



An Roinn Sláinte  
Department of Health

# Infection Prevention and Control (IPC)

National Clinical Guideline No. 30

**SUMMARY** May 2023

**NATIONAL  
CLINICAL  
EFFECTIVENESS  
COMMITTEE**



This National Clinical Guideline has been developed by the Infection and Prevention Infection Prevention and Control Guideline Development Group (GDG).

### Using this National Clinical Guideline

This National Clinical Guideline applies to all health and social care workers because the control of healthcare associated infection is everyone's responsibility. It is particularly relevant to Infection Prevention and Control (IPC) Practitioners. IPC Practitioners are those health and social care workers with specific training and expertise in the prevention and control of infection and who provide training, guidance and leadership to others on IPC. Please note: that reference to a document as a source of additional information does not represent an endorsement of the entire document cited as a part of this National Clinical Guideline. This is a summary version of the National Clinical Guideline. Due to size, the full version of the guideline is presented in two volumes. Both volumes should be cross-referenced as needed.

### Disclaimer

NCEC National Clinical Guidelines do not replace professional judgment on particular cases or particular circumstances, whereby the clinician or health professional decides that individual guideline recommendations are not appropriate in the circumstances presented. It may also happen that an individual patient declines a recommendation as a course of action in their care or treatment plan. In these circumstances the decision not to follow a recommendation should be appropriately recorded in the patient's healthcare record (individual patient) or elsewhere if the issue is not related to a specific patient.

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[www.gov.ie/clinicalguidelines](http://www.gov.ie/clinicalguidelines)

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### Membership of the Guideline Development Group (GDG)

The GDG was chaired by Professor Martin Cormican, Professor of Bacteriology, University of Galway, formerly Clinical Lead HSE, Antimicrobial Resistance and Infection Control Team (until 30<sup>th</sup> April 2022).

Membership nominations were sought from a variety of clinical and non-clinical backgrounds. This was to ensure the group was as representative as possible of key stakeholders.

**Table 1** Guideline Development Group membership

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Gwen Regan (from Oct 2021)	Director of Nursing, IPC Community Healthcare, Quality & Patient Safety Representative
Margaret Culliton (from Oct 2021)	Project Manager, AMRIC

### Credits

The role of the NCEC is to prioritise, quality assure and recommend clinical guidelines to the Chief Medical Officer for endorsement by the Minister for Health. It is intended through Ministerial endorsement that full implementation of the guideline will occur through the relevant service plans.

The NCEC and the Department of Health acknowledge and recognise the Chair and members of the Guideline Development Group (GDG) for development of the guideline; and the external reviewers for their contribution. The NCEC and Department of Health wish to express thanks and sincere gratitude to all persons contributing to this National Clinical Guideline; especially those that gave their time on a voluntary basis.

### Acknowledgments

The Chair of the GDG wishes to acknowledge the following for their particular contribution to the development of this guideline:

- The members of the GDG for their commitment through the development of this particularly important and complex guideline

- The National Health and Medical Research Council of Australia for permission to use and adapt the Australian Guidelines for the Prevention and Control of Infection in Healthcare (2019) to support development of this guideline. This guideline differs in a number of points from the Australian Guidelines (2019). The Australian Guidelines for the Prevention and Control of Infection in Healthcare (2019) was updated in 2021 and is available at the following link: <https://www.safetyandquality.gov.au/publications-and-resources/resource-library/australian-guidelines-prevention-and-control-infection-healthcare>
- The HSE Antimicrobial Resistance and Infection Control team for their outstanding support for the work of the GDG throughout the process and in particular for work on the Budget Impact Analysis and the Implementation Plan
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- Health Research Board - Collaboration in Ireland for Clinical Effectiveness Reviews (HRB-CICER) for work on Evidence Review, Budget Impact Analysis and the Implementation Plan
- Those who contributed formal feedback through the public consultation process
- The great many IPC practitioners and other healthcare workers who have informed the development of this guideline through sharing their vast practical experience with the Chair and members of the GDG through questions, conversations and email.

### External Review acknowledgement

The following are acknowledged for providing an external review of the guideline:

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Signed by the Chair(s)  
Prof. Martin Cormican

Date: 6/5/2023

## National Clinical Guidelines

Providing standardised clinical care to patients in healthcare is challenging. This is due to a number of factors, among them diversity in environments of care and complex patient presentations. It is self-evident that safe, effective care and treatment are important in ensuring that patients get the best outcomes from their care.

The Department of Health is of the view that supporting evidence-based practice, through the clinical effectiveness framework, is a critical element of the health service to deliver safe and high quality care. The National Clinical Effectiveness Committee (NCEC) is a Ministerial committee set up in 2010 as a key recommendation of the report of the Commission on Patient Safety and Quality Assurance (2008). The establishment of this Commission was prompted by an increasing awareness of patient safety issues in general and high profile health service system failures at home and abroad.

The NCEC on behalf of the Department of Health has embarked on a quality assured National Clinical Guideline development process linked to service delivery priorities. Furthermore, implementing National Clinical Guidelines sets a standard nationally, to enable healthcare professionals to deliver safe and effective care and treatment while monitoring their individual, team and organisation's performance.

The aim of these National Clinical Guidelines is to reduce unnecessary variations in practice and provide an evidence base for the most appropriate healthcare in particular circumstances. As a consequence of Ministerial mandate, it is expected that NCEC National Clinical Guidelines are implemented across all relevant services in the Irish healthcare setting.

The NCEC is a partnership between key stakeholders in patient safety. NCEC's mission is to provide a framework for national endorsement of clinical guidelines and clinical audit to optimise patient and service user care. The NCEC has a remit to establish and implement processes for the prioritisation and quality assurance of clinical guidelines and clinical audit so as to recommend them to the Minister for Health to become part of a suite of National Clinical Guidelines and National Clinical Audit. The aim of the suite of National Clinical Guidelines is to provide guidance and standards for improving the quality, safety and cost-effectiveness of healthcare in Ireland. The implementation of these National Clinical Guidelines will support the provision of evidence-based and consistent care across Irish healthcare services.

### NCEC Terms of reference

1. Provide strategic leadership for the national clinical effectiveness agenda.
2. Contribute to national patient safety and quality improvement agendas.
3. Publish standards for clinical practice guidance.
4. Publish guidance for National Clinical Guidelines and National Clinical Audit.
5. Prioritise and quality assure National Clinical Guidelines and National Clinical Audit.
6. Commission National Clinical Guidelines and National Clinical Audit.
7. Align National Clinical Guidelines and National Clinical Audit with implementation levers.
8. Report periodically on the implementation and impact of National Clinical Guidelines and the performance of National Clinical Audit.
9. Establish sub-committees for NCEC work streams.
10. Publish an annual report.

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# 1 National Clinical Guideline recommendations

## 1.1 Summary of recommendations

Recommendations are based on systematic reviews performed in the preparation of the Australian Guidelines for the Prevention and Control of Infection in Healthcare (2019) or performed in development of this Guideline. Recommendations use the GRADE (Grading of Recommendations Assessment, Development and Evaluation) approach providing the evidence to a decision framework. For each recommendation, there is an indication of the strength of the recommendation, reflecting the practical importance of the recommendation and an indication of the strength of the evidence for the recommendation. This approach is used because in some instances there is a near universal consensus that a practice is very important but the evidence base may be limited. This may happen because it is very difficult to design or perform a relevant high-quality study for practical and or ethical reasons. For each recommendation, there is also consideration of the harms and benefits of the intervention.

Please note the 2019 Australian Guidelines were updated in July of 2021 and available at <https://www.safetyandquality.gov.au/publications-and-resources/resource-library/australian-guidelines-prevention-and-control-infection-healthcare>

**Table 2** Summary of recommendations

No.	Section	Recommendation	*Grade/level
1	Hand hygiene	Routine hand hygiene is performed according to the World Health Organisation technique: <ul style="list-style-type: none"> <li>• Before touching a patient</li> <li>• Before a clean or aseptic procedure</li> <li>• After body fluid exposure</li> <li>• After touching a patient</li> <li>• After touching a patient's surroundings</li> </ul> Hand hygiene must also be performed before putting on gloves and after the removal of gloves.	Strong recommendation, strong evidence
2	Hand hygiene	Alcohol-based hand rubs that contain between 60% and 80% v/v ethanol or equivalent should be used for all routine hand hygiene practices.	Strong recommendation, strong evidence
3	Hand hygiene	Soap and water should be used for hand hygiene when hands are visibly soiled.	Strong recommendation, strong evidence

4	Hand hygiene	In the presence of known or suspected <i>Clostridioides difficile</i> and viruses such as norovirus hand hygiene must be performed as follows: <ul style="list-style-type: none"> <li>• If gloves are worn and appear intact on removal, then alcohol-based hand rub remains the agent of choice for hand hygiene</li> <li>• If gloves have not been worn, if gloves have been breached or if there is visible contamination of the hands despite glove use, use soap and water to facilitate the mechanical removal of spores</li> <li>• After washing, hands should be dried thoroughly with a single-use towel.</li> </ul>	Strong recommendation, weak evidence
5	Routine management of physical environment	Sites/surfaces should be cleaned and disinfected after spills of blood or other potentially infectious materials.	Strong recommendation, weak evidence
6	Routine management of physical environment	The use of sodium hypochlorite disinfection in addition to cleaning with a detergent solution is recommended for terminal disinfection of healthcare facilities when terminal disinfection is required for example in seeking to end <i>C. difficile</i> and norovirus outbreaks. Note: terminal disinfection must always occur in the context of a process of terminal cleaning and disinfection.	Strong recommendation, weak evidence
7	Emerging disinfection methods	<b>Recommendation AGAINST:</b> Hydrogen peroxide vapour disinfection is <b>not recommended</b> as a routine adjunct in healthcare facilities as the evidence of added value compared with conventional cleaning and disinfection is not well established.	Strong recommendation, weak evidence

