ecdc
EUROPEAN CENTRE FOR DISEASE PREVENTION AND CONTROL

PUBLIC HEALTH GUIDANCE

Proposal for EU guidance on the establishment and implementation of infection prevention and control programmes in healthcare

ECDC PUBLIC HEALTH GUIDANCE

Proposal for EU guidance on the establishment and implementation of infection prevention and control programmes in healthcare

This report of the European Centre for Disease Prevention and Control (ECDC) was coordinated by Aikaterini Mougkou.

Contributing authors
Dana Alsaialy, Sarah Earnshaw Blomquist, John Kinsman, Vivian Leung, Aikaterini Mougkou, Lucia Pastore Celentano, Diamantis Plachouras, Svetla Tsolova.

Acknowledgements
Expert group: Gabriel Birgand (University of Nantes, France); Michael Borg (Mater Dei Hospital, Malta); Andreea Capilna (Hospital 'Regina Maria' Brașov, Romania); Yehuda Carmeli (University of Tel Aviv, Israel); Martin Cormican (University of Galway, Ireland); Sonja Hansen (University of Berlin, Germany); Nico Mutters (University of Bonn, Germany); Elisabeth Presterl (University of Vienna, Austria); Jacqui Reilly (Glasgow Caledonian University, Scotland); Theoklis Zaoutis (University of Athens, Greece); Walter Zingg (University of Zürich, Switzerland), Aliénor Lerouge (Organisation for Economic Co-operation and Development).

Observers: Benedetta Allegranzi (World Health Organization HQ), Ana Paula Coutinho Rehse (World Health Organization Regional Office for Europe), Yann Heyer (European Patients' Forum), Brian Kristensen (Joint Action on Antimicrobial Resistance and Healthcare-Associated Infections (EU-JAMRAI)), Birgitta Lytsy (International Federation of Infection Control), Constantinos Tsioutis (European Committee on Infection Control (EUCIC)).

The authors wish to acknowledge EU-JAMRAI for their contributions to the preparation of this document.

Suggested citation: European Centre for Disease Prevention and Control. Proposal for EU guidance on the establishment and implementation of infection prevention and control programmes in healthcare. Stockholm: ECDC; 2026.

Stockholm, May 2026

ISBN 978-92-9498-852-2
doi: 10.2900/5234797
Catalogue number TQ-01-25-082-EN-N

Contents

Figures

Tables

Abbreviations

ABHR	Alcohol-based hand rub
AMR	Antimicrobial resistance
AMS	Antimicrobial stewardship
BSI	Bloodstream infection
CDI	*Clostridioides difficile* infection
CI	Confidence interval
CVC	Central Venous Catheter
EEA	European Economic Area
ECDC	European Centre for Disease Prevention and Control
EU	European Union
EUCIC	European Committee on Infection Control
EU-JAMRAI 2	Second EU Joint Action on Antimicrobial Resistance and Healthcare-Associated Infections
FTE	Full-time equivalent
HAI	Healthcare-associated infection
IPC	Infection prevention and control
IPCAF	Infection Prevention and Control Assessment Framework
IT	Information technology
ICU	Intensive care unit
IAP	Intubation-associated pneumonia
KPI	Key performance indicator
LTCF	Long-term care facility
MDRO	Multidrug-resistant organism
MMIS	Multimodal improvement strategies
MS	Member States
NAPHS	National Action Plan for Health Security
SBS	Social and Behavioural Sciences
SOP	Standard operating procedure
WHO	World Health Organization

Executive summary

Infections acquired in healthcare settings or where health services are provided are a significant threat to patient safety and health systems function. Preventing healthcare-associated infections (HAIs) requires systemic actions that manage the risks of spread of infectious microorganisms while supporting the delivery of holistic patient-centred care. There are variations in the implementation of infection prevention and control (IPC) programmes across European healthcare settings, indicating the need for standardised practices and enhanced efforts to improve the adoption of and monitoring compliance with IPC guidelines at national levels. This guidance underscores the need to establish and sustain IPC programmes at national and healthcare facility levels in the European Union and European Economic Area (EU/EEA) and is intended to be adapted by national authorities to their specific legal and organisational contexts, considering the heterogeneity of health systems.

Healthcare-associated infections result in increased morbidity, prolonged hospital stays, higher healthcare costs and increased mortality. More than 3.5 million cases of HAIs are estimated to occur in the EU/EEA each year, leading to more than 90 000 deaths and corresponding to approximately 2.5 million disability adjusted life years (DALYs) [1]. In addition, HAIs account for more than 70% of the burden of antimicrobial resistance (AMR) in the EU/EEA [2]. Robust surveillance and laboratory capacity, healthcare worker and care provider awareness and training, and resources for maintaining the necessary governance, structures, and activities for IPC programmes are needed to reduce these burdens.

ECDC encourages countries to establish, if not existing, maintain and strengthen national IPC programmes that adopt a risk-based approach to HAI prevention and control, grounded in surveillance data and stakeholder engagement. As levels of AMR, HAI burden, and pathogen epidemiology vary considerably across EU/EEA, countries should assess the strengths and weaknesses in their IPC programmes, prioritise areas for improvement and implement structured process improvement approaches to address gaps.

This guidance for IPC programmes, focusing on the national level, hospitals, and long-term care facilities (LTCFs), is aligned with the EU legislative framework on AMR in human health and patient safety, as well as the WHO IPC Core Components.

For effective national IPC programmes, the following actions are necessary:

- Develop a national IPC action plan that clearly identifies responsible actors, defines priorities and actions, and allocates dedicated financial and human resources.
- Implement monitoring and evaluation mechanisms for structure, process and outcome indicators for IPC, aligned with defined targets, to support continuous improvement of the IPC programme.
- Establish or strengthen HAI surveillance, a cornerstone of national IPC programmes. Progress toward digitalisation and automation should be embedded within legal frameworks, ensuring that healthcare facilities receive both financial and technological support to meet reporting requirements. National-level HAI data should be disseminated regularly and in a timely manner to relevant stakeholders, in line with the respective governance structure.
- Adopt evidence-based technical IPC guidelines at the national level that outline actions for the prevention of HAIs and define national IPC standards to support the delivery of high-quality care.
- Invest in financial and human resources to develop and sustain IPC training, both at the national level and within healthcare facilities, including partnership with higher education institutes to promote relevant research and continuous professional education.

National health authorities have the ultimate responsibility for ensuring IPC policies are developed and implemented, setting up infrastructures necessary for IPC programmes and patient safety. Sustainable implementation of national IPC programmes is essential and should be reinforced by legal frameworks and the financial means for maintaining necessary structures and capacities. IPC policies are most effective when sufficient resources are allocated, and mechanisms for monitoring policy implementation are in place. Close coordination with sub-national administrative levels and healthcare facilities is particularly important to ensure compliance with policies in all levels of care provision. Although it is important to clearly define the roles of key stakeholders at national and sub-national levels, this guidance provides only a general overview of key actors and collaborative processes. The organisation of responsibilities among authorities in each country will depend on the respective health system's governance, structure and legislative framework.

Furthermore, this guidance recognises the unique context of long-term care facilities, which can vary significantly due to differences in population characteristics, infrastructure, and staffing. Tailored approaches are therefore essential when developing the IPC programmes for LTCFs as outlined in this document. This guidance includes steps for applying social and behavioural sciences approaches for strengthening the implementation of IPC guidelines. Understanding factors influencing behaviour can guide the development of behaviourally informed strategies and interventions to improve adoption of effective IPC practices. The engagement of healthcare workers,

administration, patients and residents, who are service users, and implicated professional associations and scientific societies is essential in the co-creation of effective implementation.

Alignment across healthcare facility administrative and IPC governance structures, technical guidelines, education and training programmes, and surveillance are key. Many components of IPC programmes, as suggested by WHO, have been largely implemented in EU/EEA countries. However, further work is needed to establish continuous monitoring and evaluation of implementation of these components, necessary for continuous IPC improvement. Example outcome, process and structure indicators and targets are provided in an annex to support countries in monitoring the performance of IPC programmes over time.

Countries with well-established IPC programmes that already meet these IPC standards are encouraged to further strengthen their efforts. This includes enhancing the automation and quality of surveillance systems, expanding the use of the indicators and targets proposed in this document, and ensuring the allocation of sufficient skilled resources to sustain and improve IPC programmes over time.

Introduction

Healthcare-associated infections (HAIs) are a significant threat to patient safety resulting in increased morbidity, prolonged hospital stays, higher healthcare costs, and mortality rates. Preventing HAIs requires systemic actions that manage the risks of spread of infectious microorganisms in healthcare settings while supporting the delivery of holistic patient-centred care. There is evidence that IPC programmes can prevent a substantial proportion of HAI. IPC programmes can be defined as a set of structured and coordinated activities with the aim of preventing and controlling HAIs. Although evidence-based infection prevention and control (IPC) guidelines – including the landmark World Health Organization (WHO) guidelines on core components of IPC programmes at the national and acute healthcare facility level – are already published at international and national levels, their implementation across healthcare settings remains suboptimal.

The 2022–2023 ECDC point prevalence study (PPS) confirmed that HAIs are a major public health problem with a prevalence of 8% (95% CI: 6.6–9.7%) and 93 305 (95% CI: 76 427–111 899) patients with a HAI on any given day in European acute care hospitals [3]. In the EU/EEA, HAIs account for more than 70% of the deaths and burden of disease related to antimicrobial resistance (AMR) [2]. Over the last decade, some AMR threats associated with healthcare settings, such as methicillin-resistant *Staphylococcus aureus* (MRSA), have decreased, and some countries have managed to maintain low levels of AMR through antimicrobial stewardship (AMS) and IPC. However, several countries across the EU/EEA are experiencing a considerable increase in difficult-to-treat infections, with carbapenem-resistant *Enterobacterales*, recognised as a serious health threat for hospitalised patients [4,5].

IPC aims to prevent the transmission of pathogens in healthcare settings and prevent HAIs. Reducing the incidence of HAIs, including those caused by multidrug-resistant organisms (MDROs), reduces the need for antimicrobial treatment and minimises the emergence and spread of AMR. There is a large variation in the implementation of IPC programmes across European hospitals, indicating the need for standardised practices and enhanced efforts to improve outcomes [3].

The simultaneous presence of multiple systemic and behavioural barriers challenges implementation of available national and supranational IPC guidelines [6]. Examples of barriers include shortages of essential supplies, understaffing, inadequate infrastructure and sanitation facilities, overcrowding, limited awareness and understanding of IPC protocols among healthcare workers. Mechanisms to monitor, evaluate and develop well-informed IPC interventions are also challenging to sustain [7]. Effective implementation of IPC in healthcare settings therefore remains a significant challenge despite the availability of IPC guidelines at both national and supranational levels. To address these challenges in IPC implementation, the guidance in this document proposes a structured approach for governments, public health authorities and healthcare facilities, in collaboration with diverse stakeholders. In line with the person-centred approach, considerations for involving patients are included.

Implementing clinical practice guidelines requires changes in the behaviour of various actors. Limited understanding of behavioural drivers impacts the successful implementation of measures and the achievement of the desired outcomes [8,9]. By framing implementation challenges through a behavioural lens, insights from social and behavioural sciences (SBS) can help identify the factors influencing behaviour change and guide strategies to improve guideline adoption. Implementation science integrates approaches from multiple disciplines, with SBS playing a key role due to its focus on the cognitive, social, and environmental influences on human behaviour. The inclusion of expertise and competency in SBS is therefore reflected throughout this guidance.

Combining various approaches that work together is more likely to be successful in improving IPC than any single intervention. Multimodal improvement strategies (MMIS) are a WHO core component of IPC programmes for which WHO outlines five elements as basis for improvement: a) systems changes to enable IPC practices; b) training and education to improve the knowledge of healthcare workers; c) monitoring and feedback to assess the problem and drive appropriate change; d) reminders and communication to promote the desired actions; and e) a culture of psychological safety to facilitate an organisational climate that values the intervention [10]. SBS approaches can build directly upon WHO's MMIS framework, providing additional tools to tailor and prioritise interventions. The five MMIS components are foundational, with SBS offering enhanced diagnostic and intervention design capabilities for specific behavioural challenges. A harmonised yet flexible approach to strengthening structures and processes for IPC implementation in Europe is needed to facilitate adoption of existing and emerging evidence-based measures for HAI prevention. This guidance is therefore intended to be adapted to national systems and regulatory frameworks, considering the diverse healthcare delivery models, healthcare environments, and HAI risks across Europe.

European Union policy framework on infection prevention and control

This guidance proposes strategies and actions for effective IPC programme implementation in the EU, aligning with existing policy documents at EU level in this field over the last 15 years. Whereas the organisation and delivery of health services and healthcare remain the responsibility of Member States, EU-level initiatives have served to support national efforts and to promote high levels of infection prevention and control across the Union.

The Council Recommendation 2009/C 151/01 of 9 June 2009 on patient safety, including the prevention and control of HAIs, called for the EU Member States to join efforts to adopt and implement strategies for the prevention and control of HAIs, as well as to enhance IPC at the level of the healthcare facilities. The CR encouraged countries to involve patients in defining patient safety policies through the associations representing them. Therefore, this guidance contains a section on 'Involving patients in infection prevention and control' in which the guiding principles and priority operational steps to engage patients and patient organisations in IPC are described [11], and which should be taken into account when implementing this guidance in practice.

The European Parliament resolution of 22 October 2013 on patient safety acknowledged the progress made by the Member States since the 2009 Council Recommendation while indicating that further progress was required. This resolution included a set of measures to be implemented at Member State level for the prevention and reduction of HAIs [12].

In 2014, the Member States were asked to intensify their action to prevent HAIs in the Council Conclusions on patient safety and quality of care, including the prevention and control of healthcare-associated infections and antimicrobial resistance [13]. The 2014 Council Conclusions cited the Council Recommendation 2009/C 151/01 and ECDC's publication of 'Core competencies on infection control and hospital hygiene professionals in the European Union' [14]. The 2014 Council Conclusions invited EU Member States to implement guidelines, recommendations and good practices on patient safety and the prevention and control of HAIs and AMR, in close cooperation with ECDC. In addition, the Member States were asked to promote the education and training of healthcare workers on patient safety and HAIs.

IPC and HAI prevention have been key components of EU strategies for AMR since the 2001 Community Strategy against AMR [15]. In 2017, the European One Health Action Plan against AMR further emphasised the role of IPC [16]. In 2019, the Council adopted Council Conclusions on the next steps towards making the EU a best practice region in combatting antimicrobial resistance, which encouraged Member States, among others, to strengthen IPC measures, in particular in healthcare settings.

The EU has also funded projects in support of strengthening national action on AMR and HAI, notably two joint actions on Antimicrobial Resistance and Healthcare-Associated Infections: EU-JAMRAI 1 (2017-2021) and EU-JAMRAI 2 (2024-2027), which include activities around IPC. EU-JAMRAI 2 includes a work package dedicated to behaviour change in healthcare settings, aiming to support the implementation of state-of-the-art IPC for HAI prevention. Approaches from social and behavioural sciences applied in that EU-JAMRAI 2 work package are featured in this guidance as key elements of sustained IPC improvement.

Regulation (EU) 2022/2371 on serious cross-border threats to health set out reporting obligations of Member States regarding national capacities on prevention, preparedness and response planning, submitted every three years to the Commission (Article 7 of the Regulation (EU) 2022/2371). These capacities are assessed by ECDC together with the Commission (Article 8 of the Regulation (EU) 2022/2371) [17]. The reporting template contains capacities related to AMR and HAI, which make reference to national arrangements that implement the WHO Core Components for national IPC programmes [18].

The 2023 EU Council Recommendation on stepping up EU actions to combat AMR noted the intention of the Commission to develop this guidance document on IPC in healthcare facilities, a collaborative effort between European Commission, ECDC, and European and national professional societies. The Council Recommendation also encourages Member States to strengthen IPC in healthcare settings and long-term care facilities (LTCFs) by ensuring strong links to patient safety, upgrading healthcare facilities, and ensuring core competencies for IPC professionals [19].

Purpose and scope

The purpose of this guidance is to promote sustainable quality improvement approaches to IPC in human healthcare in the EU to enable long lasting reduction in the burden of HAIs. The document outlines core activities and administrative responsibilities for IPC programmes at national and healthcare facility levels, while including practical guidance on how IPC strategies can be effectively implemented and sustained in a cost-effective way. Further, they include approaches from social and behavioural sciences to support the development of behaviourally informed strategies and interventions to address implementation challenges.

This guidance addresses necessary structures, resources, systems, and processes in IPC programmes for quality improvement in IPC. It complements existing technical guidance from scientific societies, public health authorities, and healthcare facilities for the prevention and control of specific infections or outbreaks caused by specific pathogens.

While more evidence is needed to define structures and processes that lead to sustainable reductions in HAIs, some national and facility IPC programmes have modelled effective implementation of the WHO Core Components. This guidance therefore addresses fulfilment of the WHO Core Components through six main functions of IPC programmes:

i) Ensure effective IPC programme governance;
ii) Uphold IPC improvement cycles;
iii) Maintain technical IPC guidelines;
iv) Sustain quality IPC education and training;
v) Conduct meaningful surveillance of HAIs; and
vi) Ensure conditions for sustained prevention and control of HAIs.

Each of these six functions are addressed in one or more of the chapters of this guidance at national, healthcare facility, and long-term care facility levels.

While this guidance focuses on acute care hospitals and long-term care facilities, adaptations should be considered for other healthcare settings, including ambulatory and outpatient care, based on the risk of HAIs. National IPC programmes should seek to understand the risks of HAIs in all settings where healthcare is provided.

Target audience

This guidance, designed to strengthen IPC practices across national, regional and healthcare facility levels within EU countries, is intended for various authorities and actors in EU health systems responsible for implementing essential elements of IPC. At the national level, this document provides a comprehensive framework for policymakers in the healthcare field and offers essential guidance for the formulation, implementation and oversight of national IPC programmes within Ministries of Health and National Public Health Institutes. At the facility level, the intended audience includes healthcare facility senior administrators such as facility directors or chief executive officers; professionals responsible for the planning, development, and execution of IPC initiatives; as well as anyone else responsible for patient care. Other stakeholders in healthcare quality and safety, such as patient advocacy groups, healthcare education institutions, and healthcare professional organisations are also implicated in this guidance.

Methods

This ECDC IPC guidance was developed based on best practices derived from a systematic literature search and expert consensus. A systematic literature search, rather than a comprehensive literature review, was pursued to identify essential structures and processes for sustainable IPC implementation at the national and healthcare facility levels, including considerations for LTCFs. Additional focus was placed on patient involvement and the application of social and behavioural sciences approaches to facilitate implementation of IPC measures.

This guidance was informed by the comprehensive and well-documented literature review on evidence conducted by the WHO Guidelines Development Group and the Systematic Reviews Expert Group that produced the WHO Guidelines on Core Components of Infection Prevention and Control Programmes at the National and Acute Health Care Facility Level [20]. In addition, published examples of successful interventions at national level were considered. These publications were considered alongside expert consensus using a modified Delphi approach to develop balanced and contextually relevant implementation guidance for the EU. Criteria from the GRADE Evidence to Decision framework for health system and public health decisions were considered during the formulation of this guidance [21]. Experts were asked to consider these criteria when providing input on 1) inclusion of the recommendations in this guidance and 2) phrasing of the recommendations.

Further details regarding the methodology and three-stage systematic literature search, including search criteria, are in Annex 1.

Limitations and knowledge gaps

While there are published examples of public health IPC interventions that have led to reductions in HAIs and AMR, there is an overall lack of high-quality evidence establishing an association between specific IPC policies and effective and sustained reductions in HAIs and AMR. This lack of high-quality evidence on IPC programmes was recognised by the Guidelines Development Group for the WHO Guidelines on Core Components of Infection Prevention and Control Programmes [20].

Healthcare systems governance, organisation, and availability of human and financial resources are diverse across the EU. Therefore, any guidelines on structures and processes need to be adapted to the national healthcare system. In addition, implementation critically depends on cultural factors [22,23]. As a result, evidence on implementation generated in one setting is likely not directly applicable in all settings. Funding and implementation of well-designed studies are needed to generate high quality evidence on optimal governance structures and implementation strategies for IPC for the diverse contexts of healthcare in the EU. Further high-quality studies on improvement of behavioural IPC interventions are also needed, as are studies on cost-effectiveness of interventions and system changes.

