



An Roinn Sláinte
Department of Health

Infection Prevention and Control (IPC)

National Clinical Guideline No. 30

Annex B: Budget Impact Analysis - National Clinical Guideline:
Infection Prevention and Control



Budget impact analysis –

National Clinical Guideline:
Infection Prevention and Control

September 2022



About HRB-CICER

In 2016, the Department of Health requested the Health Research Board (HRB) to fund a dedicated multidisciplinary research group to support the activities of the Ministerial appointed National Clinical Effectiveness Committee (NCEC). Called HRB-CICER (Collaboration in Ireland for Clinical Effectiveness Reviews), a five-year contract (2017 to 2022) was awarded following a competitive process to the Health Information and Quality Authority (HIQA). The HRB-CICER team comprises a dedicated multidisciplinary research team (including expertise in health economics, qualitative and quantitative research methods and epidemiology) supported by staff from the Health Technology Assessment (HTA) team in HIQA and the HRB Centre for Primary Care Research at the Royal College of Surgeons in Ireland (RCSI), as well as national and international clinical and methodological experts.

Guideline development groups submit clinical guidelines for appraisal and endorsement by the NCEC as National Clinical Guidelines. HRB-CICER provides independent scientific support to guideline development groups tailored according to their specific needs. The main role of the HRB-CICER team is to undertake systematic reviews of the clinical effectiveness and cost-effectiveness of interventions included in the guidelines and to estimate the budget impact of implementing the guidelines. Additional support can be provided by HRB-CICER to guideline development groups including; providing tailored training sessions and working closely with the guideline development groups to develop clinical questions and search strategies; performing systematic reviews of international clinical guidelines; supporting the assessment of their suitability for adaptation to Ireland and assisting in the development of evidence-based recommendations.

Membership of the evaluation team

The members of the HRB-CICER and HIQA Evaluation Team were: Natasha Broderick, Dr Karen Cardwell, Barrie Tyner, Dr Mark O’Loughlin, Prof Susan Smith, Michelle O’Neill and Dr Máirín Ryan.

How to cite this report:

Broderick N, Cardwell K, Tyner B, O’Loughlin M, Smith SM, O’Neill M, Ryan M. Budget impact analysis: Infection Prevention and Control National Clinical Guideline. Dublin: HRB-CICER, HIQA, 2022.

Table of Contents

About HRB-CICER	2
Membership of the evaluation team	2
1 Introduction	7
1.1 Scope of work	7
1.2 Infection Prevention and Control.....	7
2 Methods.....	11
2.1 Study perspective.....	11
2.2 Time horizon.....	11
2.3 Measurement and valuation of resources	11
2.4 Rationale for included recommendations	12
2.5 Target population.....	13
3 Economic Model Inputs.....	14
3.1 E-learning modules (all recommendations)	14
3.1.1 Development and delivery	14
3.1.2 Opportunity costs of e-learning modules	15
3.2 Webinars (all recommendations).....	16
3.2.1 Development, preparation and delivery	16
3.2.2 Opportunity costs of webinars	18
3.3 Fit testing (recommendation 16).....	18
3.3.1 Fit testing costs	18
3.3.2 Volume of fit testing	20
3.4 Single Patient Rooms (recommendation 21)	20
3.4.1 Estimation of unit costs.....	22
3.4.2 Volume of single patient rooms	25
4 Analysis	26
4.1 E-learning modules (all recommendations).....	26

4.2 Webinars (all recommendations)	27
4.3 Fit testing (recommendation 16)	28
4.4 Single patient rooms (recommendation 21).....	28
5 Results.....	28
5.1 Overall budget impact	28
6 Discussion	30
7 Conclusion	33
References	34
Appendix 1: National clinical guideline recommendations	38
Appendix 2: Single Patient Rooms (recommendation 21).....	51

List of abbreviations that appear in this report

AGP	aerosol generating procedures
AMRO	antimicrobial resistant organisms
AV	audio visual
BIA	budget impact analysis
ECDC	European Centre for Disease Prevention and Control
GDG	guideline development group
HAI	hospital acquired infection
HCAI	healthcare associated infection
HCW	healthcare worker
HIQA	Health Information and Quality Authority
HPSC	Health Protection Surveillance Centre
HRB-CICER	Health Research Board Collaboration in Ireland for Clinical Effectiveness Reviews
HSE	Health Service Executive
IPC	infection prevention and control
MBR	multi-bed room
NCEC	National Clinical Effectiveness Committee
SPR	single patient room

1 Introduction

1.1 Scope of work

The completion of a BIA (budget-impact analysis) is a required step in the development of National Clinical Effectiveness Committee (NCEC) National Clinical Guidelines in Ireland.⁽¹⁾ In the context of developing this *Infection Prevention and Control National Clinical Guideline*, the purpose of this BIA was to quantify the resource implications of ensuring the ongoing implementation of, and adherence to, the recommendations within the guideline. This guideline is based on an adaptation of the Australian Guidelines for the Prevention and Control of Infection in Healthcare (2019).⁽²⁾ The Australian guideline was adapted to ensure Infection Prevention and Control (IPC) advice is relevant for the Irish context and based on accurate and up to date evidence.

This BIA was developed to support the guideline development group (GDG), who are preparing the National Clinical Guideline, *Infection Prevention and Control*, for the Irish healthcare system.

1.2 Infection Prevention and Control

According to the WHO, 'IPC is a practical, evidence-based approach preventing patients and health workers from being harmed by avoidable infection'.⁽³⁾ Practicing hand hygiene is one of many examples of effective IPC measures that can prevent infections. Handwashing can prevent the spread of microorganisms, including those that are resistant to antibiotics, that is antimicrobial resistant organisms (AMROs).⁽⁴⁾

Studies have demonstrated that IPC measures such as cleaning hands with an alcohol-based hand rub can help prevent healthcare acquired infections (HCAIs).⁽⁵⁾ HCAIs are infections that can develop either as a direct result of healthcare interventions such as medical or surgical treatment, or for other reasons during contact with a healthcare setting.⁽⁶⁾ They are a significant problem for patient safety; they can lead to prolonged hospital stay, long-term disability, additional financial burden, and excess deaths.⁽⁷⁾ The requirement for antimicrobial use to treat HCAI also contributes to the problem of antimicrobial resistance.

Healthcare acquired COVID-19 is an example of an HCAI. From 2 March 2020 to 6 March 2021 an epidemiological report recorded 223,142 cases of COVID-19 in Ireland, 15% of these cases were reported as healthcare acquired.⁽⁸⁾ During Wave 1*, the most likely source of transmission was healthcare acquired (49%). In Wave 2[†] and Wave 3[‡], healthcare acquired cases represented 6% and 12% of all cases, respectively; reflecting the surge in cases at the end of 2020 and start of 2021.⁽⁸⁾ However, it should be noted that there are a number of limitations to these findings. It is likely that a disproportionate number of COVID-19 cases may have been recorded in the healthcare setting as COVID-19 testing was often targeted in these settings particularly during periods where there was limited testing capacity. Also, in the early stages of the pandemic, testing was exclusively available in the healthcare setting. There is also uncertainty around the true source of transmission as self-assessed transmission sources may be subject to recollection bias. In an attempt to keep healthcare acquired COVID-19 at a minimum, several IPC guidance documents were published and updated on a regular basis throughout the pandemic, including the interim IPC guidance used to inform the recommendations in this National Clinical Guideline.⁽⁹⁾ Guidance that was published and updated, was often already standard practice, however heightened focus was put on this guidance to help strengthen adherence to it.

Hospital acquired infections (HAIs) are a subset of HCAs. A point prevalence survey in Ireland, performed in 60 hospitals (46 acute public and 14 private hospitals) in May 2017, found that the overall HAI prevalence amongst inpatients was 6.1%.⁽¹⁰⁾ This survey defined HAI as ‘an infection that developed more than two days after a patient was admitted to a hospital, or an infection that developed because of a medical device being inserted, or a wound infection that occurred within a defined time period after an operation’.⁽¹⁰⁾ It was also estimated that,

* wave 1: weeks 10 to 31 2020 (2 March – 1 August 2020)

† wave 2: week 32 to Week 47 2020 (2 August – 21 November 2020)

‡ wave 3: week 48 2020 to Week 9 2021 (22 November 2020 – 6 March 2021)

on any given day, there are 670 inpatients in Irish hospitals with a HAI, translating to almost 30,000 patients in Ireland affected by HAIs annually. Additionally, it was reported that up to 70% of vascular catheter related bloodstream infections and 55% of ventilator-associated pneumonia and surgical site infection cases may be reasonably prevented.⁽¹⁰⁾ HAIs are not an inevitable consequence of healthcare, many HAIs can be prevented by consistent application of well-established IPC practices. However, consistent adherence to IPC practices and guidelines in the real world context has proved challenging in all healthcare systems.⁽¹¹⁾

HAIs can occur in all types of healthcare settings, including but not limited to, inpatient, outpatient, acute care, primary care and long term care facility (LTCF) settings. The first national prevalence study of HCAI in Irish long-term care facilities was carried out in 2010.⁽¹²⁾ This study surveyed 4,170 residents in 69 Irish LTCFs in June 2010. Using a McGeer definition of a HCAI,⁽¹³⁾ which uses a complex set of criteria to diagnose a HCAI in the LTCF setting, the study found the prevalence of HAIs among residents to be 2.4%.⁽¹²⁾ In scenarios where an adapted McGeer definition was applied, the prevalence of HCAI among residents was estimated to be 3.6%.⁽¹²⁾ Prior to this, there had been no national HCAI prevalence data outside acute hospitals in Ireland.⁽¹⁴⁾

Adherence to effective IPC measures and recommendations within the healthcare system can help to reduce the incidence of HAIs and antimicrobial resistance which in turn results in a safer environment for staff and patients.^(15, 16) Studies have shown that planned and targeted dissemination of IPC guidance and training to healthcare workers (HCWs) may increase adherence to those guidelines and thus prevent the spread of infectious disease in the workplace.⁽¹⁷⁾ Implementation of IPC recommendations involves the provision of regular education to increase HCWs' awareness of, and ensure adherence to, such measures. The recommendations outlined in the *Infection Prevention and Control National Clinical Guideline* will provide all HCWs with evidence based recommendations to assist with preventing, managing and responding to HAIs in all health and social care settings.⁽¹⁸⁾ Some recommendations contained within the guideline also apply to people who use healthcare services and to visitors. While the *Infection Prevention and Control National Clinical Guideline* applies to all settings, costs associated with the recommendations will only be captured from

the public health and social care perspective. The BIA outlines the additional costs that will be incurred to support the delivery of the guideline recommendations and to help to ensure adherence to good IPC practice.