8	Emerging disinfection methods	<b>Recommendation AGAINST:</b> Ultraviolet light disinfection, ultraviolet light in combination with sodium hypochlorite and other novel approaches to healthcare environment disinfection are <b>not recommended</b> as routine adjuncts in healthcare facilities as the evidence of added value compared with conventional cleaning and disinfection is not well established.	Strong recommendation, weak evidence
9	Emerging disinfection methods	<b>Recommendation AGAINST:</b> The use of surfaces, fittings or furnishing containing materials with antimicrobial properties in healthcare facilities is <b>not recommended</b> as the evidence of added value compared with conventional cleaning and disinfection is not well established.	Strong recommendation, weak evidence
10	Aseptic technique	Sterile gloves are used for surgical aseptic procedures and contact with sterile sites.	Strong recommendation, weak evidence
11	Contact precautions	Contact precautions, in addition to standard precautions, are implemented routinely in the acute hospital setting in the presence of known or suspected infectious microorganisms that are spread by direct or indirect contact with the people cared for or their environment. The principles of contact precautions are relevant in all settings but the application must be appropriate to the context in which care is delivered and the needs of the person cared for.	Strong recommendation, weak evidence
12	Contact precautions	Hand hygiene be undertaken and personal protective equipment (PPE) be used as appropriate when healthcare workers have contact with people or with body fluids of people who require contact precautions. This principle is relevant in all settings but the application must be appropriate to the context in which care is delivered.	Strong recommendation, weak evidence

13	Contact precautions	Where possible patient-dedicated equipment or single-use patient-care equipment be used for people on contact precautions.  If common use of equipment for multiple people on contact precautions is unavoidable, clean the equipment, disinfect/sterilise if appropriate and allow it to dry before use on another person.	Strong recommendation, weak evidence
14	Droplet precautions	Healthcare workers implement droplet precautions when caring for people known or suspected to be infected with microorganisms transmitted by respiratory droplets. This includes wearing a surgical mask in the patient-care environment when a minimum distance from a person on droplet precautions cannot be maintained.	Strong recommendation, weak evidence
15	Airborne precautions	Airborne precautions, in addition to standard precautions, are implemented in the presence of known or suspected infectious microorganisms that are transmitted from person-to-person by the airborne route and when Aerosol Generating Procedures (AGPs) associated with an increased risk of infection are performed on people with known or suspected infectious microorganisms normally transmitted by the droplet route.	Strong recommendation, weak evidence
16	Airborne precautions	Wear correctly fitted and fit checked respiratory protection (FFP2 respirator) when entering the patient-care area when an airborne-transmissible infectious microorganism is known or suspected to be present and when entering the patient care area where AGPs associated with an increased risk of infection are performed on people with known or suspected infectious microorganisms normally transmitted by the droplet route.	Strong recommendation, weak evidence

17	Personal protective equipment	PPE including use of gloves, respiratory protection, face protection, aprons or gowns should be used as required by the task being performed and in line with standard or transmission-based precautions.	Strong recommendation, weak evidence
18	Personal protective equipment	Wear personal protective equipment to protect the face and eyes during procedures that generate splashes or sprays of blood and body substances into the face and eyes, when entering the patient-care area when an airborne-transmissible infectious microorganism is known or suspected to be present and when entering the patient care area where AGPs associated with an increased risk of infection are performed on people with known or suspected infectious microorganisms normally transmitted by the droplet route.	Strong recommendation, weak evidence
19	Personal protective equipment	Single-use, gloves are worn for: <ul style="list-style-type: none"> <li>• Each invasive procedure</li> <li>• Direct contact with sterile sites and non-intact skin or mucous membranes</li> <li>• Any activity that has been assessed as carrying a risk of exposure to blood and body substances.</li> </ul> Routine use of gloves for all clinical contact with people cared for is not appropriate. Use of gloves is not an alternative to hand hygiene.	Strong recommendation, weak evidence
20	Multidrug-resistant microorganisms	In the acute hospital in-patient setting, contact precautions should generally be applied in caring for people colonised or infected with specific multidrug resistant organisms (MDROs). Contact precautions in this context are generally not appropriate in healthcare settings other than acute hospital in-patient settings.	Strong recommendation, weak evidence

21	Facilities design	<p>When determining the number and type of single rooms in a health care facility, project planning teams should consider:</p> <ul style="list-style-type: none"> <li>• Trends in disease in the general population and the particular population served</li> <li>• Demographic trends in the population served</li> <li>• Specialties of the health care facility</li> <li>• Projected changes in future clinical activities.</li> </ul>	Strong recommendation, weak evidence
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### 1.2 Summary of good practice statements

**Practice Statements:** Are used for areas which are not covered by a systematic review of the evidence but where the provision of clinical guidance is deemed important. The development of practice statements is primarily based on best practice as advised by expert consensus and aligned with the GRADE approach where available evidence and judgements are considered together. However, a strength is not assigned.

**Table 3** Summary of good practice statements

No.	Section	Good Practice Point	*Grade/level
1	Hand hygiene	People who use healthcare services should be educated about the benefits of hand hygiene and how to perform hand hygiene.	Practice statement
2	Hand hygiene	Alcohol-based hand rubs that meet the requirements of European Standard EN 1500 should be used for routine hand hygiene practices.	Practice statement
3	Use and management of sharps, safety engineered devices and medication vials	<p>Dispose of single-use sharps immediately after use into an approved sharps container at the point-of-use.</p> <p>The person who has used the single-use sharp is responsible for its immediate safe disposal. Sharps containers must not be filled above the mark that indicates the maximum fill level.</p>	Practice statement
4	Routine management of physical environment	Maintain a minimum distance of 1m between healthcare service users in the healthcare setting to the greatest extent practical. This reduces the risk of contact and droplet transmission from people with unrecognised contact or droplet transmitted colonisation or infection.	Practice statement

5	Routine management of physical environment	<p>Clean surfaces routinely as follows:</p> <ul style="list-style-type: none"> <li>• Clean frequently touched surfaces with detergent solution at least daily, when visibly soiled and after every known contamination</li> <li>• Clean general surfaces and fittings when visibly soiled and immediately after spillage</li> <li>• Ensure that water drainage points in sinks and showers drain freely and completely and that surfaces are kept clean and dry.</li> </ul>	Practice statement
6	Routine management of physical environment	<p>Clean shared clinical equipment that comes into contact with skin, but not with mucosa, blood or body fluids, (that is non-critical equipment in the Spaulding classification) with a detergent solution between use on different people. Disinfection is also appropriate where indicated (for example colonisation with a Multidrug Resistant Organism).</p> <p>Exceptions to this should be justified by risk assessment.</p>	Practice statement
7	Routine management of physical environment	<p>Use surface barriers to protect surfaces such as examination couches that are in contact with a person's skin particularly if those surfaces are likely to be touched frequently with gloved hands during delivery of care or are likely to be contaminated with blood or body fluids or are difficult to clean.</p> <p>If release of body fluids is expected, the barrier should be impermeable.</p> <p>If the surface beneath the barrier is dirty or wet on removal of the barrier, the underlying surface should be cleaned and if appropriate disinfected.</p> <p>Exceptions to this should be justified by risk assessment.</p>	Practice statement



8	Routine management of physical environment	Perform disinfection using a chlorine-based product such as sodium hypochlorite or another appropriate disinfectant in addition to standard cleaning in specific circumstances as required based on institutional guidance or risk assessment. For routine use, a chlorine-based disinfectant should be used with available chlorine at 1000-parts per million.  If a non-chlorine-based disinfectant is used it should be a product suitable for use in a healthcare environment.	Practice statement
9	Droplet precautions	People who require transmission-based precautions (contact, droplet or airborne) should be accommodated in a single-patient room. Where this is not possible, people colonised or infected with the same organism should be cohorted in a discrete area with a minimum distance maintained between the people receiving care in the cohort area.  Consistent with the persons care needs, minimise the number of healthcare workers and the time healthcare workers are exposed to an infectious patient.	Practice statement
10	Airborne precautions	Place people on airborne precautions in a room with bathroom facilities and with appropriate controlled ventilation or in a room from which air does not circulate to other areas.  Exceptions to this should be justified by risk assessment.  Consistent with the persons care needs it is good practice to minimise the number of healthcare workers and the time healthcare workers are exposed within shared airspace with a person on airborne precautions.	Practice statement
11	Multidrug-resistant microorganisms	Healthcare facilities should operate a surveillance system to monitor healthcare associated infections and specific multidrug resistant microorganisms.	Practice statement

12	Outbreak prevention and management	Healthcare service providers should have processes in place to identify people with a communicable infectious disease before attendance/at presentation to the service or as soon as possible after presentation. This is to ensure that such people are cared for with appropriate IPC precautions from the outset. These processes are particularly important during an epidemic/pandemic.	Practice statement
13	Outbreak prevention and management	All residential healthcare facilities (hospitals, residential care facilities, hospices and rehabilitation facilities) should have plans in place for detection and management of outbreaks of infectious disease or colonisation with specific MDROs. Outbreaks should be investigated promptly and thoroughly and a brief outbreak report should be prepared at the conclusion of the outbreak. The outcomes of the investigations should be documented. It is good practice to notify the Medical Officer of Health promptly in writing (for example by email) of the closure of the outbreak and to provide a copy of the outbreak report when completed.	Practice statement
14	Outbreak prevention and management	Consider the use of early bay closures to control known or suspected outbreaks of norovirus and other agents causing gastrointestinal infection rather than immediate closure of entire wards/units.	Practice statement
15	Invasive medical devices	Healthcare facilities should develop, implement and review processes to address the insertion, use, maintenance, and removal of invasive medical devices. These processes should be centred on the principles of only using devices if they are deemed essential, removing them as soon as they are no longer needed and using care bundles while they are in place.	Practice statement

16	Clinical communication in infection prevention and control	Healthcare facilities should have effective clinical communication processes in place that reflects the NCEC Guidelines NCG No 5 Communication (Clinical Handover) in Maternity Services (DOH 2014) and NCG No 11 Communication (Clinical Handover) in Acute and Children's Hospital Services (DOH 2015). This communication should address infection risks and MDROs and include communication when people are transferring between healthcare facilities and when transferring from healthcare facilities to residential care facilities or to home.	Practice statement
17	Skin disinfection	Skin disinfectants including chlorhexidine should only be used when clinically indicated. Chlorhexidine-containing products, devices or solutions must never be used on or around patients with known chlorhexidine hypersensitivity.	Practice statement
18	Vaccinations	All healthcare workers should be appropriately vaccinated in accordance with current national recommendations (Immunisation Guidelines for Ireland at <a href="https://www.rcpi.ie/Healthcare-Leadership/NIAC/Immunisation-Guidelines-for-Ireland">https://www.rcpi.ie/Healthcare-Leadership/NIAC/Immunisation-Guidelines-for-Ireland</a> ).	Practice statement (supported by strong evidence of the effectiveness and safety of vaccines)
19	Avoiding work when potentially infectious for others	Healthcare workers must exclude themselves from work and visitors must stay away from healthcare facilities when they have symptoms of a communicable infectious disease. They must adhere to exclusion periods related to all infectious diseases.	Practice statement
20	Continuous professional development for IPC practitioners	Infection prevention and control professionals should participate in ongoing professional development in order to maintain the necessary expertise to fulfil their role. IPC staff at all levels should be supported to access formal and informal education and training relevant to their role.	Practice statement

### 1.3 Summary of statutory requirements

**Statutory requirement:** These are used where there is a requirement in Irish or EU law to comply with the statement. Compliance is a legal obligation.