ECDC guidance for the establishment and implementation of infection prevention and control programmes in healthcare

The guidance below outlines structures and actions that should be maintained at national and healthcare facility levels in the EU. This guidance is intended to be adapted to existing IPC structures and activities as well as local cultural contexts. The first two chapters concern IPC programmes at the national and healthcare facility levels, respectively. Within each of these sections, guidance for IPC programme governance is presented, followed by an outline for implementing improvement cycles, then IPC actions to be taken. The third chapter contains special considerations for long-term care facilities.

Chapter four describes steps for applying social and behavioural sciences approaches for strengthening the implementation of IPC guidelines, while chapter five presents ways to involve patients in IPC actions. Finally, considerations for cost effectiveness are presented, along with a call for further evidence in the diverse contexts of healthcare in the EU.

1. National infection prevention and control programmes

Governments have the ultimate responsibility for developing, implementing, and supporting the policies, actions, and structures necessary to ensure effective IPC, a key aspect of patient safety in healthcare settings. Governance and leadership models are set at national level; regional and local administrative levels may be responsible for ensuring quality and safety in healthcare settings per a country's governing structure. All settings where healthcare is provided should be considered by national IPC programmes, including hospitals, LTCFs, outpatient clinics, and other settings such as home care. Stakeholders for each of these settings can co-design and support relevant IPC activities to address HAI risks within and across their settings.

Full implementation of structures and processes for effective IPC programmes can be hindered by a variety of factors, including unclear governance structures, resource limitations (skilled workforce, infrastructure, and financial), or insufficient awareness or leadership of stakeholders. For each national-level IPC function, engagement of relevant stakeholders in co-design, implementation, and evaluation reinforces resource-sharing and coordinated IPC improvement cycles. Stakeholder mapping can help determine membership of a formal advisory group and identify other stakeholders to engage via other mechanisms. Stakeholders to consider include: scientific societies for infectious disease specialists, clinical microbiologists, nurses and doctors from diverse fields; healthcare service delivery leaders; IPC professionals; public health professionals; healthcare facility directors and environmental engineers; patients and patient advocates; and social and behavioural scientists. Collaboration and coordination mechanisms should be well described in national strategies and operational plans for the IPC programme, ensuring accountability to healthcare stakeholders.

The structure and actions described below should be integrated into those of sub-national (regional and local) administrations and public health agencies, adjusted based on their competencies as established in the governing structures of each country. Even in countries where IPC is a competency of sub-national public health institutions or other healthcare bodies, national coordination of activities remains necessary. Close coordination of national and sub-national administrative levels is particularly important for developing IPC policies, objectives, and programme implementation.

1.1 Ensure effective infection prevention and control governance at national level

Governance of IPC programmes, the first WHO Core Component for IPC, can vary across EU/EEA countries. All IPC programmes should however have a defined governance structure with clear responsibilities, processes, and accountability provisions. Ministerial-level support for the national IPC programme is essential and should be reinforced by legal frameworks and financial means for maintaining necessary structures for sustainable programme implementation. A multidisciplinary stakeholder advisory group can assist the national IPC team in setting priorities, monitoring activities and promoting best practices for implementing the national action plan for IPC. Monitoring of progress towards targets and feedback from stakeholders should be incorporated into improvement cycles of the national IPC programme.

a. **Responsible entity.** An entity (e.g., department, unit, centre) within or affiliated with the Ministry of Health (or other ministerial government body responsible for health) should be established and accountable for implementation of the national IPC programme. This entity should have a clearly defined relationship with the national public health authority, if it is not within it. This entity should also have the authority to coordinate national-level activities as described below. It should have a defined governance structure and clear terms of reference for implementing national IPC activities. The terms of reference should specify its role in influencing implementation of IPC in healthcare settings by proposing policies, establishing reporting requirements, and maintaining national oversight of IPC in healthcare settings, both public and private. This entity responsible for the national IPC programme must be positioned to coordinate (or be integrated) with entities addressing antimicrobial stewardship, AMR surveillance and response, patient safety, and healthcare facility inspections at the national level to effectively implement comprehensive IPC strategies.

b. **National IPC team.** A national IPC team within the entity responsible for day-to-day implementation of the national IPC programme should be staffed by experts dedicated to the execution of the national IPC functions. This team should have access to any necessary expertise needed to coordinate and implement the main functions of the national-level IPC programme. The team should either include or have access to specialists with expertise and experience in: microbiology and clinical infectious diseases, IPC practice, epidemiology, data analysis, communications, and social and behavioural sciences. In addition, the team should have adequate secretarial, information technology, and reference laboratory support. Dedicated full-time staff are preferred to contracted expertise, given the need to maintain continuity of expertise and to ensure a team with flexibility for timely response to crises.

c. **Integration of sub-national authorities.** In countries where IPC programme governance is administered at sub-national levels, national-level coordination and strategies are expected to integrate sub-national activities. Effective national governance of healthcare IPC places accountability for IPC with a national-level entity.

d. **Multidisciplinary advisory group.** The entity responsible for the national IPC programme should maintain an external multidisciplinary advisory group/committee to support strategic aspects of the national IPC programme. This group should meet regularly to provide recommendations to the core team relating to the national IPC programme strategy. The advisory group should consider available resources to implement that national IPC programme; HAI and AMR surveillance, and IPC monitoring data; and feedback from relevant stakeholders. This group should also monitor implementation of the IPC programme action plan and discuss relevant and feasible strategies for addressing identified gaps and challenges in IPC. The group may contribute to the development of national HAI and IPC indicators and provide analysis of context-specific behaviours associated with these indicators. This group aligns with and contributes to the broader agendas of healthcare quality, patient safety, and AMR policy, including its governance structures across healthcare settings. Periodic stakeholder evaluation can be used to determine appropriate representation for this group and engagement of relevant professional associations to address national HAI risks.

e. **National IPC programme action plan and accountability framework.** An up-to-date and comprehensive IPC programme action plan should clearly document the priorities and distinct actions for building national IPC capacities. Comprehensive action plans include a corresponding budget, time-bound targets, and an accountability framework. The accountability framework should outline roles and responsibilities, as well as process and outcome indicators to monitor progress towards the targets (examples in Annex 3). Progress monitoring should be reported at least annually by the national public health authority to identified stakeholders. For transparency, action plans and progress reports should be published for public viewing. Action plans can be either integrated in a national patient safety strategy or preferably in a stand-alone document that links to relevant plans and strategies for healthcare quality improvement including the National Action Plan for Antimicrobial Resistance and/or the National Action Plan for Health Security (NAPHS). National IPC programme action plans should be developed and implemented in improvement cycles, with relevant stakeholders engaged in evaluation of the national IPC programme and in setting realistic yet ambitious targets with each cycle.

f. **Coordination with stakeholders.** IPC programme activities should seek to reach all relevant stakeholders, particularly healthcare workers and patient representatives. Regular coordination with stakeholder groups increases the impact of national IPC programme activities by aligning values and processes, strengthening dissemination of key messages, and gathering feedback for improvement. The national IPC programme team should regularly coordinate with both healthcare facility IPC programme experts (technical level) and facility management (executive level), as well as professional societies and patient groups. In addition, patient organisations and professional societies for IPC, infectious disease and microbiology professionals can be partners in the co-development and implementation of behaviourally informed strategies and interventions. If LTCFs are regulated by an administrative entity separate from the entity responsible for the national IPC programme (e.g. Social Affairs Ministry rather than Health Ministry), coordination is needed to ensure effective IPC actions with LTCFs.

1.2 Uphold infection prevention and control improvement cycles at national level

National-level IPC improvement should follow cycles of developing, implementing, and evaluating national IPC programme actions. The aim of improvement cycles is to increase IPC programme effectiveness and impact with each successive cycle.

When implementing national IPC programme activities, the national IPC team should incorporate at least three, and ideally all five elements of WHO's multimodal improvement strategy [10]. The five elements of the WHO multimodal improvement strategy are: i) system change; ii) training and education; iii) monitoring and feedback; iv) reminders and communication; and v) culture change. These elements are integral to the six main functions of national IPC programmes.

Evidence-based strategies for building a multimodal improvement strategy

The WHO multimodal improvement strategy is a foundational approach to IPC and can be complemented by approaches from social and behavioural sciences described later in this guidance. These approaches support the design of behaviourally informed targeted interventions to enhance IPC practices and can be incorporated into the following stages:

a. **Assess IPC implementation.** Assess implementation of IPC in human healthcare using structured methods for monitoring IPC implementation with key performance indicators (KPIs). The KPIs should be used to assess national-level and facility-level IPC structures, processes, and outcomes. Example indicators are listed in Annex 3. Social and behavioural data related to IPC implementation can inform interventions aimed at improving implementation. These data can be collected via regular reporting, social and behavioural studies, point prevalence surveys, and periodic auditing.

b. **Develop and implement multimodal improvement strategies.** Address gaps in IPC identified during the structured assessment by developing a national-level IPC improvement strategy. National IPC strategies should be documented, ideally in the national IPC programme action plan. Focus should be placed on overcoming barriers and optimising facilitators to desired IPC behaviours identified during the assessment. The strategies can be implemented through interventions representing all or least three areas of the WHO multimodal improvement strategies.

c. **Evaluate IPC improvement strategies.** Evaluate IPC interventions by synthesising qualitative and quantitative data on IPC structures, processes, and outcomes. The same KPIs that were used prior to the intervention can be used to follow the impact of interventions. Evaluation of social and behavioural barriers and facilitators influencing the success of IPC interventions can be used to refine subsequent interventions. Access to expertise in health economics could also facilitate assessment of cost-effectiveness of IPC interventions.

d. **Maintain improvement cycles in the national IPC programme.** Use findings from the evaluation of implemented IPC improvement strategies to inform the next iteration of improvement strategies and the national IPC programme action plan. Adjustments to KPIs and targets for monitoring and evaluation should be considered with each iteration of the IPC action plan. Engagement of the multidisciplinary advisory group and other healthcare stakeholders in the improvement cycle supports alignment and accountability in process improvement across healthcare settings. Their role may include co-designing strategies and interventions, defining reporting requirements such as monitoring frequency and audits processes, and advising on the content and format of public reports generated by the IPC programme. Stakeholders should be engaged in feedback sessions to continually assess and understand gaps in IPC implementation and to collaborate on strategies to close them with each improvement cycle of the national IPC programme.

1.3 Maintain national infection prevention and control guidelines

Technical evidence-based guidelines that outline actions for the prevention of HAIs form the foundation of a common understanding of national IPC standards for sustaining quality care. Such guidelines are used for IPC education, training, and skills assessment, and they also provide a basis for monitoring and auditing of IPC practices.

Dissemination of national technical procedural guidelines on IPC in healthcare settings is a core function of the national IPC programme. Given existing international IPC guidelines that are based on systematic reviews of scientific evidence, the national IPC programmes are not expected to conduct comprehensive evidence reviews for developing their own IPC guidelines. Available guidance should be used to compile national-level IPC guidelines and ensure dissemination and implementation according to national needs.

When developing, adopting, or revising IPC guidelines, active involvement of stakeholder groups implicated in the guidelines is critical to ensuring relevance, adoptability, and adherence. Healthcare stakeholders and relevant regional health authorities are also critical for successful dissemination, implementation, and maintenance of a feedback mechanism for guideline improvement. The following elements are needed at the national level to support effective maintenance of IPC guidelines.

a. **Prioritise topics for IPC guideline production and revision**. The national IPC programme should conduct risk- and needs-based prioritisation of IPC topics, informed by available HAI and IPC implementation data, as well as input from healthcare stakeholders. A non-comprehensive list of suggested topics for IPC guidelines is in Annex 2. The IPC programme's multidisciplinary advisory group can advise on which guidelines to prioritise for production or revision. National guidelines should be reviewed at least once every five years and revised to reflect the most up-to date evidence base and scientific knowledge. The coordination of curation activities for IPC guidelines requires dedicated funding, time allocation for the IPC programme's core team, and secretariat and information technology (IT) support. Inclusion of these activities in the IPC programme's action plan could facilitate allocation of funding and human resources.

b. **Adopt, adapt, or develop guidelines, with an appointed multidisciplinary project team**. Convene a team of experts to produce the technical IPC guidelines. The team can be the same for all IPC topics or vary by topic. The project team is responsible for reviewing existing evidence and guidelines to determine if the national guidelines should be an adoption of existing guidelines, an adaptation of existing guidelines, or developed by the expert team themselves using a validated consensus procedure. Team members should have relevant technical expertise to critically review existing evidence, appraise existing guidelines, and develop relevant and useful guidelines for healthcare settings within the country's context. The project team should include multidisciplinary stakeholders and healthcare leaders that will also steer guideline implementation. Experts or access to expertise in social and behavioural sciences should be incorporated in the expert group(s) to support sustainable IPC implementation practices. Relevant scientific and clinical professional societies should be included in guideline development either via participation in the project team or by being involved in the formal review process. Considerations for the patient experience can also be incorporated by inviting patient organisations to the review process.

c. **Disseminate IPC guidelines effectively.** Make national IPC guidelines easily available (e.g. published online). Guideline dissemination should involve a comprehensive communications strategy that encourages systemic changes and sustainable adoption of the guidelines. Where possible, IPC content should be embedded in a variety of regular communications to healthcare stakeholders from healthcare authorities, pointing to relevant technical guidelines.

d. **Support IPC guideline implementation.** Engage healthcare facility leadership to ensure systemic changes and resources to support effective and sustained implementation. As described in section 4, knowledge and practice of social and behavioural sciences can facilitate better understanding of factors influencing behaviour change and guide the development of behaviourally informed strategies and interventions to improve guideline adoption.

e. **Monitor and evaluate guideline implementation.** Monitor IPC guideline implementation using surveys (self-reporting), on-site assessments, or audits (announced or unannounced). Social and behaviour sciences models and frameworks can be applied to understand adherence to IPC guidelines, including relating to individual beliefs, organisation support, and environmental resources. Feedback regarding barriers to and facilitators for implementing IPC guidelines should be collected from various target audiences, stakeholder groups, and local governance structures. Such feedback can be incorporated in adaptation of materials and processes, implementation support initiatives, and guideline updates.

1.4 Sustain quality infection prevention and control education and training at national level

Supporting IPC education, training, and skills assessment are core functions of the national IPC programme. IPC education should reach all who work in and visit healthcare settings, including patients and their visitors. Anyone who interacts with people receiving healthcare has a role in IPC and HAI prevention. In addition to clinical workers, senior management, facility management, administrative staff, environmental cleaning staff, and others that influence the healthcare environment should be included in mandatory in-service IPC training. As IPC involves hands-on practice, skills development and simulated scenario-based training should be an integral part of IPC training.

Quality IPC education and training require tailoring programmes to the needs of various roles in the healthcare workforce and healthcare environments. Training programmes that include healthcare workers from different healthcare settings can also strengthen inter-facility collaborations. As with other functions of the national IPC programme, contributions from multidisciplinary experts are needed, particularly in the areas of adult learning,

social and behavioural sciences, and IPC implementation. Incorporation of patient perspectives in training fosters considerations for person-centred care when implementing IPC measures.

The following elements of quality IPC education and training programmes at national level support the maintenance of competencies and practices needed to prevent HAIs. Involvement of regional health authorities in training initiatives should be incorporated according to their mandates, competencies and needs. Key IPC topics relevant for the training activities below are listed in Annex 2.

a. **Develop IPC training programmes for healthcare workers.** The national IPC programme should ensure quality IPC training programmes for healthcare workers across the country. To strengthen IPC knowledge and practices, existing institutions and organisations for training healthcare workers (such as universities and health professional associations) should be leveraged for their existing educational programmes, networks and expertise in training delivery. The actions below require dedicated funding, staff time of the IPC programme's team, secretarial support, and information technology (IT) support. Inclusion of education and training activities in the IPC programme's action plan can facilitate allocation of funding and other resources.

   i. **Integrate national IPC guidelines in curricula for healthcare professions.** Integrate national IPC guidelines into curricula and educational programming for healthcare workers. Graduate, post-graduate, and in-service training for those who have completed their formal training should ensure healthcare professionals practice these national IPC standards. Training on clinical procedures should have IPC measures integrated in the training and skills evaluation. As IPC guidelines are updated, so must associated educational programming incorporate updates. The WHO IPC pre-service education and training curriculum includes foundational content for all health curricula and a framework for discipline-specific learning, in addition to teaching strategies and assessment methods [24].

   ii. **Identify, analyse, and address gaps in IPC training.** Identify needs for IPC training activities through regular gap analysis of healthcare worker education and training. Identify target healthcare worker groups, topics to address, and appropriate training methods in consultation with the multidisciplinary advisory group. Examination of data on HAIs, AMR, and IPC and other evaluations of IPC practices can inform priorities for national IPC training initiatives and strategies. Employ social and behavioural sciences approaches presented in section four when conducting gap analyses and when designing training activities.

   iii. **Facilitate information and experience-sharing.** Cultivate shared learning across disciplines and healthcare setting types at the local, regional, and national levels. Sharing of information and experiences regarding implementation of IPC practices should extend beyond groups of IPC professionals and include other groups of healthcare workers. Coordinate regular information-sharing meetings among healthcare workers or support existing meetings established by professional societies. These meetings offer an opportunity to share and discuss the latest national IPC guidelines, the data from national HAI, AMR, and IPC surveillance, for improving IPC, and behaviour change strategies for addressing identified IPC challenges.

b. **Define career pathways for IPC professionals.** Each country needs clearly defined career pathways for IPC professionals with established core competencies [14,25]. Where IPC is not an established professional field, define and develop the discipline in collaboration with educational institutions, professional associations, hospitals, IPC experts, and relevant government institutions. Training programmes that provide IPC specialty training for nurses and doctors, available positions for IPC professionals, and opportunities for professional advancement within the field are essential elements for growing and retaining a skilled IPC workforce. Professional certification in IPC can be a result of successful completion of an accredited course, in addition to a summative assessment of competency and practical experience. International IPC certificate programmes can be used where national IPC certification programmes are not established. As IPC practices and necessary competencies evolve, so must professional requirements [26].

c. **Improve health literacy and public awareness.** The national IPC programme should include activities that increase awareness of HAIs and relevant IPC measures among healthcare workers, patients and public. Partnerships between public health authorities, IPC professionals, and stakeholder groups can promote awareness of HAIs and generate interest among the public. An example activity would be to collaborate with education authorities to incorporate hand hygiene and respiratory etiquette lessons in preschools and primary schools. Identification of target audiences, key messages, and optimal means of public communications should be done in collaboration with experts in communication and community engagement, educators, and social and behavioural scientists, and taking into account available data on health literacy.

d. **Evaluate impact of IPC education and training initiatives.** The impact of the IPC training programmes, educational and training policies, and public awareness activities should be regularly and systematically evaluated. Use evidence-based evaluation methods such as the Kirkpatrick model to inform adjustments and improvements in education and training initiatives of the national IPC programme [27,28].

1.5 Conduct meaningful surveillance of healthcare-associated infections at national level

National-level HAI surveillance and continuous improvement of the national HAI surveillance system are core activities of national IPC programmes. National HAI surveillance systems enable measurable progress towards HAI reduction. Surveillance of HAIs identifies potential outbreaks, informs prioritisation for HAI reduction, and informs the development of IPC interventions. Barriers to receiving data of useful quality and timeliness at the national level should be identified and addressed with sustainable data solutions so that HAI risks can be reliably analysed. Healthcare facility engagement in implementing national HAI surveillance can be supported by the development of surveillance toolkits, training, necessary IT and reference laboratory infrastructure, and data validation support systems. Where HAI surveillance is well-established, the focus of national actions can shift to process improvement, system sustainability, and timely feedback mechanisms.