2 Methods

In clinical guideline development, a BIA aims to quantify the additional resource implications, and savings, of implementing all the guideline recommendations. For this guideline, although all of the recommendations are considered current practice, there are ongoing resource and cost implications required to maintain and improve adherence to these recommendations. The BIA provides an estimate of the likely ongoing additional financial consequences for the Irish healthcare system in ensuring ongoing adherence to the clinical recommendations outlined in the *Infection Prevention and Control National Clinical Guideline*. The BIA was conducted in accordance with HIQA guidelines for budget impact analysis and economic evaluation in Ireland,^(19, 20) using Microsoft Excel 2013.⁽²¹⁾

2.1 Study perspective

In line with national guidelines, costs and benefits were assessed from the perspective of the publicly-funded health and social care system, the Health Service Executive (HSE).^(19, 20) As such, only direct healthcare costs were included. Indirect costs such as decreased productivity associated with morbidity, treatment or death, out of pocket expenses incurred were not included. Costs savings associated with infections avoided were also excluded from the analysis.

2.2 Time horizon

The time horizon represents the time frame over which resource use is planned. In accordance with national guidelines, the annual budget impact was estimated over a five year time horizon.^(19, 20) Consideration will also be given to costs that are accumulated within the first three years of the guideline.

2.3 Measurement and valuation of resources

Estimation of costs was carried out using a range of methods as appropriate to each item. Where possible, these estimates were informed by the experience and expert opinion of the GDG implementing the *Infection Prevention and Control National Clinical Guideline*. Where

there was no clear precedent, resource use was estimated by combining available empirical data with expert opinion from within the GDG and relevant external groups. Specific data used to inform resource use and valuation estimates are described separately for each cost item below. All salary costs were based on the mid-point of the scale adjusted for pension, pay related social insurance (PRSI) and overheads (such as office space, heating and lighting) as per the HIQA guidelines.^(19, 20)

2.4 Rationale for included recommendations

There are no changes to the treatment pathways arising from the implementation of the clinical guideline as all recommendations are already current practice. The clinical recommendations contained in the *Infection Prevention and Control National Clinical Guideline*, and the rationale for their inclusion in the BIA, are summarised in Appendix 1.

The costs included in this BIA are reflective of the costs necessary to support the ongoing efforts to promote adherence to all recommendations contained within the guideline along with potential cost savings associated with recommendation 21 (that is, the potential cost savings associated with having fewer than 100% single patient rooms (SPRs) in newly built acute hospital inpatient accommodation).

The ongoing financial consequences associated with maintaining good IPC practice and high levels of adherence to all recommendations are captured under e-learning, webinar and fit-testing costs. E-learning and webinar costs apply to all recommendations. Fit-testing costs are exclusively relevant to recommendation 16. Potential cost savings associated with the implementation of recommendation 21 are explored in scenarios **which consider the provision of** a new ward in an acute hospital inpatient setting having a proportion of two bedded rooms rather than all SPRs. **The potential cost savings reported in this BIA do not include cost savings relating to a potential reduction in HCAI from the use of SPR as there was a lack of evidence on benefits, as reported in the systematic review conducted by HRB-CICER on the clinical and cost-effectiveness of SPRs in reducing HCAI and the impact on adverse outcomes (see Annex X).**

2.5 Target population

The *Infection Prevention and Control National Clinical Guideline*, which aims to prevent HCAs, will apply to everyone working in health and social care – including HCWs, management and support staff. Effective IPC is central to providing high quality health and social care for people who use services, and a safe working environment for those who work in all health and social care settings. These recommendations provide a risk-management framework to ensure the basic principles of IPC are being applied to all health and social care settings. The level of risk is likely to vary across different types of health and social care settings. When implementing these IPC recommendations, individual health and social care facilities will need to consider the risk of transmission of infection and apply these recommendations according to their specific setting and circumstances.⁽¹⁸⁾

The overall responsibility for the success of the IPC programme rests with the health service management team but everybody working in and visiting a health and social care facility has a responsibility to support the programme. This includes all staff, people using health and social care services and visitors.⁽¹⁸⁾

3 Economic Model Inputs

3.1 E-learning modules (all recommendations)

3.1.1 Development and delivery

Interactive e-learning modules for IPC are developed and delivered by the Antimicrobial Resistance Infection Control (AMRIC) team in line with HSE Interim Guidance.⁽²²⁾ E-learning modules are delivered to provide information on, and support adherence to, all the recommendations outlined in this guideline. A report detailing the costs associated with the development and delivery of e-learning modules was published in February 2022.⁽²²⁾ The report outlines the costs associated with e-learning modules that are expected to be incurred in 2022. The GDG confirmed similar costs are expected to be incurred in each year of the BIA. However, there is a lot of uncertainty around the number of e-learning modules that will be developed each year as their development is dependent on service needs and demands. The GDG have estimated that at a minimum two e-learning modules and at a maximum five e-learning modules would be developed in each year of the BIA. In 2022,⁽²²⁾ three e-learning modules will be developed. Hence, this will be treated as the base case scenario.

The costs associated with each element of the e-learning modules **were** sourced from the Proposal for AMRIC 22 Digital Learning Plan, February 2022.⁽²²⁾ Inputs for estimating e-learning module costs are detailed below in Table 3.1.1. The following costs are incorporated into the development and delivery of e-learning modules:

- Development cost – costs associated with developing an initial suite of modules
- Audio Visual (AV) – involves pre-production, recording (Videographer/Director/Producer/Sound Engineer), video post-production, and travel and **subsistence expenses**
- Animation production – includes e-learning design, graphic design and implementation and other associated costs
- Project management – resources allocated to managing the overall programme of development with the HSeLanD Educational Lead

- Communication support – the HSeLanD Communications team supporting the HSE Communications team with ongoing learner and stakeholder engagement
- Learning impact study – includes but may not be limited to costs associated with interview design, conducting interviews, interview feedback analysis, report write up.

Table 3.1.1: Unit costs and inputs for estimating the cost of e-learning modules

E-Learning Module costs	Costs per E-Learning module			Year(s) incurred	Source
Development of E-Learning Modules	€13,650				GDG Proposal for AMRIC 22 Digital Learning
Audio Visual (AV) Production costs	€3,792				
Animation Production	€3,467				
Project management costs	€1,300				
Total variable costs	€22,208			1-5	
Number of E-learning modules	2 E-learning modules (min)	3 E-learning modules (base case)	5 E-learning modules (max)	Year(s) incurred	
	€44,417	€66,625	€111,042		
Communication Support	€1,950				
Learning Impact study costs	€29,250				
Total fixed costs	€31,200			1-5	
Total cost excl VAT	€75,617	€97,825	€142,242		
Total cost (incl 23% VAT)	€93,009	€120,325	€174,957	1-5	

3.1.2 Opportunity costs of e-learning modules

E-learning modules are available on [HSeLanD](#) to over 100,000 health and social care professionals both within and outside of HSE facilities. This includes all disciplines within the HSE, hospital groups, long term care facilities, primary care including general practice, health

and social care and voluntary organisations within Ireland. HSeLanD provides a central source of high-quality online training, learning and development.⁽²²⁾ The opportunity cost of the time associated with completing e-learning modules **could** not be estimated as there is considerable **uncertainty relating to the variety of end users and thus the breakdown of their salary scales was not available to estimate the opportunity costs.**

3.2 Webinars (all recommendations)

3.2.1 Development, preparation and delivery

Webinars are delivered to provide information on, and support adherence to, all the recommendations outlined in this guideline. The costs associated with the development, preparation and delivery of webinars are relevant to all recommendations. In 2020 and 2021 there were 32 and 27 webinars delivered, respectively. It is unlikely that the number of webinars delivered in future will be as high, as many of the webinars were developed specifically in response to the COVID-19 pandemic. While webinars had not been routinely delivered prior to the pandemic, they will now continue to be used to facilitate the delivery of education, communication and other projects. In the first quarter of 2022, five webinars were delivered. The GDG have estimated that at a minimum five webinars, and at a maximum 18 webinars will be delivered annually. A median of 12 webinars annually will be taken to be the base case. The estimated duration of each webinar is one hour.