**Table 4** Summary of statutory requirements

No.	Section	Statutory requirement	*Grade/level
1	Use and management of sharps, safety engineered devices and medication vials	Statutory requirement SI 135 of 2014 Healthcare workers should adhere to good practice related to safe sharp handling including: <ul style="list-style-type: none"> <li>• Not passing sharps directly from hand to hand</li> <li>• Keep handling to a minimum</li> <li>• Not recapping, bending or breaking needles after use.</li> </ul> <i>Healthcare workers must also comply with all legislation that controls the management of healthcare risk waste (including sharps) and healthcare non risk waste as well as workplace health and safety.</i>	Statutory requirement
2	Outbreak prevention and management	Principal Regulation is the Infectious Diseases Regulations 1981 (S.I. No. 390 of 1981). There are subsequent amendments.  All outbreaks of infectious disease and individual cases of notifiable infections must be notified promptly to the Medical Officer of Health (in the relevant Department of Public Health).	Statutory requirement

#### Supporting Resources

Note: that supporting resources are available for healthcare workers, patients and health facility managers on the Australian National Health and Medical Research Council (NHMRC) website (<https://www.safetyandquality.gov.au/publications-and-resources/resource-library/australian-guidelines-prevention-and-control-infection-healthcare>) to support implementation of the Australian Guidelines for the Prevention and Control of Infection in Healthcare (2021). These resources may be helpful for those implementing these Irish NCEC National Clinical Guidelines. Supporting resources specifically relevant to Ireland are also identified in the text.

## 2 Development of the National Clinical Guideline

Note on terminology: people who use healthcare services may identify themselves or may be referred to as patients, service users, clients, residents, person, supported individual as appropriate to the setting. The preferences of those who access services and of healthcare workers for the term they consider appropriate to their context is important but it is not practical to use all the terms in each instance in this document. For convenience, the default term generally used in this document is patient. The term service user, is also used in some instances.

### 2.1 Background

Healthcare associated infections (HCAs) are infections that can develop either as a direct result of healthcare interventions such as medical or surgical treatment, or from being in contact with a healthcare setting. The term HCAs includes any infection acquired as a direct result of treatment in any health or social care setting or as a result of healthcare delivery in the community (HIQA 2017).

In order to prevent HCAs, it is important to understand how infections occur in healthcare settings and then put in place measures to prevent them. If effectively implemented, the two-tiered approach of standard and transmission-based precautions recommended in these guidelines provide high-level protection to patients, healthcare workers and other people in healthcare settings.

While the specific risks of HCAI differ with the setting in which healthcare is delivered the basic principles of IPC apply regardless of the setting.

Effective IPC is central to providing high quality healthcare for people who use healthcare services and a safe working environment for those that work in healthcare settings. It has long been apparent healthcare systems can play a major role in accelerating the spread of newly emerging infection diseases. The COVID-19 pandemic brought the importance of IPC into very sharp focus. However, there is nothing fundamentally new about control of spread of COVID-19 compared with control of many other infections that spread in healthcare systems. Control of spread is based on the same principles and precautions (including standard precautions and transmission-based precautions) used to control other infectious diseases.

This document was developed using Australian Guidelines for the Prevention and Control of Infection in Healthcare (2019) as a starting point. The Australian Guidelines were chosen as a starting point in preference to other documents for a number of reasons. They are in the English language. They were the most up-to-date guidelines available at the time. They are comprehensive. They emphasise a risk based approach to IPC practice. The evidence base for recommendations is clearly set out. There are similarities between the structure of healthcare professions and delivery between Australia and Ireland.

#### 2.1.1 IPC is everybody's business

Understanding the way infectious organisms spread and knowing how and when to apply the basic principles of IPC is critical to the success of an IPC programme. The overall responsibility for the success of the IPC programme rests primarily with the health service management team. Everybody working in a healthcare facility, using services or visiting the facility has a responsibility to support the programme. This includes all staff, people using healthcare services and visitors. Good IPC is essential to good clinical care. IPC services in healthcare facilities exist to support everyone in delivering clean, safe care. IPC is not a discrete set of practices owned by IPC practitioners.

Successful approaches for preventing and reducing harms arising from HCAs involve applying a risk-management framework to manage 'human' and 'system' factors associated with the transmission of infectious microorganisms. This approach ensures that infectious microorganisms, whether common (for example, gastrointestinal viruses), uncommon or associated with a pandemic can be managed effectively. In addition to prevention of transmission of infectious microorganisms the harm associated with transmission can be reduced by reducing the vulnerability of people to infection. Reducing the vulnerability of people using healthcare services to infection includes promoting appropriate vaccination, minimising use of invasive devices as well as personal care, nutrition and mobilisation.

Involving people who use healthcare services and their carers is essential to successful IPC in clinical care. People using healthcare services and those who visit them need to be sufficiently informed to be able to participate in reducing the risk of transmission of infectious microorganisms.

#### 2.1.2 Basics of IPC: IPC in the healthcare setting

##### Summary

- Infectious microorganisms (also called pathogens) are biological organisms that frequently cause human infection. Infection refers to the invasion of body tissues by a microorganism. Microorganisms may only cause infection in a proportion of people to whom they are transmitted and infection may only cause disease in a proportion of people who are infected.
- Colonisation, in this context, refers to a situation in which a microorganism is established on a person's body (for example on skin, mucous membrane or wound) but is not causing infection at that time. Although the person who is colonised is not infected, the organism may spread from a colonised person to others and or subsequently cause infection in the colonised person.
- Infection that does not result in any illness or disease is referred to as asymptomatic infection. Asymptomatic infection is a common phenomenon with some infectious microorganisms and has become a focus of much attention during the COVID-19 pandemic. Although people who are colonised do not have disease, the organism may spread to others from them.
- Many different infectious microorganisms are present in healthcare settings.
- For infection to spread, 6 elements are required - causative microorganism (pathogen), reservoir, means of transmission, portal of entry, susceptible host, portal of exit. These 6 elements form what is commonly referred to as The Chain of Infection, Figure 1.
- People who use healthcare services and healthcare workers are most likely to be sources of infectious microorganisms and are also the most common susceptible hosts. Other people visiting and working in healthcare may also be at risk of infection and may be a source of transmission.
- In healthcare settings, the main ways that infectious microorganisms spread are by contact (direct and indirect) and by spread through the air. Spread through the air is categorised as either droplet or airborne transmission.

#### 2.1.3 Healthcare associated infection (HCAI)

Almost all infectious disease is associated with microorganisms including bacteria, virus and protozoa. Notable exceptions are those associated with larger parasites (worms, fleas, lice and scabies mites) and those associated with prion proteins. In general, this document will refer to microorganisms except when reference to other infectious agents is specifically required. The broad principles of IPC that apply are similar for all infectious microorganisms.

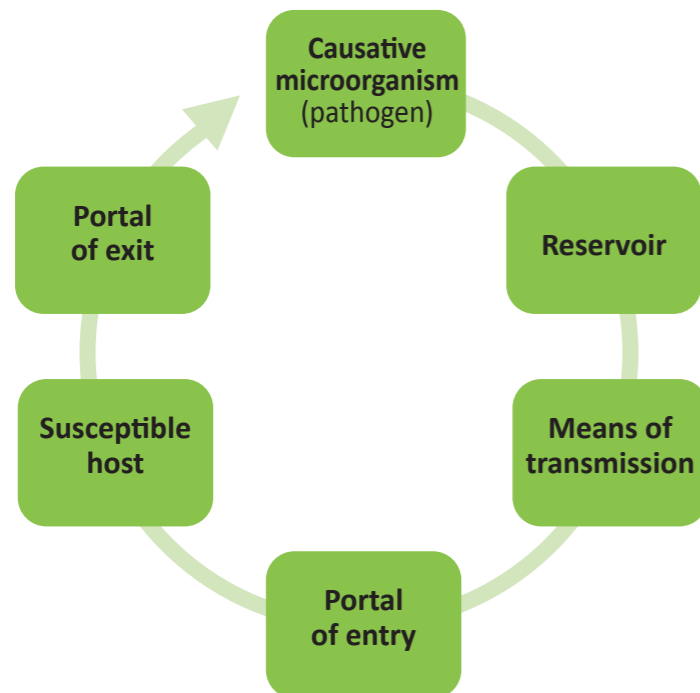
Microorganisms exist naturally everywhere in the environment. Most microorganisms do not cause infection in otherwise healthy people (for example 'good' bacteria present in the body's normal flora). However, some microorganisms can cause infection and disease in a proportion of otherwise healthy people and almost any microorganism can cause infection in some very vulnerable people.

Microorganisms including bacteria, viruses, fungi and protozoa – can be involved in causing either colonisation or infection, depending on the susceptibility of the host:

- With colonisation, there is a sustained presence of replicating microorganisms on or in the body, without causing infection or disease
- With infection, invasion of infectious microorganisms into the body results in an immune response, with or without symptomatic disease.

Transmission of infectious microorganisms within a healthcare setting requires all of the following elements:

- Causative microorganism (pathogen)
- Reservoir
- Means of transmission
- Portal of entry
- A susceptible host
- Portal of exit.