The WHO practical handbook for surveillance of healthcare-associated infections at national and facility levels provides best practices for the six essential elements of HAI surveillance: surveillance planning; data collection; analysis; interpretation; communication; and monitoring and evaluation [29]. Below are key actions for EU countries to maintain meaningful HAI surveillance at national level.

a. **Develop and implement a national HAI surveillance strategy.** Document HAI surveillance priorities and actions to improve the HAI surveillance system, with clear national objectives. This strategy can be integrated in a national patient safety strategy, in the IPC programme's action plan, or a stand-alone document that links to relevant strategy documents for healthcare quality improvement, including the National Action Plan for Antimicrobial Resistance. The design and implementation of HAI surveillance should support data transparency and accuracy, with consideration for external audits, IPC process indicators, and risk communication [30].

   As with other activities of the national IPC program, the HAI surveillance strategy should be implemented in improvement cycles involving risk assessment, interventions, and evaluation. Surveillance priorities and frequency of surveillance should be based on local context, with input from the multidisciplinary advisory group and other stakeholders that represent country's major healthcare settings with high HAI risks such as long-term care facilities and haemodialysis centres. Plans for surveillance system improvement should have a defined timeline, working towards sustainable and effective implementation of the actions below.

   i. **Maintain a legal framework to facilitate meaningful HAI surveillance.** Specify HAI reporting requirements in legal text or in a separate document referred to in legal text that is more readily updated. If HAI surveillance is a regional competency in a country, regional-level HAI surveillance should be integrated into a national surveillance system. Consider incentives for reporting and/or penalties for non-reporting. Financial and technological assistance may also improve healthcare facilities' capacities to fulfil legal obligations for timely data transfer to the national surveillance system within specified timelines.

   ii. **Support consistent application of case definitions.** Support case ascertainment at the healthcare facility level through dissemination of clear case definitions and supporting their use through regular training programmes and external validation support. Use ECDC HAI-Net case definitions as applicable for harmonisation of HAI surveillance across countries.

   iii. **Optimise data sourcing, including automation of case ascertainment and reporting.** Engage entities responsible for requested data in the advancement of national HAI surveillance to ensure high-quality data and efficient data transmission. HAI surveillance relies on data from a variety of healthcare data including medical records, laboratory findings, and administrative data from healthcare facilities. Collaborate with data sources on the following:

      - Capture contextual data needed for useful analysis of HAI findings (e.g. level of care provided in a facility or ward, facility IPC infrastructure indicators) and interpret alongside HAI case data.
      - Automate case ascertainment and reporting processes as much as possible to support consistent and timely data processing while sparing human resources. Investments in developing automated processes are needed where effective electronic case reporting is lacking [31]. Examples of processes for automation include case finding using clinical and laboratory data, pseudonymising electronic health record data, and transfer of pseudonymised data to national databases.

   iv. **Investigate molecular clusters at national reference laboratory.** National reference laboratories should have capacity for detection and investigation of molecular clusters for HAIs. The national HAI surveillance strategy should identify priority pathogens for which there should be capacity for real-time molecular analyses, including genomic analyses. Consider additional laboratory capacity needed for increased testing after outbreak detection and real-time genomic analyses to guide outbreak control.

v. **Provide timely analyses and feedback to reporting healthcare facilities.** Provide actionable feedback of HAI data and analyses to healthcare facility leadership to guide IPC interventions for HAI prevention. Financial and technical support for automated analyses and data visualisation are needed where electronic HAI surveillance platforms lack such capabilities. National IPC programmes should ensure that HAI data are being analysed and used regularly to support facility-level IPC activities in collaboration with IPC professionals in healthcare facilities.

vi. **Conduct data validation.** Support periodic validation activities, both internal (conducted by reporting healthcare facilities themselves) and external (conducted by an outside body), through provision of validation reports, validation toolkits/protocols, and/or in-person support. Evaluation of accuracy and consistency in case finding ensures data quality, informs improvements in case definition training, and improves automated systems for case ascertainment and reporting.

vii. **Disseminate findings to stakeholders**. Share findings from national HAI surveillance with stakeholders and governance structures responsible for developing and implementing IPC strategies for HAI mitigation, before sharing more widely. Raise HAI awareness and increase advocacy for prevention by sharing findings widely through established communication channels with a broad range of audiences. Relevant stakeholder groups include healthcare providers, healthcare facility leaders, clinical professional organisations, and patient advocacy groups. Feedback from healthcare stakeholders regarding behaviours and other factors that contribute to specific HAIs and IPC practices should be considered alongside HAI data when developing further IPC actions at national and facility levels.

viii. **Publish findings.** Public reporting of HAI surveillance data has been associated with HAI reduction [32]. While public reporting alone does not lead to HAI reduction, publication of HAI data fosters transparency, increases HAI awareness and encourages appropriate IPC behaviours. National-level HAI data should be published, and publication of facility-level HAI data should be considered for both public and private sector health facilities. Risks such as data accuracy, recrimination, and misinterpretation require deliberation and management prior to implementation of public reporting, particularly if facilities are identified. For countries not currently publishing facility-level HAI data, public and political readiness for HAI data should be assessed. Standards for HAI reporting and public understanding of factors that influence HAI rates should be considered by the multidisciplinary advisory group, relevant healthcare stakeholders, and communication specialists.

ix. **Ensure dedicated resources for HAI surveillance.** Funding, staff time, and IT support requirements should be documented alongside the HAI surveillance strategy to facilitate allocation of these resources needed to fulfil the strategy's goals.

b. **Evaluate the HAI surveillance system.** Inform updates to the national HAI surveillance strategy through periodic evaluations. Comprehensive evaluations involve a mixed methods approach to identifying gaps in effective HAI surveillance, in collaboration with relevant stakeholders. Existing public health surveillance system evaluation frameworks should be used to evaluate aspects of surveillance such as timeliness, usability, consistency, accuracy, completeness, and sustainability [33]. Plans for specific actions to improve the surveillance system can be incorporated into updates of the HAI surveillance strategy.

1.6 Implement national policies and procedures for infection prevention and control in healthcare facilities

National guidance and policies that establish and enforce standards for IPC in healthcare are necessary to ensure safety for patients, healthcare workers, and others that visit healthcare settings. Policies provide clarity, infrastructure, and alignment for IPC [34]. Where such policies are established at regional or local levels, national efforts to align policies enable equity and synergies in patient safety. While previous sections of this guideline referred to activities coordinated by the national IPC programme, multiple governmental institutions could be implicated in the development and implementation of IPC policies.

As elaborated in the WHO Interim practical manual supporting national implementation of the WHO guidelines on core components of IPC programmes, IPC policies are most effective when accompanied by implementation support [35]. Examples of implementation support include funding for implementing system changes, mechanisms for monitoring policy implementation, and consequences for not fulfilling mandates within established timelines. Financial incentives and disincentives can be effective for driving systemic changes, however further studies on the dynamics of specific economic incentives for HAI reduction are needed.

National policies for IPC that ensure effective IPC programmes have contributed to reductions in incidence of specific AMR pathogens and specific HAIs [36-38]. The recommended policies below are based on the WHO Core Components of IPC programmes and consider best practices in national IPC policies. As IPC improvement requires multimodal strategies, a package of policies, interventions, and support mechanisms for implementation are typically needed to effect HAI reduction.

Recommended national policy actions to improve IPC in healthcare facilities include:

a. **Adopt the WHO Core Components of IPC programmes at acute healthcare facility level into national standards**. Integrate the WHO Core Components of IPC into national standards for acute healthcare facilities across the EU. Policies, implementation support and monitoring mechanisms could facilitate achieving these standards for patient safety in EU healthcare facilities. The WHO Infection Prevention and Control Assessment Framework (IPCAF) can be used to assess implementation of the IPC core components at the acute care facility level [39].

b. **Ensure regulatory oversight of IPC practices in healthcare facilities**. To ensure fundamental patient safety in the EU, assess adherence to established national IPC standards periodically for all healthcare practices and healthcare facilities, both public and private. Oversight mechanisms will vary across healthcare practice and facility types. On-site inspections to observe implementation of IPC policies and procedures are warranted at facilities where the risk of HAIs is greatest, such as acute care hospitals. Enforcement of follow-up actions and consequences are warranted when minimum standards for IPC are not met. Financial incentives, medical practice rights, and other regulatory levers can be used to ensure that the established national patient safety standards are met.

c. **Establish national standards for the built environment (physical infrastructure) in healthcare settings that facilitate optimal IPC practices.** While the built environment is addressed in the WHO Core Components of IPC for healthcare facilities, more detailed standards for the built environment are needed in many EU countries to address factors associated with HAI prevention and control [40]. National standards for the built environment in healthcare can be integrated into national IPC guidelines or documented separately. Such standards facilitate HAI prevention by limiting opportunities for cross-contamination and improving adherence to desired IPC behaviours through structural features of the physical environment. Patient experience should be considered alongside international standards and the latest scientific evidence for building design.

d. **Prepare the healthcare system for disruption of IPC standards.** Integrate IPC into national preparedness strategies by considering the human, financial, and material resources needed to maintain national IPC standards during acute public health crises. The monitoring of IPC structures and processes is a WHO Core Component of IPC at national level. National healthcare workforce strategies should recognise the critical link between patient safety and a stable, well-resourced healthcare workforce [41]. Ensuring adequate human resources for healthcare is therefore integral to ensuring a minimum level of resources for IPC implementation.

e. **Establish policies and standards for IPC training and skills evaluation.** Consider establishing requirements for fostering and maintaining foundational IPC knowledge and skills among all personnel in healthcare settings. The development and implementation of national policies or standards for IPC training requires collaborations across healthcare education institutions, national healthcare professional licensing bodies, and healthcare facilities.

   i. **Requirements for IPC training and skills evaluation in education programmes for licensed healthcare workers.** Requirements for health degrees and licensing should include competency in IPC relevant the scope of practice of each health profession, aligning with the WHO IPC pre-service education and training curriculum [24]. Educational institutions for licensed healthcare workers (e.g. nurses, dentists) should have IPC training and IPC skills evaluation integrated into their curricula.

   ii. **Requirements for IPC topics in continuing education during licensure renewal for health professions.** Required IPC topics for continuing education would vary by specialty. Key IPC topics are listed in Annex 2. Some topics, such as standard precautions, apply to all health professionals.

   iii. **Requirements for regular in-service training for all workers in healthcare settings.** All who work in healthcare settings, including non-licensed care staff and those without clinical duties, need regular training and assessment on IPC practices for maintaining hygiene and patient safety standards. Particularly for staff who deliver care without formal licensing (e.g., home care workers or healthcare assistants) and environmental cleaning staff, in-service training sustains continuous improvement in IPC knowledge and skills [42]. In-service training should address topics relevant to the duties, risks, and IPC gaps specific to staff roles and their unique work settings.

   When establishing national minimum standards for regular in-service training on IPC, countries may decide to establish a minimum frequency (every year or every two years) for in-service training on IPC topics while allowing for flexibility in implementation at facility-level. As training alone does not change IPC behaviours, IPC training should be considered a component of multimodal improvement strategies, and trainings should be accompanied by outcome-focused evaluations [43].

f. **Establish minimum standards for HAI surveillance and contributions to national surveillance.** Mandates for HAI surveillance can facilitate data-sharing and identification of HAI risks to be addressed across facilities [30,44]. Establishment of which HAIs to report to national IPC authorities and the frequency

of reporting should therefore be formalised. Reporting requirements could be incorporated into mandates for notification of communicable diseases, with flexibility for changes with updates to the national HAI surveillance strategy. In addition to acute care hospitals, LTCFs and dialysis facilities should be considered for HAI surveillance, depending on HAI risks. A combination of implementation support (e.g. infrastructure for automated reporting) and regulatory enforcement could facilitate adherence to this mandate.

g. **Establish minimum standards for monitoring of IPC implementation in healthcare facilities**. Consider a legal framework for reporting of key indicators for IPC structure, process, and outcome monitoring. Monitoring of IPC practices drives IPC improvement, particularly when combined with feedback mechanisms and multimodal improvement strategies [45]. Consideration should be given to inclusion of different facility types, frequency of reporting, and how the data will be used for national IPC improvement strategies.

h. **Recognise healthcare facilities that are high performers in IPC.** Consider establishing rigorous standards for sustainable implementation of IPC measures beyond the minimum standards of regulatory oversight. While further evidence is needed to determine if formal acknowledgement or rewards for robust facility IPC programmes lead to reductions in HAIs, such recognition can encourage prioritisation of patient safety and infection prevention and control.

2. Healthcare facility infection prevention and control programmes

Healthcare facilities are responsible for establishing their own IPC programme, including the planning, implementation, and monitoring of IPC activities within the facility. Effective programme implementation requires clearly defined collaboration and coordination mechanisms between national authorities and healthcare facilities. These mechanisms should be articulated in both national strategies and facility-level policies to ensure coherence and mutual accountability. Healthcare facilities should also ensure that the WHO IPC Core Components are in place.

2.1 Establish robust infection prevention and control governance at healthcare facility level

Healthcare facilities should establish an IPC programme that aligns with the activities of the national IPC programme. The ultimate accountability for the facility's IPC programme lies with the healthcare facility director in accordance with local governance and reporting structures, who should support the designated IPC leader and ensure effective implementation of IPC actions and measures. Collaboration and coordination mechanisms should be clearly defined within the facility's policies and operational plans to ensure accountability across all healthcare teams and stakeholders.

a. **Components of the IPC programme.** A healthcare facility IPC programme should be established with clearly defined governance structures, formalised collaborations, roles, responsibilities, accountability frameworks, processes and activities, such as standard operating procedures. The IPC programme should include an annual action plan with an allocated budget, an annual report of IPC activities, outcomes and risks, clearly defined indicators and targets, systematic reporting protocols, mechanisms for monitoring and evaluation, and a process for outbreak investigation and control and subsequent learning. These elements should be implemented not only by large healthcare facilities but also by smaller ones, adapted to their scale and available resources. Regular evaluations of the IPC programme should summarise achievements, assess adherence with guidelines, measure progress toward targets, identify areas for improvement, and determine ongoing support needs. All healthcare facilities should develop and implement an annual action plan as part of their IPC strategy. While the scope and level of detail of such plans may vary depending on the size, complexity and available resources of the facility, the planning process remains essential across all settings. The IPC programme should be closely coordinated with the Antimicrobial Stewardship programme to ensure coherent reinforcing strategies for IPC and appropriate use of antimicrobials.

b. **IPC programme governance framework**. In line with the International Standard ISO 7101:2023(E), which establishes that senior management in healthcare organisations is responsible for fostering a culture of quality and ensuring the organisation supports and sustains effective quality monitoring, the facility senior management should hold overall accountability and responsibility for the successful implementation of the IPC programme [46]. The IPC programme should be guided by a dedicated multidisciplinary team, under the strategic guidance and management of a facility IPC leader.

   i. **The healthcare facility senior management** should support the facility IPC team and its leader by:

   - Reviewing and approving the facility IPC action plan and annual report, reflecting standardised minimum requirements;
   - Ensuring that the IPC programme is adequately supported, monitored, and integrated into the facility's broader operational framework, in line with WHO's established core components for monitoring and evaluation in healthcare facilities;
   - Delegating the necessary authority to the IPC leader to manage IPC programme's operational execution;
   - Incorporating key performance indicators in the facility's management plan in line with national IPC targets;
   - Establishing robust accountability frameworks to ensure appropriate staff compliance with IPC policies and protocols, in accordance with WHO's core monitoring and evaluation components for healthcare facilities;
   - Securing adequate human, material, financial and IT resources to support the successful and sustainable implementation of the IPC programme;
   - Collaborating with the Ministry of Health or national relevant authorities to contribute data on key indicators and provide structured feedback on the implementation of the IPC programme at the facility level, including challenges, highlighting successful practices, and sharing lessons learned;
   - Engaging key stakeholders, such as the facility leadership committee, the quality and patient safety committee and patient representatives/partners (where appropriate), ensuring they are actively involved, informed, and aligned with the strategic IPC objectives of the healthcare facility;

ii. **The IPC team leader** should be an IPC professional, employed to manage the IPC team. The facility IPC leader should report directly to the facility senior management in accordance with local governance structures and be responsible for:
   - Following national IPC strategies and engaging with the national or sub-national IPC team at the government level to provide feedback and align facility-level efforts with national strategies;
   - Establishing and managing the IPC team, while securing the appropriate expertise;
   - Leading the implementation of the IPC programme;
   - Planning and monitoring the facility's IPC plan in alignment with WHO's core monitoring and evaluation components for healthcare facilities;
   - Developing the facility IPC annual report;
   - Ensuring the establishment and oversight of a structured plan for IPC education and training for all the IPC team members and facility staff, including a defined approach for maintaining IPC core competencies as outlined in section 1.4;
   - Prioritising needs and identifying where facility resources should be directed, while ensuring the availability of necessary resources, supplies and support to address identified IPC-related issues;
   - Engaging with national IPC and AMS, microbiology, public health and infectious disease societies to inform and align with policy development and implementation.

iii. **The IPC team** should implement the IPC programme by:
   - Ensuring that the annual plan is effectively executed, monitored and aligned with defined objectives and timelines. To ensure operational autonomy and accountability, the IPC team should be allocated a dedicated budget;
   - Conducting surveillance of process and outcome indicators to identify risks and areas for intervention;
   - Recommending appropriate infection prevention and control measures and evaluating their effectiveness;
   - Identifying capacity-building needs and providing the appropriate IPC training to all facility staff;
   - Engaging and liaising with other facility IPC teams in the region or in the country;
   - Auditing and assessing of IPC practices, followed by the development and implementation of an associated quality improvement plan;
   - Conducting outbreak investigations, recommending outbreak control measures and disseminating lessons learned across the facility and in collaboration with relevant stakeholders, including public health authorities;
   - Engaging in regular collaboration with relevant facility stakeholders and committees, as well as with other healthcare facilities and referral LTCFs, to support a coordinated and IPC-focused approach.

c. **Facility IPC team composition**. The composition of the IPC team should be adapted to the facility size and the level of care provided (primary, secondary, tertiary, specialised and long-term care). Tertiary care and large secondary care hospitals should have an IPC team with dedicated full-time staff; however, in hospitals with limited bed capacity and a high volume of day-care services, the need for a dedicated full-time IPC post should be determined based on a comprehensive workforce analysis, considering risk profiles, patient demographics, staff competencies, and the scope of interventions being delivered. Primary and small secondary care hospitals and long-term care facilities should have at least one IPC focal point and access to IPC professionals who can provide the required competencies e.g. through liaising with IPC teams in other facilities.

   The IPC team should be adequately staffed, including dedicated secretarial and IT support, to guarantee the effective execution of the programme's activities. It is essential that all the members of the team are allocated dedicated time to fulfil the full scope of their responsibilities, thereby avoiding conflicts between other clinical duties and IPC programme commitments.

   The IPC team should be multidisciplinary and include IPC professionals with clinical background (physician/nurse/clinical microbiologist) and other staff members with competencies in laboratory microbiology, epidemiology, data analysis, IT, social and behavioural sciences and bioinformatics. Facility leadership should ensure that the IPC team has access to laboratory support and relevant expertise, either through internal collaboration or external partnerships reflecting local governance structures.

