
Infection prevention and control in-service education and training curriculum



World Health
Organization

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Abbreviations and acronyms

| | |
|---------------|---|
| AMR | antimicrobial resistance |
| AMS | antimicrobial stewardship |
| BSI | bloodstream infection |
| CABSI | catheter-associated bloodstream infection |
| CAUTI | catheter-associated urinary tract infections |
| CLABSI | central line-associated bloodstream infection |
| CVC | central venous catheter |
| HAI | health care-associated infection |
| HCW | health and care worker |
| HIV | human immunodeficiency virus |
| IPC | infection prevention and control |
| MDRO | multidrug-resistant organisms |
| MMIS | multimodal improvement strategy |
| PPE | personal protective equipment |
| SOP | standard operating procedure |
| SSI | surgical site infection |
| TBP | transmission-based precautions |
| UNICEF | United Nations Children’s Fund |
| VAP | ventilator-acquired pneumonia |
| WASH | water, sanitation and hygiene |
| WHO | World Health Organization |

Executive summary

Over the last decade, the global community has experienced several major outbreaks such as Ebola virus disease and the Middle East respiratory syndrome coronavirus (MERS-CoV) and, more recently, the Sudan virus disease outbreak in Uganda and the coronavirus disease 2019 (COVID-19) pandemic. These have well demonstrated how outbreaks can both spread rapidly through the community and be significantly amplified in health care settings. Notably, these events have exposed the gaps in infection prevention and control (IPC) programmes that exist in all countries, irrespective of the resources available or the national level of income. In addition, the increasing endemic burden of health care-associated infections (HAIs) and antimicrobial resistance (AMR), which harm patients every day across health care systems in all countries and can spread to the community, is a less visible but equally compelling reason to address gaps in IPC.

HAIs are among the most frequent adverse events occurring in the context of health service delivery. These infections, many of which are caused by multidrug-resistant organisms, harm patients, visitors and health workers, and place a significant burden on health systems, including the associated increased costs.

Having active IPC programmes in place is a proven effective approach to protect patients, health workers and visitors to health care facilities by preventing avoidable infections acquired during care provision, including those caused by antimicrobial-resistant and epidemic- and pandemic-prone pathogens.

In May 2022, the Seventy-fifth World Health Assembly adopted a global strategy on infection prevention and control (IPC), which called for the implementation of accredited IPC curricula at all levels of health care education. In response to this call, this curriculum provides a comprehensive framework for improving IPC practices through targeted in-service education for all health and care workers. This includes both clinical personnel and all other personnel that support health service delivery (administrative and managerial staff, auxiliary service staff, cleaners, etc.), embodying a people-centered approach to care that prioritizes safety and effectiveness across all roles within health care settings.

The primary objective of this curriculum is to equip health and care workers with the essential knowledge and competencies necessary for delivering safe and effective care. By doing so it aims to significantly reduce HAIs and combat antimicrobial resistance, thereby safeguarding both patient and HCWs well-being.

This curriculum is developed to meet the needs of IPC professionals responsible for developing learning resources and overseeing training within health care organizations. Moreover, the curriculum is intended to encompass all individuals involved in health care delivery and support. This holistic approach includes a wide range of staff -ranging from clinical workers to administrative and auxiliary services, thus ensuring a broad and inclusive approach to IPC training.

The guide is designed to be flexible, allowing for adaptation to various educational and practical contexts to meet specific national and local IPC requirements and policies. It delineates three distinct competency levels within the curriculum:

- **foundational:** introduces basic IPC principles applicable universally across all health and care worker roles;
- **intermediate:** delivers more detailed IPC practices, particularly for clinical practitioners in direct contact with patients;
- **advanced:** provides specialized IPC knowledge tailored for clinical specialists and managerial roles, reflecting the specific needs of their positions and settings.

This curriculum serves as an essential reference tool to support the planning, development, and localization of IPC education materials, aligning closely with the WHO core components for IPC programmes and the directions provided within the WHO global strategy and action plan on IPC. It supports countries in their efforts to implement actions to improve IPC knowledge and skills among health and care workers according to the recommendations in the WHO global action plan and monitoring framework. By enhancing the IPC competencies of health and care workers, this guide supports the capacity of the health care system to effectively manage and prevent infections, which is particularly crucial in improving patient outcomes and promoting safer health care environments, including in the context of epidemics, pandemics and other public health emergencies.

1.

**Introduction
and proposed framework**



1. Introduction and proposed framework

Over the last decade, the global community has experienced several major outbreaks such as Ebola virus disease and the Middle East respiratory syndrome coronavirus (MERS-CoV) and, more recently, the Sudan virus disease outbreak in Uganda and the coronavirus disease 2019 (COVID-19) pandemic. These have well demonstrated how outbreaks can both spread rapidly through the community and be significantly amplified in health care settings. Notably, these events have exposed the gaps in infection prevention and control (IPC) programmes that exist in all countries, irrespective of the resources available or the national level of income. In addition, the increasing endemic burden of health care-associated infections (HAIs) and antimicrobial resistance (AMR), which harm patients every day across health care systems in all countries and can spread to the community, is a less visible but equally compelling reason to address gaps in IPC (1).

HAIs are among the most frequent adverse events occurring in the context of health service delivery. These infections, many of which are caused by multidrug-resistant organisms, harm patients, visitors and health workers, and place a significant burden on health systems, including the associated increased costs (1).

Having active IPC programmes and best practices in place is a proven effective approach to protect patients, health workers and visitors to health care facilities by preventing avoidable infections acquired during care provision, including those caused by antimicrobial-resistant and epidemic- and pandemic-prone pathogens (1).

Considering this, in May 2022, the Seventy-fifth World Health Assembly (WHA) approved a resolution WHA.75.13 (2) calling for a global strategy (3), action plan and monitoring framework on infection prevention and control (IPC) (4). The global strategy, adopted at the Seventy-sixth WHA, specifically calls on Member States to take steps toward creating and implementing accredited IPC curricula within pre-graduate, postgraduate and in-service continuous education for all relevant disciplines, IPC professionals and all health and care workers (HCWs), respectively, where and as appropriate in national contexts.

To deliver this strategy, countries need to take a stepwise approach to implement the World Health Organization (WHO) core components for effective IPC programmes (5), starting with the minimum requirements (6). Based on scientific evidence, expert consensus and country experiences, the core components are the foundation for establishing or strengthening effective programmes at the national and facility level. However, the IPC core components cannot be implemented without competent IPC professionals and an understanding of IPC principles and practices by HCWs. Thus, the creation and implementation of IPC curricula in pre-graduate and in-service continuous education is essential.

IPC capacity and expertise at the country and facility level are linked to the implementation of IPC core component three, IPC education and training. However, in a WHO survey conducted at the facility level in 2019 (7), the core component of IPC programmes that scored the lowest across 4440 health care facilities from 81 countries was IPC education and training.

Strengthening IPC knowledge skills and behaviours across all HCWs is a priority action to support the provision of safe and effective care and deliver on the actions outlined in the WHO IPC global strategy.

Purpose of the document

Strategic direction #4 of the global strategy for IPC calls on countries to develop IPC curricula for health and care workers, spanning pre- and postgraduate and in-service training (3). Starting with the in-service curriculum, targeting the current health care workforce, an environmental scan was conducted to identify existing IPC in-service curricula for health workers. Published curricula were not identified via web search and there was a lack of standardization noted in those that were shared through targeted outreach to countries. There were competencies identified for IPC among health and care workers, which have been considered on the development of this work.

The purpose of this in-service curriculum is to support health care facilities and local and national IPC programmes to design, develop and deliver educational programmes aimed at empowering all HCWs with the knowledge and skills necessary to effectively implement IPC principles and practices during health care delivery. It emphasizes the integration of evidence-based IPC measures as a core component of all initial, induction, and annual in-service training, ensuring that every member of the health care team, from clinical to support staff, is proficient and confident in IPC practices.

By fostering an understanding of IPC expectations, this curriculum enables HCWs to demonstrate competencies that are essential for effective and safe IPC practice. This not only aims to improve patient outcomes, but also enhances the overall safety and quality of care, reflecting a commitment to people-centred care where care without avoidable HAIs is a priority.

Objectives and scope

The objective of this curriculum is to ensure that HCWs receive education and training to contribute to the prevention and control of infections, regardless of their roles and duties in health service delivery. The curriculum is aimed at guiding those responsible for IPC education in the development or review of learning materials for in-service learners. Given the differences between the various settings of health education and practice, it is recommended for users to adapt the IPC curriculum according to local relevance, needs, IPC patterns, and local and national IPC policy or plans.