The GDG estimated, based on previous experience, that the development and preparation of each webinar will require:

- one Director of Nursing for six to eight hours
- one Assistant Director of Nursing for six to eight hours
- one Consultant for four hours.

On the day of the webinar that the following will be required:

- one Director of Nursing for one hour
- one Assistant Director of Nursing for one hour

- one Consultant for one hour.

Salary costs are calculated using consolidated salary scales available from the Department of Health for public-sector employees.⁽²³⁾ As per HIQA guidelines, midpoint salaries scales are used and are adjusted to account for PRSI, pension costs and overheads.⁽²⁰⁾ Inputs for estimating webinar costs are detailed below in Table 3.2.1.

Table 3.2.1: Unit costs and inputs for estimating the cost of webinars

Breakdown of webinar costs							
Staff required	Number of staff	Cost per minute	Length of time (minutes)			Year(s) incurred	Source
			Lower	Median	Upper		
Preparation						1 October 2021 Consolidated Salary Scales ⁽²³⁾ GDG	
Director of Nursing BAND 1 (GENERAL)	1	€1.29	360	420	480		
Assistant Director of Nursing (BAND 1 HOSPITALS)	1	€1.00	360	420	480		
Consultant [^]	1	€3.08	240	240	240		
Presentation							
Director of Nursing BAND 1 (GENERAL)	1	€1.29	60	60	60		
Assistant Director of Nursing (BAND 1 HOSPITALS)	1	€1.00	60	60	60		
Consultant [^]	1	€3.08	60	60	60		
Total cost (per webinar)			€1,886	€2,023	€2,161		
Annual number of webinars			5	12	18		
			€9,429	€24,281	€38,898		
Summary of annual webinar costs			€9,429 (€24,281 to €38,898)			1-5	

[^]The mid-point for a consultant's salary has been calculated as the mean of the mean values of 'consultant categories' and 'contract type'.

3.2.2 Opportunity costs of attending webinars

Webinars are advertised to all relevant health and social care workers in public and private sectors; invitations are not confidential and access to the webinars is not restricted. As before the opportunity cost of the time associated with completing e-learning modules **could** not be estimated as there is considerable **uncertainty relating to the variety of end users**.

3.3 Fit testing (recommendation 16)

3.3.1 Fit testing costs

Fit testing is provided to ensure ongoing adherence to guideline recommendation 16. Information in relation to fit testing was provided by the HSE. The primary purpose of fit testing is to:

- Identify a specific model(s) and size of tight-fitting respirator mask which matches the wearer's facial features and seals adequately to the wearer's face so as to provide the required level of protection against inhalation of particulates⁽²⁴⁾
- Identify respirator masks which are not suitable for a particular employee
- Identify employees for whom respirator masks do not provide the required level of protection against inhalation of particulates
- Provide employees with training in correct donning and fit-checking of a mask identified as appropriate for their facial features.

A fit test should be carried out as part of the initial selection of respirator mask for an individual. Quantitative fit testing in the HSE is carried out by an external provider and face fit testing of a respirator mask is carried out in accordance with HSE guidelines.

Following fit testing and the identification of a suitable respirator mask for an individual, a Pre-Use Wearer Seal/Fit Check should be carried out each time a piece is worn and before entering the hazardous environment. This check is to determine whether the wearer has correctly donned a respirator before entering a potentially contaminated work area.

The frequency of fit testing is based on employer's risk assessment and Standard Operating

Procedures. Repeat fit testing will be required on some individuals as not everyone can obtain a good fit with one specific respirator. If the respirator fails the fit test, then another make, model, or size must be tried. For some people it may not be possible to identify any respirator mask that achieves a satisfactory fit-test. The employer must address this issue on a case by case basis to ensure that the associated risk is managed.

The fit of the respirator must be retested whenever there is a change in physical condition that could affect the fit of the respirator. Reasons for needing a repeat fit-test include but are not limited to: any change in the respirator mask type supplied by the employer in relation to type, size, model or material or whenever there is a change to the circumstances of the wearer that could alter the fit of the respirator mask, for example, if a HCW has experienced weight loss or gain, major dental work (such as new dentures), or surgery that may have changed the shape of their face.

Prior to the COVID-19 pandemic, the use of respiratory protective equipment as a control for staff exposure to biological agents in a normal clinical environment was less common. Though surgical masks were often required for clinical infection control purposes.

The costs associated with fit testing were provided by the HSE and are illustrated below in Table 3.3.1. Cost per fit is provided at two different rates rate A or rate B. Cost per fit ranges from €38.46 to €64.10 depending on what day and at what rate the fit testing is carried out on. Fit testing takes approximately 20 minutes to complete.

Table 3.3.1: Unit costs and inputs for estimating the cost of fit testing at the two rates

Rate A	Time	Length of shift (hours)	Approximate number of fit tests delivered	Cost per shift	Cost per fit
Mon- Fri	(9am-5pm)	8	20	€800	€40
Sat-Sun & Bank Holidays			20	€1,200	€60
Rate B	Time	Length of shift (hours)	Approximate number of fit tests delivered	Cost per shift	Cost per fit
Mon- Fri	(8:40-24:00)	15	39	€1,500	€38.46
Sat-Sun & Bank Holidays			39	€2,500	€64.10

3.3.2 Volume of fit testing

It is difficult to estimate the annual frequency of fit testing among health and social care workers as the number of people required to be fit tested annually is highly variable. Risk assessments are carried out on these individuals to determine if they need a respirator. If a respirator mask is required, then it will be necessary to undertake fit testing in order to ensure that staff receive the expected level of protection.

3.4 Single Patient Rooms (recommendation 21)

Single patient room (SPR) accommodation has been suggested as an approach to reducing the transmission of HCAs, based on the principles of reducing opportunities for transmission of organisms both by contact and through the air.⁽²⁵⁾ Placing patients in separate rooms (with separate bathrooms), largely eliminates opportunities for the contact between patients who are colonised or infected with infectious organisms and other patients. This is expected to reduce the spread of all organisms transmitted by contact. Placement in a single room (with the door closed) also means that each patient is effectively within their own air space. This is expected to reduce spread of all organisms transmitted through the air. Additionally, heating, ventilation and air conditioning systems can be used to control the concentration of airborne particulates in high risk areas, to minimise the risk of infection by means of air pressure, flow control and air filtration. The level of control should be proportional to the risk. In 2008,

Infection Prevention and Control Building Guidelines for Acute Hospitals in Ireland were published by the HPSC stating that newly built acute hospital inpatient accommodation should comprise 100% SPRs and newly built non-acute hospital inpatient accommodation should comprise a minimum of 50% SPRs.⁽²⁶⁾ Guidance published by HIQA in 2017 states there should be **adequate** SPRs in acute healthcare settings with no percentage stated.⁽⁶⁾

A systematic review was carried out by HRB-CICER to identify and evaluate the clinical and economic evidence relating to the use of SPRs in the prevention and control of HCAs, to inform Recommendation 21 (see Annex X). HRB-CICER found that overall, due to the lack of high quality evidence on the impact of SPR design on patient and healthcare outcomes, it was not possible to conclude whether SPRs (when compared to MBR accommodation) were effective in reducing HCAI rates or led to an increase in adverse events. Furthermore, there was a lack of economic studies linking costs with benefits. Recommendation 21 of this guideline relates to the number and type of SPRs that should be available in a healthcare facility. The recommendation states:

When determining the number and type of single rooms in a health care facility, project planning teams should consider:

- Trends in disease in the general population and the particular population served.
- Demographic trends in the population served.
- Specialties of the health care facility.
- Projected changes in future clinical activities.

Given that the HPSC guidance states that newly built acute hospital inpatient accommodation should comprise 100% SPRs,⁽²⁶⁾ we will consider the potential cost savings associated with changes to this practice only. As mentioned above, potential cost savings relating to a reduction in HCAI are not included due to a lack of evidence on clinical benefits.

In relation to this recommendation, three ward design scenarios (scenario 1, scenario 2 and scenario 3) will be considered. These are illustrated in Appendix 2 and are as follows:

- In scenario 1 (base-case), that is, 100% SPRs, there are 12 SPRs on a ward. Each single patient room has its own en suite.
- In scenario 2, there are 10 SPRs, each with their own en suite. There is also one MBR with two beds in one room. In the MBR each bed has access to its own en suite.
- In scenario 3, there are eight SPRs, each with its own en suite. There are also two MBRs. In each MBR, there are two beds. Every bed in a MBR has access to its own en suite.

3.4.1 Estimation of unit costs

The three scenarios described above were discussed with estates representatives from the HSE. Consideration was given to any potential cost savings or implications that may arise from opting for scenario 2 or scenario 3 as opposed to scenario 1. It was agreed that scenario 1 would incur the most costs with potential cost savings associated with scenario 2 and scenario 3. Following this discussion, representatives from estates provided us with estimates of costs and assumptions that would be associated with **the provision of** each scenario. These are illustrated in Table 3.4.1 below.