   IPC team staffing should be guided by the complexity, volume, and activity of healthcare services rather than fixed bed-to-staff ratios. A differentiated approach—based on care setting and service type – is recommended. Based on expert consensus, and in alignment with the ECDC PPS and WHO's guidelines, to ensure adequate support for IPC programmes:

   - A minimum ratio of one full-time equivalent (FTE) IPC professional (medical doctor, nurse, or other health-related professional) per 250 beds should be ensured across all healthcare facilities;
   - In high-risk settings, such as tertiary care hospitals and ICUs, a ratio of 1 FTE per 100 beds should be considered to support the increased demands of IPC programme implementation.

d. **Stakeholder Engagement and Collaboration**. The facility senior management, the IPC leader and the IPC team are collectively responsible for establishing and maintaining effective collaboration with all relevant stakeholders within the facility.
    i. **Facility leadership**. Strategic collaboration among key leaders – particularly senior medical and nursing directors, main department heads, and the laboratory director – is essential to coordinate efforts on shared priorities for consistent direction. To achieve this, all parties should actively support one another and convene regularly in joint meetings to monitor IPC performance and progress.
    ii. **Antimicrobial stewardship teams**. The IPC team should actively collaborate with AMS team, recognising that both teams share common objectives and performance targets related to IPC. Given that some staff may be involved in both teams, effective communication and coordination of activities are essential to avoid duplication of efforts, ensure consistency in implementation and optimise resource use. Joint planning, regular meetings and shared reporting mechanisms should be established to facilitate alignment.
    iii. **Healthcare workers**. The leadership of the healthcare facility, in collaboration with the IPC team, plays a critical role in fostering a culture that prioritises patient safety and actively engages staff at all disciplines and levels. Preventing HAIs is a shared responsibility requiring active commitment and participation of all healthcare workers across the facility. For this reason, it is essential that the IPC team actively engages and involves staff at all levels, fostering a sense of ownership and collaboration to ensure sustained improvement.
    iv. **Liaisons**. Designated liaison roles – such as link nurses or doctors, educators, auditors, and IPC champions- should be assigned to trained volunteers from the existing staff. By taking on these additional responsibilities, they act as key advocates for best IPC practices, help disseminate guidance, and motivate their colleagues. To sustain engagement and effectiveness, it is important to provide appropriate motivation – such as formal recognition, opportunities for professional development, or other forms of acknowledgment. Their involvement strengthens communication between the IPC team and clinical departments, enhances visibility, and promotes adoption of IPC guidelines.
    v. **Laboratory**. The IPC team should collaborate closely with microbiology laboratory services, including reference laboratories and the laboratory and surveillance representatives from the national IPC team, to support integrated surveillance systems. This partnership promotes consistency in laboratory practices and strengthens the outbreak response capacity.
    vi. **Communication**. Strong partnership between the IPC team and the healthcare facility's public relations and communication department is essential for planning, organising, and executing IPC-related campaigns. Clear and timely communication is also important during outbreaks. It ensures that staff, patients and public are informed and respond quickly to evolving situations. Regular updates, clear reporting lines, and accessible information help manage risks, protect patients, and support efficient outbreak control through the outbreak control team. Visible endorsement of IPC priorities by facility leadership is essential to ensure staff alignment and programme credibility. Regular communication and providing feedback on IPC data – presented through visual displays with clearly defined goals and progress indicators – can serve as a powerful tool to engage staff. When designed to foster friendly competition and recognise high-performing units, these displays can motivate sustained improvements in IPC practices – especially when supported by access to behavioural sciences expertise, which helps ensure the strategies are grounded in evidence about what drives lasting change.
    vii. **Public health authorities**. The IPC team should establish close collaboration with public health authorities to strengthen the coordination of surveillance and ensure timely response to outbreak investigations. Such collaboration not only facilitates data-sharing and strategic alignment but also supports capacity building efforts – by enabling training, resource mobilisation, and the development of sustainable systems for long-term public health resilience. In addition, the notification of HAI outbreaks requiring attention at the regional level should be part of this coordination, to enable timely and harmonised response actions across facilities.
    viii. **Occupational health**. Collaboration with the occupational health department is essential to address infectious risks to healthcare workers with potential impact for cross transmission and patient safety due to outbreaks and vaccine preventable infectious diseases and implement mitigation strategies, including vaccination programs, such as those against measles, influenza and hepatitis B.
    ix. **Facility services**. The IPC team should establish close coordination with facility and engineering services to address environmental determinants of IPC – such as ventilation systems, water infrastructure, the physical layout of the facility, and cleaning, disinfection and sterilisation-thereby safeguarding both patient and staff wellbeing.

x. **Legal experts**. IPC teams should have access to legal advice and support as needed to effectively carry out their roles. This may include, but is not limited to, guidance on data protection, GDPR compliance, and outbreak management. Given that many facilities may not have dedicated legal departments, access to broader legal expertise – whether internal or external – should be considered essential.

xi. **Professional societies**. It is important for the IPC team to build strong cooperative relationships with the national IPC, infectious disease, and microbiology societies to exchange knowledge and receive updates of evidence-based IPC practices.

2.2 Sustain infection prevention and control improvement cycles at healthcare facility level

The facility IPC leader and the IPC team should be responsible for implementing, monitoring and evaluating the impact of the IPC activities with regular and timely feedback to the facility senior management through the local governance structures. To support implementation, integration of approaches from social and behavioural sciences are encouraged, including local access to these areas of expertise. This can be supported by partnering with social and behavioural sciences experts working within relevant public health authorities or through collaborations with academia.

A comprehensive facility-wide risk assessment is fundamental to the effective design, development and implementation of targeted IPC activities within healthcare settings. This process enables facilities to systematically identify and prioritise surveillance and prevention measures based on local epidemiological data and areas of concern, guiding the allocation of resources. The WHO IPCAF can be used as a basis for assessing IPC and HAI risks in a facility [38]. Outbreak investigations also serve as a key opportunity to identify systemic gaps in IPC practices.

The implementation of IPC interventions can be significantly strengthened using care bundles (e.g. peripheral and central line-associated bloodstream infection bundle, surgical site care bundle). Care bundles are highly effective tools that combine a group of evidence-based practices applied collectively and consistently, leading to improved clinical outcomes compared to isolated interventions. Audit mechanisms to monitor compliance and associated quality improvement initiatives support adherence to these IPC best practices.

Indicators for monitoring and evaluation: Indicators are essential tools used in monitoring and evaluation to assess the progress, effectiveness, and impact of IPC programmes. They provide measurable evidence that helps stakeholders understand whether objectives are being met and guide decision-making. For indicators to be effective, they must adhere to certain key characteristics. They should be specific, meaning clearly defined and unambiguous, ensuring a shared understanding of what is being measured. Indicators must also be measurable, allowing for quantifiable tracking of progress. They need to be achievable, realistic within the programme's resources and scope, and relevant, directly linked to the programme's goals and objectives. Finally, they should be time-bound, with a defined time frame for measurement to facilitate timely assessments and adjustments. These are the types of indicators applicable to the IPC programmes:

- **Structure indicators**, such as the ones included in the WHO IPC Assessment Framework at facility level [39] can guide structural improvement efforts.
- **Process indicators** are important tools for improvement. Such indicators are often measured through process audits. Regular announced and unannounced audits of IPC practices should be conducted to assess adherence with guidelines and procedures and identify weaknesses and targets for training and improvement. The IPC team should develop SOPs for audits and coordinate, and report on, the progress of the audits in the targeted units or departments. They should also disseminate and communicate constructively the results of audits, and the lessons learned to healthcare workers and senior hospital administration and develop a quality improvement plan to address the findings.
- **Outcome indicators** derived from surveillance are key in monitoring trends, identifying targets for improvement and evaluating the effect of interventions. The selection of indicators should take into account those defined by the national IPC programme, the availability of surveillance data and a local risk assessment. Examples of indicators are included in Annex 3.

2.3 Maintain infection prevention and control guidelines at healthcare facility level

Healthcare facilities should develop or adopt local IPC guidelines and procedures based on the national guidelines, ensuring regular reviews and updates to reflect changes in practices and emerging infections. Annex 2 outlines a selection of key topics intended to support the development of IPC technical guidelines and training materials. While these topics provide valuable insights, they are not exhaustive and should be supplemented as necessary to address specific IPC programme requirements and objectives.

Responsibility for drafting, adapting and adopting national or international guidelines aligned with local conditions should be assigned to the IPC team, with input from clinical specialities, key nursing staff, and, where available, healthcare quality assurance personnel and endorsed by the facility senior management. A collaborative approach involving all relevant stakeholders, including social and behavioural sciences experts to ensure effective implementation of the guidelines should be mandated.

New or revised IPC guidelines should be disseminated through coordinated communication strategies and supported by structured training programmes and evaluation mechanisms. These efforts are essential to facilitate systemic change and promote the sustainable integration of IPC practices across healthcare settings.

2.4 Ensure infection prevention and control education and training at healthcare facility level

The facility's senior management, in collaboration with the IPC team, should establish a structured framework to guide the development of an effective facility IPC training programme.

a. **Education and training strategy.** A comprehensive capacity-building strategy should be formulated outlining clear objectives, detailed content, and ensures the coordination of all education and training activities within the facility. The IPCAF tool comprises ten indicators on IPC training and education and can be used to support the practical implementation, maintenance, and further development of IPC competencies within the facilities. Tailored training should be in place for all healthcare workers, including clinical, laboratory and auxiliary staff, IPC and environmental cleaning staff. Training should also be designed to address the needs of newly recruited staff, but also to regular refresh and update the knowledge and awareness of existing healthcare workers according to the latest data (national, local, newly published), as well as in response to any outbreaks. Education on IPC should also be provided to senior administrative staff to ensure they are well-informed and equipped with the necessary knowledge.

b. **Education and training components.** Education and training content should comprehensively address all procedures and guidelines related to IPC within the healthcare facility, ensuring that the content is appropriately aligned with the professional roles and responsibilities of the intended audience. Consideration should be given to sustainability and the development of structured training methodologies that incorporate the 'train-the-trainer' model, complemented by innovative approaches such as gamification, virtual reality, simulations, webinars and other interactive learning tools to strengthen capacity-building efforts and promote sustained knowledge transfer. In this context, designated IPC liaisons should act as peer trainers, facilitating the dissemination of best IPC practices and reinforcing the training content through peer-to-peer engagement. To further support effective implementation, the IPC team should also receive training in the application of social and behavioural sciences approaches, which can enhance the adoption of interventions. This training should equip them with the necessary skills and knowledge to effectively integrate these approaches into their IPC activities.

c. **Patient Involvement**. Education on hand hygiene and IPC principles should be provided regularly to patients and their carers by the designated IPC liaisons or other trained healthcare workers. These sessions should be engaging and interactive, allowing participants to ask questions and practice techniques under professional guidance. Where appropriate, patients and carers should be encouraged to participate in such educational activities, with consideration given to their individual needs and preferences.

d. **Student involvement**. The IPC team should promote the involvement of health and life sciences students, such as those in medicine and nursing, in monitoring adherence to hand hygiene and other IPC practices, providing both educational value for the students and support for IPC implementation.

e. **Evaluation.** The IPC training needs of the facility and healthcare workers should be systematically assessed using a combination of methodologies, including consultations, surveys and gap analysis, to ensure that training programmes are tailored to address specific competencies and implementation challenges.

2.5 Establish and sustain comprehensive surveillance of healthcare-associated infections at healthcare facility level

Surveillance of HAIs is a core component of IPC programmes for monitoring trends in HAI incidence, identifying targets for improvement, guiding IPC interventions, and identifying and monitoring outbreaks.

a. **HAI surveillance strategy**. Facility-based surveillance systems should be seamlessly integrated into national surveillance frameworks, with clearly defined reporting lines to ensure consistent transmission of data from facilities to the national level. The IPC leader together with the IPC team are responsible for establishing IPC surveillance strategy with targets and objectives based on national recommendations but tailored to the facility's local epidemiology and regular risk assessments. In smaller facilities, the designated IPC focal point should determine the strategic approach, seeking input from IPC experts in other facilities when necessary. The IPC surveillance strategy should be evaluated regularly. Infections under surveillance should include the ones defined by the national IPC programme and can expand to other infections based on specific healthcare facility needs. Surveillance is recommended to be prospective and can be either healthcare facility-wide or targeted to specific departments based on risk assessment. The selection and prioritisation of process and outcome indicators to be included in the surveillance system should be guided by a risk assessment. Approaches such as incidence or point-prevalence surveys should be employed based on risk assessment. Participation in national and international surveillance networks including point-prevalence surveys and use of standardised case definitions are important for understanding the burden of HAI and for national and international benchmarking.

b. **Data collection and analysis**. It is essential that the IPC team has access to the facility's data warehouse – including medical records, microbiology data, and other relevant datasets – to support active surveillance, screening, and outbreak investigations. Preferably, the team would also have access to dedicated, networked IT systems specifically designed to facilitate the effective implementation of IPC activities. Surveillance activities must adhere to data confidentiality regulations, ensuring that all collected information is handled with compliance with established legal and ethical standards. The IPC team should oversee the collection, management and analysis of surveillance data, ensuring data quality. It should also establish a comprehensive and well-defined framework outlining the responsibilities for each stage of the data management process. This includes the systematic collection, analysis and insightful interpretation of data. Availability of dedicated human and IPC IT resources should be ensured to fulfil the surveillance objectives.

c. **Laboratory support**. Microbiology laboratory capacity should be developed and maintained through a tiered laboratory system that ensures valid and robust surveillance data. Clinical laboratories should have access at least to reliable and high-quality routine diagnostic testing, while specialised functions such as reference laboratory activities and whole-genome sequencing, should be available at national or regional reference laboratories where they can be sustainably supported. Appropriate diagnosis is essential for the identification of HAIs to avoid both under- and over-diagnosis. Healthcare facilities should have in place diagnostic stewardship with guidelines, training and monitoring of appropriate diagnostic practices, including for microbiological cultures (e.g. blood, urine, wound, respiratory and other samples) [47].

d. **Information technology support**. IT tools should be available to support implementation of IPC, e.g. tools for rapid alert of the IPC team and automated/semi-automated surveillance. The IT systems should be fit-for-purpose to support surveillance activity, including validation processes for data accuracy. Also, IT systems should facilitate the real-time integration of data from multiple sources, such as administrative, clinical, microbiological, surgical and pharmacy datasets. In addition, robust health informatics support is essential to ensure the effective management and utilisation of this integrated data. Automated or semi-automated surveillance based on electronic health records facilitates surveillance and frees up time of IPC staff to be used for implementation of measures and feedback. Healthcare facilities should work towards establishing surveillance based on electronic health records ensuring the availability of the necessary financial resources, as well as IT and health informatics competencies. The roadmap published by the PRAISE network provides guidance for the establishment of automated HAI surveillance [48].

e. **Dissemination of findings**. The IPC team should interpret the findings from the surveillance and communicate the results to relevant staff using clear, context-appropriate language to support informed decision-making and continuous improvement in IPC practices. Reports should be disseminated promptly and systematically at the administrative level (facility senior management) and within individual facility units. These reports should include surveillance data, incorporating trend analysis over time, benchmarking comparisons, outbreaks, compliance rates with IPC practices and adherence findings from IPC audits. In addition, the IPC team should document the outcomes of implemented interventions, the utilisation of material resources, the results of risk assessments and updates on adherence to regulatory compliance standards. Importantly, clear roles should be assigned for the effective dissemination of outputs to ensure transparency, relevance and alignment with targets.

2.6 Uphold effective environmental cleaning and disinfection

Healthcare facilities should ensure a clean environment and equipment to minimise the exposure of patients and staff to harmful pathogens and establish a structured environmental cleaning programme as part of their IPC programme.

The administration of each healthcare facility, in collaboration with the IPC team, should ensure that cleaning and disinfection are carried out according to SOPs that comply with national or international IPC guidelines. In settings where the environmental cleaning services are outsourced, the contracted service provider is responsible for developing and implementing these SOPs, while the facility maintains oversight to ensure compliance with standards and quality. The procedures should address cleaning and disinfection methods and products, regular and terminal cleaning, cleaning schedules and cleaning after discharge or transfer of patients infected or colonised with specific pathogens, such as *C. difficile, C. auris* and multidrug-resistant organisms. A designated focal person or a cleaning programme manager should be accountable for monitoring the adherence to protocols.

Consideration of environmental impact is essential when selecting facility's disinfectants and preference should be given to products with high biodegradability and low toxicity, while avoiding those that produce persistent or hazardous by-products.

Cleaning staff should undergo regular training on established environmental cleaning procedures to ensure consistency. The effectiveness of environmental cleaning and disinfection should be regularly monitored, with results communicated to both the cleaning personnel and facility management to identify gaps and inform actions for improvement. Close coordination between cleaning service management and the IPC team is essential to ensure alignment with IPC standards, with any barriers to effective cleaning, such as inadequate storage, or overcrowding, identified and addressed in collaboration with relevant stakeholders.

2.7 Strengthen the built environment, materials and equipment needed to support effective infection prevention and control

To safeguard patient health and ensure that infrastructure supports IPC practices, the IPC team must be engaged at the earliest stages of planning for any construction, renovation, or maintenance activities within or around the healthcare facility. Early involvement is critical to identifying and mitigating risks associated with construction processes, including pathogens such as *Aspergillus spp.* and *Acinetobacter spp.* The IPC team should collaborate closely with architects, engineers, and facility maintenance personnel to develop and implement comprehensive policies governing construction and renovation activities. These policies must clearly define procedures to maintain a safe environment throughout all phases of construction, including risk assessment, containment measures, and post-construction evaluation [49].

The facility should assess the patient population it serves to determine appropriate infrastructure needs. This includes establishing an adequate number of single-occupancy rooms, each equipped with private toilet facilities, as well as designated spaces designed to support patient cohorting and the isolation of suspected or confirmed infectious cases. Facility's ward design, bed capacity and distance between beds should adhere to national standards. Access to hand hygiene facilities equipped with alcohol-based handrubs and (where appropriate) with water, soap and disposable towels should be provided at the point of care. Facilities should maintain effective ventilation – particularly in isolation and procedure rooms and operating theatres – and ensure environmental controls such as water quality, drainage, and surface integrity to mitigate the risk of pathogen transmission, especially in high-risk areas such as ICUs.

Adequate supply of appropriate personal protective equipment should be available, supported by clear SOPs for stock and order management. The facility is responsible for managing waste in compliance with national or international policies standards, prioritising environmental sustainability.

3. Considerations for long-term care facilities

IPC measures in long-term care facilities (LTCFs) will vary depending on the goals of care for individuals receiving care and the level of healthcare provided. Understanding that models for delivery of healthcare services in long-term care settings vary across countries, national standards for IPC in long-term care settings are expected to vary. Nonetheless, national performance indicators for IPC in European LTCFs have been previously proposed [50]. National-level assessments of HAI risks in LTCFs, with the engagement of local and regional administrative levels as appropriate, are necessary to clarify standards for IPC programmes in the LTCF types specific to each country.

The guidance below addresses specific challenges in LTCFs related to the implementation of the six elements of healthcare facility IPC programmes from the prior chapter. Compared to acute care hospitals, long-term care settings are generally less equipped with human, financial, and material resources for IPC. Despite these and other implementation challenges, interventions in hand hygiene, oral hygiene, hygiene and sanitation, screening, as well as basic and additional precautions are effective in reducing HAIs in LTCFs and also cost-effective [51,52].

3.1 Establish infection prevention and control governance

Implementing the WHO Core Components for IPC programmes at facility level and the WHO multi-modal strategy has been shown to control HAIs in LTCFs [53]. IPC leadership and governance may differ across LTCFs. For example, primary care physicians could have a key role in IPC in some facilities, while in other facilities it is more suitable for nursing leadership or facility administrators to lead the IPC programme. While the IPC team will likely consist of a single person in many LTCFs, this person should have the support of facility leadership to maintain a sustainable IPC programme in collaboration with the LTCF staff and with relevant external stakeholders. Collaboration with other local healthcare facilities' IPC programmes, such as those of acute care facilities and other LTCFs, can enable shared resources for IPC and address common IPC challenges. Linking with IPC programmes in national, regional, or local public health authorities is also critical.