Target audience

The target audience for this curriculum is as follows:

- IPC and other professionals responsible for the development of IPC learning resources and organizing and delivering IPC training for HCWs in their organizations.
- All HCWs involved in service delivery and patient care and all other personnel that support health service delivery (administrative and managerial staff, auxiliary service staff, cleaners, etc.).

Proposed framework

The content of this document is based on the principles, recommendations and minimum requirements related to WHO core component three for IPC programmes at national and facility levels, that is, IPC education and training (see Table 1.1).

Table 1.1. WHO recommendations and minimum requirements for IPC training and education¹

| CORE COMPONENT 3 RECOMMENDATIONS | NATIONAL LEVEL | FACILITY LEVEL |
|-------------------------------------|---|---|
| | <p>At the national level, the national IPC programme should support education and training of the health workforce as one of its core functions.</p> | <p>At facility level, IPC education should be in place for all HCWs by using team- and task-based strategies that are participatory and include bedside and simulation training to reduce the risk of health care-associated infection (HAI) and antimicrobial resistance (AMR).</p> |
| MINIMUM REQUIREMENTS | National training policy and curriculum | ■ PRIMARY CARE: IPC training for all clinical practitioners and cleaners upon hire |
| | <ul style="list-style-type: none"> • National policy that all HCWs are trained in IPC (in-service training). • An approved IPC national curriculum aligned with national guidelines and endorsed by the appropriate body. • National system and schedule of monitoring and evaluation to check on the effectiveness of IPC training and education (at least annually). | <ul style="list-style-type: none"> • All clinical practitioners and cleaners must receive education and training on the facility IPC guidelines/standard operating procedures (SOPs) upon employment. • All IPC link persons in primary care facilities and IPC officers at the district level (or other administrative level) need to receive specific IPC training. |
| | | ■ SECONDARY CARE: IPC training for all front-line clinical staff and cleaners upon hire |
| | | <ul style="list-style-type: none"> • All clinical practitioners and cleaners must receive education and training on their IPC guidelines/SOPs upon employment. • All IPC staff need to receive specific IPC training. |
| | | ■ TERTIARY CARE: IPC training for all front-line clinical staff and cleaners upon hire and annually |
| | | <ul style="list-style-type: none"> • All clinical practitioners and cleaners must receive education and training on the facility IPC guidelines/SOPs upon employment and annually. • All IPC staff need to receive specific IPC training either online or participate in courses. |

¹ Minimum requirements for infection prevention and control. Geneva: World Health Organization; 2019 (<https://iris.who.int/handle/10665/330080>, accessed 16 April 2024).

Furthermore, as a critical strategic direction, the WHO global strategy on IPC calls upon Member States to take steps toward creating and implementing accredited IPC curricula within pre-graduate, postgraduate and in-service continuous education, as well as expertise and career pathways for IPC practitioners.

This curriculum guide delineates three distinct competency levels, each including specific proposed IPC technical content (Table 1.2):

Competency level: foundational

The *foundational* competency level is designed for all HCWs regardless of their role, years of experience, setting and interaction with patients (including administrative staff, technicians, porters, environmental service and cleaning staff, volunteers). This outlines the basic principles of IPC practice that are essential to stop the spread of infectious agents and antimicrobial resistance (AMR), prevent infections, and promote safe environments within the health care systems that are applicable to every HCW role.

Competency level: intermediate

The *intermediate* competency level is designed for clinical practitioners who interact with patients and those accessing health services, such as nurses, doctors, allied health care professionals, health care assistants, etc. The topics covered within this competence level are intended to build on the foundational competency level and provide more details on IPC implementation within clinical practices and patient pathways.

Competency level: advanced

The *advanced* level is designed for staff who require additional specialized knowledge and skills determined by their clinical roles and settings, such as specialists working in clinical areas where invasive procedures are performed (for example, surgical departments, intensive and semi-intensive care units, burn units, oncology and other clinical settings), and facility managers (who may need specific competencies, for example, clinical governance, concepts of cost-effectiveness). This content can be selected as relevant to the role of the staff and is intended to build on the foundational and intermediate levels. Modules will be chosen according to the clinical or institutional role of the HCW category and not all modules need to be covered in each HCW category. This level does not include the IPC professional. Even though topics are relevant to IPC professionals, they are covered more in depth in a dedicated curriculum.

Table 1.2 outlines the proposed IPC technical content to be covered at each competency level.

Table 1.2. IPC technical content by competency level

| FOUNDATIONAL | INTERMEDIATE | ADVANCED |
|--|---|--|
| <ol style="list-style-type: none"> 1. General concepts of microbiology. 2. Chain of transmission. 3. Overview of health care-associated infection (HAI) epidemiology. 4. General concepts of standard precautions (hand hygiene, respiratory etiquette, personal protective equipment, environmental cleaning, waste management). 5. General concepts of transmission-based precautions. 6. Prevention of infection among HCWs, including the role of occupational health and safety, vaccinations, and post-exposure evaluations and follow-up. | <ol style="list-style-type: none"> 1. Standard precautions: deep dive (risk assessment, management of reusable medical equipment/ devices, linen management, prevention of needlestick injury, aseptic technique, patient placements). 2. Transmission-based precautions: deep dive. 3. Multimodal strategies for IPC interventions. 4. General concepts of antimicrobial resistance (AMR) prevention and antimicrobial stewardship. 5. Peripheral vascular catheter-associated bloodstream infection prevention. 6. Catheter-associated urinary tract infection prevention. 7. General principles of HAI surveillance and monitoring of IPC indicators. | <ol style="list-style-type: none"> 1. The WHO core components and minimum requirements of IPC programmes. 2. Health care facility-built environment, infrastructure and building requirements to support IPC. 3. Medical device reprocessing. 4. Central catheter-associated bloodstream infection prevention. 5. Ventilator-associated pneumonia prevention. 6. Surgical site infection prevention. 7. Other specific HAI prevention. 8. Additional concepts of antimicrobial stewardship. 9. The role of leadership in IPC. 10. Importance and basic principles of HAI and AMR surveillance and feedback. 11. Facility outbreak investigation and response. 12. Importance and basic principles of monitoring of IPC indicators and feedback. 13. Cost of HAIs and cost-effectiveness of IPC interventions. |

An example of time involved to deliver the training is provided as annex 2. This will vary based on teaching and assessment strategies used to deliver the content.

Examples of content of the advanced level that would apply to specific HCW roles are provided in Table 1.3 (this is not an inclusive list).

Table 1.3. Examples of advanced level topics for relevant HCW groups

| Health and care worker group | Recommended advanced level content |
|---|--|
| Facility managers | <ul style="list-style-type: none"> • The WHO core components and minimum requirements of infection prevention and control infection prevention and control (IPC) programmes. • Health care facility-built environment, infrastructure and building requirements to support IPC. • Cost of health care-associated infections (HAIs) and cost-effectiveness of IPC interventions. • The role of leadership in IPC. |
| Medical doctors, nurses and other clinical practitioners working in clinical areas where invasive procedures are performed (for example, surgical departments, intensive and semi-intensive care units, burn units, oncology and other clinical settings) | <ul style="list-style-type: none"> • Central catheter-associated bloodstream infection prevention. • Ventilator-associated pneumonia prevention. • Surgical site infection prevention. • Other specific HAI prevention. • Specific measures for high-risk services (for example, oncology, burn, adult and neonatal intensive care units, dialysis). • Additional concepts of antimicrobial stewardship. |
| IPC link doctors and nurses | <ul style="list-style-type: none"> • The WHO core components and minimum requirements of IPC programmes. • Health care facility-built environment, infrastructure and building requirements to support IPC. • Additional concepts of antimicrobial stewardship. • The role of leadership in IPC. • Importance and basic principles of HAI and antimicrobial resistance surveillance, prepare reports and provide feedback. • Outbreak investigations and response. • Importance and basic principles of monitoring of IPC indicators, prepare reports and provide feedback. |
| Medical device reprocessing staff | <ul style="list-style-type: none"> • Medical device reprocessing |

2.



Competency level:
Foundational



2. Competency level: foundational

◆ 2.1 General concepts of microbiology

Microbes are living organisms that can be beneficial, neutral or harmful to humans. They can be divided into five categories - bacteria, viruses, fungi, parasites and prions. They can be naturally resistant to antimicrobials or can become resistant through the misuse and incorrect administration of antimicrobials. Some pathogens are able to become resistant to many drugs; these pathogens are called multidrug-resistant organisms (MDRO).