Table 3.4.1: Cost comparison of SPR and MBR scenarios provided by estates representatives from the HSE (adapted from Offices of National Director, Capital & Estates, HSE)

Item	Description	Scenario 2 [Ward with 10 SPRs and 1 MBR with 2 beds, each bed with its own separate en suite]	Scenario 3 [Ward with 8 SPRs and 2 MBRs with 2 beds in each room and each bed with its own separate en suite]
	Total project savings <i>[Inclusive of VAT]</i>	€2,000 to €3,000	€4,000 to €6,000
	Notes:		
1	All scenarios presented are based on 12 beds with naturally ventilated rooms.		
2	Due to the deviation of construction & project costs taking into account the location, type of build level of competition, inflation and size of project involved, it was decided that scenario 1 would act as the “ Base Cost ”.		
3	Scenario 1 has been identified as the most expensive option, with scenario 2 achieving a potential saving of €2,000 to €3,000 with scenario 3 achieving a further potential saving of between €4,000 to €6,000 inclusive of VAT .		

- | | |
|---|---|
| 4 | No reduction of floor area has been taken into account as this juncture as it is difficult to note any reduction in areas from the sketches presented. However typically, a 1m ² of floor area reduction would comprise of potential further Project Savings of circa €4,000 to €6,000/m² . |
| 5 | If considered and deemed acceptable from an infection control perspective further project savings would be achieved if 1 en suite was omitted for each shared room.

[Typically, project costs associated with 1nr en suite would cost circa between €10,000 to €15,000 . This is subject to size, location in building and service requirements.] |
| 6 | There may be further savings on heating, ventilation and electrical loads within a slightly smaller room, however these potential impacts may be required to be technically assessed separately. |

Key: MBR, multi-bed room; SPR, single patient room.

Summary of cost implications of recommendation 21:

Scenario 1 was identified as the most expensive option, with scenario 2 achieving a potential project saving of €2,000 to €3,000, and scenario 3 achieving further potential savings of between €4,000 to €6,000 inclusive of VAT (see Table 3.4.1).

Potential savings in scenario 2 and scenario 3 reflect the following:

- Wall partition savings in MBR, there is no requirement to have a wall between beds.
- Each room in scenario 1 would have its own clinical sink, clinical waste bin, hand dispenser and light switch element. However in scenario 2 and scenario 3 these items would be shared in MBRs.
- Scenario 2 and scenario 3 would incur cost savings as a result of sharing a point of entry, that is, there would only be one door in a room to access both beds.

Other potential cost savings that may be incurred by scenario 2 and scenario 3 that were not included in the BIA are:

- Further savings on heating, ventilation and electrical loads with a slightly smaller shared room, however these potential impacts may require separate technical assessment.
- Service costs may be reduced as a result of sharing rooms. For example, in relation to servicing a medical waste bin, it would only be necessary to service one bin in a shared room as opposed to two for separate rooms.
- There may be some minor reductions in cleaning and upkeep costs if rooms are shared.

Potential additional costs in scenario 2 and scenario 3 reflect the following:

- To ensure privacy between patients in MBRs in scenario 2 and scenario 3, there would be a requirement to ensure there is a curtain around each bed. This is an additional cost that would be incurred in scenario 2 and scenario 3.

Given deviations in construction and project costs, location, type of build, level of competition, inflation and size of project would need to be considered. As such, it is not

possible to estimate accurately total potential cost savings associated with the different scenarios. However, opting for alternative scenarios such as scenario 2 or scenario 3 instead of scenario 1 would result in potential cost savings albeit these are unlikely to be of material significance in the context of overall construction costs.

3.4.2 Volume of single patient rooms

It is not currently possible to estimate how many new beds will be added to the bed stock each year over the time frame of the BIA.

4 Analysis

Costs and resources related to ensuring adherence to the recommendations detailed in this guideline are described below by intervention.

4.1 E-learning modules (all recommendations)

In each year, IPC e-learning modules will be available on HSeLanD to health and social care professionals across all disciplines within the HSE, hospital groups, healthcare and voluntary organisations within Ireland. The costs associated with these e-learning modules are provided in Table 4.1.1 and include the following development, production and delivery costs:

- Development of e-learning modules
- Audio visual (AV) production
- Project management cost
- Animation production
- Communication support
- Learning impact study.

The opportunity costs of undertaking e-learning modules are not included.

Table 4.1.1: Cost of e-learning modules

	Year 1	Year 2	Year 3	Year 4	Year 5	Total (Years 1-3)	Total (Years 1-5)
E-learning	€120,325 (€93,009 to €174,957)	€120,325 (€93,009 to €174,957)	€120,325 (€93,009 to €174,957)	€120,325 (€93,009 to €174,957)	€120,325 (€93,009 to €174,957)	€360,975 (€279,027 to €524,871)	€601,625 (€465,045 to €874,785)

It is estimated that a minimum of two and a maximum of five e-learning modules will be developed each year. The annual cost associated with the e-learning modules is estimated at €120,325, with costs ranging from €93,009 to €174,957. It is expected that similar costs will be incurred in each year of the BIA. It is estimated that e-learning module costs accumulated after three years will be €360,975, with costs ranging from (€279,027 to €524,871). The total cost associated with webinars throughout the five-year time frame of the BIA is estimated at

€601,625, with costs ranging from €465,045 to €874,785. The uncertainty around the costs incurred in each year of the BIA, reflects the uncertainty in the number of e-learning modules that are developed annually. Additionally, the costs associated with updating e-learning modules have not been included in the BIA as any requirement to update these modules would only be triggered by the publication of an updated guideline.

4.2 Webinars (all recommendations)

The costs associated with IPC webinars are provided in Table 4.2.1 and include the following costs:

- Preparation costs
- Presentation costs.

The opportunity costs of attending webinars are not included.

Table 4.2.1: Cost of webinars

	Year 1	Year 2	Year 3	Year 4	Year 5	Total (Years 1- 3)	Total (Years 1-5)
Webinars	€24,281 (€9,429 to €38,898)	€24,281 (€9,429 to €38,898)	€24,281 (€9,429 to €38,898)	€24,281 (€9,429 to €38,898)	€24,281 (€9,429 to €38,898)	€72,843 (€28,287 to €116,694)	€121,405 (€47,145 to €194,490)

It is estimated that a minimum of five and a maximum of 18 webinars will be delivered in each year of the BIA. The median of 12 webinars was considered as the base case. The annual cost associated with the preparation and presentation of webinars is estimated to be €24,281, with costs ranging from €9,429 to €38,898. It is expected that similar costs will be incurred in each year of the BIA. It is estimated that webinar costs accumulated after three years will be €72,843, with costs ranging from €28,287 to €116,694. The total cost associated with webinars throughout the five-year time frame of the BIA is estimated at €121,405, with costs ranging from €47,145 to €194,490. The uncertainty around the costs incurred in each year of the BIA reflects the uncertainty in the number of webinars that will be developed and delivered annually. As with the e-learning modules, the costs associated with updating webinars have not been included in the BIA as any requirement to update these webinars

would only be triggered by the publication of an updated guideline.

4.3 Fit testing (recommendation 16)

Respirator mask fit testing costs will be incurred annually. However given the variability in annual fit testing requirements, it is not possible to estimate annual fit testing costs.

4.4 Single patient rooms (recommendation 21)

The potential cost-savings per year included in this BIA relate to the costs associated with each type of ward design (that is, scenarios 1, 2 and 3) as described in section 3.4.1. Other costs and cost-savings, for example, those associated with reduced HCAI and volume of new beds added could not be estimated due to a lack of evidence on benefits (as outlined in Section 3.4 and Annex X), and the uncertainty with regard to the volume of new beds which will be added to the bed stock each year over the time frame of the BIA. In any case, potential cost-savings are not likely to be material in the context of overall construction costs.

5 Results of the budget impact analysis

5.1 Overall budget impact

The overall budget impact of the *Infection Prevention and Control National Clinical Guideline* was estimated at €723,030 (€512,190 to €1,069,275) over five years, with €601,625 (€465,045 to €874,785) attributed to e-learning modules and €121,405 (€47,146 to €194,490) attributed to webinars. Over a three year period, the overall budget impact was estimated at €433,818 (€307,314 to €641,565). Of this, €360,975 (€279,027 to €524,871) was attributed to e-learning modules and €72,843 (€28,287 to €116,694) attributed to webinars. These costs are illustrated in Table 5.1.1 below.

Table 5.1.1: Incremental budget impact over a five year time horizon

	Year 1	Year 2	Year 3	Year 4	Year 5	Total (Year 1-3)	Total (Year 1-5)
Webinars	€24,281 (€9,429 to €38,898)	€24,281 (€9,429 to €38,898)	€24,281 (€9,429 to €38,898)	€24,281 (€9,429 to €38,898)	€24,281 (€9,429 to €38,898)	€72,843 (€28,287 to €116,694)	€121,405 (€47,145 to €194,490)
E-learning	€120,325 (€93,009 to €174,957)	€120,325 (€93,009 to €174,957)	€120,325 (€93,009 to €174,957)	€120,325 (€93,009 to €174,957)	€120,325 (€93,009 to €174,957)	€360,975 (€279,027 to €524,871)	€601,625 (€465,045 to €874,785)
Total	€144,606 (€102,438 to €213,855)	€144,606 (€102,438 to €213,855)	€144,606 (€102,438 to €213,855)	€144,606 (€102,438 to €213,855)	€144,606 (€102,438 to €213,855)	€433,818 (€307,314 to €641,565)	€723,030 (€512,190 to €1,069,275)

Additionally, fit testing costs will be incurred annually. Although the estimates for per fit test costs are detailed in Table 3.3.1, it is difficult to estimate the annual frequency of fit testing among HCWs as the number of people required to be fit tested annually is highly variable.