3.2 Implement infection prevention and control improvement cycles

With an established IPC programme, improvement cycles enable targeted HAI reduction through risk assessment, behaviourally informed interventions, monitoring of relevant indicators, and evaluation of IPC interventions.

a. **Perform a setting-specific HAI risk assessment.** Residents in long-term care typically do not require as much intensive hands-on medical care as acute care patients do, reducing opportunities for HAIs. However, long-term care residents could have significant HAI risks if they have conditions that increase their vulnerability to infection, require extensive support for toileting and hygiene, have indwelling catheters, or are frequently admitted to acute healthcare facilities. When assessing HAI risk at facility-level, the presence of residents with these risk factors should be considered alongside available data on infection rates. Consider also focusing on the most common infections in LTCFs: urinary tract infections, respiratory infections, and skin infections [54].

b. **Implement person-centered IPC interventions for managing HAI risks.** In healthcare settings where people reside for extended periods of time, quality of life and personal wellbeing during the stay should be given even more consideration compared to acute healthcare settings. When determining IPC strategies for managing HAI risks in a LTCF, finding an optimal balance between IPC effectiveness and personal living preferences can be challenging. There should be no reduction in the standard of care provided for acute care procedures (e.g. aseptic technique for catheter placement), but other IPC measures require adjustment based on local risk assessment and individual resident needs. For example, residents would not tolerate IPC measures that continuously interfere with daily living activities in their own home such as long-standing contact precautions for individuals colonised with MDROs. IPC measures may be tailored for individual residents based on their capacity to understand and follow measures and rules, infection transmission risks, and the unique circumstances of their home life.

c. **Monitor appropriate and feasible IPC indicators.** When selecting IPC structure, process, and outcome indicators for monitoring, not all those listed in Annex 3 are relevant for LTCFs. A small set of indicators that are linked to identified setting-specific HAI risks can be followed. Influenza vaccination coverage for staff and residents, hand hygiene compliance, and urinary tract infections are among the most relevant and potentially impactful indicators for LTCFs. Consider selected IPC process indicators associated with desired behaviours, as suggested in the next chapter.

d. **Evaluate interventions and maintain IPC improvement cycles.** In addition to evaluating structures, processes, and outcomes, resident feedback is particularly important for IPC interventions in LTCFs to

address concerns regarding impacts on activities of daily living. Staff input is also critical for understanding needs to maintain sustainability of IPC practices given the available human and material resources. Improvement cycles should involve residents and staff from across the facility and can address IPC gaps identified through HAI and IPC monitoring, resident and staff feedback, or investigation of outbreaks and their spread.

Mechanisms to monitor, evaluate, and develop well-informed IPC interventions are challenging to sustain, especially in resource-strained LTCFs. Nevertheless, cyclical IPC improvement is necessary in LTCFs to maintain IPC as a priority, particularly with turnover in facility staff. Collaborations with the IPC programmes of local public health authorities or hospitals can support completion of the steps above to sustain improvement cycles and to help limit local HAI burden [55].

3.3 Maintain practical policies and procedures for infection prevention and control guidelines

As development of technical IPC guidelines might not be feasible, existing evidence-based IPC guidelines for LTCFs [51,52] can be adopted or adapted to facility needs. Evidence-based IPC guidelines for LTCFs [51,52] can be adopted or adapted to facility needs. Most importantly, practical policies and procedures for routine IPC are needed, with example topics being hand hygiene, standard precautions, organism-specific control measures, and staff IPC education [56]. As outbreaks of respiratory and gastrointestinal infections can be common in LTCFs, protocols and plans for outbreak control should be in place and ideally validated by an IPC professional. In the most recent point prevalence survey of healthcare-associated infections and antimicrobial use in European long-term care facilities, 77% and 82% of facilities had written outbreak protocols for gastrointestinal and respiratory tract infections, respectively [54]. Protocols, policies, and procedures should be periodically evaluated and updated as part of cyclic IPC improvement to address resident and staff needs identified during outbreaks or HAI risk evaluations.

3.4 Conduct infection prevention and control education and training

In LTCFs, IPC practices should be emphasised during the induction of new staff and through in-service training. Policies and procedures for routine IPC practices should be the focus of trainings, with practical skills observation and assessment as applicable. Additional training interventions are necessary when policies or procedures are updated, new staff are hired, or when gaps in IPC practice are identified.

3.5 Conduct surveillance of healthcare-associated infections

Continuous HAI surveillance in LTCFs can be challenging without digital tools that help automate data collection and analysis. Still, LTCFs should periodically (quarterly or annual) examine data on resident infection to assess HAI risks to inform IPC improvement cycles. Monitoring of trends in the most common LTCF infections (urinary tract - both catheter-associated and non-catheter-associated, respiratory, and skin), along with their severity, can contribute to evaluation of the impact IPC interventions and prioritisation of subsequent actions. Where AMR rates are concerning, monitoring of infections with multidrug-resistant organisms could also inform needs for enhanced IPC measures for AMR control. Finally, LTCFs should participate in periodic multifacility point prevalence studies (PPS) of HAIs and antimicrobial use administrated by public health agencies, including the ECDC PPS of HAIs and antimicrobial use in European LTCFs [54].

3.6 Strengthen environmental cleaning and disinfection

There is limited evidence for best practices and effective environmental cleaning and disinfection in LTCFs [42]. In the home-like setting of LTCFs, resident and staff perception of necessary disinfection practices could differ from that of acute-care settings. Despite known resource constraints in LTCFs, enhancing environmental cleaning and disinfection is necessary if infections associated with indirect transmission are identified during a facility's HAI risk assessment. Pathogen-specific disinfection protocols could be necessary when residents are infected with certain pathogens (e.g., CRE, *C. auris, Acinetobacter*, *C. difficile*). When strict isolation and contact precautions are not feasible or desirable, enhanced environmental cleaning and disinfection is critical to control the spread of infection. As with hand hygiene and other IPC practices, environmental cleaning and disinfection should be incorporated into monitoring and evaluation as part of IPC improvement cycles, as well as routine IPC education and training.

3.7 Strengthen the built environment, materials and equipment needed

The built environment of LTCFs can pose challenges to controlling the spread of pathogens. Frequent occupation of shared spaces by residents and the use of fabrics and other porous materials in the home-like environment can increase environmental contamination. In addition to maintaining adequate supply of materials and equipment needed for routine and enhanced environmental cleaning and disinfection, particular attention should be paid to maintaining adequate supply of alcohol-based hand rub. Consideration should also be given to availability and placement of sinks for hand washing, as alcohol-based hand rub is not sufficient for hand hygiene after certain procedures and with the presence of certain pathogens.

When designing the built environment of LTCFs, both IPC aspects and resident comfort should be considered to promote resident safety and wellbeing. Prior to construction, renovation, or maintenance activities, LTCFs could consider reaching out to public health authorities or IPC programmes of local acute care hospitals for support should they not have expertise in assessing and mitigating IPC risks during these activities.

4. Application of approaches from social and behavioural sciences for strengthening the implementation of infection prevention and control guidelines

Implementing IPC guidelines often requires changes in behaviour across various actors, including adopting new practices or modifying existing ones [8,57-59]. Inconsistent application of relatively simple IPC measures, such as hand hygiene and surface disinfection, can result from a limited understanding of behavioural dynamics among the actors involved in IPC implementation [60].

In this setting, social and behavioural sciences (SBS) play a key role due to their focus on individual, social, cultural and organisational influences on human behaviour [6,61]. By framing IPC implementation challenges through a behavioural lens, the use of SBS approaches and findings from SBS research can help to identify the factors influencing behaviour change and guide the development of strategies and interventions to improve IPC implementation [62].

Stepwise processes, such as the WHO's '5 Steps for the application of behavioural science', can be useful for structuring the development of IPC guideline implementation strategies and interventions [63]. This stepwise process uses a 'systems thinking' approach – which takes into account how different parts of a system interact and influence each other – to address the complexity of these issues.

For example, the WHO 5 Steps, applied by ECDC to the implementation of IPC guidelines, includes:

Step 1: **defining** IPC guidelines in terms of 'desired behaviours', through their translation into behavioural terms;

Step 2: **diagnosing** the barriers to and facilitators of the identified 'desired behaviours' for IPC guideline implementation;

Step 3 **designing** behaviourally informed IPC guideline implementation strategies and interventions, taking into account co-design with implementers and target populations;

Step 4: **implementing** behaviourally informed IPC guideline implementation strategies and interventions; and

Step 5: **evaluating** IPC guideline implementation strategies and interventions in order to derive learning and make adjustments.

Developing, implementing, and evaluating strategies and interventions based on SBS approaches requires the systematic inclusion of or access to expertise and/or competency in these sciences in IPC teams.

Step 1: Defining infection prevention and control guidelines in terms of 'desired behaviours', through their translation into behavioural terms

As guidelines often do not specify the behaviour changes required, IPC teams may find it challenging to identify what needs to be done differently, and by whom, to achieve effective implementation. Therefore, translating guidelines into behavioural terms resolves this dilemma by defining 'desired behaviours' [62].

A 'desired behaviour' includes the necessary actions/inactions needed to achieve implementation. This can mean doing a new practice, doing more of an existing practice, doing less of an existing practice, or stopping something entirely. It may also include several actors doing something different. These actions/inactions can be made concrete by defining them in terms of who, what, when, where and with/for whom for the relevant healthcare workers. For example, healthcare workers should perform hand hygiene 'before' as well as 'after' patient contact during their ward rounds.

Processes upstream of 'desired behaviours', including the physical environment in health care facilities, also need to be described and monitored (e.g. flow of 'clean hands' procedures – from the procurement of alcohol-based hand rub (ABHR), to placing the ABHR bottles in appropriate locations, and the use of it by healthcare workers at the right moments) [40].

Step 2: Diagnosing barriers to and facilitators of 'desired behaviours' for infection prevention and control guideline implementation

After defining the 'desired behaviours' to address, the next step is to diagnose barriers to and facilitators of the intended behaviour change. While some factors, such as seniority, specialty, and sex, are non-modifiable, others such as environmental context, social influences, and beliefs about consequences are modifiable and can be addressed [59]. Barriers and facilitators can be situated within a person (e.g. abilities, motivations), their social and cultural environment (e.g. what others do/expect, consciously or unconsciously), or beyond (e.g. infrastructure,

affordability). Standard practice in implementation science draws upon frameworks of factors that we already know are likely to influence behaviour [61,64].

Data collection methods for the diagnosis stage may include informal brainstorming, semi-structured qualitative interviews, surveys or systematic observations, depending on resources and team expertise. Input from both implementers of IPC guidelines and the target populations affected is essential.

Data collected from these various sources can be mapped as barriers or facilitators to the 'desired behaviours'. This forms a behavioural diagnosis which in turn informs the development of tailored (more precisely called 'behaviourally informed') strategies and interventions.

As inspiration to IPC implementation teams, Table 1 illustrates select IPC process indicators alongside corresponding examples of 'desired behaviours' for IPC implementation. Example barriers and facilitators relating to each example 'desired behaviours' are also included.

Table 1. Selected IPC process indicators associated with example 'desired behaviours' and related barriers and facilitators

#	Selected IPC process indicators	Example 'desired behaviours'
1	**Hand hygiene compliance rate [59,65]**	**Performance of hand hygiene 'before' as well as 'after' patient contact during ward rounds.** **Example barriers:** • Lack of equipment and materials (e.g. empty dispenser) • Time pressure and high workload • Unpleasant sensations and effects (e.g. dryness, eczema) from products and procedures **Example facilitators:** • Availability of equipment and materials (e.g. ABHR, sinks for handwashing) • Social/professional identity that hand hygiene is part of a healthcare worker's professional duty • Visual and verbal reminders for hand hygiene
2	**Urinary catheter utilisation rate [8]**	**Removal of catheter when it is not clinically needed.** **Example barriers:** • Lack of routine, processes, or systems for regular catheter review • Lack of staff time to assist with toileting **Example facilitators:** • Availability of medical alternatives to urinary catheterisation • Frequent communication between healthcare workers and high peer-to-peer support
3	**Influenza vaccination coverage of healthcare workers**	**Healthcare worker is vaccinated against influenza in line with the local recommendations.** **Example barriers:** • Travel time outside working hours to the vaccination centre • Complacency about the risks of contracting and transmitting influenza **Example facilitators:** • Provision of vaccination in the workplace • Availability of information from trusted sources to respond to questions or concerns about vaccination
4	**Environmental cleaning protocol compliance rate [42,66]**	**Accurate completion of environmental cleaning documentation checklist.** **Example barriers:** • Lack of adequate training and auditing • Lack of integration with IPC and clinical staff **Example facilitators:** • Translation of materials into local languages • Engagement of hospital leadership to link environmental cleaning with IPC (e.g. integration, emphasising importance)

5	**Catheter care bundle compliance rate [67]**	**Audited completion of all bundle items while conducting the procedure.** **Example barriers:** • Logistical constraints during procedures • High complexity of bundle checklist **Example facilitator:** • Simple bundles (e.g. with ≤ 7 items) • Use of multidisciplinary teams (shared responsibility) and formative evaluations

Step 3: Designing behaviourally informed IPC guideline implementation strategies and interventions, taking into account co-design with implementers and target populations

Designing strategies and interventions to address barriers to and build on facilitators of the 'desired behaviours' is the next step. Co-design with the implementers and target populations can be leveraged to create ownership and ensure relevance, thereby increasing the chances of successful implementation [63].

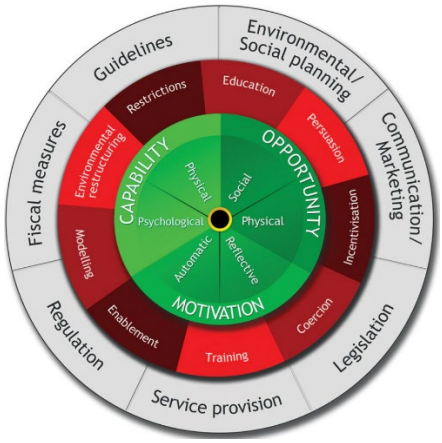
Along with helping to increase acceptability of the strategies and interventions, collaboration with different actors can also help to identify important implementation barriers and facilitators. Through co-design, strategies and interventions can be tailored to meet the unique needs and preferences of the implementers and those they intend to reach.

The Behaviour Change Wheel (BCW) is a comprehensive framework for designing behaviour change strategies and interventions, built around the COM-B model [68]. The COM-B model includes three constructs, Capability, Opportunity, and Motivation, with 'B' referring to the target Behaviour:

- **Capability** refers to an individual's knowledge, skills, memory, attention, and decision-making related to the behaviour.
- **Opportunity** encompasses both physical factors, such as resources, equipment, and facility layout, and social factors, such as peer norms, team dynamics, and managerial support.
- **Motivation** involves prioritising the desired behaviour over competing actions, shaped by confidence, beliefs about outcomes, incentives, and emotional responses.

Combined with other tools and approaches, summarising and categorising the barriers to and facilitators of 'desired behaviours' into the different constructs of the COM-B model can help to inform the process of designing strategies and interventions. As different types of actions will be needed to change factors that influence each construct, the Behaviour Change Wheel includes nine intervention functions and seven policy categories around the COM-B core that can guide the development of effective strategies and interventions.

Figure 1. The behaviour change wheel: a framework for characterising and designing behaviour change interventions



Implementation strategies for IPC can be further specified using the Expert Recommendations for Implementing Change (ERIC) taxonomy. ERIC is a consensus-based taxonomy of seventy-three implementation strategies developed by over seventy IPC experts, serving as a flexible toolkit and shared language for designing and tailoring IPC implementation efforts to overcome specific barriers and leverage enablers [62].

Step 4: Implementing behaviourally informed IPC guideline implementation strategies and interventions

Planning the implementation of a behaviourally informed strategy or intervention in terms of what, where, when and who is the next step. A detailed intervention plan relating to specific actions (e.g. mode of delivery, provider, setting) and potential barriers and facilitators can be useful.

Combining various approaches that work together is more likely to be successful in improving IPC than any single intervention [69]. Multimodal improvement strategies are a WHO core component of IPC programmes including several elements (three or more; usually five) implemented in an integrated way to guide action and provide a clear focus for the implementer [10].

WHO identifies the following five elements for IPC multimodal strategies in a healthcare context: a) systems changes to enable IPC practices, b) training and education to improve healthcare workers' knowledge, c) monitoring and feedback to assess the problem and drive appropriate change, d) reminders and communication to promote the desired actions, and e) a culture of psychological safety to facilitate an organisational climate that values the intervention.

Step 5: Evaluating IPC guideline implementation strategies and interventions to derive learning and make adjustments

Evaluation is an essential component of any strategy or intervention to understand whether the objectives are being met, to demonstrate impact, and to inform any necessary adjustments along the way [70]. There are three main types of evaluation relating to different phases of the strategy or intervention:

i. **Process evaluation** – What type of activities relating to the strategy or intervention can be monitored?
ii. **Outcome evaluation** – Can any conclusions be drawn about the effect of the strategies and interventions, usually providing comparisons between before (the intervention) and after (e.g. changes in knowledge, attitudes or behaviour)?
iii. **Impact evaluation**: What impact have the strategies and interventions had on IPC implementation (e.g. potential changes in the number of infections relating to urinary catheter usage)?

Even evaluation at a smaller scale can generate useful data and insights to refine and contextualise a behaviourally informed strategy or intervention for greater health impact before scaling up. Data can be collected from various sources, including document reviews, as well as primary data collection using qualitative and/or quantitative methods.

The use of so-called 'fidelity measures' can facilitate the assessment of the degree to which strategies and interventions are applied as intended. Reporting fidelity should be standard practice when presenting outcomes of behaviourally informed strategies and interventions [71].

It encompasses five measures:

1. **Adherence:** alignment with the intervention protocol.
2. **Dose:** the amount of intervention content delivered.
3. **Quality of delivery:** the manner and consistency of implementation.
4. **Participant responsiveness:** the level of engagement and receptivity.
5. **Program differentiation:** clarity on how the intervention differs from other conditions.

Detailed guidance on how to evaluate the impact of strategies and interventions addressing health behaviours, including considerations and tools, has been published by WHO [72].

5. Involving patients in infection prevention and control

Involving patients in IPC is a critical element of comprehensive safety strategies. When patients are adequately engaged in IPC processes and informed through appropriate channels, they can adopt safer self-care behaviours and further reinforce IPC practice. This participatory approach fosters mutual understanding of infection prevention and control practices, which strengthens trust in healthcare services and enhances the overall effectiveness and sustainability of IPC programmes [73].

This section outlines guiding principles and priority actions for involving patients during the development of IPC interventions at national, local, and healthcare facility levels. When incorporating the patient experience in IPC implementation, a wide range of perspectives can be considered, including patients' social circles (e.g. family members, caregivers); patient groups and support networks, and advocates such as patient safety champions. Patient associations play an important role in organising and representing patients' perspectives.

Patients requiring IPC measures are often among the most vulnerable and require special attention to ensure their rights and well-being are fully protected. Those under transmission-based precautions for colonisation or infection with MDROs such as carbapenem-resistant *Enterobacterales* (CRE) retain the same right to timely and appropriate health and social care as any other patient. Their condition, or the need for additional precautions, should not result in undue delays when transferring between healthcare facilities, nor should it limit their access to care in settings that best meet their needs. When transmission-based precautions are in place, it is imperative that these patients continue to receive the same standard of care as individuals without MDROs colonisation or infection. Heightened awareness is also necessary to mitigate the potential psychological harms of isolation measures, such as feelings of anxiety, depression, or stigma, that may arise from prolonged or repeated separation [74]. Safeguarding both the clinical and emotional well-being of patients in IPC is essential to uphold dignity, equity, and quality in care.

e. Guiding principles for patient involvement

Involvement of patients in achieving safe, quality, and person-centred care is based on the following guiding principles:

i. **Recognition and engagement of patients as partners in safe care.**

Safe healthcare must be recognised and operationalised as a basic human right. As a service-oriented domain, healthcare requires a model of co-creation between providers and users. Mechanisms to ensure patients are recognised, informed, engaged, and treated as partners in care, particularly consent, are essential.

ii. **Integrating patient experiences, alongside scientific expertise.**

Planning, designing, and delivering safe healthcare services requires both scientific expertise and understanding of the patient experience. Collecting feedback on patients' experiences should be integrated into the monitoring and evaluation framework to support ongoing quality improvement.

f. Priority actions for patient involvement

In line with the guiding principles listed above, involvement of patients in IPC at the national and healthcare facility levels includes:

i. **Empowering patients and patient organisations.**

- Establish and support channels and mechanisms (a) to enable patients to unify and share experiences (e.g. forums, portals, groups) and (b) to systematically collect patient insights for further analysis and application.
- Recognise and reinforce patients' roles through various actions, namely by supporting patient organisations in advocacy and awareness for enhanced policy action on IPC measures.

ii. **Co-design and collaboration.**

- **Co-design.** Involve patients at various levels, from policy formulation to decision-making at the point-of-care, and across phases of IPC implementation. Engage patients through various means, such as advisory committees. Co-design can shape outcomes and outputs (e.g. isolation policies).
- **Collaboration.** Promote healthcare worker-patient relationships that build trust, support open communication, and reinforce mutual respect. Foster a strong culture of patient safety within healthcare settings, where patients feel empowered to report concerns in a blame-free environment. Encourage collaboration between healthcare professionals and patient organisations, including joint meetings between hospital nursing and medical associations and

patient groups. Where feasible, public health authorities at national, regional, or local level may facilitate or initiate such collaborative activities.

iii. **Communicating harms and disclosing incidents to affected patients.**

- **Obtain consent.** Ensure that informed consent for medical care and procedures is always obtained in an appropriate manner. Communicate risk of infection and any actions taken to mitigate these risks.
- **Disclose incidents.** Inform patients, within existing legal frameworks, if they were potentially infected in healthcare settings. Provide information on and support for testing and treatment of infections that patients may have acquired in healthcare settings.

iv. **Supporting patients' health literacy and raising awareness.**

- **Support health literacy.** Improve content and accessibility of information about HAIs, IPC, and patients' roles. Implement health literacy initiatives that align with evidence-based IPC, to ensure empowerment supports, rather than resists, established practices.
- **Raise awareness.** Enhance visibility of HAIs, IPC, and patients' roles within patient communities and the public through various actions (e.g. campaigns). Balance positive messaging on IPC with awareness of HAI burden. Adapt initiatives to patient diversity and cultural context of the community or region.