**Figure 1** The chain of infection

Infectious microorganisms transmitted during healthcare come primarily from human sources, including people who use healthcare services, healthcare workers and visitors. Source individuals may be actively ill, may have no symptoms but be in the incubation period of a disease or may be temporary or long-term carriers of an infectious microorganism with or without symptoms. Infectious microorganisms may also reside in the healthcare environment.

Infection is the result of a complex interrelationship between a host and an infectious microorganism. People vary in their response to exposure to an infectious microorganism:

- Some people exposed to infectious microorganisms become infected quite quickly and then become severely ill and may die
- Some people exposed to infectious microorganisms become infected but have a very mild illness or no illness
- Some people may become temporarily or permanently colonised but never become infected
- Some people develop colonisation at first but go on to develop infection either soon after exposure or weeks or months after they become colonised.

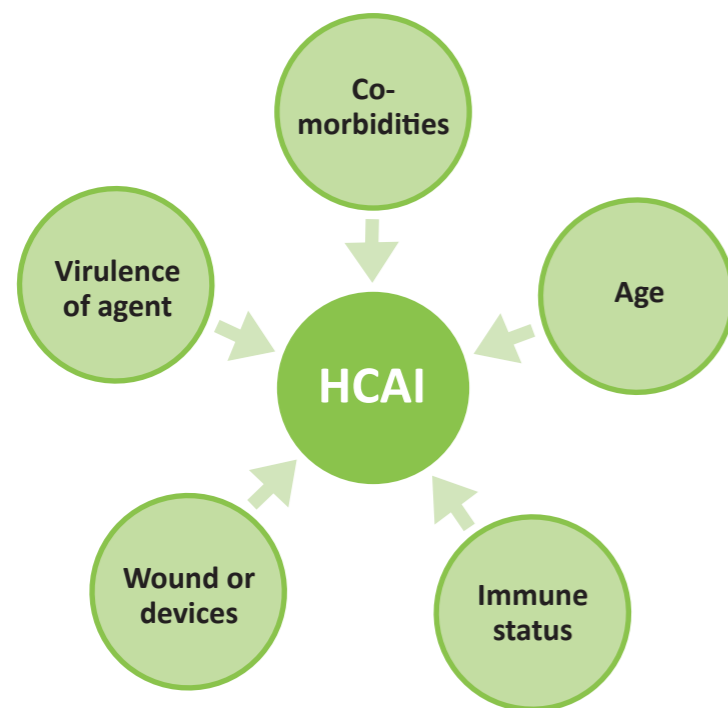
Important predictors of an individual's outcome after exposure to a microorganism or infectious microorganism include:

- Their immune status at the time of exposure. For some infectious microorganisms' previous infection or vaccination may confer lasting immunity (**acquired immunity**) to infection and or to disease caused by the microorganism (for example measles virus). For other infectious microorganisms lasting immunity does not occur reliably and there may be no vaccine
- In a pandemic of a newly emerged infectious microorganism the fact that no one in the population has acquired **immunity** means that everyone is vulnerable to infection with that microorganism and therefore the control of spread of the microorganism is more difficult to achieve

In addition to the effect of previous infection and vaccination, immune status depends on other factors and may be compromised by medical treatment (such as immunosuppressive drugs or irradiation). Examples of other factors include:

- The persons age (for example new-borns and older people are generally more susceptible)
- Their general health status (when a person has other underlying disease such as diabetes or is a smoker there are 'comorbidities' that increase risk of infection)
- The virulence of the infectious microorganism (virulence means the ability of the microorganism to cause illness)
- Other factors that increase the risk of developing infection (for example undergoing surgery, requiring an indwelling device such as a catheter or remaining in hospital for lengthy periods).

Figure 2 summarises key factors that influence the occurrence of healthcare associated infection in an individual following exposure to a microorganism.



**Figure 2** Factors influencing healthcare associated infection

In healthcare settings, the most common susceptible hosts are people who use healthcare services and healthcare workers:

- People who use healthcare services may be exposed to microorganisms from themselves (endogenous infection). These microorganisms include bacteria residing on their skin, in the respiratory or gastrointestinal tract. They may be exposed to microorganisms from other people, from instruments and equipment, or the environment (exogenous infection). The level of risk of being exposed to microorganisms relates to the healthcare setting (specifically, the type of microorganism's present), the type of healthcare procedures performed, adherence to hand hygiene, vaccination status of people who use healthcare services and staff and the general susceptibility of the person
- Healthcare workers may be exposed to microorganisms from infected or colonised people who use healthcare services, instruments and equipment, or the environment. The level of risk relates to the type of clinical contact healthcare workers have with potentially infected or colonised people, instruments or environments, adherence to standard and transmission-based precautions, and the health status of the healthcare worker (for example immunised or immunocompromised).

In healthcare settings, the main modes of transmission of microorganisms are contact (including blood borne) and spread through the air (droplet and airborne transmission). The modes of transmission vary by type of microorganism. In some cases, the same microorganism may be transmitted by more than one route (for example norovirus, influenza and respiratory syncytial virus (RSV) can be transmitted by contact and droplet routes).

## Routes of transmission

### Contact transmission

Contact is the most common mode of transmission and usually involves transmission by touch, in particular contact with blood or body substances. Contact may be direct or indirect:

- *Direct contact transmission* occurs when microorganisms are transferred directly from one person to another – for example, the blood of a person using healthcare services entering a healthcare workers body through an unprotected cut in the skin
- *Indirect contact transmission* involves the transfer of microorganisms through a contaminated intermediate object or person – for example, a healthcare workers hands transmitting microorganisms to a person using healthcare services after touching an infected body site on another person, or a healthcare worker coming into contact with fomites (for example bedding) or faeces and then with a person using healthcare services.

Examples of microorganisms transmitted by contact include multidrug resistant organisms (MDROs), *Clostridioides difficile* (formerly *Clostridium difficile*), bacteria (*Streptococcus pyogenes/Staphylococcus aureus*) which can cause highly contagious skin infections (for example impetigo) and mites that cause infestations (for example scabies).

### Droplets and aerosols

Respiratory viruses, including SARS-CoV-2 and Influenza virus are present in oral and respiratory fluids. Transmission of these viral agents occurs mainly as a consequence of shedding of virus in liquid respiratory particles into the air from the respiratory tract of an infectious person. These particles are shed when coughing, sneezing, talking and breathing. Respiratory particles shed from the respiratory tract can cause infection if the virus in the particles reaches the respiratory mucosa of a susceptible person. This is much more likely to occur in indoor and other enclosed settings. The virus can reach the respiratory tract mucosa (eyes, nose and mouth) of a susceptible person in two ways:

- (1) travelling directly through the air to the respiratory tract or
- (2) indirectly as a result of contamination of hands or other surfaces and subsequent transfer to the respiratory mucosa (see above regarding contact transmission).

### Transmission directly through the air to the respiratory tract

In relation to IPC theory and practice, direct transmission of infectious microorganisms through the air to the respiratory tract is represented as being comprised of two categories of droplet and airborne transmission.

### The standard theoretical background to droplet and aerosol transmission

Within this framework liquid respiratory particles are considered as droplets (larger liquid particles) or aerosols (smaller particles). A cut-off value of 5 microns diameter is applied to differentiate between the two categories. Liquid particles with a diameter of more than 5 microns are considered droplets and those with a diameter of less than 5 microns are considered aerosols.

Droplets are expected to land on surfaces or to fall out of the air on to surfaces, including respiratory mucosa, quickly and within a short distance of where they are generated. Spread in this way is known as droplet transmission.

Aerosols are expected to stay suspended in the air for an extended period and to travel throughout the air space within which they are generated. Transmission in this way is airborne transmission.

Some infectious agents including (*Neisseria meningitidis*, Influenza virus, Respiratory Syncytial Virus) are considered as predominantly droplet transmitted and others including *Mycobacterium tuberculosis*, chickenpox and measles are considered as classically airborne transmitted. Within that standard framework of droplet and airborne transmission the distinction between droplet and airborne transmission is not absolute. While some infectious microorganisms are predominantly droplet transmitted they can be airborne transmitted in some circumstances. One example is when aerosol generating procedures (AGPs) with an increased risk of transmission of infection are performed. AGPs are certain medical procedures for example endotracheal intubation.

The COVID-19 pandemic prompted extensive research and review of evidence regarding the physics of liquid particles generated from the respiratory tract and pathways of direct transmission of virus through the air. Liquid particles are generated from the respiratory tract when breathing, talking, singing, shouting or laughing. It is increasingly accepted that the division of these particles into two discrete categories of droplets and aerosols is not well supported. There is a continuous range in size of particles from those large enough to see with the naked eye to those that are invisible. Some are so small that they are measured in nanometres. How long any individual respiratory particle stays in the air and how far it travels before landing on a surface depends on a range of factors. Amongst other factors, these include the size of the particle, the force with which it is scattered from the nose or mouth and the extent of air movement in the air space. Particles, including those greater than 5 microns in diameter, may be borne upwards on warm, turbulent airflow from exhaled human breath, rather than fall directly to the ground under the influence of gravity. Subsequent intensity of exposure of an individual to particles will depend on the rate of settling of particles and air exchange in the air space both of which are influenced by factors such as prevailing air currents and ventilation. Based on these considerations the distinction between droplets and aerosols and between droplet transmission and airborne transmission may be considered as useful for practical purposes but considered as overlapping categories rather than discrete categories. This is well summarised in a recent paper by Randall and others (Randall *et al.* 2021). The relative importance long-range airborne transmission of SARS-CoV-2 is the subject of ongoing discussion. However, there is persuasive evidence that transmission over longer distances in smaller respiratory particles occurs in some circumstances (Duval *et al.* 2022).

The likelihood of transmission of infection from liquid respiratory particles in any setting will depend on the proportion of particles that carry infectious organisms, how much organism they carry and on the quantity of organism required to establish infection (infectious dose). Lower infectious dose is associated with a higher probability of infection at lower intensity of exposure. In the case of SARS-CoV-2, variants emerged in the course of the pandemic (for example alpha and delta variants) that are more readily transmissible than the original form of the virus and that were reported as more commonly associated with transmission in indoor, poorly ventilated places over a longer range. Variation in patterns of transmission between different variants of a specific virus (such as SARS-CoV-2) supports the view that droplet and airborne transmission are overlapping rather than discrete categories.