A basic understanding of microbiology will help the HCW to understand how they can break the cycle of transmission, prevent HAIs and reduce AMR.

Learning aims

On completion of this section, the learner will be able to explain the microorganisms involved in HAIs, including the AMR mechanisms, and apply these concepts to break the chain of transmission.

Learning outcomes

Knowledge

The learner is able to:

1. identify the classifications of microorganisms, including bacteria, viruses, fungi, parasites and prions; gram-positive and gram-negative bacteria. etc.;
2. explain why these different categories of microorganisms are of concern in health care settings;
3. describe the concepts of contamination, colonization and infection;
4. identify factors affecting microbial survival and discuss the implications for infection prevention;
5. describe basic concepts and mechanisms of AMR.

Skills

The learner is able to:

1. apply microbiology knowledge to identify how to break the cycle of transmission and prevent HAIs.

Recommended tools and resources

Basic microbiology (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-MICRO-EN>, accessed 16 April 2024).

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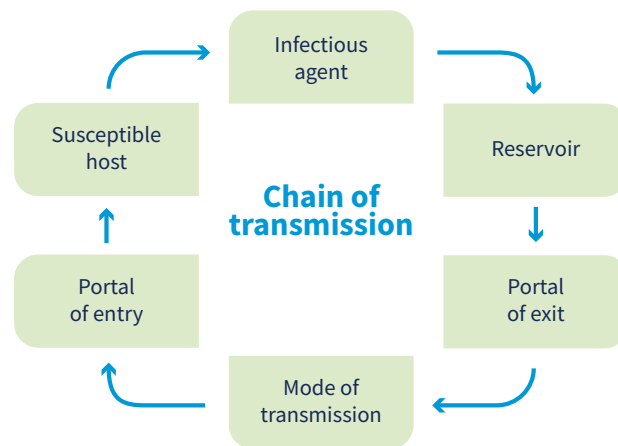
◆ 2.2 Chain of transmission

Introduction

To reduce the risk of HAI, it is important to understand how different microorganisms spread. Microorganisms are found in the air, soil, water and on or in our bodies. Some microorganisms are helpful and constitute the human microbiome, whereas others can be harmful and cause infections.

Figure 2.1 represents the chain of transmission. For an infection to develop and spread, all steps in the chain must occur. The key to stopping the spread of infection is to break at least one link in the chain. In a health care setting, the chain of transmission refers to numerous opportunities for pathogens to spread among patients, HCWs and the environment. Effective IPC interventions aim to break the chain.

Figure 2.1. Chain of transmission



🎯 Learning aims

On completion of this section, the learner will be able to describe the chain of transmission and apply methods to prevent the spread of infection in relation to IPC.

🌱 Learning outcomes

⚙️ Knowledge

The learner is able to:

1. outline each component in the chain of transmission (infectious agent, reservoir, portal of exit, mode of transmission, portal of entry, susceptible host);
2. discuss the routes of transmission of the most frequent microorganisms in health care;
3. explain how and why the application of IPC interventions break the chain of transmission.

Skills

The learner is able to:

1. apply knowledge of the components and dynamics of the chain of infection to the care practices relevant to their work setting and break the chain of infection.

Recommended tools and resources

Chain of infection components. Atlanta, GA: National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention; 2022 (<https://www.cdc.gov/niosh/learning/safetyculturehc/module-2/3.html>, accessed 16 April 2024).

Introduction to IPC (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-INTRO-EN/overview>, accessed 16 April 2024).

Project Firstline. Introduction to reservoirs: where germs live training toolkit. Atlanta, GA: Centers for Disease Control and Prevention; 2023 (<https://www.cdc.gov/infectioncontrol/projectfirstline/healthcare/training.html>, accessed 16 April 2024).

Project Firstline. Learn where germs live in health care. Atlanta, GA: Centers for Disease Control and Prevention; 2022 (<https://www.cdc.gov/infectioncontrol/projectfirstline/healthcare/where-germs-live.html>, accessed 16 April 2024).

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Infection prevention and control education framework. NHS England, 7 March 2023 (<https://www.england.nhs.uk/long-read/infection-prevention-and-control-education-framework/>, accessed 16 April 2024).

Jarvis WR, editor. Bennett & Brachman's hospital infections, seventh edition. Lippincott Williams & Wilkins; 2022.

Siegel JD, Rhinehart E, Jackson M, Chiarello L. Management of multidrug-resistant organisms in health care settings, 2006. Am J Infect Control. 2007;35(10):S165-93 (DOI: <https://doi.org/10.1016/j.ajic.2007.10.006>, accessed 16 April 2024).

◆ 2.3 Overview of HAI epidemiology

HAIs affect patients, HCWs and anyone accessing health care services. Every year, hundreds of millions of individuals around the world are affected by HAIs. Every day, HAI results in prolonged hospital stays, long-term disability, increased resistance of microorganisms to antimicrobials, massive additional costs for health systems, an emotional and personal burden for patients and their family, and unnecessary deaths. For effective IPC, it is important to identify the local situation, including the local HAI morbidity, mortality and other consequences, understand their causes, and evaluate whether interventions to reduce HAIs are successful.

Learning aims

On completion of this section, the learner will be able to explain the HAI definitions and their epidemiology worldwide and to apply this knowledge in clinical care, according to their role.

Learning outcomes

Knowledge

The learner is able to:

1. explain the term HAI and list the most frequent types of HAI;
2. discuss the epidemiology of HAIs globally, as well as in their care setting;
3. discuss the risk factors that contribute to the occurrence of HAIs, including those related to health care procedures, patient-specific factors, and environmental factors;
4. explain the personal and social burden of HAIs on patients and their families.

Skills

The learner is able to:

1. apply knowledge of HAIs to identify patients who present a risk for transmission of infections;
2. communicate to patients about HAIs risks and the importance of preventive measures, as appropriate.

Recommended tools and resources

Introduction to IPC (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-INTRO-EN/overview>, accessed 16 April 2024).

Types of Health care-associated infections. Atlanta, GA: Centers for Disease Control and Prevention; 2014 (<https://www.cdc.gov/hai/infectiontypes.html>, accessed 16 April 2024).

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Addressing the burden of infections and AMR associated with health care. Geneva: Organisation for Economic Co-operation and Development; World Health Organization; 2022 (<https://www.oecd.org/health/Addressing-burden-of-infections-and-AMR-associated-with-health-care.pdf>, accessed 16 April 2024).

Balasubramanian R, Van Boeckel TP, Carmeli Y, Cosgrove S, Laxminarayan R. Global incidence in hospital-associated infections resistant to antibiotics: an analysis of point prevalence surveys from 99 countries. PLoS Med. 2023 (<https://doi.org/10.1371/journal.pmed.1004178>, accessed 16 April 2024).

Global report on infection prevention and control. Geneva: World Health Organization; 2022 (<https://iris.who.int/handle/10665/354489>, accessed 16 April 2024).

Infection prevention and control education framework. NHS England, 7 March 2023 (<https://www.england.nhs.uk/long-read/infection-prevention-and-control-education-framework/>, accessed 16 April 2024).

◆ 2.4 General concepts of standard precautions (hand hygiene, personal protective equipment, respiratory etiquette, environmental cleaning, waste management)

Standard precautions aim to protect both HCWs and patients by reducing the risk of transmission of microorganisms from recognized and unrecognized sources. They are the minimum standard of IPC practices that should be used by all HCWs, during the care of all patients, at all times, in all settings. When applied consistently, standard precautions can prevent the transmission of microorganisms between patients, HCWs and the environment.

Key elements of standard precautions include:

- risk assessment
- hand hygiene
- respiratory hygiene and cough etiquette
- patient placement
- personal protective equipment (PPE)
- aseptic technique
- safe injections and sharps injury prevention
- environmental cleaning
- handling of laundry and linen
- waste management
- decontamination and reprocessing of reusable patient care items and equipment.

Learning aims

On completion of this section, the learner will be able to discuss and apply the key elements of standard precautions for all patients, whether infection is known to be present or not, to prevent the transmission of microorganisms among HCWs, patients, and visitors.

Learning outcomes

Knowledge

The learner is able to:

1. define key terms related to standard precautions;
2. explain the use of standard precautions as a method to prevent the transmission of microorganisms among HCWs, patients and visitors;
3. discuss the essential elements of standard precautions (with a focus on hand hygiene, respiratory etiquette, PPE, environmental cleaning, and waste management) and how to apply them to prevent HAIs.