There are potential cost savings associated with having fewer than 100% SPRs in newly built acute hospital inpatient accommodation (recommendation 21). Scenarios associated with this recommendation are illustrated in Appendix 2. Scenario 1 (100% SPRs) was treated as the base case. It is estimated that deviations from the base case could result in potential costs savings of between €2,000 to €3,000 (scenario 2, one MBR) and €4,000 to €6,000 (scenario 3, two MBRs) inclusive of VAT for each 12-bed ward acute in an inpatient hospital setting. Given deviations in construction and project costs, location, type of build, level of competition, inflation and size of project it is not possible to estimate total potential cost savings associated with each scenario. Neither can we accurately estimate the number of new wards that will be built over the time frame of the BIA. In any case it appears that the cost-savings accrued will not be of material significance in the context of the overall construction costs.

6 Discussion

This BIA was conducted to inform the resource and financial implications of the recommendations contained within the *Infection Prevention and Control National Clinical Guideline*. Although all of the recommendations contained within this guideline are considered current practice, there are ongoing resource and cost implications required to maintain good IPC practice and high adherence to these recommendations. The aim of this National Clinical Guideline is to reduce unnecessary variations in practice and provide an evidence base for the most appropriate IPC practice in particular circumstances.⁽¹⁸⁾ The BIA for this National Clinical Guideline estimated the costs associated with providing e-learning modules and webinars relating to good IPC practice over a three and five year period would be €433,818 (€307,314 to €641,565) and €723,030 (€512,190 to €1,069,276), respectively. The opportunity costs of staff participating in e-learning modules and webinars could not be estimated.

In each year of the BIA there will also be additional costs associated with providing annual fit testing for respirator masks to those who require them. However, annual fit testing costs could not be estimated as the likely annual frequency of fit testing is difficult to determine.

There are potential cost savings associated with recommendation 21, where deviations from the base case scenario (100% SPRs), that is, the use of some MBRs are associated with potential cost savings. However, these potential cost savings are likely to not be materially significant in the context of overall construction costs.

HCAIs are increasingly being recognised as an important cause of patient mortality and morbidity contributing significantly to healthcare costs. The ECDC have estimated that approximately 4.1 million patients acquire a HCAI in the EU each year with 37,000 attributable deaths annually.⁽²⁸⁾ The ECDC also estimated that HCAIs contribute to an additional 110,000 deaths and result in financial losses of approximately €7 billion per year.⁽²⁸⁾ With relevance to Ireland, a point prevalence survey of HCAI and antimicrobial use in European acute care hospitals carried out by the ECDC in 2011-2012 estimated that Ireland had 494 patients with

a HCAI on any day in acute care hospitals, which equated to 5.2% of patients.⁽²⁹⁾ In recent years, HCAs have become more prominent as a result of the complexity of hospital patients' conditions and developments in healthcare, which in some instances render patients more vulnerable to infection. For example procedures like surgeries and the use of medical devices such as catheters or ventilators can increase a patient's risk of acquiring a HCAI.⁽³⁰⁾

Due to the difficulties associated with measuring adherence to IPC and sources of HCAI infections, it is difficult to quantify reductions in HCAI due to improvements in adherence to IPC measures and the associated cost savings were not included in the BIA. There are challenges associated with measuring and interpreting adherence to IPC measures given that those working in health and social care settings are likely to change their IPC behaviours if they are aware that they are being observed, this is referred to as the Hawthorne effect.⁽³¹⁾ It is also incredibly challenging to measure if poor adherence to IPC recommendations are the cause of a HCAI. Sources of infections are often difficult to determine as patients can be exposed to numerous different environmental and human contacts that may lead to an infection.⁽³¹⁾ Despite this, studies have suggested that the behaviours of those working in health and social care settings, such as relaxed attention to IPC measures can influence the rate of HCAs. For example, a study by Harbarth et al. found that relaxed attention to IPC measures during periods of understaffing and overcrowding in a neonatal intensive-care unit was associated with an increased risk of a patient acquiring a HCAI.⁽³²⁾ In the study, adherence to hand hygiene practices before contact with an infant's intravenous line was 25% during the workload peak, but increased to 70% after the end of a period of understaffing and overcrowding; continued surveillance showed that being hospitalised during this period carried a fourfold increased risk of acquiring an HCAI.⁽⁷⁾ A systematic review that analysed the effectiveness of IPC programmes in LTCFs found that there is some evidence for the effectiveness of IPC programmes to control HCAs in LTCFs, however it was noted that the evidence is limited.⁽³³⁾

There are a number of limitations within this BIA. Firstly, this National Clinical Guideline is different to other National Clinical Guidelines, in that all of the recommendations contained within the guideline are already implemented as current practice, although there is variation

in adherence. Thus the approach taken was to consider the costs associated with maintaining good IPC practice and high adherence to the recommendations (webinar and e-learning costs), fit-testing costs and cost savings associated with recommendation 21. Another limitation to the BIA is that there is a lot of uncertainty around the number of e-learning modules and webinars that will be developed and delivered annually as this is dependent on service needs and demands, and in particular, the pandemic phase transition. Also, the costs associated with providing e-learning modules and webinars are an underestimate as the opportunity costs for those attending these were not included in the BIA. In relation to recommendation 16 (fit-testing), the frequency of fit testing is highly variable making it difficult to estimate annual fit testing costs for this BIA. Risk assessments are carried out to identify staff that require fit testing. Hence, it is difficult to estimate how many HCWs would require fit testing annually. In relation to recommendation 21, there are a number of reasons why it is not possible to accurately estimate total potential cost savings over the time frame of the BIA. These costs only apply to newly built inpatient hospitals and it is difficult to estimate the size and quantity of inpatient hospitals that will be built over the time frame of the BIA. In addition, given that deviations in construction and project costs, there is a need to consider location, type of build, level of competition, inflation and size of project involved, to accurately estimate total potential cost savings. The potential cost savings associated with infection avoided is not included.

Overall this BIA acknowledges that there are costs associated with maintaining good IPC practice and high adherence to the recommendations. The continued provision of e-learning modules and webinars will help to ensure there is a platform to continuously keep health and social care workers informed of the IPC recommendations outlined in this guideline.

7 Conclusion

The budget impact of the *Infection Prevention and Control National Clinical Guideline*, which reflects the ongoing costs of current recommendations, was estimated at €433,818 (€307,314 to €641,565) over a three year period and €723,030 (€512,190 to €1,069,275) over a five year period. The majority of the total estimated cost is associated with the development and delivery of e-learning modules. Over a three year period webinar costs totalled €72,843 (€28,287 to €116,694) and e-learning totalled €360,975 (€279,027 to €524,871). Over the five year period, webinar costs totalled €121,405 (€47,145 to €194,490) and e-learning costs totalled €601,625 (€465,045 to €874,785). The opportunity costs of participating in e-learning modules and webinars is not included.

In addition, respirator mask fit testing costs will be incurred annually. However given the variability in annual fit testing requirements, it is not possible to estimate annual fit testing costs. On the other hand, there are potential cost savings associated a reduction in the proportion on SPRs in new buildings (recommendation 21). However, these are unlikely to be materially significant in the context of the overall construction costs.

References[‡]

1. National Clinical Effectiveness Committee. National Clinical Effectiveness Committee Guideline Developers Manual. [Available from: <https://health.gov.ie/national-patient-safety-office/ncec/resources-and-learning/ncec-processes-and-templates/>]. 2019
2. National Health and Medical Research Council (NHMRC). Australian Guidelines for the Prevention and Control of Infection in Healthcare (2019) [Available from <https://www.nhmrc.gov.au/about-us/publications/australian-guidelines-prevention-and-control-infection-healthcare-2019>] 2019
3. World Health Organisation (WHO). Infection prevention and control [Available from: <https://www.who.int/teams/integrated-health-services/infection-prevention-control>] 2022
4. Centers for Disease Control and Prevention (CDC). Hand Hygiene in Healthcare Settings [Available from: <https://www.cdc.gov/handhygiene/index.html>] 2019 [
5. World Health Organisation (WHO). A guide to the implementation of the WHO multimodal hand hygiene improvement strategy. [Available from: <https://apps.who.int/iris/handle/10665/70030>] 2009
6. Health Information and Quality Authority (HIQA). National Standards for the prevention and control of healthcare-associated infections in acute healthcare services. [Available from: <https://www.hiqa.ie/sites/default/files/2017-05/2017-HIQA-National-Standards-Healthcare-Association-Infections.pdf>]. 2017
7. (WHO) WHO. WHO Guidelines on Hand Hygiene in Health Care [Available from: http://apps.who.int/iris/bitstream/handle/10665/44102/9789241597906_eng.pdf;jsessionid=D7B43ABF3D27435B3E53242AEDE2EAF?sequence=1]. 2009
8. HSE Health Protection Surveillance Centre. COVID-19 Annual Report 2020 2022 [Available from: <https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/casesinireland/covid-19annualreports/First%20year%20of%20the%20COVID-19%20pandemic%20in%20Ireland.pdf>]
9. Health Service Executive (HSE). Current recommendations for the use of Personal Protective Equipment (PPE) in the context of the COVID-19 pandemic. [Available from: <https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/guidance/infectionpreventionandcontrolguidance/ppe/Current%20recommendations%20for%20the%20use%20of%20PPE.pdf>] 2022

[‡] All online references were accessed during preparation of this report. Please note that web addresses can change over time.