Cost effectiveness

In 2020, Benenson et al highlighted that nosocomial infections are associated with both increased resource utilisation and increased length of stay [75].

The ECDC Point prevalence study 2022–2023 confirmed that HAIs, and AMR in bacteria responsible for HAIs, represent a significant public health challenge for the EU/EEA, with a total estimated number of 4.3 million patients who acquired at least one HAI per year in EU/EEA acute care hospitals. Indeed, the care for these patients require additional resources and inevitably cause decrease in quality of life of the affected people. Therefore, investments in preventive measures should be regularly evaluated and promoted.

Most available evidence indicates that IPC interventions are cost-effective [76]. An umbrella review of economic evaluations of interventions for the prevention and management of healthcare-associated infections in adult hospital patients, published in 2025, highlighted that hand hygiene, environmental cleaning, selective screening for MDROs, followed by contact precautions and isolation, decolonisation (when feasible), and the use of IPC bundles have been shown to be cost-effective. Universal screening can be cost-effective in settings with high prevalence. The evidence is less certain for interventions such as education and training, and use of PPE. The authors stated that in evaluating cost-effectiveness it is important to understand the components of cost, both in terms of the cost savings generated through infections prevented, as well as the costs incurred through implementation of the intervention itself. According to the studies reviewed, the costs of HCAI are largely driven by additional length of hospital stay due to infection [77].

A study published by OECD and ECDC found that a longer hospital stay, caused by slower recovery from infection and a higher risk of complications, will be one of the key drivers behind an increase in healthcare expenditure [78].

LTCFs setting is specifically reviewed in an OECD publication on antimicrobial resistance in long-term care facilities suggested that infection prevention and control (IPC) is challenging in LTCFs due to extended stays, socialisation among residents and limited resources. Older LTCF residents are also more likely than community dwelling older adults to be infected with multi-drug resistant organisms (MDROs), which has economic effect on the health service provision [79].

Beard et al compared six domains related to behavioural interventions associated with cost-effectiveness. They concluded that training, persuasion and restriction may be more cost-effective, as may those that encourage goal setting and comparison of behaviours with others [80].

As more evidence is needed, evaluating the implementation of IPC guidance and collecting examples of economic evaluations in the EU/EEA countries should be considered, including the estimates on the resource utilization (e.g. number of diagnostic procedures, treatment duration).

OECD estimated that, among interventions to control AMR, hand hygiene and environmental hygiene are estimated to yield the greatest health benefits, the highest savings in health expenditure and generate the highest productivity gains.

There are still limitations and knowledge gaps in the cost-effectiveness of IPC interventions. Cost-effectiveness depends on contextual factors, such as geography, healthcare system, reimbursement system, the type of

infection, prevalence and implementation, and there is a large heterogeneity of interventions. Therefore, the results of studies should be generalised with caution. Furthermore, the estimated cost components in cost-effectiveness analysis have often been criticised.

It is essential to outline the methods used to calculate cost-effectiveness, as this is a critical tool across all stages of IPC implementation. Cost-effectiveness is typically assessed by subtracting potential cost savings – such as those from avoided extended hospital stays – from the combined costs of the intervention and its implementation. Comprehensive estimates should account for all relevant resources, including human, financial, and material inputs. Two key types of economic evaluation may be applied.

Cost-effectiveness analysis (CEA) uses condition-specific outcome measures such as infections avoided, infection-related mortality, hospital admissions, or length of stay. CEA is particularly useful when working within fixed budgets (e.g. for infection control specialists), though it is limited to comparisons within the same condition.

Cost-utility analysis (CUA) employs generic outcome measures such as quality-adjusted life years (QALYs) or disability-adjusted life years (DALYs), enabling comparison across different disease areas. It relies on the incremental cost-effectiveness ratio (ICER), calculated as the difference in costs divided by the difference in outcomes. This approach supports broader healthcare decision-making by helping allocate resources efficiently across a health system.

References

1. Cassini A, Plachouras D, Eckmanns T, Abu Sin M, Blank HP, Ducomble T, et al. Burden of Six Healthcare-Associated Infections on European Population Health: Estimating Incidence-Based Disability-Adjusted Life Years through a Population Prevalence-Based Modelling Study. PLoS Med. 2016 Oct;13(10):e1002150. Available at: https://www.ncbi.nlm.nih.gov/pubmed/27755545
2. European Centre for Disease Prevention and Control (ECDC). Assessing the health burden of infections with antibiotic-resistant bacteria in the EU/EEA, 2016-2020. Stockholm: ECDC; 2022. Available at: https://www.ecdc.europa.eu/en/publications-data/health-burden-infections-antibiotic-resistant-bacteria-2016-2020
3. European Centre for Disease Prevention and Control (ECDC). Point prevalence survey of healthcare-associated infections and antimicrobial use in European acute care hospitals – 2022-2023. Stockholm: ECDC; 2024. Available at: https://www.ecdc.europa.eu/en/publications-data/PPS-HAI-AMR-acute-care-europe-2022-2023
4. European Centre for Disease Prevention and Control (ECDC). Rapid risk assessment - Carbapenem-resistant Enterobacterales – third update. Stockholm: ECDC; 2025. Available at: https://www.ecdc.europa.eu/en/publications-data/carbapenem-resistant-enterobacterales-rapid-risk-assessment-third-update
5. European Centre for Disease Prevention and Control (ECDC). Antimicrobial resistance in the EU/EEA (EARS-Net) - Annual Epidemiological Report for 2024. Stockholm: ECDC; 2025. Available at: https://www.ecdc.europa.eu/en/publications-data/antimicrobial-resistance-eueea-ears-net-annual-epidemiological-report-2024
6. Birgand G, Johansson A, Szilagyi E, Lucet JC. Overcoming the obstacles of implementing infection prevention and control guidelines. Clin Microbiol Infect. 2015 Dec;21(12):1067-71. Available at: https://www.ncbi.nlm.nih.gov/pubmed/26369604
7. Tartari E, Tomczyk S, Pires D, Zayed B, Coutinho Rehse AP, Kariyo P, et al. Implementation of the infection prevention and control core components at the national level: a global situational analysis. J Hosp Infect. 2021 Feb;108:94-103. Available at: https://www.ncbi.nlm.nih.gov/pubmed/33271215
8. Atkins L, Sallis A, Chadborn T, Shaw K, Schneider A, Hopkins S, et al. Reducing catheter-associated urinary tract infections: a systematic review of barriers and facilitators and strategic behavioural analysis of interventions. Implement Sci. 2020 Jul 6;15(1):44. Available at: https://www.ncbi.nlm.nih.gov/pubmed/32624002
9. Trivedi KK, Schaffzin JK, Deloney VM, Aureden K, Carrico R, Garcia-Houchins S, et al. Implementing strategies to prevent infections in acute-care settings. Infect Control Hosp Epidemiol. 2023 Aug;44(8):1232-46. Available at: https://www.ncbi.nlm.nih.gov/pubmed/37431239
10. World Health Organization (WHO). A guide to the implementation of the WHO multimodal hand hygiene improvement strategy. Geneva: WHO; 2009. Available at: https://www.who.int/publications/i/item/a-guide-to-the-implementation-of-the-who-multimodal-hand-hygiene-improvement-strategy
11. Council of the European Union. Council Recommendation of 9 June 2009 on patient safety, including the prevention and control of healthcare associated infections (2009/C 151/01). OJ C. 2009; 52(151):[1–6 pp.]. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=oj:JOC_2009_151_R_0001_01
12. European Parliament. European Parliament resolution of 22 October 2013 on the report from the Commission to the Council on the basis of Member States' reports on the implementation of the Council Recommendation (2009/C 151/01) on patient safety, including the prevention and control of healthcare-associated infections (2013/2022(INI)). OJ C. 2013; 59(208):[55–66 pp.]. Available at: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52013IP0435
13. Council of the European Union. Council conclusions on patient safety and quality of care, including the prevention and control of healthcare-associated infections and antimicrobial resistance (2014/C 438/05). OJ C. 2014; 57(438):[7-11 pp.]. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.C_.2014.438.01.0007.01.ENG
14. European Centre for Disease Prevention and Control (ECDC). Core competencies for infection control and hospital hygiene professionals in the European Union. Stockholm: ECDC; 2013. Available at: https://www.ecdc.europa.eu/en/publications-data/core-competencies-infection-control-and-hospital-hygiene-professionals-european
15. Commission of the European Communities. Communication from the Commission on a Community Strategy against antimicrobial resistance. 2001. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52001DC0333

16. European Commission. Communication from the Commission to the Council and the European Parliament: A European One Health Action Plan against Antimicrobial Resistance (AMR). Brussels: European Commission; 2017. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52017DC0339
17. European Parliament and the Council of the European Union. Regulation (EU) 2022/2371 of the European Parliament and of the Council of 23 November 2022 on serious cross-border threats to health and repealing Decision No 1082/2013/EU (Text with EEA relevance). OJ L. 2022; 65(314):[26-63 pp.]. Available at: https://eur-lex.europa.eu/eli/reg/2022/2371/oj
18. World Health Organization (WHO). Guidelines on core components of infection prevention and control programmes at the national and acute health care facility level. Geneva: WHO; 2016. Available at: http://apps.who.int/iris/handle/10665/251730
19. Council of the European Union. Council Recommendation on stepping up EU actions to combat antimicrobial resistance in a One Health approach 2023/C 220/01. OJ C. 2023; 66(220):[1–20 pp.]. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32023H0622%2801%29
20. Storr J, Twyman A, Zingg W, Damani N, Kilpatrick C, Reilly J, et al. Core components for effective infection prevention and control programmes: new WHO evidence-based recommendations. Antimicrob Resist Infect Control. 2017;6:6. Available at: https://www.ncbi.nlm.nih.gov/pubmed/28078082
21. Moberg J, Oxman AD, Rosenbaum S, Schunemann HJ, Guyatt G, Flottorp S, et al. The GRADE Evidence to Decision (EtD) framework for health system and public health decisions. Health Res Policy Syst. 2018 May 29;16(1):45. Available at: https://www.ncbi.nlm.nih.gov/pubmed/29843743
22. Sreeramoju P. Reducing Infections A Review of Socioadaptive Approaches. Open Forum Infect Dis. 2019 Feb;6(2):ofy348. Available at: https://www.ncbi.nlm.nih.gov/pubmed/30740469
23. World Health Organization Regional Office for Europe (WHO Europe). A guide to tailoring health programmes: using behavioural and cultural insights to tailor health policies, services and communications to the needs and circumstances of people and communities. Copenhagen: WHO Europe; 2023. Available at: https://www.who.int/europe/publications/i/item/9789289058919
24. World Health Organization (WHO). Infection prevention and control pre-service education and training curriculum: foundational content for all health and care workers. Geneva: WHO; 2025. Available at: https://www.who.int/publications/i/item/9789240109964
25. World Health Organization (WHO). Core competencies for infection prevention and control professionals. Geneva: WHO; 2020. Available at: https://www.who.int/publications/i/item/9789240011656
26. Jeyaratnam U KA, Kristensen B. EU-JAMRAI 2 - DL 7.1 - Recommendations for changes to ECDC's technical 2013 document on IPC core competencies: EU-JAMRAI; 2025. Available at: https://eu-jamrai.eu/wp-content/uploads/2025/12/FINAL_251217_evaluation-report_of-ECDC-2013-IPC-core-competency-document.pdf
27. Kirkpatrick DKJ. Evaluating Training Programs: The Four Levels: Berrett-Koehler; 2006.
28. Elsheikh S, Magdy A, Asem L. Assessing infection control training in ICUs using the Kirkpatrick model: a prospective cohort study. Antimicrob Resist Infect Control. 2025 Jun 9;14(1):65. Available at: https://www.ncbi.nlm.nih.gov/pubmed/40490776
29. World Health Organization (WHO). Surveillance of health care-associated infections at national and facility levels: practical handbook. Geneva: WHO; 2024. Available at: https://www.who.int/publications/i/item/9789240101456
30. Martin M, Zingg W, Hansen S, Gastmeier P, Wu AW, Pittet D, et al. Public reporting of healthcare-associated infection data in Europe. What are the views of infection prevention opinion leaders? J Hosp Infect. 2013 Feb;83(2):94-8. Available at: https://www.ncbi.nlm.nih.gov/pubmed/23273963
31. Freeman R, Moore LS, Garcia Alvarez L, Charlett A, Holmes A. Advances in electronic surveillance for healthcare-associated infections in the 21st Century: a systematic review. J Hosp Infect. 2013 Jun;84(2):106-19. Available at: https://www.ncbi.nlm.nih.gov/pubmed/23648216
32. Centers for Disease Control and Prevention, Association of State and Territorial Health Officials. Policies for Eliminating Healthcare-associated Infections: Lessons Learned from State Stakeholder Engagement. Arlington: ASTHO; 2012. Available at: https://stacks.cdc.gov/view/cdc/154003
33. European Centre for Disease Prevention and Control (ECDC). Data quality monitoring and surveillance system evaluation - A handbook of methods and applications: ECDC; 2014. Available at: https://www.ecdc.europa.eu/en/publications-data/data-quality-monitoring-and-surveillance-system-evaluation-handbook-methods-and
34. Havers SM, Kate Martin E, Wilson A, Hall L. A systematic review and meta-synthesis of policy intervention characteristics that influence the implementation of government-directed policy in the hospital setting: implications for infection prevention and control. J Infect Prev. 2020 May;21(3):84-96. Available at: https://www.ncbi.nlm.nih.gov/pubmed/32494292

35. World Health Organization (WHO). Interim practical manual: supporting national implementation of the WHO guidelines on core components of infection prevention and control programmes . Geneva: WHO; 2017. Available at: https://www.who.int/publications/i/item/WHO-HIS-SDS-2017-8
36. Alvarez-Lerma F, Palomar-Martinez M, Sanchez-Garcia M, Martinez-Alonso M, Alvarez-Rodriguez J, Lorente L, et al. Prevention of Ventilator-Associated Pneumonia: The Multimodal Approach of the Spanish ICU "Pneumonia Zero" Program. Crit Care Med. 2018 Feb;46(2):181-8. Available at: https://www.ncbi.nlm.nih.gov/pubmed/29023261
37. Duerden BI. Responsibility for managing healthcare-associated infections: where does the buck stop? J Hosp Infect. 2009 Dec;73(4):414-7. Available at: https://www.ncbi.nlm.nih.gov/pubmed/19765862
38. Solter E, Adler A, Rubinovitch B, Temkin E, Schwartz D, Ben-David D, et al. Israeli National Policy for Carbapenem-Resistant Enterobacteriaceae Screening, Carrier Isolation and Discontinuation of Isolation. Infect Control Hosp Epidemiol. 2018 Jan;39(1):85-9. Available at: https://www.ncbi.nlm.nih.gov/pubmed/29241475
39. World Health Organization (WHO). Infection prevention and control assessment framework at the facility level: WHO; 2018. Available at: https://www.who.int/publications/i/item/WHO-HIS-SDS-2018.9
40. Nadi ZB, Raisali F, Jafari N, Bayramzadeh S. The influence of physical environment on health care-associated infections: A literature review. Am J Infect Control. 2024 Feb;52(2):229-42. Available at: https://www.ncbi.nlm.nih.gov/pubmed/37356457
41. Stone PW, Pogorzelska M, Kunches L, Hirschhorn LR. Hospital staffing and health care-associated infections: a systematic review of the literature. Clin Infect Dis. 2008 Oct 1;47(7):937-44. Available at: https://www.ncbi.nlm.nih.gov/pubmed/18767987
42. Hewage SCN, Cao LTT, Jones RM, Fraser AM. Factors associated with environmental service worker cleaning practices in health care settings: A systematic review of the literature. Am J Infect Control. 2021 Jul;49(7):919-27. Available at: https://www.ncbi.nlm.nih.gov/pubmed/33434592
43. Qureshi MO, Chughtai AA, Seale H. Recommendations related to occupational infection prevention and control training to protect healthcare workers from infectious diseases: a scoping review of infection prevention and control guidelines. BMC Health Serv Res. 2022 Mar 1;22(1):272. Available at: https://www.ncbi.nlm.nih.gov/pubmed/35232449
44. Centers for Disease Control and Prevention, Association of State and Territorial Health Officials. Eliminating healthcare associated infections: State policy options. Arlington: ASTHO; 2011. Available at: https://www.cdc.gov/healthcare-associated-infections/media/pdfs/toolkit-hai-policy-2012-508.pdf
45. Price L, Gozdzielewska L, Hendry K, McFarland A, Reilly J. Effectiveness of national and subnational interventions for prevention and control of health-care-associated infections in acute hospitals in high-income and upper-middle-income counties: a systematic review update. Lancet Infect Dis. 2023 Sep;23(9):e347-e60. Available at: https://www.ncbi.nlm.nih.gov/pubmed/37023784
46. ISO. Healthcare organization management - Management systems for quality in healthcare organizations - Requirements. Geneva: ISO; 2023.
47. Rodríguez ML CE, Rojo MP, Álvarez-Fernández A. Diagnostic stewardship in blood cultures: A literature review and adaptation to the EU context: EU-JAMRAI; 2025. Available at: https://eu-jamrai.eu/wp-content/uploads/2025/10/Diagnostic-Stewardship-in-Blood-Cultures.pdf
48. Van Mourik MSM, van Rooden SM, Abbas M, Aspevall O, Astagneau P, Bonten MJM, et al. PRAISE: providing a roadmap for automated infection surveillance in Europe. Clin Microbiol Infect. 2021 Jul;27 Suppl 1:S3-S19. Available at: https://www.ncbi.nlm.nih.gov/pubmed/34217466
49. Olmsted RN. Prevention by Design: Construction and Renovation of Health Care Facilities for Patient Safety and Infection Prevention. Infect Dis Clin North Am. 2016 Sep;30(3):713-28. Available at: https://www.ncbi.nlm.nih.gov/pubmed/27515144
50. Cookson B, Mackenzie D, Kafatos G, Jans B, Latour K, Moro ML, et al. Development and assessment of national performance indicators for infection prevention and control and antimicrobial stewardship in European long-term care facilities. J Hosp Infect. 2013 Sep;85(1):45-53. Available at: https://www.ncbi.nlm.nih.gov/pubmed/23932737
51. Bloch N, Manner J, Gardiol C, Kohler P, Kuhn J, Munzer T, et al. Effective infection prevention and control measures in long-term care facilities in non-outbreak and outbreak settings: a systematic literature review. Antimicrob Resist Infect Control. 2023 Oct 18;12(1):113. Available at: https://www.ncbi.nlm.nih.gov/pubmed/37853477
52. Tchouaket EN, El-Mousawi F, Robins S, Kruglova K, Seguin C, Kilpatrick K, et al. A systematic review of economic evaluation of healthcare associated infection prevention and control interventions in long term care facilities. Health Econ Rev. 2024 Nov 29;14(1):101. Available at: https://www.ncbi.nlm.nih.gov/pubmed/39612116

