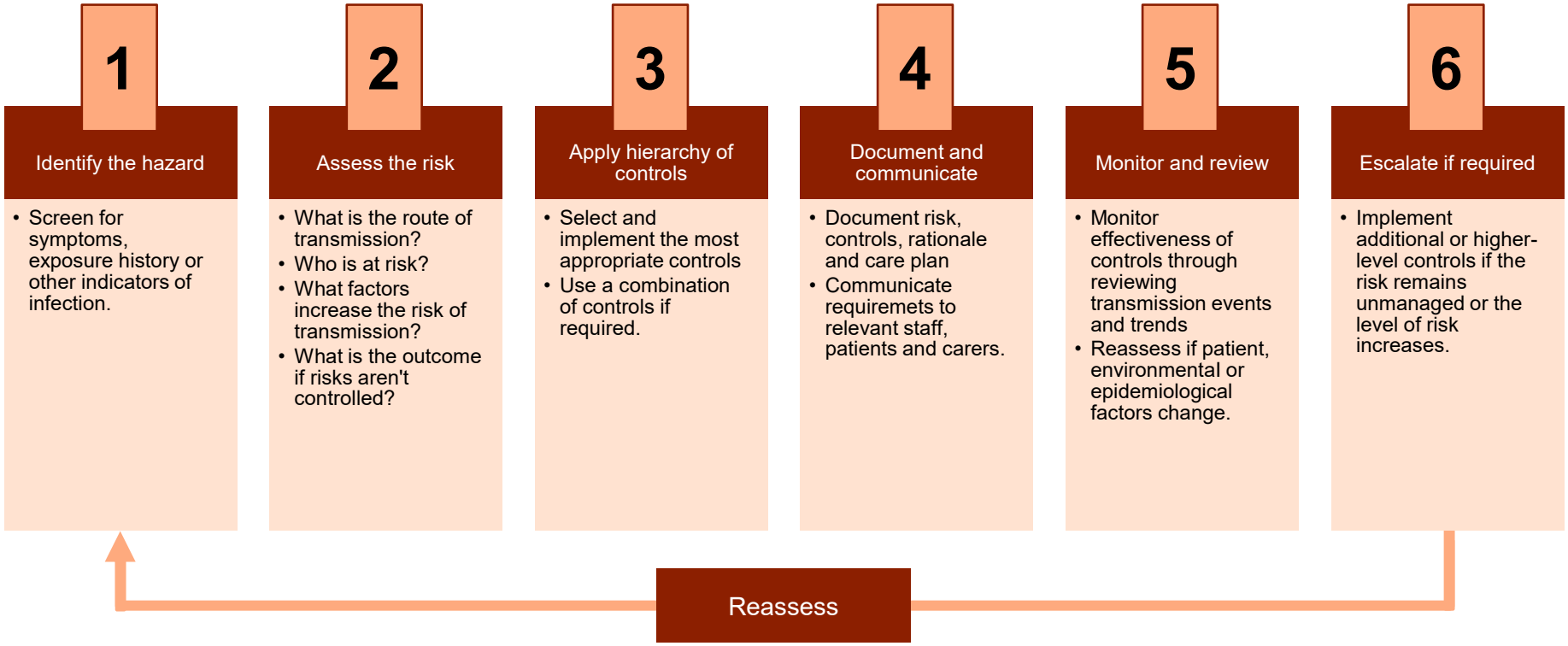
This resource focuses on risk assessment. For guidance on risk management see the Australian Guidelines for the Prevention and Control of Infection in Healthcare and the National Safety and Quality Health Service Standards.

Infection prevention and control risk assessment

IPC risk assessment is a systematic and ongoing process used to identify infection hazards, assess risk, apply the hierarchy of controls, and monitor their effectiveness. The process requires documentation, communication and ongoing reassessment when patient, environmental or epidemiological factors change, with escalation to higher-level controls where risks remain unmanaged.

Figure 1 outlines a six-step IPC risk assessment process for frontline HCWs, with reassessment occurring throughout to ensure controls remain appropriate and effective.

Figure 1 Infection prevention and control risk assessment.



Hierarchy of controls in infection prevention and control

The hierarchy of controls (**Figure 2**) provides a structured approach to managing IPC risks by applying the most effective controls first. The hierarchy includes system-level controls that act on the hazard at its source, as well as individual-level controls that rely on safe work practices and personal protective equipment. In practice, multiple controls are often used together to provide layered protection.