Skills

The learner is able to:

1. demonstrate the proper application of all elements of standard precautions relevant to their work setting and practice for every patient encounter (with a focus on hand hygiene, respiratory etiquette, PPE, environmental cleaning, and waste management);
2. act as a role model supporting other HCWs, patients, and visitors in the application of standard precautions.

Recommended tools and resources

Infection prevention and control. Basic IPC and primary care. Geneva: World Health Organization (<https://www.who.int/teams/integrated-health-services/infection-prevention-control/basic-ipc-and-primary-care>, accessed 16 April 2024).

Introduction to IPC (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-INTRO-EN/overview>, accessed 16 April 2024).

Standard precautions for the prevention and control of infections: aide-memoire. Geneva: World Health Organization; 2022 (<https://iris.who.int/handle/10665/356855>, accessed 16 April 2024).

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Guideline for isolation precautions: preventing transmission of infectious agents in healthcare settings. Atlanta, GA: Centers for Disease Control and Prevention; 2007. (<https://www.cdc.gov/infectioncontrol/guidelines/isolation/index.html>, accessed 16 April 2024).

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Infection prevention and control education framework. NHS England, 7 March 2023 (<https://www.england.nhs.uk/long-read/infection-prevention-and-control-education-framework/>, accessed 16 April 2024).

◆ 2.4.1 Hand hygiene

The simple act of cleaning hands can save lives and reduce illness by helping to prevent the spread of infectious diseases. As people frequently touch their face, food, objects and surfaces, hands play a significant role in spreading microorganisms.

Therefore, clean hands of HCWs play a critical role in keeping patients safe. If HCWs do not clean their hands at the right moments, using the appropriate methods and products, they can transmit microorganisms through their hands from one patient to another. Performing hand hygiene at key moments is one of the most effective health care interventions. Hand hygiene significantly reduces the transmission of microorganisms (including those that are antibiotic-resistant) and the occurrence of HAIs, and thus, the need for using antimicrobials, which leads to decreasing AMR. It improves patient safety, and is cost-saving.

Learning aims

On completion of this section, the learner will be able to explain hand hygiene as a critical element of standard precautions and demonstrate correct hand hygiene performance at the right time and using the appropriate technique.

Learning outcomes

Knowledge

The learner will be able to:

1. define key terms related to hand hygiene;
2. explain hand hygiene as a method to prevent the transmission of microorganisms among HCWs, patients and visitors;
3. discuss when and how to apply hand hygiene practice to prevent HAIs, including:
 - a. the WHO “5 moments for hand hygiene”;
 - b. the two methods for hand hygiene (using an alcohol-based hand rub (ABHR) or soap, water and a single-use or clean towel or other drying methods) and when each method should be used;
4. explain local hand hygiene policies and procedures;
5. identify the hand hygiene compliance rate(s) for their unit(s) or area(s) (if applicable) and where to find this information.

Skills

The learner will be able to:

1. demonstrate the application of the WHO hand hygiene technique using ABHR, or soap and water and a single-use or clean towel or other drying methods;
2. demonstrate appropriate hand hygiene performance according to the WHO “5 moments for hand hygiene” in a range of health care situations;
3. teach patients/families/visitors the importance of hand hygiene and to correctly perform hand hygiene.

Recommended tools and resources

My 5 Moments for hand hygiene: the game. Geneva: World Health Organization; 2024 (<https://5mgame.lxp.academy.who.int/>, accessed 16 April 2024).

Standard precautions: hand hygiene (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-HH-en>, accessed 16 April 2024).

WASHFIT (the Water and Sanitation for Health Facility Improvement Tool) training modules. Geneva: World Health Organization; United Nations Children’s Fund; 2024 (<https://www.washinhcf.org/wash-fit-training-modules/>, accessed 16 April 2024).

WHO hand hygiene training tools. Geneva: World Health Organization (<https://www.who.int/teams/integrated-health-services/infection-prevention-control/hand-hygiene/training-tools>, accessed 16 April 2024).

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Hand hygiene in outpatient and home-based care and long-term care facilities: a guide to the application of the WHO multimodal hand hygiene improvement strategy and the “My Five Moments For Hand Hygiene” approach. Geneva: World Health Organization; 2012 (<https://iris.who.int/handle/10665/78060>, accessed 16 April 2024).

Infection prevention and control core competencies for health care providers. Updated consensus document. Winnipeg: Infection Prevention and Control (IPAC) Canada; 2022 (https://ipac-canada.org/photos/custom/pdf/IPAC_CoreCompetencies_2022_web.pdf, accessed 16 April 2024).

Infection prevention and control education framework. NHS England, 7 March 2023 (<https://www.england.nhs.uk/long-read/infection-prevention-and-control-education-framework/>, accessed 16 April 2024).

Pittet D, Allegranzi B, Sax H, Dharan S, Pessoa-Silva CL, Donaldson L, et al. Evidence-based model for hand transmission during patient care and the role of improved practices. *Lancet Infect Dis.* 2006;6(10):641-52 (DOI: [https://doi.org/10.1016/S1473-3099\(06\)70600-4](https://doi.org/10.1016/S1473-3099(06)70600-4), accessed 16 April 2024).

State of the world’s hand hygiene: a global call to action to make hand hygiene a priority in policy and practice. New York; United Nations Children’s Fund; World Health Organization; 2021 (<https://iris.who.int/handle/10665/350184>, accessed 16 April 2024).

WHO guidelines on hand hygiene in health care. Geneva: World Health Organization; 2009 (<https://iris.who.int/handle/10665/44102>, accessed 16 April 2024).

◆ 2.4.2 Respiratory hygiene and cough etiquette

Respiratory hygiene/cough etiquette infection prevention measures are designed to limit the transmission of respiratory pathogens spread by droplet or airborne routes. Respiratory hygiene/cough etiquette should be practised by anyone with signs of respiratory illness including cough, congestion, runny nose, or increased production of respiratory secretions, particularly those accessing or working in the health care setting.

The elements of respiratory hygiene/cough etiquette include:

- asking those with respiratory symptoms to wear a mask or use a tissue to cover their nose and mouth when sneezing, coughing, wiping, and blowing their nose;
- where this is not possible, sneeze into their elbow/sleeve; and
- placing acute respiratory symptomatic patients at least 1 metre (3 feet) away from others in common waiting areas in health care settings.

Learning aims

On completion of this section, the learner will be able to discuss the elements and preventative practices included in respiratory hygiene/cough etiquette and apply them to prevent the transmission of microorganisms through the air.

Learning outcomes

Knowledge

The learner will be able to:

1. define key terms related to respiratory hygiene/cough etiquette;
2. explain respiratory hygiene/cough etiquette as a method to prevent the transmission of microorganisms through the air;
3. explain how to apply the different elements of respiratory hygiene/cough etiquette.

Skills

The learner will be able to:

1. demonstrate the practice of respiratory hygiene/cough etiquette;
2. teach patients/families/visitors how and when to use respiratory hygiene/cough etiquette practices.

Recommended tools and resources

Guideline for isolation precautions: preventing transmission of infectious agents in healthcare settings. Atlanta, GA: Centers for Disease Control and Prevention; 2007. (<https://www.cdc.gov/infectioncontrol/guidelines/isolation/index.html>, accessed 16 April 2024).

Infection prevention and control: guidance to action tools. Aide-mémoire: respiratory and hand hygiene. Copenhagen: World Health Organization Regional Office for Europe; 2021 (<https://iris.who.int/handle/10665/341107>, accessed 16 April 2024).

Project Firstline. Infection control actions for respiratory viruses. Atlanta, GA: Centers for Disease Control and Prevention; 2023 (<https://www.cdc.gov/infectioncontrol/projectfirstline/healthcare/respiratory-virus-prevention.html>, accessed 16 April 2023).

Standard precautions for the prevention and control of infections: aide-memoire. Geneva: World Health Organization; 2022 (<https://iris.who.int/handle/10665/356855>, accessed 16 April 2024).

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Infection prevention and control education framework. NHS England, 7 March 2023 (<https://www.england.nhs.uk/long-read/infection-prevention-and-control-education-framework/>, accessed 16 April 2024).

◆ 2.4.3 Personal protective equipment

PPE is specialized equipment worn by HCWs for protection against infectious materials. When used correctly, PPE provides a physical barrier that protects the eyes, nose, mouth, skin, and clothing. It is important that all HCWs have a general understanding of when the different types of PPE should be used and how to use them.

🎯 Learning aims

On completion of this section, the learner will be able to discuss and apply the principles and practice of PPE.