53. 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. J Hosp Infect. 2019 Aug;102(4):377-93. Available at: https://www.ncbi.nlm.nih.gov/pubmed/30794854
54. European Centre for Disease Prevention and Control (ECDC). Point prevalence survey of healthcare-associated infections and antimicrobial use in European long-term care facilities 2023-2024. Surveillance and monitoring. Stockholm: ECDC; 2025. Available at: https://www.ecdc.europa.eu/en/publications-data/point-prevalence-survey-healthcare-associated-infections-and-antimicrobial-use-6
55. Dumyati G, Stone ND, Nace DA, Crnich CJ, Jump RL. Challenges and Strategies for Prevention of Multidrug-Resistant Organism Transmission in Nursing Homes. Curr Infect Dis Rep. 2017 Apr;19(4):18. Available at: https://www.ncbi.nlm.nih.gov/pubmed/28382547
56. Smith PW, Bennett G, Bradley S, Drinka P, Lautenbach E, Marx J, et al. SHEA/APIC Guideline: Infection prevention and control in the long-term care facility. Am J Infect Control. 2008 Sep;36(7):504-35. Available at: https://www.ncbi.nlm.nih.gov/pubmed/18786461
57. Sands M, Aiken AM, Cumming O, Aunger R. The effect of behavioural interventions targeting hand hygiene practices among nurses in high-income hospital settings: a systematic review. Public Health Rev. 2020 Dec 7;41(1):29. Available at: https://www.ncbi.nlm.nih.gov/pubmed/33372645
58. Bonaconsa C, Mbamalu O, Surendran S, George A, Mendelson M, Charani E. Optimizing infection control and antimicrobial stewardship bedside discussion: a scoping review of existing evidence on effective healthcare communication in hospitals. Clin Microbiol Infect. 2024 Mar;30(3):336-52. Available at: https://www.ncbi.nlm.nih.gov/pubmed/38101471
59. Schutte M, van Mansfeld R, de Vries R, Dekker M. Determinants of compliance with infection prevention measures by physicians: a scoping review. J Hosp Infect. 2024 Nov;153:30-8. Available at: https://www.ncbi.nlm.nih.gov/pubmed/39214255
60. World Health Organization (WHO). Toolkit for implementation of the WHO intrapartum care and immediate postnatal care recommendations in health-care facilities. Geneva: WHO; 2023. Available at: https://www.who.int/publications/i/item/9789240081314
61. Kc D, Smith J, Currie K, Ness V. Theoretical models applied to understand infection prevention and control practices of healthcare workers during the COVID-19 pandemic: A systematic review. J Infect Prev. 2025 Jan;26(1):33-43. Available at: https://www.ncbi.nlm.nih.gov/pubmed/39544635
62. Crawshaw J, Callum J, Charge S, Lorencatto F, Presseau J, Raza S, et al. How do we leverage implementation science to support and accelerate uptake of clinical practice guidelines in transfusion medicine. Transfusion. 2025 May;65(5):799-813. Available at: https://www.ncbi.nlm.nih.gov/pubmed/40198325
63. World Health Organization (WHO). Principles and steps for applying a behavioural perspective to public health 2021. Available at: https://cdn.who.int/media/docs/default-source/documents/bi-tag-technical-note1_principles-and-steps.pdf?sfvrsn=efdefb39_5
64. French SD, Green SE, O'Connor DA, McKenzie JE, Francis JJ, Michie S, et al. Developing theory-informed behaviour change interventions to implement evidence into practice: a systematic approach using the Theoretical Domains Framework. Implement Sci. 2012 Apr 24;7:38. Available at: https://www.ncbi.nlm.nih.gov/pubmed/22531013
65. Blair CJ, McCrudden C, Brazier A, Huf S, Gregory A, O'Driscoll F, et al. A helping hand: Applying behavioural science and co-design methodology to improve hand hygiene compliance in the hospital setting. PLoS One. 2024;19(12):e0310768. Available at: https://www.ncbi.nlm.nih.gov/pubmed/39666641
66. Patrick M, Kilpatrick C, Storr J, Gon G, Huynh T, Thang PM, et al. Environmental cleaning barriers and mitigation measures identified through two initiatives in four countries, 2018-2023: a commentary. Antimicrob Resist Infect Control. 2024 Nov 8;13(1):134. Available at: https://www.ncbi.nlm.nih.gov/pubmed/39511662
67. Gilhooly D, Green SA, McCann C, Black N, Moonesinghe SR. Barriers and facilitators to the successful development, implementation and evaluation of care bundles in acute care in hospital: a scoping review. Implement Sci. 2019 May 6;14(1):47. Available at: https://www.ncbi.nlm.nih.gov/pubmed/31060625
68. Michie S, van Stralen MM, West R. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. Implement Sci. 2011 Apr 23;6:42. Available at: https://www.ncbi.nlm.nih.gov/pubmed/21513547
69. Zingg W, Holmes A, Dettenkofer M, Goetting T, Secci F, Clack L, et al. Hospital organisation, management, and structure for prevention of health-care-associated infection: a systematic review and expert consensus. Lancet Infect Dis. 2015 Feb;15(2):212-24. Available at: https://www.ncbi.nlm.nih.gov/pubmed/25467650
70. European Centre for Disease Prevention and Control (ECDC). Tools and methods for promoting vaccination acceptance and uptake: a social and behavioural science approach. Stockholm: ECDC; 2025. Available at:

https://www.ecdc.europa.eu/en/publications-data/tools-and-methods-promoting-vaccination-acceptance-and-uptake

71. Musuuza JS, Barker A, Ngam C, Vellardita L, Safdar N. Assessment of Fidelity in Interventions to Improve Hand Hygiene of Healthcare Workers: A Systematic Review. Infect Control Hosp Epidemiol. 2016 May;37(5):567-75. Available at: https://www.ncbi.nlm.nih.gov/pubmed/26861117
72. World Health Organization Regional Office for Europe (WHO Europe). Evaluating the impact of interventions addressing health behaviour: considerations and tools for policy-makers. Copenhagen: WHO Europe; 2024. Available at: https://www.who.int/europe/publications/i/item/WHO-EURO-2024-10200-49972-75147
73. Marschang S, Bernardo G. Prevention and control of healthcare-associated infection in Europe: a review of patients' perspectives and existing differences. J Hosp Infect. 2015 Apr;89(4):357-62. Available at: https://www.ncbi.nlm.nih.gov/pubmed/25769366
74. Hammoud S, Amer F, Lohner S, Kocsis B. Patient education on infection control: A systematic review. Am J Infect Control. 2020 Dec;48(12):1506-15. Available at: https://www.ncbi.nlm.nih.gov/pubmed/32512081
75. Benenson S, Cohen MJ, Schwartz C, Revva M, Moses AE, Levin PD. Is it financially beneficial for hospitals to prevent nosocomial infections? BMC Health Serv Res. 2020 Jul 14;20(1):653. Available at: https://www.ncbi.nlm.nih.gov/pubmed/32664922
76. Rice S, Carr K, Sobiesuo P, Shabaninejad H, Orozco-Leal G, Kontogiannis V, et al. Economic evaluations of interventions to prevent and control health-care-associated infections: a systematic review. Lancet Infect Dis. 2023 Jul;23(7):e228-e39. Available at: https://www.ncbi.nlm.nih.gov/pubmed/37001543
77. Pollard J, Agnew E, Pearce-Smith N, Pouwels KB, Salant N, Robotham JV, et al. Umbrella review of economic evaluations of interventions for the prevention and management of healthcare-associated infections in adult hospital patients. J Hosp Infect. 2025 Apr;158:47-60. Available at: https://www.ncbi.nlm.nih.gov/pubmed/39842639
78. Organisation for Economic Co-operation and Development (OECD). Antimicrobial Resistance Tackling the Burden in the European Union: Tackling the Burden in the European Union. Paris: OECD Publishing; 2019. Available at: https://doi.org/10.1787/33cbfc1c-en
79. Eze N, Cecchini M, Oliveira Hashiguchi T. Antimicrobial resistance in long-term care facilities. OECD Health Working Papers. 2022; (136). Available at: https://doi.org/10.1787/e450a835-en
80. Beard E, Lorencatto F, Gardner B, Michie S, Owen L, Shahab L. Behavioral Intervention Components Associated With Cost-effectiveness: A Comparison of Six Domains. Ann Behav Med. 2022 Feb 11;56(2):176-92. Available at: https://www.ncbi.nlm.nih.gov/pubmed/34114597

Annex 1. Methodology

ECDC conducted a systematic search of published guidelines and systematic reviews on key domains, including IPC at the national and healthcare facility levels, considerations for LTCFs, patient involvement, and social and behavioural sciences approaches. The search strategies were developed and executed in three stages.

We utilised text word synonyms and database-specific subject headings for healthcare-associated infections in IPC and LTCFs. The electronic databases included Medline via PubMed, Embase via embase.com, and Cochrane Database of Systematic Reviews (CDSR) via cochranelibrary.com (14 February 2025). The following restrictions were applied: documents in English, published since 2000, and publication types limited to systematic reviews or guidelines.

In addition, search strategies for the social and behavioural sciences aspects of IPC were developed. We searched the electronic databases Medline via PubMed, Embase via embase.com, Scopus, WHO IRIS, CDC Stacks and ESCMID Library (14 March 2025). The following restrictions were applied: date of publication since 2015 and review publication type.

Lastly, supplementary searches focused on guidelines were conducted in Epistemonikos, the National Institute for Health and Care Excellence (NICE), the Guidelines International Network (GIN) and the ECRI Guidelines Trust (31 March 2025). To retrieve additional grey literature, members of the HAI expert community in the EU/EEA countries were contacted and asked for information about their relevant projects and publications.

The search results were reviewed independently by two reviewers.

References were exported to Endnote 20 and deduplicated following the ECDC Library guide. Our electronic searches identified 7 956 unique records. In total, 86 publications were included in the synthesis of evidence.

ECDC held three expert meetings to solicit input and feedback from a panel of IPC experts who were selected based on their expertise. The first was online on 11 March 2025, the second was an in-person meeting on 14 and 15 May 2025, and the third was online on 13 June 2025. The experts provided input on: 1) the inclusion of the recommendations in this guidance; and 2) the phrasing of the recommendations. Criteria from the GRADE Evidence to Decision framework for health system and public health decisions were considered in discussions with the expert group. The Delphi method was used for the Phase II of the development of guidelines. A Delphi panel was composed of selected experts in the field. Delphi panel members completed three online surveys on topics and recommendations identified during the second and third meetings to require further decisions regarding inclusion and wording formulation.

PubMed – Stage 1 Search		
No.	**Query**	**Results**
1	'Cross Infection'[Mesh] OR 'cross infection*'[tiab] OR 'cross-infection*'[tiab] OR 'hospital associated infection*'[tiab] OR 'healthcare associated infection*'[tiab] OR 'health care associated infection*'[tiab] OR 'hospital-acquired infection*'[tiab] OR 'hospital acquired infection*'[tiab] OR HAI[tiab] OR HCAI[tiab] OR 'hospital infection*'[tiab] OR 'iatrogenic infection*'[tiab] OR 'institutional infection*'[tiab] OR 'nosocomial infection*'[tiab] OR 'ward infection*'[tiab] OR 'intra-hospital infection*'[tiab] OR IHI[tiab] OR 'long term care infection'[tiab:~2] OR 'long term care infections'[tiab:~2] OR 'long-term care infection'[tiab:~2] OR 'long-term care infections'[tiab:~2] OR 'nursing home infection'[tiab:~2] OR 'nursing home infections'[tiab:~2] OR 'convalescence home infection'[tiab:~2] OR 'convalescence home infections'[tiab:~2] OR 'convalescence hospital infection'[tiab:~2] OR 'convalescence hospital infections'[tiab:~2] OR 'extended care infection'[tiab:~2] OR 'extended care infections'[tiab:~2] OR 'intermediate care infection'[tiab:~2] OR 'intermediate care infections'[tiab:~2] OR 'geriatric home infection'[tiab:~2] OR 'geriatric home infections'[tiab:~2] OR 'healthcare associated pneumonia*'[tiab] OR 'health care associated pneumonia*'[tiab] OR 'hospital-acquired pneumonia*'[tiab] OR 'hospital acquired pneumonia*'[tiab] OR 'nosocomial pneumonia*'[tiab] OR 'ventilator associated pneumonia*'[tiab] OR 'ventilator-associated pneumonia*'[tiab]	96,578
2	'Infection Control'[Mesh] OR 'prevention and control'[Subheading] OR 'infection* control*'[tiab] OR 'infection* prevent*'[tiab] OR 'infection control'[tiab:~3] OR 'infection prevention'[tiab:~3] OR 'IPC measure*'[tiab] OR 'IPC method*'[tiab] OR 'IPC intervention*'[tiab] OR 'Primary Prevention'[Mesh] OR 'Secondary Prevention'[Mesh] OR 'Tertiary Prevention'[Mesh] OR sterilization*[tiab] OR sterilisation*[tiab] OR disinfection*[tiab] OR 'patient Isolation*'[tiab] OR 'Negative Pressure Isolation*'[tiab]	1,751,133
1	#1 AND #2	40,603
4	'Systematic Review'[pt] OR 'systematic review'[ti:~2] OR 'systematic reviews'[ti:~2] OR 'systematic meta-review*'[ti] OR 'umbrella review*'[ti] OR 'Meta-Analysis'[pt] OR 'meta-analys*'[ti] OR 'metanalys*'[ti] OR 'meta analys*'[ti] OR 'meta synthes*'[ti] OR ((syst rev [ta] OR cochrane database syst rev [ta] OR health technol assess [ta] OR evid rep technol assess summ [ta] OR jbi database system rev implement rep [ta]) AND review[pt])	470,993

5	'Guideline'[pt] OR 'Guideline Adherence'[Mesh] OR 'Health Planning Guidelines'[Mesh] OR guideline*[ti] OR guidance*[ti] OR guide[ti] OR guides[ti]	217,318
6	#4 OR #5	682,208
7	#3 AND #6	3,555
8	#4 AND 2000:3000 [dp]	3,172
9	#5 AND eng[la]	2,938

Embase – Stage 1 Search		
No.	**Query**	**Results**
1	'healthcare associated infection'/exp OR ((('health care*' OR healthcare* OR hospital* OR iatrogenic* OR 'hospital acquired' OR institutional* OR nosocomial* OR ward* OR 'intra hospital*' OR 'long term care*' OR 'long-term care*' OR ltcf OR 'nursing home*' OR 'convalescence home*' OR 'extended care*' OR 'intermediate care*' OR 'geriatric home*' OR device OR devices OR 'injection* site*' OR surgical*) NEAR/3 (infection* OR pneumonia*)):ti,ab,kw) OR hai:ti,ab,kw OR hcai:ti,ab,kw OR ihi:ti,ab,kw	277,745
2	'infection control'/exp OR 'infection prevention'/exp OR ((ipc NEAR/2 (measure* OR method* OR intervention*)):ti,ab,kw) OR ((infection* NEAR/3 (prevent* OR control*)):ti,ab,kw)	299,458
3	#1 AND #2	43,374
4	'systematic review'/exp OR 'meta analysis'/exp OR 'umbrella review'/exp OR (((systematic OR umbrella) NEAR/2 (review* OR 'meta review*')):ti) OR 'meta-analys*':ti OR 'metanalys*':ti OR 'meta analys*':ti OR 'meta synthes*':ti OR (('syst rev':jt,ta OR 'cochrane database syst rev':jt,ta OR 'health technol assess':jt,ta OR 'evid rep technol assess summ':jt,ta OR 'jbi database system rev implement rep':jt,ta) AND 'review':it)	727,479
5	'practice guideline'/de OR 'protocol compliance'/de OR 'guideline'/de OR 'guideline':ti OR 'guidelines':ti OR 'guidance':ti OR 'guidances':ti OR 'guide':ti OR 'guides':ti	717,931
6	#4 OR #5	1,401,574
7	#3 AND #6	6,378
8	#7 AND [01-01-2000]/sd	6,096
9	#8 AND [english]/lim	5,773

Cochrane – Stage 1 Search		
No.	**Query**	**Results**
1	MeSH descriptor: [Cross Infection] explode all trees	2,267
2	('cross infection' OR 'cross infections' OR cross-infection*):ti,ab,kw	1,834
1	((('health care' OR healthcare* OR hospital* OR iatrogenic* OR 'hospital acquired' OR institutional* OR nosocomial* OR ward* OR 'intra hospital' OR 'long term care' OR 'long-term care' OR 'nursing home' OR 'convalescence home' OR 'extended care' OR 'intermediate care' OR 'geriatric home' OR device OR devices OR 'injection site' OR surgical*) NEAR/3 (infection* OR pneumonia*))):ti,ab,kw	24,980
4	#1 OR #2 OR #3	26,113
5	MeSH descriptor: [Infection Control] explode all trees	1,698
6	((ipc NEAR/2 (measure* OR method* OR intervention*))):ti,ab,kw	97
7	(infection* NEAR/3 (prevent* OR control*)):ti,ab,kw	25,298
8	'sterilisation*':ti,ab,kw OR 'sterilization*':ti,ab,kw OR 'disinfection*':ti,ab,kw OR 'patient isolation':ti,ab,kw OR 'negative pressure isolation':ti,ab,kw	8,777
9	#5 OR #6 OR #7 OR #8	33,110
10	#4 AND #9 with Cochrane Library publication date Between Jan 2000 and Feb 2025, in Cochrane Reviews	142

PubMed – Stage 2 Search		
No.	**Query**	**Results**
1	((('behavior* change*'[tiab] OR 'behaviour* change*'[tiab] OR ((multimodal[tiab] OR people-centred[tiab] OR 'people centred'[tiab] OR multidisciplinar*[tiab]) AND (implementation*[tiab] OR approach*[tiab] OR strateg*[tiab] OR intervention*[tiab])) OR MMIS[tiab] OR 'capability opportunity motivation behaviour'[tiab] OR COM-B[tiab] OR 'capability opportunity motivation behavior'[tiab] OR 'theoretical domains framework*'[tiab] OR (('Hand Hygiene/methods'[Mesh] OR 'hand hygien*'[tiab] OR 'basic hygien*'[tiab] OR 'hand washing'[tiab]) AND (behaviour*[tiab] OR behavior*[tiab] OR training*[tiab] OR routine*[tiab] OR self-monitoring[tiab])) OR 'HH behaviour*'[tiab]) AND (('Infection Control/methods'[Mesh] OR ('infection* control*'[tiab] OR 'infection* prevent*'[tiab] OR 'infection control'[tiab:~3] OR 'infection prevention'[tiab:~3]) AND (measure*[Title/Abstract] OR method*[Title/Abstract] OR intervention*[Title/Abstract] OR guideline*[Title/Abstract] OR guidance*[Title/Abstract])) OR 'IPC measure*'[tiab] OR 'IPC method*'[tiab] OR 'IPC intervention*'[tiab] OR 'IPC practice*'[tiab] OR 'IPC guideline*'[tiab] OR 'IPC guidance*'[tiab] OR 'IP&C'[tiab])) AND ('Cross Infection/prevention and control'[Mesh] OR 'hospital associated infection*'[tiab] OR 'healthcare associated infection*'[tiab] OR 'health care associated infection*'[tiab] OR 'hospital-acquired infection*'[tiab] OR 'hospital acquired infection*'[tiab] OR HAI[tiab] OR HCAI[tiab] OR ICU[tiab] OR 'intensive care unit*'[tiab] OR 'hospital infection*'[tiab] OR 'iatrogenic infection*'[tiab] OR 'institutional infection*'[tiab] OR 'nosocomial infection*'[tiab] OR 'ward infection*'[tiab] OR 'intra-hospital infection*'[tiab] OR IHI[tiab] OR 'long term care infection'[tiab:~2] OR 'long term care infections'[tiab:~2] OR 'long-term care infection'[tiab:~2] OR 'long-term care infections'[tiab:~2] OR 'nursing home infection'[tiab:~2] OR 'nursing home infections'[tiab:~2] OR 'convalescence home infection'[tiab:~2] OR 'convalescence home infections'[tiab:~2] OR 'convalescence hospital infection'[tiab:~2] OR 'convalescence hospital infections'[tiab:~2] OR 'extended care infection'[tiab:~2] OR 'extended care infections'[tiab:~2] OR 'intermediate care infection'[tiab:~2] OR 'intermediate care infections'[tiab:~2] OR 'geriatric home infection'[tiab:~2] OR 'geriatric home infections'[tiab:~2])) AND ('review'[pt] OR review[ti])	163
2	#1 AND 2015:3000[dp]	93