System controls (healthcare organisation)

System controls include elimination, substitution, isolation and engineering controls. These are typically implemented by the healthcare organisation through governance arrangements, facility design, infrastructure, procurement and other organisational systems. As these controls act on the hazard at its source, they provide the most effective and sustainable means of reducing risk.

Individual controls (frontline healthcare workers)

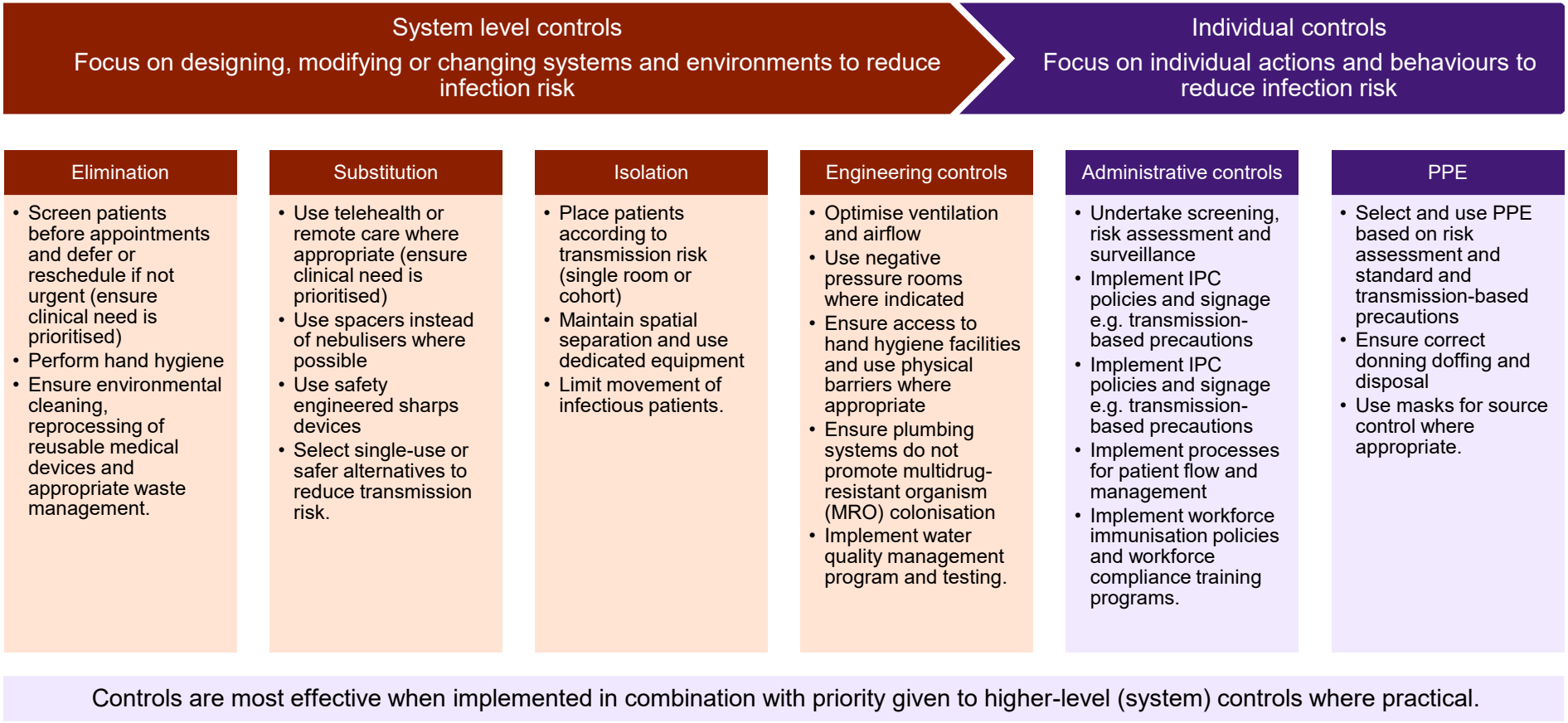
Individual controls include administrative controls and personal protective equipment (PPE). Administrative controls include policies, procedures, training, education, supervision and work practices that support safe care. These controls are typically implemented by frontline healthcare workers and rely on adherence to established IPC practices and workflows. Individual controls complement system controls and provide an additional layer of protection where risks cannot be eliminated.

Applying multiple controls

The distinction between system (healthcare organisation) and individual (frontline HCW) controls is not always absolute. Some control measures may involve both organisational and individual responsibilities. Where risks cannot be eliminated, they must be reduced so far as is reasonably practicable through the application of multiple controls to provide layered protection.