Although the categories are not discrete IPC practitioners find that the categories of **droplet** and **airborne** transmission have a practical utility for concise communication with healthcare workers regarding the set of IPC precautions recommended for specific circumstances. For this reason, these terms are retained in this guidance. However, it is important that those who use and communicate regarding those categories understand their limitations.

### Limitations of categories of droplet and aerosol and of droplet transmission and aerosol transmission

An understanding of transmission of infectious agents through the air should be based on the continuum of risk associated with potentially infectious liquid particles from the respiratory tract. The basis for using the general categories “droplet” and “airborne” categories are more soundly based on observed patterns of transmission rather than on the physics of respiratory particles. Some agents are predominantly transmitted to susceptible people in close proximity to the source. A distance of 1m is widely used as a guide in this context although some authorities use distances of 1.5, 1.8 or 2m. This pattern of relatively short range transmission is generally referred to as droplet transmission. Some agents are readily transmitted to susceptible people anywhere within an enclosed air space that is shared with the source of infection. This pattern of transmission is generally referred to as airborne transmission. Organisms with an airborne pattern of transmission have also been observed to transmit readily to susceptible people who enter the air space soon after the infectious person has vacated the space.

For a susceptible person in shared air space with a person shedding an infectious organism in respiratory particles the risk of transmission through the air is very complex.

Factors influencing the risk are likely to include the following:

- How much infectious organism is being shed by the infectious person
- How infectious the organism is (infectious dose)
- How long the susceptible person is in the shared air space
- How close they are to the nose and mouth of the infectious person
- Their orientation towards the infected person (are they directly facing the infectious person)
- How forcefully the infectious person is scattering respiratory particles
- What barriers (including masks) are in place that impede the particles
- The degree to which air movement and ventilation keep the particles suspended and/or dilute the particles.

Recognising that droplet and airborne transmission are not discrete categories has practical implications in that it points to a general requirement for increased emphasis on capacity for adequate ventilation in healthcare facilities. Any healthcare facility may deal with infectious agents transmitted through the air and infectious people may not always be easy to recognise. Ventilation, either natural ventilation or mechanical ventilation depending on the nature of the healthcare service should be appropriate for the setting. Furthermore, IPC practitioners will frequently need to carry out risk assessments to manage the risk of transmission through the air within the available facilities.

In addition to the typical pattern of transmission associated with the infectious agent (droplet or airborne patterns) the risk assessment will consider:

- The likelihood that infectious people are present
- The susceptibility to infection of potentially exposed people
- The likely intensity of exposure in any given situation
- The available built environment.

In circumstances where transmission of infection through the air is identified as a risk, the following core components for risk reduction should be considered:

- Vaccination of susceptible individuals against the infectious disease when an effective vaccine is available
- Minimise the number of people who share air space with an infectious person by patient placement in a place that supports limiting the number of other people exposed (ideally closed room with controlled ventilation)
- In so far as consistent with good patient care, minimise the duration of exposure of those people who must enter the space where the patient is placed
- Minimise the shedding of microorganisms by the infectious person (anti-infective agents where these are of proven benefit)
- Minimise the scattering of microorganisms by the infectious person (respiratory and cough etiquette and wearing mask if tolerated)
- Maintain as much distance as is reasonably practical while in the shared air space
- Maintain ventilation (often natural, mechanical where required) as much as practical to dilute infectious particles
- Use of appropriate personal protective equipment including an appropriate face mask.

Some agents are associated with variable or intermediate patterns of spread in different contexts. These can be particularly challenging to manage in terms of assessing and managing the risks in particular circumstances.

In day-to-day practice IPC practitioners may continue to use the terms droplet transmission and airborne transmission as labels for general patterns of transmission but with an awareness of the limitations of these terms and the extent to which patterns of transmission may vary with circumstances and virus variants. In general, where there is doubt, a higher level of transmission-based precautions should apply. This must take account of what is practical within the limits of available facilities although these issues should inform future new building and refurbishment.

#### 2.1.4 Standard and transmission-based precautions

Successful IPC involves implementing work practices that reduce the risk of transmission of microorganisms through a two-tiered approach, including:

- Routinely applying basic IPC strategies to minimise risk to both people who use healthcare services and healthcare workers, such as hand hygiene, respiratory hygiene, appropriate use of personal protective equipment, cleaning and safe handling and disposal of sharps (standard precautions)
- Effectively managing microorganisms where standard precautions may not be sufficient on their own – these specific interventions control infection by interrupting the mode of transmission (transmission-based precautions).

#### 2.1.5 Standard Precautions

All people potentially harbour infectious microorganisms. Standard precautions refer to those work practices that are applied to everyone, regardless of their perceived or confirmed infectious status. Standard precautions ensure a basic level of IPC. Implementing standard precautions as a first-line approach to IPC in the healthcare environment minimises the risk of transmission of microorganisms from person to person, even in high-risk situations.

Standard precautions are used by healthcare workers to prevent or reduce the likelihood of transmission of microorganisms from one person or place to another and to render and maintain objects and areas as free as possible from infectious microorganisms. Guidance on implementing standard precautions is given in Sections 3.1, 3.3, 3.11, 7.2 and 7.3.

#### 2.1.6 How standard precautions are implemented:

- Personal hygiene practices, particularly hand hygiene, aim to reduce the risk of contact transmission of microorganisms (see sections 3.1.1)
- Appropriate use of personal protective equipment, which may include gloves, gowns, disposable aprons, masks/face shields and eye protection, aims to prevent exposure of the healthcare worker and people who use healthcare services to infectious microorganisms (see section 3.3)
- Safe handling and disposal of sharps assist in preventing transmission of blood borne virus to people who use healthcare services and to healthcare workers (see section 3.1.2)
- Environmental controls including cleaning and spills management, assist in preventing transmission of microorganisms from the environment to people who use healthcare services and healthcare workers (see sections 3.1.3 and 3.11.1)
- Single use equipment and appropriate reprocessing of reusable equipment and instruments including appropriate use of disinfectants, aims to prevent person to person transmission of microorganisms (see section 3.1.4)
- Practising respiratory hygiene and cough etiquette reduces the risk of transmission of infectious microorganisms spread by droplets and aerosols (see section 3.1.5)
- Aseptic technique aims to prevent microorganisms on hands, surfaces or equipment from being introduced into a susceptible site (see section 3.1.6)
- Appropriate handling and disposal of waste and linen assists in reducing transmission of microorganisms (see sections 3.1.7 and 3.1.8).

#### 2.1.7 Transmission-based precautions

Any IPC strategy should be based on the use of standard precautions as a minimum level of control. Transmission-based precautions are recommended as additional work practices in situations where standard precautions alone may be insufficient to prevent transmission. This includes the use of transmission-based precautions in the event of an outbreak (for example gastroenteritis) to assist in containing the outbreak and preventing further infection.

Transmission-based precautions should be tailored to the particular infectious microorganisms involved and its mode of transmission. This may involve a combination of practices.

Guidance on when and how to implement transmission-based precautions is given in sections 3.2, 3.5 and section 7.3.

#### 2.1.8 Types of transmission-based precautions

- **Contact precautions** are used when there is a known or suspected risk of direct or indirect transmission of infectious microorganisms that is not effectively contained by standard precautions alone (see Section 3.2.2).

- **Droplet precautions** are used for people who use healthcare services who are known or suspected to be infected with microorganisms transmitted over short distances by large respiratory droplets (see section 3.2.3).
- **Airborne precautions** are used for people who use healthcare services who are known or suspected to be infected with microorganisms transmitted from person to person by the airborne route and for microorganism transmitted by droplets when aerosol generating procedures (AGPs) associated with an increased risk of infection are performed. (See section 3.2.4).

### 2.1.9 Strategies for implementing transmission-based precautions:

- HCWs performing an assessment of risk when a person first presents to a service in any setting in order to anticipate and communicate the potential need for transmission-based precautions at every step of subsequent care
- Allocating a single room inclusive of bathroom facilities to any person with a suspected or confirmed infection that requires transmission-based precautions and closing the door (source isolation)
- Placing people colonised or infected with the same infectious microorganism in a room together (cohorting). Note: for this purpose “the same infectious microorganism” means that there is no difference of clinical consequence between the microorganisms. For this purpose, a patient with infection with *M. tuberculosis* fully sensitive to anti-tuberculosis agents does not have “the same organism” as a patient with infection with *M. tuberculosis* resistant to anti-tuberculosis agents.
- Wearing specific personal protective equipment and removal after use
- Providing patient dedicated equipment
- Providing a clean environment and using sodium hypochlorite or other appropriate disinfectant as required
- Using specific air handling techniques when required
- Restricting the movement of both people who use healthcare services and healthcare workers in so far as possible consistent with meeting care needs.

### 2.1.10 Overview of risk management in IPC

#### Summary

- Identifying and analysing risks associated with healthcare is an integral part of successful IPC
- Adopting a risk-management approach at all levels of the facility is necessary. This task is primarily the responsibility of the facility’s management. It requires cooperation between management, healthcare workers and support staff and the support of people using healthcare services and visitors
- Differing types and levels of risk exist in different healthcare settings. In adapting this guidance, each healthcare facility should conduct its own risk assessment (that is to consider how to avoid, identify, analyse, evaluate and treat risks in that setting) and also refer to discipline-specific guidance where relevant.

### 2.1.11 Risk management basics

In the context of these guidelines, the principal risk is the possibility for microorganism colonisation or infection in people using healthcare services or healthcare workers arising from activities within a healthcare service. Effective risk management is key for preventing and reducing harm arising from healthcare associated infection.

A successful approach to risk management occurs on many levels within a healthcare service:

- Service/facility wide – for example, providing support for effective risk management through an organisational risk-management policy, staff training, follow up of outcomes, monitoring and reporting
- Ward, department or practice based – for example, embedding risk management into all policies so that risks are considered in every situation
- Individual – for example, considering the risks involved in carrying out a specific procedure and questioning the necessity of the procedure as part of clinical decision making, attending education sessions (for example hand hygiene or respirator fit testing). Note: that it is valuable to support patients/service users to contribute to risk assessments that relate to their care.