🌱 Learning outcomes

⚙️ Knowledge

The learner will be able to:

1. discuss the principles, rationale and indications for using PPE;
2. outline the types of PPE that might be used in different frequent care situations (for example, gowns, gloves, medical masks/respirators, and eye protection);
3. describe the correct procedures for putting on, removing and disposing of PPE;
4. describe the importance of accessibility at point of care.

👉 Skills

The learner will be able to:

1. demonstrate how to appropriately select, put on, remove and dispose of PPE, in the most frequent care situations according to their role.
2. teach patients/families/visitors how and when to use PPE when needed.

🔗 Recommended tools and resources

How to put on and take off personal protective equipment. Geneva: World Health Organization; 2008 (<https://iris.who.int/handle/10665/70066>, accessed 26 April 2024).

Standard precautions for all patient care. Atlanta, GA: Centers for Disease Prevention and Control; 2016 (<https://www.cdc.gov/infectioncontrol/basics/standard-precautions.html>, accessed 26 April 2024).

Standard precautions for the prevention and control of infections: aide-memoire. Geneva: World Health Organization; 2022 (<https://iris.who.int/handle/10665/356855>, accessed 16 April 2024).

Standard precautions: the role of personal protective equipment (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-SP-PPE-EN>, accessed 16 April 2024).

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Infection prevention and control education framework. NHS England, 7 March 2023 (<https://www.england.nhs.uk/long-read/infection-prevention-and-control-education-framework/>, accessed 16 April 2024).

◆ 2.4.4 Environmental cleaning and disinfection

The health care facility environment contains a diverse population of microorganisms and can be a reservoir for potential pathogens. Environmental cleaning and disinfection reduce the risk of microbial spread. If environmental cleaning and disinfection is not performed correctly, environmental contamination can contribute to the spread of microorganisms, including those resistant to antimicrobials, and to the occurrence of HAIs. Patient care areas have procedures for routine cleaning and disinfection when a patient occupies a bed or room, and terminal cleaning and disinfection when a patient has been discharged or transferred. This helps to remove microorganisms that could contaminate the next patient occupying that space. These protocols may differ if a patient has a suspected or confirmed infectious disease. There should also be cleaning protocols for outpatient care settings and public spaces in health care facilities. Finally, blood or body fluid spills always need to be cleaned and disinfected immediately according to specific protocols.

Learning aims

On completion of this section, the learner will be able to explain the importance of environmental cleaning and disinfection and apply these practices.

Learning outcomes

Knowledge

The learner will be able to:

1. define key terms related to environmental cleaning and disinfection (cleaning, disinfection, high-touch surfaces);
2. explain environmental cleaning and disinfection as a method to prevent the spread of infection;
3. articulate the importance of cleaning and disinfecting high-touch surfaces routinely in the work area;
4. describe why the work environment must be visibly clean and free from non-essential items and equipment to facilitate cleaning and disinfection;
5. outline the basic principles and practices for cleaning and disinfection (for example, clean to dirty, method “one wipe, one direction, one surface”).

Skills

The learner will be able to:

1. apply environmental basic cleaning and disinfection measures to prevent HAIs;
2. demonstrate basic cleaning and disinfection practices while using the right products and wearing appropriate PPE;
3. teach patients/families/visitors the importance of maintaining a clean, hygienic and uncluttered environment where health care is being provided.

Recommended tools and resources

Best practices for environmental cleaning in global healthcare facilities with limited resources. Atlanta, GA: Centers for Disease Control and Prevention; 2023 (<https://www.cdc.gov/hai/prevent/resource-limited/cleaning-procedures.html>, accessed 16 April 2024).

Environmental cleaning and infection prevention and control in health care facilities in low- and middle-income countries. Modules and resources. Geneva: World Health Organization; 2022 (<https://iris.who.int/handle/10665/366380>, accessed 16 April 2024).

Environmental cleaning and infection prevention and control in health care facilities in low- and middle-income countries. Trainer's guide. Geneva: World Health Organization; 2022 (<https://iris.who.int/handle/10665/366379>, accessed 16 April 2024).

Infection prevention and control: guidance to action tools. Aide-memoire: environmental cleaning, waste and linen management. In: Infection prevention and control: guidance to action tools. Copenhagen: World Health Organization Regional Office for Europe; 2021 (<https://iris.who.int/handle/10665/341107>, accessed 16 April 2024).

Learning to deliver training in IPC and environmental cleaning for health care facilities in low-and-middle-income countries (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/ipc-enviro-cleaning-trainer>, accessed 16 April 2024).

Standard precautions: environmental cleaning and disinfection (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-EC-EN>, accessed 16 April 2024).

WASHFIT training modules: environment cleaning technical module. Geneva: World Health Organization; United Nations Children's Fund; 2024 (<https://www.washinhcf.org/wash-fit-training-modules/>, accessed 16 April 2024).

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Best practices for environmental cleaning in global healthcare facilities with limited resources. Atlanta, GA: Centers for Disease Control and Prevention; 2023 (<https://www.cdc.gov/hai/prevent/resource-limited/cleaning-procedures.html>, accessed 16 April 2024).

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Infection prevention and control education framework. NHS England, 7 March 2023 (<https://www.england.nhs.uk/long-read/infection-prevention-and-control-education-framework/>, accessed 16 April 2024).

◆ 2.4.5 Waste management

Health care waste requires careful management to protect patients, staff and the public. It is important to understand the different waste categories, their proper management according to local regulations, and the effective use of disposal equipment. HCWs need to be trained in the safe segregation and disposal of all types of health care waste, including compliance with local regulations for handling contaminated items, preventing environmental contamination and applying environmentally friendly practices such as waste minimization. Health care waste should be managed from the point of generation to final treatment disposal.

🎯 Learning aims

On completion of this section, the learner will be able to explain the principles of waste management from segregation through to final disposal and apply these best practices.

🌱 Learning outcomes

🧠 Knowledge

The learner will be able to:

1. identify the categories and sources of waste at a health care facility;
2. explain the risks caused by unsafe health care waste management practices in health care facilities;
3. describe the best practices for minimizing, segregating, collecting, transporting, storing, treating and disposing of health care waste;
4. identify different waste treatment technologies available and which are most environmentally friendly.

👐 Skills

The learner will be able to:

1. apply waste management practices (to prevent HAIs) from generation to disposal;
2. demonstrate the safe segregation of waste into appropriate receptacles and waste streams;
3. demonstrate the safe disposal of items contaminated with blood, body fluids, secretions and excretions as per local regulations.

🛠️ Recommended tools and resources

Health-care waste: key facts. Geneva: World Health Organization; 2018 (<https://www.who.int/news-room/fact-sheets/detail/health-care-waste>, accessed 16 April 2024).

Standard precautions: waste management (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-WM-EN>, accessed 16 April 2024).

WASHFIT training modules: waste. Geneva: World Health Organization; United Nations Children's Fund; 2024 (<https://www.washinhcf.org/wash-fit-training-modules/>, accessed 16 April 2024).

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Infection prevention and control education framework. NHS England, 7 March 2023 (<https://www.england.nhs.uk/long-read/infection-prevention-and-control-education-framework/>, accessed 16 April 2024).

Standard precautions: Waste management (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-WM-EN>, accessed 16 April 2024).

WHO, 2014. *Safe management of wastes from health care activities*. Second Edition. World Health Organization, Geneva. <https://www.who.int/publications/i/item/9789241548564>

WHO, 2017. *Safe management of wastes from health care activities: a summary*. World Health Organization, Geneva. <https://apps.who.int/iris/handle/10665/259491>

WHO, 2019. *Overview of treatment technologies for infectious and sharp waste from health care facilities*. World Health Organization, Geneva. <https://apps.who.int/iris/handle/10665/328146>

◆ 2.5 General concepts of transmission-based precautions

TBP are used in addition to standard precautions for patients with known or suspected infection or colonization by transmissible and/or epidemiologically significant pathogens. In addition to the use of PPE, these precautions include additional considerations for patient placement and movement throughout the facility, dedicated patient equipment and specific environmental cleaning protocols and ventilation considerations, to reduce the spread of organisms. The type of TBP assigned to a patient depends on the transmission route of the microorganism, that is contact, droplet, or airborne. All HCWs should be aware of the elements of TBP and the need to apply them in the health care setting in certain circumstances.

Learning aims

On completion of this section the learner will be able to discuss the concepts of TBP and apply them in specific situations, based on IPC professionals' advice.