The examples provided below are intended as a guide and should be considered within the context of local systems, processes and clinical practice. **Table 1** demonstrates how infection hazards can be assessed and managed through application of the IPC risk assessment process and a combination of multiple controls.

Figure 2 Examples of infection prevention and control measures using the hierarchy of controls.



Note: Examples of controls are not exhaustive and should be selected on local risk assessment.

Table 1 Infection prevention and control risk assessment – Integrating the hierarchy of controls

Infection hazard	Assess risk	Application of the hierarchy of controls
Infectious respiratory pathogens carried by a patient	**Route of transmission:** Contact, droplet, airborne (depending on pathogen) **Who is at risk:** Patients, HCWs, visitors and carers **Factors increasing the risk of transmission:** Crowded/shared environments, poor ventilation, delayed identification or isolation, aerosol-generating procedures, prolonged exposure, poor respiratory hygiene, seasonal respiratory virus activity **Outcome if risks are not controlled:** Transmission of respiratory pathogens in healthcare settings, outbreaks, disruption to services	**Elimination:** Perform hand hygiene; reschedule appointments where possible if not clinically urgent; conduct environmental cleaning regularly, with frequency determined by the clinical area's risk profile; reprocess reusable medical devices; ensure appropriate waste management; allow sufficient time for clearance of airborne contaminants based on the required air changes before re-use of rooms **Substitution:** Use telehealth or remote communication where appropriate; use spacers instead of nebulisers where possible **Isolation:** Manage patient placement – Single room with ensuite or cohort; coordinate clinical and surgical lists to minimise the risk of transmission by scheduling infectious patients preferably at the end of clinic or operating list where feasible (ensure clinical need is prioritised); minimise patient movement **Engineering:** Use negative pressure room where indicated; optimise ventilation; ensure anterooms are appropriately set up for PPE use and disposal **Administrative:** Screen other patients who have been in close proximity to source case; screen patients for infectious symptoms before appointments; review local transmission and outbreaks; undertake laboratory testing and surveillance; ensure verbal and written communication of infection risks, including transmission-based precaution signage on entry to patient zone **PPE:** Apply PPE consistent with standard precautions (anticipated blood or body fluid exposure) and transmission-based precautions, where required; use masks (on patients/HCW/visitors) for source control where appropriate (e.g. if patient can tolerate during transit and in waiting rooms)
Multi-resistant organism (MRO)	**Route of transmission:** Direct and indirect contact	**Elimination:** Perform hand hygiene; remove unnecessary invasive devices; ensure environmental cleaning, reprocessing of reusable medical devices and appropriate waste management

Infection hazard	Assess risk	Application of the hierarchy of controls
	Who is at risk: Patients, HCWs and others entering the patient environment **Factors increasing the risk of transmission:** Previous colonisation, wounds, invasive devices, prolonged healthcare exposure, transfer from high-risk settings (intensive care units, overseas hospitalisation, aged care facilities), hand hygiene compliance, environmental and shared patient equipment cleaning, and environmental reservoirs such as contaminated sinks, drains or plumbing systems **Outcome if risks are not controlled:** Colonisation, infection, outbreaks, disruption to services	**Substitution:** Use alternatives to invasive devices where clinically appropriate e.g. switching to oral medications from intravenous; use single use equipment where appropriate **Isolation:** Manage patient placement – Single room with ensuite or cohort; use dedicated patient care equipment; coordinate clinical and surgical lists to minimise the risk of transmission by scheduling infectious patients preferably at the end of clinic or operating list where feasible (ensure clinical need is prioritised); minimise patient movement **Engineering:** Use equipment designed for effective cleaning and disinfection; ensure plumbing does not promote MRO colonisation; ensure anterooms are appropriately set up for PPE use and disposal **Administrative:** Follow local screening and surveillance policies; ensure communication of MRO status at handover and in clinical records; undertake staff education and competency assessment for infection prevention and control measures (e.g. donning and doffing and hand hygiene); implement auditing program for hand hygiene and transmission-based precautions; use transmission-based precaution signage on entry to patient zone **PPE:** Apply PPE consistent with standard precautions (anticipated blood or body fluid exposure) and transmission-based precautions, where required and as per cleaning product specifications
Exposure to blood or body substances	**Route of transmission:** Contact with blood or bodily fluids via non-intact skin, mucous membranes or sharps injury **Who is at risk:** Primarily HCWs, patients and others involved in care activities may also be at risk depending on the nature of the exposure	**Elimination:** Perform hand hygiene; avoid unnecessary exposure-prone procedures; ensure prompt management of spills; dispose of sharps at the point of care **Substitution:** Use safety-engineered devices and needle-free systems **Isolation:** Implement defined procedural zones for high-risk procedures **Engineering:** Provide sharps containers at point of care