As healthcare settings differ greatly in their day to day function, it is not possible to provide a one size fits all approach to risk management. Even within a single setting (for example primary care), increasingly complex care is delivered by a range of health professionals with diverse qualifications and training. All healthcare services and facilities need to be able to determine the risks in their own context and select the appropriate course of action. Therefore, it is necessary for services and facilities to regularly conduct IPC risk assessments and ensure that all staff understand their responsibility in managing these risks.

The HSE Integrated Risk Management Policy 2017 provides additional information on risk management in the healthcare system in Ireland. <https://www.hse.ie/eng/about/who/riskmanagement/risk-management-documentation/hse-integrated-risk-management-policy-part-2-risk-assessment-and-treatment.pdf>

The risk management process as outlined in the document is summarised below:

1. Establishing the context – means defining the external and internal factors that must be considered when managing risk for example key stakeholders, the legal and regulatory framework, type of health service/facility, extent of and support for the facility’s IPC programme.
2. Risk assessment is comprised of three steps:
  - (a) Risk identification – a risk is something that may happen that could impact on the delivery of clean safe care. Ideally a risk should be identified before an incident has happened
  - (b) Risk analysis – is a process that is used to gain a better understanding of the risk identified and the level of risk associated with it. Assessing the level of associated risk takes account of controls in place to mitigate the risk
  - (c) Risk evaluation – this a process to determine if the level of risk is acceptable. If the risk is not acceptable it is essential to consider how to treat the risk.
3. Risk treatment - this is the process of selecting and implementing measures to modify the risk.



Monitoring and review is an essential component of the risk management process. This ensures that:

- New risks are identified
- Risk assessment is reviewed in the context of data on incidents (if possible)
- Risk treatment is implemented effectively.

Communication and consultation are also key elements of clinical risk management. An interactive exchange of information between management, healthcare workers, people who use healthcare services and other stakeholders provides the basis for increased awareness of the importance of IPC, identification of risks before they arise and prompt management of risks as they occur.

Using an impact table, likelihood scoring and risk matrix as outlined in the HSE Integrated Risk Management Policy may assist with risk analysis and provide input into evaluation and decision making on whether the risks need action and what the most appropriate risk treatment strategies and methods may be.

An important part of reducing risk is the appropriate management and learning from incidents. The HSE Incident Management Framework (2020) provides a comprehensive approach to incident management. <https://www.hse.ie/eng/about/who/nqpsd/qps-incident-management/incident-management/hse-2020-incident-management-framework-guidance.pdf>

### Applying the risk management process

The following case study gives an example of applying the risk-management process in a primary care setting. Case studies giving examples of how to use this process in primary, acute and long-term care settings, including relevant considerations in specific situations are included Appendix 7. While the basic process of risk management applies regardless of setting, all healthcare facilities should develop risk management policies and procedures that are appropriate to the setting.

#### 2.1.12 Case study: Measles virus outbreak

The Department of Public Health inform a general practice of an outbreak of measles. The Department of Public Health will assist the practice with advice about management of potential exposures. Information about the outbreak is communicated to all practice staff.

#### 1. Establish the context

The context is a large general practice in the outer suburbs of Dublin, which caters for a diverse group of patients including disadvantaged groups and many young families.

#### 2. Risk assessment

##### a) Risk identification

The risk is transmission of measles virus in the practice.

##### b) Risk analysis

Measles is a highly transmissible infection; routes of transmission include airborne transmission. The degree of risk depends on the number of non-immune patients or staff in the general practice and community, and also the appropriateness of IPC practices in place. There is a risk of transmission of measles, primarily from infectious patients in the waiting room. The infection can be transmitted to any susceptible person breathing the same air as the infectious patient while the patient is present and for up to two hours after the patient has left the area. The infection also has the potential for indirect contact transmission if droplets settle on to surfaces. If appropriate IPC measures are already in place, then the risk may already be adequately addressed (treated).

#### c) Risk evaluation

If it is assessed as likely that a patient with measles will attend the practice and be in contact with a susceptible person and the consequence of transmission of measles is assessed as moderate to major, this is not an acceptable level of risk and additional risk treatment is required promptly.

### 3. Risk treatment

Suspected cases and cases of measles should be identified as quickly as possible and be managed from an IPC perspective as infectious cases whilst awaiting laboratory results.

Intermediate responses may include:

- Establish if all staff members are immune to measles
- Placing signs at the entrance to the practice advising people to phone if they suspect they have measles or if they have a skin rash and temperature
- Examine suspected cases in their own home where possible or arrange for them to be seen when the surgery is otherwise empty, for example at the end of a clinical session
- Communicate with the public by local media and or social media and display information for people coming to the practice at reception warning about suspected measles cases
- Identifying and managing any person that presents at the practice with suspected measles or similar symptoms for example suspected cases should avoid the waiting room
- Suspected cases should be given surgical mask to wear and if at all possible taken to a separate room where they can be assessed by staff who are known to be immune to measles. If there is no separate room and they travelled to the surgery by car, it may be possible for them to wait in the car until they are seen
- Perform the consultation in a room which can remain vacant for two hours post consultation with suspected cases
- Identify any known high-risk patients (for example infants and unvaccinated children, immunocompromised patients) who may have an appointment at the general practice and consider potential for exposure
- Respiratory etiquette and hand hygiene can be encouraged through communication / information resources and staff
- Thorough surface and environmental cleaning and disinfection
- Clinically suspected and confirmed cases should be notified to the Medical Officer of Health promptly.

Long-term measures may include:

- Providing additional education to staff on measles identification and management including the process for reporting this notifiable disease to the Medical Officer of health and use of airborne precautions
- Review staff vaccination policy and records
- At risk staff who are not known to be immune and have not been vaccinated can be identified and encouraged to be immunised.

Consider which risks need to be actively managed, how this will be achieved, and prioritise which actions to take based on the impacts. A tabular format for evaluation of risk treatment options such as illustrated in Table 5 below may help to determine the ease and impact of possible strategies when deciding which to implement. Note: that priority must be given to activities that address risks that are high and which could have a potentially catastrophic outcome.

**Table 5** Examples of evaluation of risk treatment options

Example	Ease	Analysis	Impact
Ensure all staff have been immunised against measles	Easy	Measles vaccine is highly effective and safe	High
Ensure all staff have been trained in appropriate infection prevention and control including use of appropriate personal protective equipment	Moderate	Good IPC practice helps protect staff from measles and all other infectious disease	High
Clean and disinfect surfaces	Easy	Potential for measles contact transmission if droplets settle on surfaces	High
Isolation of suspected cases and use of surgical mask	Easy	Isolation of suspected case reduces the risk of exposure of others to infectious aerosols. Use of a surgical mask by patient may reduce dispersal of aerosols	High
Provide alcohol-based hand rub (ABHR) in waiting, clinical rooms and consultation rooms	Easy	Shown to improve compliance with hand hygiene, which has an impact on the spread of HCAI	High
Consider if people travelling by car can wait in their car until called to be seen	Easy	May reduce number of people exposed and duration of exposure	High

#### 4. Monitor and review

- Each clinical suspected and confirmed case of measles identified should be notified to the Medical Officer of Health promptly.
- Monitor and/or follow up with any known at-risk patients for example immunocompromised.
- Provide feedback to staff.

**Source:** Adapted from Australian Guidelines for the Prevention and Control of Infection in Healthcare (2019).

#### 2.1.13 A person centred approach

##### Summary

- Healthcare services and facilities need to take an organisational approach to involving people who use healthcare services in their care.
- A person-centred healthcare system is known to be associated with safer and higher quality care.
- A two-way approach that encourages participation by people who use healthcare services is essential to successful IPC.

##### Person-centred healthcare

Person-centred healthcare is respectful of, and responsive to, the preferences, needs and values of people who use healthcare services. Care of children must facilitate the central role of parents and guardians in their care. People receiving healthcare, and in the case of children, their parents and guardians, increasingly expect to be given information about their condition and treatment options and this extends to their rights and responsibilities as users of healthcare services. The best possible outcomes are more likely where person-centred health care is a priority of the healthcare facility and a strong and consistent effort is made to respect the rights and expectations of people who use healthcare services.

The National Healthcare Charter 2012, You and Your Health Service sets out what patients and families can expect in this regard when using healthcare services in Ireland and what patients and families can do to help the health service deliver more effective and safe services.

<https://www.hse.ie/eng/services/yourhealthservice/hcharter/>

#### 2.1.14 How does person centred care relate to IPC?

The purpose of IPC is to support people's access to appropriate care that is clean and safe. Effective IPC is central to providing high quality person-centred healthcare.

Putting people who use healthcare services at the centre of IPC and enabling them to participate in the care process is not just about explaining the risks of treatments but involves considering the person's needs at every level. This has to be balanced with the requirement to maintain an environment for everyone (other service users and staff) where care can be delivered in a safe manner, which minimises the spread of infection. This ranges from designing the facility to maximise comfort and safety for service users to having a range of processes to engage people in their care. Healthcare workers need to listen and act on feedback from service users as well as provide the person with education and support so that they can be involved in looking after themselves.

To support a two-way approach to IPC and encourage the participation of people using the service in actions to minimise cross-infection or transmission of infectious microorganisms, it is important to:

- Take perspectives of people who use healthcare services into account when developing policies and programmes
- Familiarise people who use healthcare services with the IPC strategies that are employed in healthcare facilities to protect them, the people caring for them and the healthcare environment
- Discuss with people who use healthcare services the specific risks associated with their medical and/or surgical treatment

- Encourage people who use healthcare services to disclose their health or risk status to healthcare workers or others within the healthcare facility if there is a potential risk or source of infection
- Provide opportunities for people who use healthcare services to identify and communicate risk and encourage them to use feedback procedures for any concerns that they have about IPC practices
- Provide educational materials about IPC using a variety of media (for example posters in waiting rooms, printed material and educational videos)
- Inform people who use healthcare services about the protocols for protecting their privacy and confidentiality.