Learning outcomes

Knowledge

The learner will be able to:

1. define key terms related to TBP and identify categories of TBP (contact, droplet, or airborne);
2. explain that TBP are measures put in place when indicated, in addition to standard precautions, to prevent the transmission of specific microorganisms.

Skills

The learner will be able to:

1. apply specific TBP in specific situations, in consultation with an IPC professional (or designate);
2. teach patients/family/visitors the importance of TBP and how to apply them, as relevant.

Recommended tools and resources

Transmission-based precautions for the prevention and control of infections: aide-memoire. Geneva: World Health Organization; 2022 (<https://www.who.int/publications/i/item/WHO-UHL-IHS-IPC-2022.2>, accessed 16 April 2024).

Transmission-based precautions (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-TBP-EN>, accessed 16 April 2024).

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Atlanta, GA: Centers for Diseases Control and Prevention; 2007 (<https://www.cdc.gov/infectioncontrol/guidelines/isolation/index.html>, accessed 16 April 2024).

Infection prevention and control core competencies for health care providers. Updated consensus document. Winnipeg: Infection Prevention and Control (IPAC) Canada; 2022 (https://ipac-canada.org/photos/custom/pdf/IPAC_CoreCompetencies_2022_web.pdf, accessed 16 April 2024).

Infection prevention and control education framework. NHS England, 7 March 2023 (<https://www.england.nhs.uk/long-read/infection-prevention-and-control-education-framework/>, accessed 16 April 2024).

Transmission-based precautions for the prevention and control of infections: aide-memoire. Geneva: World Health Organization; 2022 (<https://iris.who.int/handle/10665/356853>, accessed 16 April 2024).

Transmission-based precautions (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-TBP-EN>, accessed 16 April 2024).

◆ 2.6 Prevention of infection in health and care workers, including the role of occupational health and safety, vaccinations, and post-exposure evaluations and follow-up

HCW health and hygiene are important components of creating a safe work environment and preventing transmission of infectious agents in health care settings. Adherence of HCWs to recommended occupational health policies will help to decrease this risk.

This includes:

- knowing personal immunization status and recommended vaccinations to protect HCWs and to prevent the acquisition of HAIs;
- following standard precautions and transmission-based precautions (including those for protecting themselves, such as appropriate and correct use of PPE and hand hygiene),
- safe handling of sharps;
- reporting exposures and infections that put themselves and others at risk for transmission.

The effective management of staff exposures requires the cooperation of both occupational health and IPC services and teams. Occupational health policies and procedures should address proof of immunity and required vaccinations upon employment, post-exposure follow-up (including blood and body fluid exposures) and prophylaxis when indicated.

Learning aims

On completion of this section the learner will be able to explain the importance of occupational health and safety policies and practices and their role in establishing a safe work environment, and to follow the recommended protocols and practices to decrease the risk of occupational infections.

Learning outcomes

Knowledge

The learner is able to:

1. explain how HCWs own health or hygiene might pose a risk to the individuals they provide care to or work with;
2. identify the measures necessary to protect the health and safety of HCWs and patients;
3. explain the role of vaccination to prevent acquisition of occupational infections;
4. discuss all recommended vaccinations, including seasonal vaccination, as per agency and public health requirements;
5. discuss the risks associated with blood and body fluid exposures, and how to manage them;
6. explain the main steps for reporting exposures and infections.

Skills

The learner is able to:

1. perform a self-assessment for symptoms of infectious conditions prior to coming to work and stay home when ill;
2. apply safe practices to minimize the risk for exposure to infectious agents;
3. follow local protocols for the reporting and management of exposure to infectious diseases, including blood and body fluid exposures;
4. maintain records of personal vaccination history ensuring that all vaccines are up to date.

Recommended tools and resources

Best practices for injections and related procedures toolkit. Geneva: World Health Organization; 2010 (<https://iris.who.int/handle/10665/44298>, accessed 16 April 2024).

Essential programme on immunization. Geneva: World Health Organization; 2022 (<https://www.who.int/teams/immunization-vaccines-and-biologicals/essential-programme-on-immunization/integration/health-worker-vaccination>, accessed 16 April 2024).

Immunization in practice: a practical guide for health staff. Geneva: World Health Organization; 2015 (<https://www.who.int/publications/i/item/immunization-in-practice-a-practical-guide-for-health-staff>, accessed 16 April 2024).

Infection prevention and control: injection safety. Geneva: World Health Organization (<https://www.who.int/teams/integrated-health-services/infection-prevention-control/injection-safety>, accessed 16 April 2024). PPT, trainer guide, student handbook and “How to give a safe injection” video: all accessible under “training tools”.

Standard precautions: injection safety and needlestick injury management (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-IS-EN>, accessed 16 April 2024).

Table 4: WHO recommendations for routine immunization. Geneva: World Health Organization; 2023 (<https://www.who.int/publications/m/item/table-4-who-recommendations-for-routine-immunization>, accessed 16 April 2024).

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Infection prevention and control education framework. NHS England, 7 March 2023 (<https://www.england.nhs.uk/long-read/infection-prevention-and-control-education-framework/>, accessed 16 April 2024).

WHO guideline on the use of safety-engineered syringes for intramuscular, intradermal and subcutaneous injections in health-care settings. Geneva: World Health Organization; 2015 (<https://iris.who.int/handle/10665/250144>, accessed 16 April 2024).

3.



Competency level:
Intermediate



3. Competency level: intermediate

◆ 3.1 Standard precautions (risk assessment, PPE, management of reusable medical equipment/devices, linen management, prevention of needlestick injury, aseptic technique)

The basic concepts related to standard precautions that would apply to all HCWs and the details about some of the procedures and practices that are part of them are addressed in the “foundational” competency level (section 2). The intermediate level integrates the remaining standard precautions, thereby offering a more comprehensive understanding of the subject.

◆ 3.1.1 Risk assessment

Risk assessment is an important component of the appropriate adoption of standard precautions and TBP. There are two types of risk assessment. One is done by the health care facility and one by the HCW. Both are necessary to create a safe work environment.

Early recognition and assessment of risk of exposure to potentially infectious agents is a key activity for HCWs in every patient interaction in order to reduce their risk of exposure to infectious agents, such as:

- blood and/or body fluids, including secretions/excretions, splashes and/or sprays, tissues;
- non-intact skin;
- mucous membranes;
- contaminated equipment or surfaces;
- symptoms of infection.

Health care facilities should also conduct risk assessments related to the population they serve, as well as the level of care they provide (including common procedures) and available control measures, and implement prevention measures and training based on this assessment.

Learning aims

On completion of this section, the learner will be able to discuss the role of HCWs in risk assessment, apply this practice to identify the appropriate precautions to protect themselves from exposure to potentially infectious agents and prevent the transmission of HAI.

Learning objectives

Knowledge

The learner is able to:

1. discuss risk assessment as a component of standard precautions and TBP;

2. explain the potential infectious risk in different situations and according to presenting signs and symptoms of infection as appropriate to their specific role/local context.

Skills

The learner is able to:

1. perform risk assessment and select appropriate controls based on this assessment (for example, asking a coughing patient to wear a mask and spatially separating them from other patients or wearing a gown and gloves to provide direct care to a patient with diarrhoea if there is a risk of contaminating clothing or skin).

Recommended tools and resources

Introduction to IPC (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-INTRO-EN/overview>, accessed 17 April 2024).

Project Firstline. Recognize infection risks in health care. Atlanta, GA: Centers for Disease Control and Prevention; 2022 (<https://www.cdc.gov/infectioncontrol/projectfirstline/healthcare/recognize-risks.html>, accessed 17 April 2024).

Project Firstline. Recognizing risk using reservoirs training toolkit. Atlanta, GA; Centers for Disease Control and Prevention; 2023 (<https://www.cdc.gov/infectioncontrol/projectfirstline/healthcare/training.html>, accessed 17 April 2024).

Standard precautions for the prevention and control of infections: aide-memoire. Geneva: World Health Organization; 2022 (<https://iris.who.int/handle/10665/356855>, accessed 17 April 2024).

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Public Health Ontario. 2024 (https://www.publichealthontario.ca/-/media/documents/i/2020/ipac-core-accessible-cot-course.pdf?la=en&sc_lang=fr&hash=E58BBD25510B7B568AD2DCDADED6D052, accessed 17 April 2024).

Standard precautions for the prevention and control of infections: aide-memoire. Geneva: World Health Organization; 2022 (<https://iris.who.int/handle/10665/356855>, accessed 17 April 2024).