Infection hazard	Assess risk	Application of the hierarchy of controls
	Factors increasing the risk of transmission: Sharps use, use of sharps without safety devices, exposure-prone procedures, poor PPE compliance, unsafe sharps disposal and spill management **Outcome if risks are not controlled:** Occupational exposure and transmission of infectious pathogens, including bloodborne pathogens	**Administrative:** Ensure incident reporting and occupational exposure management; assess patient compliance with procedure and implement management plan if behavioural risks are identified; promote and monitor workforce adherence to immunisation policy; ensure procurement systems are in place to purchase products that reduce occupational exposure risks **PPE:** Apply PPE consistent with standard precautions (anticipated blood or body fluid exposure) and transmission-based precautions, where required and as per cleaning product specifications
Introduction of infectious pathogens by healthcare workers	**Route of transmission**: Contact, droplet, airborne (depending on pathogen) **Who is at risk:** Patients, HCWs, visitors and carers **Factors increasing the risk of transmission:** Working while symptomatic, compliance with immunisation policy, adherence to standard and transmission-based precautions, shared staff facilities and break rooms, inadequate ventilation **Outcome if risks are not controlled:** Transmission of pathogens in healthcare settings, outbreaks, disruption to services	**Elimination:** Do not attend work when infectious **Substitution:** Work remotely or deploy to non-patient-facing duties where appropriate **Isolation:** Exclude infectious staff according to policy **Engineering:** Employ ventilation and physical separation measures **Administrative:** Promote and monitor workforce adherence to immunisation policy; initiate outbreak management procedures where appropriate; ensure incident reporting and occupational exposure management **PPE:** Apply PPE based on exposure risk, use masks as source control
Environmental contamination	**Route of transmission:** Direct and indirect contact **Who is at risk:** Patients, HCWs, visitors and carers	**Elimination:** Perform hand hygiene; remove unnecessary equipment and clutter from clinical areas and workstations; conduct environmental cleaning regularly, with frequency determined by the clinical area's risk profile; reprocess reusable medical devices; ensure appropriate waste management

Infection hazard	Assess risk	Application of the hierarchy of controls
	Factors increasing the risk of transmission: Cleaning of the environment and shared equipment, clutter, contaminated plumbing systems, hand hygiene, prolonged survival of pathogens in the environment, high patient turnover, delayed identification of environmental cleaning issues **Outcome if risks are not controlled:** Healthcare-associated infection from environmental transmission	**Substitution:** Use single-use equipment where appropriate; ensure materials in the environment are easy to clean **Isolation:** Use dedicated patient care equipment; segregate contaminated equipment and waste away from clean stock; ensure clean to dirty workflow in reprocessing areas **Engineering:** Have hand hygiene products readily available; ensure doors seals and negative pressure are in working order; ensure appropriate design of sinks and plumbing; implement preventative maintenance programs **Administrative:** Implement environmental cleaning schedules and policies including auditing, and staff training programs **PPE:** Apply PPE consistent with standard precautions (anticipated blood or body fluid exposure) and transmission-based precautions, where required and as per cleaning product specifications
Contaminated shared clinical equipment and reusable medical devices	**Route of transmission**: Contact through contaminated equipment or devices **Who is at risk:** Patients and HCWs **Factors increasing the risk of transmission:** Reprocessing procedures and systems, damaged or difficult-to-clean equipment, equipment traceability, staff training and competency, storage and transport practices **Outcome if risks are not controlled:** Cross-contamination, colonisation and invasive infection	**Elimination:** Perform hand hygiene; remove damaged or non-cleanable equipment from service; reprocess reusable medical devices to the appropriate level (cleaning, disinfection, or sterilisation) based on the Spaulding classification **Substitution:** Use single use equipment where appropriate **Isolation:** Quarantine equipment where appropriate; segregate clean and dirty equipment; dedicate patient care equipment where appropriate **Engineering**: Implement preventative maintenance programs; ensure equipment purchased can be cleaned and is made of suitable materials **Administrative:** Ensure reprocessing procedures and policies are in place, including competency assessment and training for staff **PPE:** Apply PPE consistent with standard precautions (anticipated blood or body fluid exposure) and transmission-based precautions, where required and as per cleaning product specifications