Embase – Stage 2 Search		
No.	**Query**	**Results**
1	((infection* NEAR/2 (prevent* OR control*)):ti,ab,kw) AND (measure*:ti,ab,kw OR method*:ti,ab,kw OR intervention*:ti,ab,kw OR guideline*:ti,ab,kw OR guidance*:ti,ab,kw) OR (((ipc OR 'ip&c') NEAR/2 (measure* OR method* OR intervention* OR guideline* OR guidance*)):ti,ab,kw)	65,494
2	(((behavior$ OR behavioral OR behaviour$ OR behavioural) NEAR/2 change*):ti,ab,kw) OR (((multimodal OR 'people-centred' OR 'people centred' OR multidisciplinar*) NEAR/2 (implementation* OR approach* OR strateg* OR intervention*)):ti,ab,kw) OR 'mmis':ti,ab,kw OR 'capability opportunity motivation behaviour':ti,ab,kw OR 'com-b':ti,ab,kw OR 'capability opportunity motivation behavior':ti,ab,kw OR 'theoretical domains framework*':ti,ab,kw OR ('hand washing'/exp AND ('behaviour*':ti,ab,kw OR 'behavior*':ti,ab,kw OR 'training*':ti,ab,kw OR 'routine*':ti,ab,kw OR 'self-monitoring':ti,ab,kw)) OR 'hh behaviour*':ti,ab,kw OR ((('hand hygien*' OR 'basic hygien*' OR 'hand washing' OR 'hand cleansing' OR 'hand drying' OR 'hand sanitation' OR 'hand sanitization' OR 'hand scrubbing' OR 'handscrubbing' OR 'handwashing' OR 'surgical scrubbing') NEAR/2 ('behaviour*' OR 'behavior*' OR 'training*' OR 'routine*' OR 'self-monitoring')):ti,ab,kw)	168,577
1	'healthcare associated infection'/exp OR ((('health care*' OR healthcare* OR hospital* OR iatrogenic* OR 'hospital acquired' OR institutional* OR nosocomial* OR ward* OR 'intra hospital*' OR 'long term care*' OR 'long-term care*' OR ltcf OR 'nursing home*' OR 'convalescence home*' OR 'extended care*' OR 'intermediate care*' OR 'geriatric home*' OR device OR devices OR 'injection* site*' OR surgical*) NEAR/3 (infection* OR pneumonia*)):ti,ab,kw) OR hai:ti,ab,kw OR hcai:ti,ab,kw OR ihi:ti,ab,kw OR icu:ti,ab,kw OR 'intensive care unit*':ti,ab,kw	603,183
4	#1 AND #2 AND #3	1,261
5	#4 AND 'review'/it	98
6	#5 AND [01-01-2015]/sd	55

Scopus – Stage 2 Search		
No.	**Query**	**Results**
1	((TITLE-ABS-KEY ('healthcare associated infection' OR hai OR hcai OR ihi OR icu OR 'intensive care unit*')) OR (TITLE-ABS-KEY (('health care*' OR healthcare* OR hospital* OR iatrogenic* OR 'hospital acquired' OR institutional* OR nosocomial* OR ward* OR 'intra hospital*' OR 'long term care*' OR 'long-term care*' OR ltcf OR 'nursing home*' OR 'convalescence home*' OR 'extended care*' OR 'intermediate care*' OR 'geriatric home*' OR 'injection* site*' OR surgical*) W/3 (infection* OR pneumonia*)))) AND ((((TITLE-ABS-KEY ((behavior$ OR behavioral OR behaviour$ OR behavioural) W/2 change*))) OR (TITLE-ABS-KEY ((multimodal OR people-centred OR 'people centred' OR multidisciplinary) W/2 (implementation* OR approach* OR strateg* OR intervention*))) OR (TITLE-ABS-KEY (mmis OR 'capability opportunity motivation behaviour' OR com-b OR 'capability opportunity motivation behavior' OR 'theoretical domains framework*' OR 'hh behaviour*')) OR (TITLE-ABS-KEY (('hand hygien*' OR 'basic hygien*' OR 'hand washing' OR 'hand cleansing' OR 'hand drying' OR 'hand sanitation' OR 'hand sanitization' OR 'hand scrubbing' OR handscrubbing OR handwashing OR 'surgical scrubbing') W/2 (behaviour* OR behavior* OR training* OR routine* OR self-monitoring)))) AND ((TITLE-ABS-KEY (ipc W/2 (measure* OR method* OR intervention* OR guideline* OR guidance*))) OR (TITLE-ABS-KEY (infection* W/2 (prevent* OR control*)) AND TITLE-ABS-KEY (measure* OR method* OR intervention* OR guideline* OR guidance*)))) AND PUBYEAR > 2014 AND (LIMIT-TO (DOCTYPE , 're'))	60

Annex 2. Key infection prevention and control topics for technical guidelines and training

1. **Standard precautions**
   - i. Hand hygiene
   - ii. Personal protective equipment and transmission-based precautions, including patient placement and isolation for specific pathogens and specific situations
   - iii. Respiratory hygiene
   - iv. Safe injection practices
2. **Cleaning and disinfection**
   - i. Environmental cleaning and disinfection
   - ii. Decontamination and sterilisation of medical instruments
   - iii. Handling of linen/laundry and healthcare waste management
3. **Patient placement, including isolation and cohorting**
4. **Healthcare worker attire, including clothing and jewellery**
5. **HCW pre-employment and regular health screening, vaccination, and occupational health**
6. **Built environment in healthcare settings**
   - i. Healthcare setting design and physical infrastructure
   - ii. Water systems
   - iii. Ventilation systems
7. **Screening and prevention of multidrug-resistant microorganisms (and other IPC-relevant pathogens)**
8. **Outbreak preparedness, identification, investigation, and management**
9. **Prevention of specific HAIs:**
   1. Vascular catheter-associated bloodstream infections;
   2. Urinary catheter-associated infections;
   3. Pneumonia, including ventilator-associated pneumonia, and other respiratory tract infections, including viral infections;
   4. *C. difficile* infections;
   5. Surgical site infections;
   6. *Candidozyma auris* infections;
   7. *Legionella* infections;
   8. Endoscopy-related infections;
   9. Infections related to construction activities.

Guidelines for consideration

- WHO guidelines on hand hygiene in healthcare
- Global guidelines for the prevention of surgical site infection
- Guidelines for the prevention of bloodstream infections and other infections associated with the use of intravascular catheters: part I: peripheral catheters.
- Also see the ECDC directory of online resources for AMR and HAI prevention and control.

Annex 3. Example indicators for monitoring and evaluation of infection prevention and control implementation

Establishing national indicators and requirements for healthcare facility reporting should be an activity of the national IPC programme. Establishing facility-level indicators beyond reporting requirements should be established by facility IPC programmes.

Outcome Indicators
Healthcare-associated infections per 1 000 patient days
Hospital-onset bloodstream infections per 1 000 patient days (+/- by pathogen)
Central line-associated bloodstream infections (BSIs) per 1 000 central line days
Intubation-associated pneumonias per 1 000 intubation days
Catheter-associated urinary tract infections per 1 000 catheter days
Percentage of surgical site infections per 100 operations
Carbapenem-resistant *Klebsiella pneumoniae* BSIs per 1 000 patient days
BSIs with third-generation cephalosporin-resistant *Escherichia coli* per 1 000 patient days
BSIs with methicillin-resistant *Staphylococcus aureus* per 1 000 patient days
BSIs with *Acinetobacter spp* per 1 000 patient days
C. difficile infections per 1 000 patient days
Reported notifications of healthcare-associated outbreaks
Process Indicators
Hand hygiene compliance rate
Number of observed hand hygiene opportunities per 1 000 patient days
Alcohol-based handrub consumption (litres/1 000 patient days)
Number of blood culture sets per 1 000 patient days
Number of stool tests for *C.difficile* infection per 1 000 patient days
Influenza vaccination coverage of healthcare workers
Monitoring of implementation of IPC guidelines/Standard operating procedures
Education and training on IPC guidelines/ Standard operating procedures
Central Venous Catheter (CVC) utilisation rate (CVC days/100 patient days)
Urinary catheter utilisation rate (urinary catheter days/100 patient days)
Intubation utilisation rate (intubation days/100 patient days)
Structure Indicators
IPC programme
Dedicated budget specifically for the IPC programme
Approved IPC plan
Approved IPC report

IPC team

IPC guidelines/SOPs

In-service IPC training and education for staff

FTE IPC professional

FTE registered ICU nurses

FTE registered nurses hospital-wide

ICU staff-to-patient ratio

Alcohol-based handrub dispensers at point of care

Beds in single rooms (percent of total number of beds)

Number of airborne infection isolation rooms

Implementation of HAI surveillance system

Automated HAI surveillance

Availability of microbiology services during weekends

Targets

IPCAF total facility score

IPC professional FTEs: 1 per 100 beds

Alcohol-based hand rub consumption (litres/1 000 patient days)

Number of observed hand hygiene opportunities/1 000 patient days

Alcohol-based hand rub dispensers at point-of-care (percent beds)

Number of beds in single rooms (percent of total number of beds)

Reduction of the incidence of BSIs with carbapenem-resistant *Klebsiella pneumoniae* (BSIs/1 000 pt days): ***country target***

Reduction of the incidence of BSIs with *Acinetobacter spp* (BSIs/1 000 pt days): ***country target***

Reduction of the incidence of BSIs with methicillin-resistant *Staphylococcus aureus* (MRSA): ***country target***

Reduction in the incidence of BSIs with third-generation cephalosporin-resistant *Escherichia coli*: ***country target***

Table 2. Suggested audits for IPC adherence

Audits
Adherence to central line bundle protocol
Adherence to transmission-based precautions protocol
Adherence to SSI prevention protocol
Adherence to intubation bundle protocol
Adherence to urinary catheter bundle protocol
Adherence to use of personal protective equipment protocol
Adherence to active screening procedure for MDRO colonisation
Adherence to environmental cleaning protocol

Annex 4. Models, theories, and frameworks to support infection prevention and control implementation

This annex provides detailed descriptions and further reading materials on models, theories, and frameworks ('approaches') to support IPC implementation, including approaches from:

1. **Implementation science**
    - Consolidated Framework for Implementation Science (**CFIR**)
    - Recommendations for Implementing Change (**ERIC**)

    Note. CFIR maps to ERIC (called 'CFIR-ERIC' matching) and is useful for unpacking factors relating to resource settings and the environmental context.
2. **Social and behavioural sciences**
    - Theoretical Domains Framework (**TDF**)
    - Capability, Opportunity, Motivation, and Behaviour (**COM-B**)
    - Behaviour Change Wheel (**BCW**)

    Note. COM-B and TDF map to the BCW and are useful for understanding and categorising barriers and facilitators of individual and group behaviours, which are then translated into tailored (called 'behaviourally-informed') interventions.
3. **WHO's 5 steps for application**

Approaches from implementation science

CFIR is an approach for determining implementation factors, which summarises a total of 19 implementation models. CFIR supports the systematic evaluation of potential barriers and facilitators of implementation. It maps 39 constructs of implementation success into five dimensions: (1) the innovation, (2) the outer setting, (3) the inner setting, (4) the individuals, and (5) the implementation process.

Ten years after the initial publication, CFIR was updated, considering feedback from a growing community of CFIR users. A dedicated website (https://www.cfirguide.org) provides detailed information and tools on CFIR.

ERIC is an approach based on consensus of repeated consultations with a total of over 70 experts with theoretical or practical experience in implementation science. The work defined 73 implementation strategies.

The ERIC list can be understood as a 'building block' from which individual implementation strategies can be selected and combined to form a tailor-made, multimodal implementation strategy.

CFIR-ERIC-Matching: CFIR and ERIC complement each other, where CFIR can be used to identify barriers and facilitators for the implementation of a project and ERIC offers corresponding implementation strategies.

Nearly 170 users with experience in applying CFIR assigned CFIR constructs to ERIC strategies. The results are summarised in the 'Implementation strategy selection tool', available on the website https://www.cfirguide.org. In a first step, users record barriers for a planned project; in a second step, the tool ranks the ERIC strategies according to their likelihood of addressing the identified barriers. Users can then combine all or individual suggested strategies into a multimodal implementation strategy.

Approaches from social and behavioural sciences

TDF is a framework to identify determinants of behaviour. It was established by behavioural scientists and implementation scientists, who synthesised 33 theories on behaviour from a cognitive, social, and environmental lens.

The first version of TDF was published in 2005 and included 12 domains, with a subsequent version published in 2012 including two additional domains. The final 14 TDF domains are:

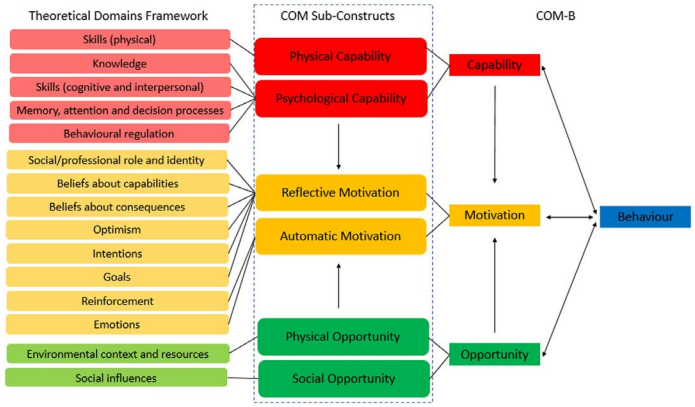
Physical skill	Environmental context and resources	Social/professional role and identity
Knowledge	Social influences	Beliefs about capabilities
Cognitive/interpersonal skills		Beliefs about consequences
Memory, attention, and decision processes		Optimism
Behavioural regulation		Intentions
		Goals
		Reinforcement
		Emotions

A dedicated article provides detailed information on using TDF, titled '*A guide to using the Theoretical Domains Framework of behaviour change to investigate implementation problems'* by Atkins et al (2017).

COM-B is a model that builds on TDF by synthesising the 14 domains into three constructs (each containing two sub-constructs): (Michie, 2011)

Capability		**Opportunity**		**Motivation**	
Physical capability	Psychological capability	Physical opportunity	Social opportunity	Reflective motivation	Automatic motivation

As mentioned, TDF and COM-B are complementary; COM-B provides a simplified framework, while TDF offers greater detail for in-depth analysis.

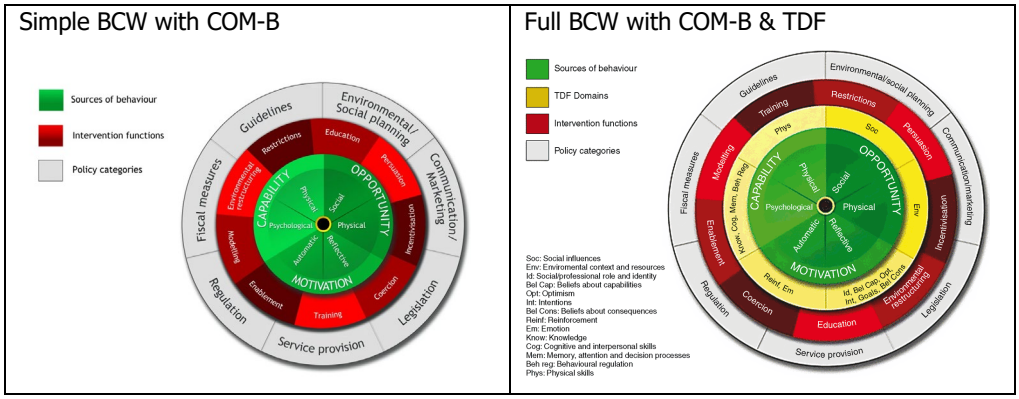


In 2023, the WHO introduced the Tailoring Health Programmes (THP) approach, which is based on the COM-B model and adapted specifically for health-related applications (https://iris.who.int/bitstream/handle/10665/367041/9789289058919-eng.pdf?sequence=2).

BCW is an integrated model/comprehensive framework that builds on the COM-B model (and thus TDF) by translating its elements into nine intervention functions and seven policy categories.

Intervention functions	Policy categories
Education	Communication/Marketing
Persuasion	Guidelines
Incentivisation	Fiscal measures
Coercion	Regulation
Training	Legislation
Restriction	Environmental/social planning
Environmental restructuring	Service provision
Modelling	
Enablement	

The intervention functions are designed to address deficits in one or more COM-B elements and are supported by policy categories that facilitate intervention implementation and delivery.



A dedicated book provides detailed information on using the BCW and how it links with COM-B and TDF, titled '*The Behaviour Change Wheel: A Guide to Designing Interventions*' by Michie, Atkins & West (2014).

Important note. Although approaches from implementation science and the social and behavioural sciences serve as diagnostic tools, their purpose is to encourage contextual thinking rather than formulaic matching. Hence, they support the mapping of evidence-based interventions to specific settings but do not promote prescriptive or one-size-fits-all solutions. This distinction is critical, as it ensures that implementation strategies are tailored to the characteristics of each context, rather than being imposed uniformly across diverse environments.

WHO's 5 steps for application

Figure 2. Illustration of WHO's 5 steps for the application of behavioural science

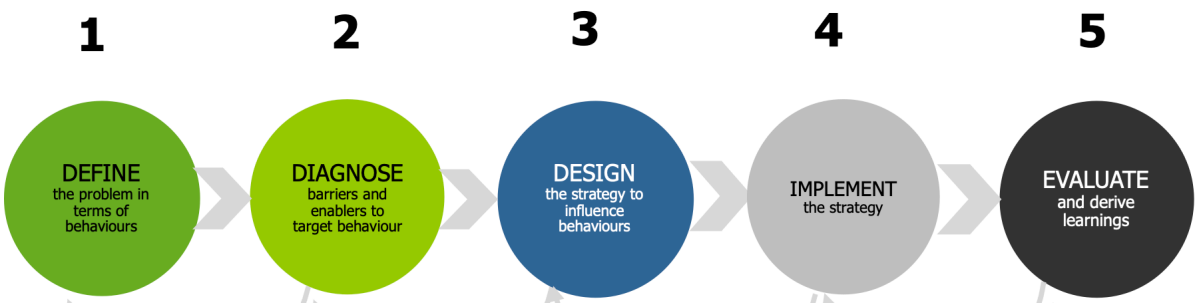
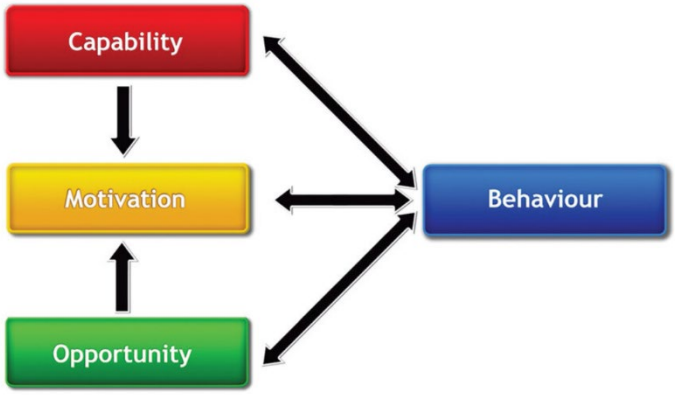


Figure 3. The COM-B Model of Behaviour Change



European Centre for Disease Prevention and Control (ECDC)

Gustav III:s Boulevard 40
16973 Solna, Sweden

Tel. +46 858 60 10 00
ECDC.info@ecdc.europa.eu

www.ecdc.europa.eu

Publications Office
of the European Union