◆ 3.1.2 PPE – deep dive

In addition to being able to identify the activities where PPE should be worn and the different types of PPE that can be used, it is essential to be able to conduct risk assessment in each situation and decide what sets of PPE need to be worn. It is also critical for all clinical practitioners to understand how to correctly put on, use and remove PPE. Correct procedures to put on PPE ensures protection for HCWs and patients and proper removal prevents self-contamination. Understanding and applying these principles of PPE use correctly will enable HCWs and patients to protect themselves from contact with potentially infectious materials.

PPE is a tool that can ensure protection and safety during health care delivery, but it relies on the correct and consistent use by HCWs.

Due to the latter issues, it can be less effective than the replacement or removal of hazards, engineering controls and administrative controls.

Learning aims

On completion of this section, the learner will be able to explain the role of HCWs in the use of PPE and to correctly apply procedures to put on, remove and dispose of PPE.

Learning outcomes

Knowledge

The learner will be able to:

1. discuss the principles, rationale and indications for the use of PPE;
2. explain how PPE is used according to risk assessment and in the context of standard precautions and TBPs;
3. describe the correct procedures for putting on, removing and disposing of PPE;
4. describe when a respirator (N95 or equivalent) is required, including the need to perform a fit test and seal check.

Skills

The learner will be able to:

1. select the appropriate PPE based on a risk assessment;
2. correctly perform procedures for putting on, removing and disposing of PPE;
3. correctly perform a seal check (fit check) each time a fit-tested respirator is used;
4. assist patients/others in the correct use of PPE.

Recommended tools and resources

How to put on and how to remove personal protective equipment (PPE). Geneva: World Health Organization; 2015 (<https://www.who.int/publications/i/item/WHO-HIS-SDS-2015.1>, accessed April 28).

Infection prevention and control: guidance to action tools. Aide-mémoire: personal protective equipment. Copenhagen: World Health Organization Regional Office for Europe; 2021 (<https://iris.who.int/handle/10665/341107>, accessed 26 April 2024).

Standard precautions for the prevention and control of infections: aide-memoire. Geneva: World Health Organization; 2022 (<https://iris.who.int/handle/10665/356855>, accessed 17 April 2024).

Standard precautions: the role of personal protective equipment (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-SP-PPE-EN>, accessed 17 April 2024).

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Guideline for isolation precautions: preventing transmission of infectious agents in healthcare settings. Atlanta, GA: Centers for Disease Control and Prevention; 2007. (<https://www.cdc.gov/infectioncontrol/guidelines/isolation/index.html>, accessed 16 April 2024).

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Infection prevention and control education framework. NHS England, 7 March 2023 (<https://www.england.nhs.uk/long-read/infection-prevention-and-control-education-framework/>, accessed 16 April 2024).

◆ 3.1.3 Aseptic technique

Aseptic technique refers to the manner of handling, preparing and storing medication, injection equipment/supplies (for example, syringes, needles), catheters and other devices, which enter body cavities, to prevent microbial contamination and infection.

In particular, HCWs should understand this concept when sterile supplies and equipment are required, as well as the importance of using an aseptic technique for the insertion and maintenance of all invasive devices and aseptic/clean clinical procedures for surgical procedures to prevent infections, such as when changing or removing a wound dressings.

Learning aims

On completion of this section, the learner will be able to discuss the role of HCWs in relation to the principles and practice of an aseptic technique and apply these to practice to prevent HAIs.

Learning outcomes

Knowledge

The learner will be able to:

1. define an aseptic technique;
2. provide examples when an aseptic technique is required for preventing HAIs.

Skills

The learner will be able to:

1. apply an aseptic technique for the prevention of infection in relation to invasive procedures, the use of devices, or wound care (for example, injections, insertion and maintenance of all invasive devices, and wound dressings).

Recommended tools and resources

Infection prevention and control: injection safety. Geneva: World Health Organization (<https://www.who.int/teams/integrated-health-services/infection-prevention-control/injection-safety>, accessed 17 April 2024). PPT, trainer guide, student handbook and “How to give a safe injection” video: all accessible under “training tools”.

Standard precautions for the prevention and control of infections: aide-memoire. Geneva: World Health Organization; 2022 (<https://iris.who.int/handle/10665/356855>, accessed 17 April 2024).

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Guideline for isolation precautions: preventing transmission of infectious agents in healthcare settings. Atlanta, GA: Centers for Disease Control and Prevention; 2007 (<https://www.cdc.gov/infectioncontrol/guidelines/isolation/index.html>, accessed 17 April 2024).

Guidelines for the prevention of bloodstream infections and other infections associated with the use of intravascular catheters. Part 1: Peripheral Catheters. Geneva: World Health Organization; 2024 (<https://iris.who.int/handle/10665/376722>, accessed 13 May 2024).

Infection prevention and control education framework. NHS England, 7 March 2023 (<https://www.england.nhs.uk/long-read/infection-prevention-and-control-education-framework/>, accessed 16 April 2024).

Preparing vaccines for administration. Atlanta, GA: Centers for Disease Control and Prevention; 2019 (<https://www.cdc.gov/vaccines/hcp/admin/prepare-vaccines.html>, accessed 17 April 2024).

◆ 3.1.4 Injection safety and needlestick injury management

Use of safe injection practices is key to preventing infections during health care delivery. It covers the causes of unsafe injection practices, proper techniques for administering injections, safe disposal of needles and sharps, and effective management of needlestick injuries to protect HCWs and patients. The content also addresses the risks associated with needlestick injuries, including the potential for infection and the importance of a thorough training in sharps injury prevention to mitigate underreporting and ensure that safety practices are consistently applied.

Learning aims

On completion of this section, the learner will be able to explain the principles safe injection techniques and needlestick injury management and apply these in practice.

Learning outcomes

Knowledge

The learner will be able to:

1. identify common factors that contribute to unsafe injection practices;
2. explain the risks associated with unsafe injection practices and infections caused by them;
3. describe the seven steps of a safe injection;
4. explain the mechanism of safety-engineered syringes;
5. identify the ways in which needlestick injuries can occur in their facility;
6. describe what to do if a needlestick injury does occur;
7. explain exposure management for hepatitis B, hepatitis C and human immunodeficiency virus from needlestick injuries.

Skills

The learner will be able to:

1. apply injection safety best practices;
2. demonstrate safe handling and disposal of needles and other sharps;
3. demonstrate safe practices to minimize the risk for exposure to blood and body fluids;
4. demonstrate safe management of reusable items contaminated with blood and body fluids;
5. demonstrate safe sharps management, including the use of safety engineered devices;
6. apply local protocols for blood and body fluid exposures;
7. participate in the implementation of multimodal strategies to reduce needlestick injuries in their facility.

Recommended tools and resources

Best practices for injections and related procedures toolkit. Geneva: World Health Organization; 2010

(<https://iris.who.int/handle/10665/44298>, accessed 16 April 2024).

Infection prevention and control: injection safety. Geneva: World Health Organization (<https://www.who.int/teams/integrated-health-services/infection-prevention-control/injection-safety>, accessed 17 April 2024). PPT, trainer guide, student handbook and “How to give a safe injection” video: all accessible under “training tools”.

Standard precautions: injection safety and needle-stick injury management (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-IS-EN>, accessed 17 April 2024).

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WHO guideline on the use of safety-engineered syringes for intramuscular, intradermal and subcutaneous injections in health-care settings. Geneva: World Health Organization; 2015 (<https://iris.who.int/handle/10665/250144>, accessed 16 April 2024).

◆ 3.1.5 Management of reusable medical equipment/devices

Management of reusable medical equipment, including the critical processes of cleaning, disinfection and sterilization, is vital for maintaining a safe health care environment and preventing infection due to contaminated medical equipment/devices. Equipment soiled with blood, body fluids, secretions and excretions should be handled in a manner that prevents skin and mucous membrane exposure, contamination of clothing, and transfer of pathogens to other patients or the environment.

Reusable equipment should be cleaned and disinfected (or sterilized, depending on the type and use of patient care equipment) before use with another patient. Education ensures that staff can distinguish between single-use and reusable devices, understand the specific reprocessing requirements, and apply appropriate methods to prevent the cross-contamination of sterile medical equipment. Emphasizing the importance of these practices is essential as the proper handling and processing of medical devices directly contribute to preventing HAIs among both patients and HCWs.

Learning aims

On completion of this section, the learner will be able to explain the appropriate management of reusable medical equipment/devices including the basic principles and practices for cleaning, disinfection and sterilization, and appropriately apply cleaning, disinfection and storage procedures of reusable equipment, as required in their daily functions.