Infection hazard	Assess risk	Application of the hierarchy of controls
Patient movement	**Route of transmission:** Contact, droplet, airborne (depending on pathogen) **Who is at risk:** Patients, HCWs, visitors and carers **Factors increasing the risk of transmission:** Frequent transfers, shared waiting areas, delayed recognition of infection or outbreaks, overcrowding, adherence to IPC precautions during transport **Outcome if risks are not controlled:** Transmission of infectious pathogens in healthcare settings, outbreaks, disruption to services	**Elimination:** Perform hand hygiene; avoid unnecessary transfers and movement; where airborne pathogens or aerosol-generating procedures are involved, allow sufficient time for clearance of airborne contaminants based on the required air changes before re-use of rooms. **Substitution:** Consider using virtual consultations where possible **Isolation:** Manage patient placement based on risk assessment **Engineering**: Ensure hand hygiene products are readily available for patients, staff, visitors and carers **Administrative:** Ensure verbal and written communication of infection risks during transfers **PPE:** Apply PPE consistent with standard precautions (anticipated blood or body fluid exposure) and transmission-based precautions, where required
Introduction of infectious pathogens by visitors and carers	**Route of transmission:** Contact, droplet, airborne (depending on pathogen) **Who is at risk:** Patients, HCWs, visitors and carers **Factors increasing the risk of transmission:** Visitors attending while unwell, prolonged close contact, hand and respiratory hygiene, symptom screening, high visitor volumes, seasonal respiratory virus activity **Outcome if risks are not controlled:** Transmission of infectious pathogens in healthcare settings, outbreaks, disruption to services	**Elimination:** Perform hand hygiene; restrict visits from infectious individuals where possible **Substitution:** Implement virtual visitation options where possible **Isolation:** Protective isolation strategies such as limiting visitors to high-risk areas (e.g. transplant units, intensive care units, outbreak units); dedicated equipment **Engineering**: Use physical barriers and make hand hygiene products readily available **Administrative:** Ensure visitor screening and policies, including processes to allow visitation during exceptional circumstances during outbreaks; ensure visitor and carer education on PPE use and respiratory etiquette; promote community vaccination programs

Infection hazard	Assess risk	Application of the hierarchy of controls
		PPE: Apply PPE consistent with standard precautions (anticipated blood or body fluid exposure) and transmission-based precautions, where required
Outbreaks/community transmission	**Route of transmission:** Contact, droplet, airborne **Who is at risk**: Patients, healthcare workers, visitors, carers and the broader community **Factors increasing the risk of transmission:** Delayed identification of infection, overcrowding, poor ventilation, ability to perform respiratory hygiene/source control, aerosol-generating procedures, prolonged exposure to infectious patients, seasonal increases in infectious diseases, community and household transmission risks, particularly for vulnerable populations (e.g. immunocompromised individuals, older persons and those with chronic health conditions) **Outcome if risks are not controlled:** Introduction and transmission of infectious pathogens, outbreaks, disruption to services	**Elimination:** Perform hand hygiene; exclude infectious staff, patients and visitors from non-essential activities; increase environmental cleaning; cleaning and disinfection of shared equipment **Substitution:** Replace face-to-face activities with virtual alternatives where appropriate; use single use equipment where appropriate **Isolation:** Implement cohorting and isolation of cases and contacts; dedicate patient care equipment where appropriate; coordinate clinical and surgical lists to minimise the risk of transmission by scheduling infectious patients preferably at the end of clinic or operating list where feasible (ensure clinical need is prioritised) **Engineering**: Use enhanced ventilation and physical separation measures; ensure anterooms are appropriately set up for PPE use and disposal **Administrative:** Monitor trends (e.g. identifying multiple patients with vomiting and diarrhoea) through enhanced surveillance, monitoring community infectious diseases activity; screening, testing, contact tracing; implement outbreak management and escalation procedures including convening the outbreak management team; ensure signage on entry to the outbreak area; provide discharge information and education on reducing infectious disease transmission in home and community settings, particularly for vulnerable populations **PPE:** Apply PPE consistent with standard precautions (anticipated blood or body fluid exposure) and transmission-based precautions, where required; use masks (on patients/HCW/visitors) for source control where appropriate (e.g. if patient can tolerate during transit and in waiting rooms); consider asking patients and visitors to use masks as source control in the clinical area during respiratory outbreaks

Important links and resources

- Australian Guidelines for the Prevention and Control of Infection in Healthcare
- NSQHS Standards Workforce Immunisation Risk Matrix
- Risk assessment - use of alcohol-based hand rub in healthcare facilities
- NSQHS Standards
- NSQHS Standards Risk management approach
- Safe Work Australia guidance
- Patient risk screening and assessment.

For more information

Please visit: Australian Commission on Safety and Quality in Healthcare, Infection Prevention and Control

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