10. Health Protection Surveillance Centre (HPSC). Point Prevalence Survey of Hospital Acquired Infections & Antimicrobial Use in European Acute Care Hospitals, May 2017: National Report Ireland. [Available from: https://www.hpsc.ie/a-z/microbiologyantimicrobialresistance/infectioncontrolandhai/surveillance/hospitalpointprevalencesurveys/2017/nationalppsreports/PPS%202017%20National%20Report_FINAL_191218.pdf]. 2018
11. Houghton C, Meskell P, Delaney H, Smalle M, Glenton C, Booth A, et al. Barriers and facilitators to healthcare workers' adherence with infection prevention and control (IPC) guidelines for respiratory infectious diseases: a rapid qualitative evidence synthesis. *Cochrane Database Syst Rev.* 2020;4:CD013582
12. Health Protection Surveillance Centre (HPSC). European Point Prevalence Survey on Healthcare Associated Infections and Antibiotic use in Long-Term Care Facilities National Report – Republic of Ireland 2010 [Available from: <https://www.hpsc.ie/a-z/microbiologyantimicrobialresistance/infectioncontrolandhai/surveillance/hcaiinlongtermcarefacilities/haltreports/2010report/File,4723,en.pdf>]
13. McGeer A, Campbell B, Emori TG, Hierholzer WJ, Jackson MM, Nicolle LE, et al. Definitions of infection for surveillance in long-term care facilities [Available from: <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.372.8544&rep=rep1&type=pdf>]. *American Journal of Infection Control.* 1991;19(1):1-7
14. Health Protection Surveillance Centre (HPSC). How to link PPS data to prevention The HALT 2010 study in Ireland – what we did next 2010 [Available from: <https://www.hpsc.ie/a-z/microbiologyantimicrobialresistance/infectioncontrolandhai/surveillance/hcaiinlongtermcarefacilities/guidelinesresources/File,13875,en.pdf/>]
15. World Health Organisation (WHO). WHO Guidelines on Hand Hygiene in Health Care: First Global Patient Safety Challenge Clean Care Is Safer Care. [Available from: <https://www.ncbi.nlm.nih.gov/books/NBK144030/>] 2009
16. Alhumaid S, Al Mutair A, Al Alawi Z, Alsuliman M, Ahmed GY, Rabaan AA, et al. Knowledge of infection prevention and control among healthcare workers and factors influencing compliance: a systematic review. *Antimicrobial Resistance & Infection Control.* 2021;10(1):86
17. Silva MT, Galvao TF, Chapman E, da Silva EN, Barreto JOM. Dissemination interventions to improve healthcare workers' adherence with infection prevention and control guidelines: a systematic review and meta-analysis. *Implementation Science.* 2021;16(1):92
18. Infection Prevention and Control Guideline Development Group. NCEC Draft Guidance on Infection Prevention and Control 2022 [Available from: <https://www.hse.ie/eng/about/who/nqpsd/nirp/ncec-ipc-guideline-2022-for-consultation.pdf>]. 2022
19. Health Information and Quality Authority (HIQA). Guidelines for the Economic

- Evaluation of Health Technologies in Ireland. [Available from <https://www.higa.ie/sites/default/files/2020-09/HTA-Economic-Guidelines-2020.pdf>]. 2020
20. Health Information and Quality Authority (HIQA). Guidelines for the Budget Impact Analysis of Health Technologies in Ireland [Available from: https://www.higa.ie/sites/default/files/2018-01/HIQA_BIA_Guidelines_2018_0.pdf]. 2018
 21. Microsoft Corporation. Microsoft Excel 2013, Redmond, Washington, USA. 2021
 22. Health Service Executive (HSE). Proposal for AMRIC 22 Digital Learning Plan 2022
 23. Health Service Executive (HSE). Consolidated Payscales 1st October 2021 [Available from: <https://www.hse.ie/eng/staff/resources/hr-circulars/1-october-2021-consolidated-salary-scales.pdf>]. 2021
 24. Health and Safety Executive. Guidance on respiratory protective equipment (RPE) fit testing 2019 [Available from: <https://www.hse.gov.uk/pubns/indg479.htm>]
 25. Chaudhury H, Mahmood A, Valente M. Advantages and Disadvantages of Single-Versus Multiple-Occupancy Rooms in Acute Care Environments:A Review and Analysis of the Literature. *Environment and Behavior*. 2005;37(6):760-86
 26. Health Protection Surveillance Centre (HPSC). Infection Prevention and Control Building Guidelines for Acute Hospitals in Ireland. Strategy for the control of Antimicrobial Resistance in Ireland (SARI). [Available from: <https://www.hpsc.ie/a-z/microbiologyantimicrobialresistance/infectioncontrolandhai/guidelines/File,3439,en.pdf>]. 2008
 27. Health Information and Quality Authority (HIQA). DRAFT Clinical and cost-effectiveness of healthcare-associated infection interventions: a systematic review [Unpublished]. 2022
 28. Tithe an Oireachtais (Houses of the Oireachtas). Hospital Acquired Infections 2016 [Available from: <https://www.oireachtas.ie/en/debates/question/2016-05-26/192/>]
 29. European Centre for Disease Prevention and Control (ECDC). Point prevalence survey of healthcare-associated infections and antimicrobial use in European acute care hospitals 2011–2012. [Available from: <https://www.ecdc.europa.eu/sites/default/files/media/en/publications/Publications/healthcare-associated-infections-antimicrobial-use-PPS.pdf>]. 2013
 30. Centers for Disease Control and Prevention (CDC). Types of Healthcare-associated Infections [Available from: <https://www.cdc.gov/hai/infectiontypes.html>] 2014
 31. Braun BI, Chitavi SO, Suzuki H, Soyemi CA, Puig-Asensio M. Culture of Safety: Impact on Improvement in Infection Prevention Process and Outcomes. *Current infectious disease reports*. 2020;22(12):34
 32. Harbarth S et al. Outbreak of *Enterobacter cloacae* related to understaffing, overcrowding, and poor hygiene practices. *Infection Control and Hospital*

- Epidemiology. 1999
33. Lee MH, Lee GA, Lee SH, Park YH. Effectiveness and core components of infection prevention and control programmes in long-term care facilities: a systematic review. *Journal of Hospital Infection*. 2019;102(4):377-93
 34. Health Service Executive (HSE). Guidelines for hand hygiene in Irish healthcare settings. Update of 2005 guidelines January 2015. [Available from: <https://www.hpsc.ie/a-z/microbiologyantimicrobialresistance/infectioncontrolandhai/guidelines/File,15060,en.pdf>]. 2015
 35. Health Protection Surveillance Centre (HPSC). National Hand Hygiene Compliance Results. [Available from: <https://www.hpsc.ie/a-z/microbiologyantimicrobialresistance/europeansurveillanceofantimicrobialconsumptionsac/PublicMicroB/HHA/Report1.html>]. 2021
 36. HCAI AMR National Clinical Programme. National Hand Hygiene “How-to” Guide For Infection Prevention and Control Nurses within Community Healthcare Organisations. (Available from: <https://www.hse.ie/eng/about/who/healthwellbeing/our-priority-programmes/hcai/hand-hygiene-in-irish-healthcare-settings/training/hand-hygiene-how-to-guide-for-chos.pdf>) 2017
 37. HSE-Health Protection Surveillance Centre (HPSC). Report on Hand Hygiene Compliance in Acute Hospitals. Sixth national hand hygiene audit. (Available from: <https://www.hpsc.ie/a-z/microbiologyantimicrobialresistance/infectioncontrolandhai/handhygiene/handhygieneaudit/handhygieneauditresults/previousreports/File,14481,en.pdf>) 2013
 38. Health Service Executive (HSE). National Specification for Alcohol-based Hand Hygiene Products December 2013. [Available at: <https://www.hpsc.ie/a-z/microbiologyantimicrobialresistance/infectioncontrolandhai/handhygiene/publications/File,14574,en.pdf>]. 2014
 39. Health Service Executive (HSE). Guidelines for the Prevention and Control of Multi-drug resistant organisms (MDRO) excluding MRSA in the healthcare setting. [Available from: https://www.hpsc.ie/a-z/microbiologyantimicrobialresistance/infectioncontrolandhai/guidelines/Guidelines%20for%20the%20Prevention%20and%20Control%20of%20MDRO_Final%20Revised_July%202014.pdf]. 2014

Appendix 1: National clinical guideline recommendations

No.	Recommendation	Cost relevant to recommendations	Notes on BIA Implications
1	<p>Routine hand hygiene is performed according to the World Health Organisation technique:</p> <ul style="list-style-type: none"> ▪ Before touching a patient. ▪ Before a clean or aseptic procedure. ▪ After body fluid exposure. ▪ After touching a patient. ▪ After touching a patient’s surroundings. <p>Hand hygiene must also be performed before putting on gloves and after the removal of gloves.</p>	E-learning modules and webinars	<p>The GDG confirmed that this recommendation has already been implemented and is current practice.⁽³⁴⁾ However there are ongoing costs associated with ensuring that the adherence to this recommendation remains high. According to National Hand Hygiene Compliance Results compliance with five WHO moments was 92.9%.⁽³⁵⁾</p> <p>It is standard HR policy in the HSE that Hand Hygiene (HH) training is provided to all healthcare staff every two years.^(36, 37) However, the costs associated with providing this training will not be estimated as it is part of the day to day role of staff. It is difficult to quantify the time it takes to provide HH training. The trainer is usually a nurse and HH training its part of their everyday role as an Infection Prevention and Control nurse (IPCN) or healthcare professional hand hygiene trainer. For this reason this cost will not be included in the BIA.</p> <p>The following activities are also carried out as part of the daily roles of existing IPC staff to support this recommendation and will also not be included in the BIA:</p> <ul style="list-style-type: none"> ▪ Organisational IPC teams and hand hygiene champions ▪ Link practitioner programmes in community services aligned to AMRIC guidance ▪ Implementation of hand hygiene audits and hand hygiene auditor training programme. <p>A suite of e-learning modules and webinars will be delivered annually to support the ongoing adherence to this recommendations. These costs will be included in the BIA.</p>