### 2.1.15 Involving people who use healthcare services in their care

People who use healthcare services and visitors should be informed of what they can do to prevent the spread of infection and keep themselves safe from infection in healthcare settings. Healthcare organisations should provide specific information to people who use healthcare services to assist them in becoming involved in identifying and reducing risks.

Healthcare workers should, where possible:

- Explain the processes of IPC (for example the importance of hand hygiene, reasons for wearing personal protective equipment (PPE), importance of appropriate handling and disposing of sharps to people who use healthcare services and their carers)
- Engage people who use healthcare services and their carers in the decision-making process regarding their care and how it is delivered
- Ensure all people who use healthcare services and their carers are aware that they are welcome to ask questions of healthcare professionals.

Written material (such as brochures and posters) can be used to reinforce verbal discussions with people who use healthcare services as part of their care. This information aims to inform people who use healthcare services, visitors, families and carers about healthcare associated infection, what activities healthcare facilities may have in place to reduce the risk of infections as much as possible and what they, as people who use healthcare services, can do to limit the number of infections. Information for people who use healthcare services is available at [www.hse.ie/infectioncontrol](http://www.hse.ie/infectioncontrol). There is also information available on a number of specific microorganisms associated with HCAI. Information developed for patients and service users should be developed with regard to ensuring the materials are accessible to most people. The National Adult Literacy Agency (NALA at <https://www.nala.ie>) provide support for ensuring that written information is user friendly. Where standardised materials are available at national level it is generally preferable to use those materials to ensure that messages are consistent. A number of such materials are available at <https://bit.ly/3CRmRal>.

Some examples of the types of information that should be provided to people who use healthcare services are below:

- Wearing of gowns, gloves and masks, when required for the task being performed, is a common part of IPC in healthcare – it is used for everybody’s safety. Healthcare workers sometimes use the term PPE for these items
- Healthcare workers should clean their hands before putting on and after removing gowns, gloves and masks. When gloves are required this is always in addition to cleaning hands and not instead of cleaning hands

- Items of PPE are used in the patient care area – healthcare workers usually remove the PPE before they leave the area to reduce the risk of spreading infection. There may be some exceptions to this when PPE is removed after leaving the patient care area
- Gowns or aprons are used so that the healthcare workers skin or clothing does not become contaminated
- Healthcare workers may wear a mask if there is a risk that they may be exposed to infection through the air or if there is risk that they may shed an infectious microorganism from their nose or mouth (for example the SARS-CoV-2 virus)
- Eye protection (eye goggles or face shield) is worn by a healthcare worker in situations where fluid from the person cared for may splash on to their eyes and face or droplets from the nose or mouth of the person cared for may land in their eye
- Healthcare workers wear gloves when they will have direct hand contact with blood or body fluid, mucous membranes or wounds or if there is a substantial risk that touching the person cared for could transmit infection
- People who are sensitive or allergic to latex should tell their healthcare workers to ensure that latex containing products are not used. Nitrile gloves are now generally used in Ireland which helps to protect people who use healthcare services and staff from risk of reaction to latex
- IPC practices may change at different times during care depending on the situation at that time
- People who use healthcare services are welcome to ask a healthcare worker about whether the healthcare worker has performed hand hygiene and if they should be using PPE or whether they are using it properly
- Healthcare workers are at risk of injury and infection when using sharp equipment such as needles and scalpel
- Healthcare workers take steps to handle sharp devices in a way that prevents injury to the user and to others who may come across the device during or after a procedure
- Special containers, often called sharp’s bins, are used for the disposal of sharp devices
- People who use healthcare services are welcome to ask a healthcare worker about the way in which they are handling or disposing of sharp devices
- People who need to use sharps after going home should check that they have been told how to use them and dispose of them safely.

Outbreak situations may require people who use healthcare services to be aware of changes to IPC activities within the healthcare facility:

- An outbreak means that somebody has noticed that there is or probably is spread of an infectious microorganism between people or that more people than is usual are getting a particular type of infection. An outbreak may involve two people or many people. Outbreaks can be associated with any healthcare facility and can cause a lot of service disruption. Staff must act quickly if they know or suspect that there is an outbreak of an infection. Actions may include testing people to see who may be carrying the infectious microorganism, placing people in single rooms or with other people who have the infection and limiting movements of people around the facility
- Hand hygiene is the most important part of preventing spread in most outbreaks
- If people from a ward/unit who have certain kinds of infection are moving to other parts of a hospital/unit, they may be asked to wear a mask

- People who use healthcare services and who have an infection or are colonised with an infectious microorganism may be asked to avoid or limit movement around the building
- To lower the risk of spread of infectious microorganisms in healthcare facilities, visitors should clean their hands using an alcohol-based hand rub before coming into or leaving the patient care area. In particular circumstances, for example if they are assisting with care of the person, they may also be asked to wear gloves and a disposable apron / gowns
- There may be limits on the number of visitors or children and people at increased risk of infection may be advised not to visit.

## 2.2 Clinical and financial impact of healthcare associated infection

HCAIs are one of the most common complications affecting people who are hospitalised. As well as causing unnecessary pain and suffering for people using healthcare services and their families, these adverse events prolong hospital stays and are costly to the health system. Based on the 2017 Point Prevalence Survey of HCAI in Ireland slightly more than 1 in 20 of hospitalised patients in Ireland have a HCAI (Murchan *et al.* 2018). Australian data suggest that HCAI is associated with an estimated increase to the cost of a person's admission of 8.6% (IHPA 2017).

The impact of preventable healthcare associated infection on individuals is illustrated very well by cases of *S. aureus* blood stream infection associated with use of intravenous catheters. An example of this is a man admitted to hospital for surgery requiring a period of two days for pre-operative imaging and other assessments. He developed a high temperature on his second hospital day and was diagnosed with *S. aureus* blood stream infection originating from the site of an intravenous catheter inserted in his forearm shortly after admission. The catheter had not been used to administer any treatment in the interval between insertion and onset of fever. As a result of the infection he required more than two weeks of intravenous antibiotic treatment in hospital before his surgery could proceed. In addition to the direct suffering related to the infection, a hospitalisation expected to last 5 to 7 days extended to more than 3 weeks creating major challenges for him with respect to family and social commitments and lost time from work. For the healthcare services, a single such incident represents an additional 16 days of in-hospital care plus the cost of additional investigations and treatments related to the management of the infection. Looked at from another perspective an incident such as this represents a lost opportunity to provide essential elective procedures for other people awaiting care since it represents a minimum of 16 lost bed-days.

Many studies have attempted to estimate the financial costs associated with healthcare associated infection. These studies are very context dependent but it is quite clear that the financial impact of healthcare associated infection is very significant in all healthcare systems in which this has been studied. A study in Ireland considered costs associated with *Clostridium difficile* infection in one hospital in 2015. The authors estimated the incremental cost at €5,820 per patient with key cost drivers being cleaning, pharmaceuticals, and length of stay (Ryan *et al.* 2017).

The problem of HCAI is not limited to hospitals. HCAIs can occur in any healthcare setting, including general practice surgeries, dental clinics, residential services for older people and people with disabilities as well as the ambulance service and other settings in which paramedics work. There is evidence to suggest a considerable infection burden exists among long-term care residents in Ireland (HPSC European Point Prevalence Survey HCAI in Long-Term Care Facilities 2017). Any person working in or entering a healthcare facility is at risk of HCAI. It is possible to significantly reduce the number of HCAIs through effective IPC. Clear and authoritative national clinical guidance is important to support healthcare services to keep the number of HCAIs at the lowest practical level. This guideline was developed to meet that requirement.

## 2.3 Rationale for this National Clinical Guideline

Many HCAIs are preventable. A healthcare system has a duty to prevent HCAIs to the greatest practical extent. Prevention of HCAI is an element in the prevention and control of antimicrobial resistance (AMR). This is reflected in Ireland's second One Health National Action Plan on Antimicrobial Resistance (iNAP2). The surveillance and control of HCAI and of Antimicrobial Resistance more generally is universally accepted at European and global level as critical to the quality and patient safety and sustainability of healthcare delivery.

The purpose of IPC is to support the delivery of appropriate and safe healthcare, including care of those with infectious diseases while avoiding preventable HCAI. Decisions regarding the optimal approach to treatment required in a given situation are made by the treating clinician and the people using healthcare services. IPC then supports the implementation of that treatment decision to the greatest extent practical and with the least practical risk to people using healthcare services and staff. Good IPC practice therefore is an enabler of appropriate care. IPC must not become and must not be perceived to be a process that creates barriers to appropriate placement and care although in some circumstances IPC may point to the need for additional planning and preparation to minimise risk.

## 2.4 Aim and objectives

By assisting healthcare workers to improve the quality of the care they deliver, these Guidelines aim to promote and facilitate the overall goal of IPC: the creation of clean and safe healthcare environments through the implementation of evidence-based practices that minimise the risk of transmission of infectious microorganisms.

## 2.5 Guideline scope

This Guideline represents a national approach to IPC, focusing on core principles and priority areas for action. As this document provides overall guidance on infection prevention and as such it encompasses, amongst other things, control of Meticillin-Resistant *Staphylococcus aureus* (MRSA) and *Clostridioides difficile*. Therefore, it will replace pre-existing pathogen-specific national IPC guidelines including Prevention and Control of Meticillin-Resistant *Staphylococcus aureus* (MRSA) NCEC National Clinical Guideline No. 2 (2013) and Surveillance, Diagnosis and Management of *Clostridium difficile* Infection in Ireland NCEC National Clinical Guideline No. 3 (2014). However, some pathogen specific content in certain existing guidelines that has not yet been incorporated into this document may remain relevant.

These guidelines provide a basis for healthcare workers and healthcare facilities to develop detailed protocols and processes for IPC specific to local settings where they are required to address specific needs at the service level. However, hospitals and other services providers are advised that investing time and resources in developing site specific IPC guideline documents that reiterate or reformat this document should not be done routinely and should be limited to situations in which the site specific document adds additional value.

The approach taken in this document is underpinned by a risk-management framework to ensure the basic principles of IPC can be applied to a wide range of health and social care settings. This includes hospitals and community healthcare services including GP surgeries, dental clinics, community pharmacies, vaccination services, residential services for older people and people with disabilities, home care and ambulance services. The level of risk of HCAI differs according to the different types of services.