No.	Recommendation	Cost relevant to recommendations	Notes on BIA Implications
2	Alcohol-based hand rubs that contain between 60% and 80% v/v ethanol or equivalent should be used for all routine hand hygiene practices	E-learning modules and webinars	<p>Previously it was recommended that alcohol-based hand rubs be greater than or equal to 70-85% alcohol by volume ethanol, iso-propanol, or n-propanol, or a combination of these products.⁽³⁸⁾</p> <p>While this recommendation may represent a change to current practice, the GDG has confirmed that it is not likely that the ethanol content would not make a substantial difference to the cost. It was understood that the reduction in ethanol percentage contained within alcohol based hand rubs would not contribute to a substantial cost savings. Therefore this element will not be included in the BIA.</p> <p>The following activities are carried out as part of the daily roles of existing IPC staff to support this recommendation and will not be included in the BIA:</p> <ul style="list-style-type: none"> ▪ Organisational IPC teams and hand hygiene champions ▪ Link practitioner programme available in community services aligned to AMRIC guidance ▪ Implementation of hand hygiene audit schedule and hand hygiene auditor training programme. ▪ Train the trainers programme implemented. <p>E-learning modules and webinar costs are associated with this recommendation as they provide an educational platform to ensure HCWS are aware of what is current practice and to inform them of any changes in practice.</p>
3	Soap and water should be used for hand hygiene when hands are visibly soiled.	E-learning modules and webinars	<p>The GDG confirmed that this recommendation has been implemented and is current practice. However there are ongoing costs associated with ensuring adherence to this recommendation.⁽³⁴⁾ A suite of e-learning modules and webinars will be delivered annually to support the ongoing adherence to this recommendations.</p>

No.	Recommendation	Cost relevant to recommendations	Notes on BIA Implications
			<p>These costs will be included in the BIA.</p> <p>It is HR policy that Hand Hygiene (HH) training is provided to all health care staff every two years.^(36, 37) It is difficult to quantify the time it takes to provide HH training. The trainer is usually a nurse and HH training its part of their everyday role as an IPCN or HCW hand hygiene trainer. For this reason this cost will not be included in the BIA.</p> <p>The following activities are carried out as part of the daily roles of existing IPC staff to support this recommendation and will not be included in the BIA:</p> <ul style="list-style-type: none"> • Organisational IPC teams and hand hygiene champions • Link practitioner programme available in community services aligned to AMRIC guidance • Implementation of hand hygiene audit schedule and hand hygiene auditor training programme
4	<p>In the presence of known or suspected <i>Clostridioides difficile</i> and viruses such as norovirus hand hygiene must be performed as follows:</p> <ul style="list-style-type: none"> ▪ If gloves are worn and appear intact on removal, then alcohol-based hand rub remains the agent of choice for hand hygiene. 	E-learning modules and webinars	<p>The GDG confirmed that this recommendation has been implemented and is current practice.⁽³⁴⁾ However there are ongoing costs associated with ensuring adherence to this recommendation. A suite of e-learning modules and webinars will be delivered annually to support the ongoing adherence to this recommendations. These costs will be included in the BIA.</p> <p>It is HR policy that Hand Hygiene (HH) training is provided to all health care staff every two years.^(36, 37) The trainer is usually a nurse and HH training its part of their everyday role as an IPCN or HCW hand hygiene trainer. For this reason this cost will not be included in the BIA.</p> <p>The following activities are carried out as part of the daily roles of existing IPC staff</p>

No.	Recommendation	Cost relevant to recommendations	Notes on BIA Implications
	<ul style="list-style-type: none"> ▪ 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. ▪ After washing, hands should be dried thoroughly with a single-use towel. 		<p>to support this recommendation and will not be included in the BIA:</p> <ul style="list-style-type: none"> ▪ Organisational IPC teams and hand hygiene champions ▪ Link practitioner programme available in community services aligned to AMRIC guidance ▪ Implementation of hand hygiene audit schedule and hand hygiene auditor training programme.
5	<p>Sites should be cleaned and disinfected after spills of blood or other potentially infectious materials.</p>	<p>E-learning modules and webinars</p>	<p>The GDG confirmed that this recommendation is already implemented and current practice, with the use of spill kits as standard practice. However, the composition of spill kits has changed as a result of this recommendation. Most healthcare settings would typically have spill kits; these would contain appropriate personal protective equipment for managing spills, chlorine granules, paper towels among other content. Some spill kits would be commercially prepared. Following a UK MHRA alert regarding risks of use of chlorine releasing granules/ clumping agents onto a spill; this recommendation was adapted, and no states that a pill should be absorbed with absorbent material, then clean then disinfect; and is now aligned with WHO, CDC and current IPC interim guidance. The change in composition of spill kits is not considered to be substantial. Therefore it will not be included in the BIA.</p> <p>To support this recommendation it is part of the day to day role of IPC staff to ensure the following:</p> <ul style="list-style-type: none"> ▪ Environmental post clean audits (local) are carried out.

No.	Recommendation	Cost relevant to recommendations	Notes on BIA Implications
			<ul style="list-style-type: none"> ▪ Hygiene services committees are established in community when needed ▪ There are HR dedicated roles and responsibilities for hygiene services. <p>As the above is already part of the daily role of existing staff, costs associated with these will not be included in the BIA.</p> <p>A suite of e-learning modules and webinars will be delivered annually to support the ongoing adherence to this recommendation and to notify healthcare workers of any changes in current practice. These costs will be included in the BIA.</p>
6	<p>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.</p> <p>Note terminal disinfection must always occur in the context of a process of terminal cleaning and disinfection.</p>	E-learning modules and webinars	<p>The GDG confirmed that this recommendation is already implemented and current practice.</p> <p>To support this recommendation it is part of the day to day role of IPC staff to ensure the following:</p> <ul style="list-style-type: none"> ▪ Environmental post clean audits (local) are carried out. ▪ Hygiene services committees are established in community when needed ▪ There are HR dedicated roles and responsibilities for hygiene services. <p>As the above are already part of the daily role of existing staff, costs associated with them will not be included in the BIA.</p> <p>A suite of e-learning modules and webinars will be delivered annually to support the ongoing adherence to this recommendation and to notify healthcare workers of any changes in current practice. These costs will be included in the BIA.</p>
7	<p>Recommendation AGAINST</p> <p>Hydrogen peroxide vapour disinfection is not recommended</p>	E-learning modules and webinars	<p>The GDG confirmed that the use of Hydrogen peroxide vapour disinfection as a routine adjunct in healthcare facilities is not current routine practice; to their knowledge such routine use is not widely available nor commonly used in healthcare</p>

No.	Recommendation	Cost relevant to recommendations	Notes on BIA Implications
	as a routine adjunct in healthcare facilities as the evidence of added value compared with conventional cleaning and disinfection is not well established.		<p>settings in Ireland. However, it may be used in very specific circumstances or on a pilot or evaluation basis. Hence this element will not be included in the BIA.</p> <p>To support this recommendation it is part of the day to day role of IPC staff to ensure hygiene services committees are established in community when needed. As this is already part of the daily role of existing staff, costs associated with it will not be included in the BIA.</p> <p>A suite of e-learning modules and webinars will be delivered annually to support the ongoing adherence to this recommendations. These costs will be included in the BIA.</p>
8	<p>Recommendation AGAINST</p> <p>Ultra-violet light disinfection, ultra-violet light in combination with sodium hypochlorite and other novel approaches to hospital environment disinfection are not recommended as routine adjuncts in healthcare facilities as the evidence of added value compared with conventional cleaning and disinfection is not well established.</p>	E-learning modules and webinars	<p>The GDG confirmed that Ultra-violet light disinfection, ultra-violet light in combination with sodium hypochlorite and other novel approaches to hospital environment disinfection as routine adjuncts in healthcare facilities is not currently standard practice. Therefore this element will not be included in the BIA.</p> <p>To support this recommendation it is part of the day to day role of IPC staff to ensure hygiene services committees are established in community when needed. As this is already part of the daily role of existing staff, costs associated with this will not be included in the BIA.</p> <p>A suite of e-learning modules and webinars will be delivered annually to support the ongoing adherence to this recommendations. These costs will be included in the BIA.</p>
9	<p>Recommendation AGAINST</p> <p>The use of surfaces, fittings or furnishing containing materials</p>	E-learning modules and webinars	<p>The GDG confirmed that the use of surfaces, fittings or furnishing containing materials with antimicrobial properties in healthcare facilities is not currently standard practice. Therefore this element will not be included in the BIA.</p>