The evidence base for the IPC guidelines is drawn predominantly from the acute-hospital setting. There is generally less evidence available for other health services settings. The recommendations should be read in the context of the evidence base. Some recommendations in this guideline may not be applicable in all settings. When implementing these recommendations all healthcare facilities need to consider the risk of HCAI and implement the guideline according to their specific setting and circumstances and advice on the practical application of the recommendations. Case studies giving examples of risk assessments have been included to help illustrate how these recommendations can be applied to different settings.

The Guidelines make reference to but do not include detailed information on:

- The reprocessing of reusable medical instruments or devices
- Hospital hotel services such as food services, laundry services or waste disposal
- Comprehensive information on many specific infectious diseases
- Health facility design and engineering
- Workspace health and safety
- Pandemic planning.

### Target Audience

The Guidelines are for use by all those working in healthcare - this includes healthcare workers, healthcare students, management and support staff. They are also relevant to people using healthcare services. Sections of particular relevance to people using healthcare services are highlighted as such in the text.

### 2.6 Conflict of interest statement

The guideline development process followed the conflict of interest policy set out by NCEC. All members of the GDG were required to complete a Conflict of Interest (CoI) Declaration on appointment to the group, and on an annual basis, which were managed by the Chair. There were no conflicts of interest stated.

### 2.7 Sources of funding

No external funding was received for the development of this guideline. The Budget Impact Analysis conducted by the Health Research Board-Collaboration in Ireland for Clinical Effectiveness (HRB-CICER) and the work to support development of an Implementation Plan was funded by the Department of Health. HSE-AMRIC and HPSC who supported the GDG are funded by the Health Service Executive (HSE).

### 2.8 Guideline methodology

This guideline was developed by taking the Australian Guidelines for the Prevention and Control of Infection in Healthcare (2019) as a starting point. Almost all of the 21 recommendations in the Guideline are based on the recommendations in that Guideline with no change or with editorial changes to fit the context in Ireland. In those cases the evaluation of the evidence presented in the Australian Guidelines has been accepted as the basis for the recommendation.

The recommendations in the Australian Guideline, and by extension in this guideline, are based on systematic reviews, with the GRADE (Grading of Recommendations Assessment, Development and Evaluation) approach providing the evidence to decision framework. This supported the structure and wording of each recommendation. The recommendation has an accompanying strength reflecting the quality of the evidence and additional factors relating to the harms and benefits of the intervention.

The Australian Guideline uses the following terms -

**Strong Recommendation:** Confident that the desirable effects of adherence to a recommendation outweigh the undesirable effects. Overall the recommendation is based on high quality evidence and is strongly recommended for implementation.

and

**Weak/Conditional Recommendation:** Concludes that the desirable effects of adherence to a recommendation probably outweigh the undesirable effects. Overall the recommendation is based on supportive evidence and a strong theoretical rationale and is recommended for implementation.

The GDG in Ireland agreed that healthcare workers may be inclined to view a weak recommendation as indicating that the GDG was suggesting that there was substantial individual or institutional discretion regarding the adherence to the recommendation. For that reason, the GDG in each case makes a distinction between the strength of the evidence (which follows the Australian Guideline grading) and the strength of the recommendation reflecting the consensus view of the GDG regarding the importance of adherence to the recommendation. In general, the GDG took the view that it could give a strong recommendation based on established international and experience although indicating that the evidence base for the recommendation is weak at present.

Recommendation 21 which relates to Facilities Design is based on a systematic review prepared by HRB-CICER which is provided as an annex to this guideline document.

The response to the COVID-19 pandemic resulted in a specific focus on IPC. In response to practitioners requests for support the HSE issued an interim IPC guideline based on work done on developing this guideline up to that point. This represented an opportunity to gain insight into how the main elements of this guideline were likely to be accepted and used by the health and social care services. Informal feedback was that the guideline was used as a desktop reference, that it generally reflected established practice based on international norms and represented a valuable resource as an authoritative reference for practice in Ireland. The volume and detail of feedback received on public consultation (see section 2.9) most likely reflects that the interim guidance document was in daily use and therefore people in the services were taking note of points that required clarification or question.

Two clinical and cost effectiveness systematic reviews and a budget impact analysis were conducted by HRB-CICER. The first systematic review was an update of the Cochrane review of interventions to improve adherence to hand hygiene recommendations among healthcare workers (to support section 3.8.1 of the clinical guideline). The second was a *de novo* systematic review of the effectiveness of single patient rooms in reducing the incidence of healthcare-associated infection (to inform Recommendation 21). The budget impact analysis focused on quantifying the resource implications of ensuring the ongoing implementation of, and adherence to, the recommendations within the guideline.

### 2.9 Consultation summary

An advanced draft of this document was made available for public consultation in January 2022. During the consultation period more than 50 individuals or groups provided feedback varying from brief observations on individual points to comprehensive line by line feedback extended in some cases to almost 30 pages of detailed feedback. As discussed in section 2.8 the feedback most likely informed by the practical experience of using the HSE Interim guidance as a desk top reference for more than a year in advance of the public consultation. There was positive feedback on the strong emphasis on risk assessment and a risk based approach to managing risks of HCAI.

A number of points that represent a change in practice or emphasis emerged as a focus for particular attention. These include recommendation 4 that alcohol hand rub is now acceptable for hand hygiene when caring for people with *C. difficile* or norovirus infection. Some concerns were expressed regarding detailed text accompanying recommendation 5 regarding a change in one aspect of the traditional management of spills of blood and body fluids to conform to current WHO guidance. Concerns were also expressed from a number of sources regarding recommendations 7 to 9 against general adoption of emerging disinfection technologies. In the context of the pandemic there was a significant focus in feedback on aspects of transmission through the air (droplet and airborne) and related precautions including appropriate use of personal protective equipment and protection of staff. There was substantial comment in the feedback regarding the challenges of fully implementing this guideline in the context of existing infrastructure challenges and high occupancy. Feedback from people working in community based healthcare and social care services suggested rebalance of the guideline so as to be less hospital focused.

Given the volume of feedback this short summary of main themes represents a subjective assessment by the chair of the GDG of key themes and it cannot reflect all of the issues important to each person or group that contributed to feedback. Inevitably there were differences of emphasis and contrasting opinions in the feedback. All feedback was considered carefully in developing the final document and provided the basis for substantial improvement in the pre-consultation draft document.

### 2.10 External review

Initially, a small number of individual external reviewers who were recognised as experts were approached with a request to review the document in June to July 2022. This process failed to identify reviewers who were willing to undertake the review. In July 2022 the ESCMID Study Group on Nosocomial Infection (ESNGI) of the European Society for Clinical Microbiology and Infectious Diseases (ESCMID) were asked to issue a request to all members for volunteers who were willing to review the document. Several ESGNI members from Europe, North America and Asia offered to review the document and were provided with copies of the draft document as of June 2022. The reviewers were asked to answer the following questions and to provide their review by early September 2022.

1. Has the appropriate evidence been identified and reviewed in line with the scope and clinical questions posed by this guideline?
2. Are there specific links between decisions and the available scientific evidence?
3. Have the risks and potential harms of recommendations been fully considered in the context of clinical practice?
4. Is the guideline clearly written, user friendly and allow for individual clinician decisions?
5. Is the guideline suitable for routine use as intended (in so far as you are able to comment on the Irish situation)?
6. Are there relevant international or well referenced guidelines (recommendations) on the same topic that these guidelines conflict with, and if yes are the reasons for this justified in the guidelines?

As of September 26<sup>th</sup> 2022 three external reviewers had responded with reviews. One reviewer expressly answered the six questions posed. The reviewer answered yes to questions one to five and no to question six. The reviewer suggested changes to text in relation to two points. These were addressed. A second reviewer provided positive feedback on the draft guideline with five specific suggestions for improvements. These suggestions were addressed. A third reviewer expressed a number of reservations about aspects of the draft guideline. Specifically the reviewer indicated that there was a lack of clarity as to whether the guideline was focused primarily on meticillin-resistant *S. aureus* and *C. difficile*, suggested greater emphasis on water-borne infection in the healthcare setting and considered that different formatting of the guideline would make it more readable. The reviewer also provided more than 40 individual suggestions for improvement to the draft guideline. Each of the points were addressed in developing the final guideline and in particular the document was revised to avoid any misunderstanding about its scope, additional content was included on water-borne infection. The document was reviewed to improve readability but the overall structure was not changed as the structure conforms to the NCEC template.

### 2.11 Implementation

The implementation process for this Guideline is somewhat atypical. Although there has been no previous general IPC guideline much of what is recommended in this report is established practice in the healthcare system in Ireland based on application of international guidance and accepted practice. Furthermore, given the necessity to respond to the COVID-19 pandemic, a preliminary version of this guideline was made available as a HSE-Interim Infection Prevention and Control Guideline in mid-2020. Therefore much of what is in this guideline is already widely implemented in whole or in part. The implementation process for this guideline then is primarily to deliver more consistent and more uniform implementation of good IPC practice. Further detail is provided in the Implementation Plan (Appendix 6).

### 2.12 Monitoring and audit

Monitoring and audit play a central role in ensuring that the recommendations in this guideline are implemented. Many larger health care institutions already have well embedded institutional programmes for audit that address key recommendations including for example many of those recommendations that relate to hand hygiene and cleaning. There is also a national programme for audit of hand hygiene performance. Because of the nature of the recommendations the audits that relate specifically to the recommendations are audits of process. Monitoring of outcomes are also critical to assess if the guidelines overall are being implemented in a way that improves patient care. Within the HSE for example all hospitals are required to report monthly on the incidence of hospital acquired *Staphylococcus aureus* blood stream infection and on healthcare associated *Clostridioides difficile* infection. The HSE has key performance indicators (KPIs) that represent ambitious goals for improvement in these outcomes. When an institution is assessing its implementation of this guidance it should consider both the process audits outlined in Appendix 8 and these and other relevant indicators of outcome.

### 2.13 Plan to update this National Clinical Guideline

This guideline will be due for update 2 years after the date of initial publication.

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