No.	Recommendation	Cost relevant to recommendations	Notes on BIA Implications
	with antimicrobial properties in healthcare facilities is not recommended as the evidence of added value compared with conventional cleaning and disinfection is not well established.		<p>To support this recommendation it is part of the day to day role of IPC staff to ensure hygiene services committees are established in community when needed. As this is already part of the daily role of existing staff, costs associated with this will not be included in the BIA.</p> <p>A suite of e-learning modules and webinars will be delivered annually to support the ongoing adherence to this recommendation. These costs will be included in the BIA.</p>
10	Sterile gloves are used for surgical aseptic procedures and contact with sterile sites.	E-learning modules and webinars	The GDG confirmed that this recommendation is already implemented and current practice. However, a suite of e-learning modules and webinars will be delivered annually to support the ongoing adherence to this recommendation. These costs will be included in the BIA.
11	Contact Precautions, in addition to Standard Precautions, are implemented 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.	E-learning modules and webinars	<p>The GDG confirmed that this recommendation is already implemented and current practice. However, a suite of e-learning modules and webinars will be delivered annually to support the ongoing adherence to this recommendation. These costs will be included in the BIA.</p> <p>In instances where there is a change to guidance, AMRIC Standardised Transmission Based Precautions (TBP) posters will be developed based on IPC TBP. However it is not possible to estimate how frequently how frequently posters will be developed as this is subject to whether or not guidance changes in the future. Given the uncertainty underlying this, the costs associated with updating posters will not be included in the BIA.</p>

No.	Recommendation	Cost relevant to recommendations	Notes on BIA Implications
12	Hand hygiene be undertaken and personal protective equipment (PPE) be used as appropriate when healthcare workers have contact in the acute hospital setting 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.	E-learning modules and webinars	<p>The GDG confirmed that this recommendation is already implemented and current practice. However there are ongoing costs associated with ensuring that the adherence to this recommendation. A suite of e-learning modules and webinars will be delivered annually to support the ongoing adherence to this recommendation. These costs will be included in the BIA.</p> <p>In instances where there is a change to guidance, AMRIC Standardised Transmission Based Precautions (TBP) posters will be developed based on IPC TBP. However it is not possible to estimate how frequently how frequently posters will be developed as this is subject to whether or not guidance changes in the future. Given the uncertainty underlying this, the costs associated with updating posters will not be included in the BIA.</p>
13	<p>Where possible patient-dedicated equipment or single-use patient-care equipment be used for people on Contact Precautions.</p> <p>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.</p>	E-learning modules and webinars	<p>The GDG confirmed that this recommendation is already implemented. However, a suite of e-learning modules and webinars will be delivered annually to support the ongoing adherence to this recommendation. These costs will be included in the BIA.</p> <p>In instances where there is a change to guidance, AMRIC Standardised Transmission Based Precautions (TBP) posters will be developed based on IPC TBP. However it is not possible to estimate how frequently how frequently posters will be developed as this is subject to whether or not guidance changes in the future. Given the uncertainty underlying this, the costs associated with updating posters will not be included in the BIA.</p>
14	Healthcare workers implement Droplet Precautions when caring	E-learning modules and webinars	The GDG confirmed that this recommendation is already implemented. However, a suite of e-learning modules and webinars will be delivered annually to support the

No.	Recommendation	Cost relevant to recommendations	Notes on BIA Implications
	<p>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.</p> <p>NOTE: For the purpose of recommendation 14 a minimum distance of 1 metre is generally applied when caring for people suspected or known to have droplet transmitted infections (for example meningococcal meningitis). Note however that a recommendation for mask use when within a distance of 2m of a person using healthcare services or other healthcare worker currently applies in the context of a specific recommendation issued to this effect by the National Public Health Emergency Team (NPHE) convened in the context</p>		<p>ongoing adherence to this recommendation. These costs will be included in the BIA.</p>

No.	Recommendation	Cost relevant to recommendations	Notes on BIA Implications
	of the COVID-19 pandemic.		
15	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.	E-learning modules and webinars	The GDG confirmed that this recommendation is already implemented. However, a suite of e-learning modules and webinars will be delivered annually to support the ongoing adherence to this recommendation. These costs will be included in the BIA.
16	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 Aerosol Generating Procedures associated with an	Fit testing, E-learning modules and webinars	The GDG confirmed that this recommendation is already implemented. Prior to the COVID-19 pandemic, the use of respiratory protective equipment as a control for staff exposure to biological agents in a normal clinical environment was less common. Though surgical masks were often used/required for clinical infection control purposes. Additionally it is believed that adherence to fit testing may have improved as a result of COVID-19. It is important that this recommendation continues to be adhered to in the future. Therefore costs associated with fit testing will also be included in the BIA. A suite of e-learning modules and webinars will be delivered annually to support the

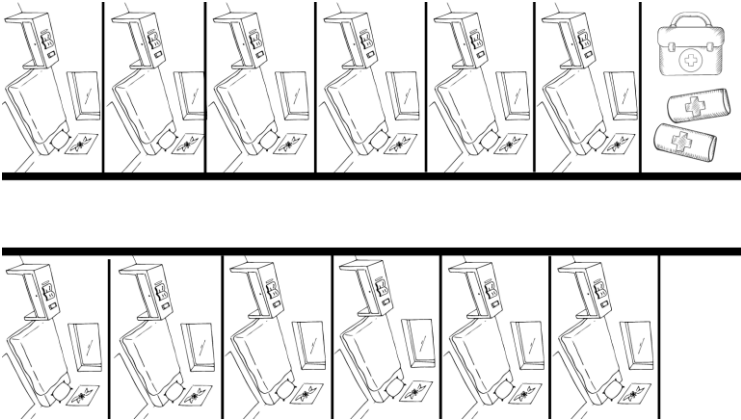
No.	Recommendation	Cost relevant to recommendations	Notes on BIA Implications
	increased risk of infection (AGPs) are performed on people with known or suspected infectious microorganisms normally transmitted by the droplet route.		ongoing adherence to this recommendation. These costs will be included in the BIA.
17	Personal protective equipment 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.	E-learning modules and webinars	The GDG confirmed that this recommendation is already implemented and current practice. However, a suite of e-learning modules and webinars will be delivered annually to support the ongoing adherence to this recommendation. These costs will be included in the BIA.
18	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 Aerosol Generating	E-learning modules and webinars	The GDG confirmed that this recommendation is already implemented and current practice. However, a suite of e-learning modules and webinars will be delivered annually to support the ongoing adherence to this recommendation. These costs will be included in the BIA.

No.	Recommendation	Cost relevant to recommendations	Notes on BIA Implications
	Procedures associated with an increased risk of infection (AGPs) are performed on people with known or suspected infectious microorganisms normally transmitted by the droplet route.		
19	<p>Single-use, fit for purpose gloves are worn for:</p> <ul style="list-style-type: none"> ▪ Each invasive procedure ▪ Direct contact with sterile sites and non-intact skin or mucous membranes ▪ Any activity that has been assessed as carrying a risk of exposure to blood and body substances. <p>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.</p>	E-learning modules and webinars	The GDG confirmed that this recommendation is already implemented. However, a suite of e-learning modules and webinars will be delivered annually to support the ongoing adherence to this recommendation. These costs will be included in the BIA.
20	In the acute hospital in-patient setting, Contact Precautions should generally be applied in	E-learning modules and webinars	The GDG confirmed that this recommendation is already implemented and current practice. ⁽³⁹⁾ However, a suite of e-learning modules and webinars will be delivered annually to support the ongoing adherence to this recommendation. These costs will

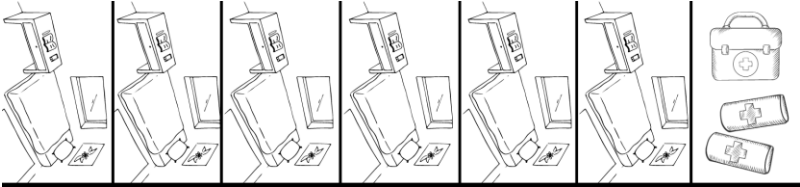
No.	Recommendation	Cost relevant to recommendations	Notes on BIA Implications
	<p>caring for people colonised or infected with specific multi-drug resistant organisms (MDROs). Contact Precautions in this context are generally not appropriate in healthcare settings other than acute hospital in-patient settings.</p>		<p>be included in the BIA.</p>
21	<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"> ▪ Trends in disease in the general population and the particular population served. ▪ Demographic trends in the population served. ▪ Specialties of the health care facility. ▪ Projected changes in future clinical activities. 	<p>E-learning modules, webinars and potential costs savings associated with this recommendation</p>	<p>Guidance published in 2008 states that newly built acute hospital inpatient accommodation should comprise 100% single-patient rooms. Newly built non-acute hospital inpatient accommodation should comprise a minimum of 50% single-patient rooms.⁽²⁶⁾</p> <p>Guidance published by HIQA in 2017 states there should be adequate single rooms with no percentage stated.⁽⁶⁾</p> <p>Consideration will be given to the potential cost savings associated with having different quantities of single-patient rooms in newly built acute hospital inpatient accommodation.</p>

Appendix 2: Single Patient Rooms (recommendation 21)

Scenario 1: 100% SPR acute inpatient hospital ward



Scenario 2: SPR acute inpatient hospital ward with one MBR



Scenario 3: SPR acute inpatient hospital ward with two MBRs