Learning outcomes

Knowledge

The learner will be able to:

1. explain the importance of cleaning and/or disinfection of equipment used to deliver care in the health care environment;
2. describe the difference between single-use versus reusable devices;
3. explain the difference between critical, semi-critical and non-critical health care equipment, the rationale for each classification type, and the type of reprocessing required for each device;
4. explain the difference between cleaning, disinfection (low- and high-level) and sterilization, and their specific rationale;
5. describe the proper storage and management of clean and sterile medical supplies/equipment (for example, separation of clean and dirty), including the safe transportation of used/dirty supplies.

Skills

The learner will be able to:

1. identify single-use versus reusable equipment and how to manage these;
2. perform the appropriate cleaning and disinfection of reusable equipment and storage of clean and sterile medical supplies/equipment, as required in their daily functions.

Recommended tools and resources

Decontamination and reprocessing of medical devices for health care facilities: aide-memoire. Geneva: World Health Organization; 2022 (<https://iris.who.int/handle/10665/364587>, accessed 17 April 2024).

Standard precautions for the prevention and control of infections: aide-memoire. Geneva: World Health Organization; 2022 (<https://iris.who.int/handle/10665/356855>, accessed 17 April 2024).

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Decontamination and reprocessing of medical devices for health-care facilities. World Health Organization and Pan American Health Organization, 2016. (<https://www.who.int/publications/item/9789241549851>, accessed 24 March 2024).

Guideline for isolation precautions: preventing transmission of infectious agents in healthcare settings. Atlanta, GA: Centers for Disease Control and Prevention; 2007. (<https://www.cdc.gov/infectioncontrol/guidelines/isolation/index.html>, accessed 16 April 2024).

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◆ 3.1.6 Linen management

Although rare, infections have been associated with the transmission of microorganisms associated with inappropriate management of hospital linen. Exposure of staff to harmful microorganisms can occur if soiled linens are not handled appropriately, with minimal manipulation or agitation. It is important to remove heavily soiled material (for example, faeces) from linen while wearing appropriate PPE before placing it in the laundry bag. In most reported staff exposures, failure to use appropriate PPE and/or inappropriate handling of linen resulted in aerosolization, which contributed to the transmission of microorganisms. Once cleaned, linen needs to be stored in a manner that protects it from environmental contaminants. The collection, transport, handling, washing and drying of soiled linen, including protection of staff, are all important components of environmental cleaning programmes as part of standard precautions.

🎯 Learning aims

On completion of this section, the learner will be able to explain the HCWs role in the safe handling and management of clean and soiled linen and apply these practices to prevent the transmission of microorganisms to HCWs and patients.

🌟 Learning outcomes

🧠 Knowledge

The learner will be able to:

1. describe the safe management of linen, including collecting, handling, transporting, washing and drying;
2. describe the what precautions HCWs should adopt to protect themselves during linen management.

👉 Skills

The learner will be able to:

1. apply the practices to safely manage clean and soiled linen.

🔧 Recommended tools and resources

Healthcare-associated infections. Appendix D – Linen and laundry management. Atlanta, GA: Centers for Disease Control and Prevention; 2023 (<https://www.cdc.gov/hai/prevent/resource-limited/laundry.html>, accessed 17 April 2024).

Standard precautions for the prevention and control of infections: aide-memoire. Geneva: World Health Organization; 2022 (<https://iris.who.int/handle/10665/356855>, accessed 17 April 2024).

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Environmental cleaning in global healthcare settings: best practices for global healthcare facilities with limited resources. Atlanta, GA: Centers for Disease Control and Prevention/Infection Control Africa Network (ICAN); 2023 (<https://www.cdc.gov/hai/prevent/resource-limited/index.html>, accessed 17 April 2024).

Guideline for isolation precautions: preventing transmission of infectious agents in healthcare settings. Atlanta, GA: Centers for Disease Control and Prevention; 2007. (<https://www.cdc.gov/infectioncontrol/guidelines/isolation/index.html>, accessed 16 April 2024).

Infection prevention and control core competencies for health care providers. Updated consensus document. Winnipeg: Infection Prevention and Control (IPAC) Canada; 2022 (https://ipac-canada.org/photos/custom/pdf/IPAC_CoreCompetencies_2022_web.pdf, accessed 17 April 2024).

◆ 3.2 Transmission-based precautions: deep dive

TBP are used in addition to standard precautions for patients with known or suspected infection or colonization with transmissible and/or epidemiologically significant pathogens. In addition to the use of PPE, these precautions include additional considerations for patient placement and movement throughout the facility, dedicated patient equipment, and specific environmental cleaning protocols and ventilation considerations to reduce the spread of organisms. The type of TBP assigned to a patient depends on the transmission route of the microorganism; that is contact, droplet or airborne. When indicated, a combination of TBP may be required, based on potential routes of transmission (for example, chickenpox and contact/airborne precautions). HCWs providing clinical care should appropriately apply TBP according to risk assessment.

Learning aims

On completion of this section, the learner will be able to explain TBP and correctly apply these practices according to risk assessment.

Learning outcomes

Knowledge

The learner will be able to:

1. describe the differences between contact, droplet and/or airborne precautions;
2. describe the different routes of transmission of microorganisms, which determine the type of precaution category required in a particular health care setting;
3. identify elements of TBP (type of PPE, patient placement, signage, environmental cleaning, and disinfection, and patient transport) and describe examples of their indications according to the type of pathogen.

Skills

The learner will be able to:

1. demonstrate the ability to choose and implement the different elements of TBP, based on the specific needs of each patient case and guidance from the IPC team;
2. apply TBP (including in combination) when indicated by using risk assessment, clinical judgement and, where relevant to their role, making decisions based on the following elements:
 - a. suspected/known infectious agents;
 - b. severity of the illness caused;
 - c. transmission route of the infectious agent (contact, airborne, and/or droplet);
 - d. care setting and procedures undertaken;
3. correctly select, put on, remove and dispose of the required PPE according to the type of TBP.

Recommended tools and resources

Transmission-based precautions for the prevention and control of infections: aide-memoire. Geneva: World Health Organization; 2022 (<https://iris.who.int/handle/10665/356853>, accessed 17 April 2024).

Transmission-based precautions (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-TBP-EN>, accessed 17 April 2024).

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Guideline for isolation precautions: preventing transmission of infectious agents in healthcare settings. Atlanta, GA: Centers for Disease Control and Prevention; 2007. (<https://www.cdc.gov/infectioncontrol/guidelines/isolation/index.html>, accessed 16 April 2024).

Infection prevention and control core competencies for health care providers. Updated consensus document. Winnipeg: Infection Prevention and Control (IPAC) Canada; 2022 (https://ipac-canada.org/photos/custom/pdf/IPAC_CoreCompetencies_2022_web.pdf, accessed 17 April 2024).

Infection prevention and control education framework. NHS England, 7 March 2023 (<https://www.england.nhs.uk/long-read/infection-prevention-and-control-education-framework/>, accessed 16 April 2024).

◆ 3.3 Multimodal strategies for IPC interventions

A multimodal improvement strategy (MMIS) consists of several elements or components (three or more; usually five) implemented in an integrated way with the aim of improving an outcome and changing behaviour. It includes tools, such as bundles and checklists developed by multidisciplinary teams that take into account local conditions.

The five most common components include: (i) system change (that is, availability of the appropriate infrastructure and supplies to enable IPC best practices); (ii) education and training of HCW and key players (for example, managers); (iii) monitoring infrastructures, practices, processes, outcomes and providing data feedback; (iv) reminders in the workplace/communications; and (v) culture change with the establishment or strengthening of a safety climate.

MMIS are the most effective way to implement IPC interventions at the point of care. It is important for HCWs to understand this as they are usually the target audience for these interventions and should understand their role in implementing them to improve patient outcomes.

Learning aims

On completion of this section, the learner will be able to discuss the role of HCWs in implementing MMIS for IPC interventions and apply these to improve implementation of IPC.

Learning outcomes

Knowledge

The learner will be able to:

1. explain the various elements of the WHO MMIS and how they are relevant to achieve compliance with the most relevant IPC practices in the HCW's local setting;
2. articulate their role in the implementation of MMIS in their workplace.

Skills

The learner will be able to:

1. participate in the implementation of elements of MMIS in the workplace as they relate to their role.

Recommended tools and resources

Applying the WHO multimodal strategy for successful infection prevention improvements in health care. Geneva: World Health Organization; 2021 (<https://youtu.be/pCKBltlE3c>, accessed 22 April 2024).

Improving infection prevention and control at the health facility: interim practical manual supporting implementation of the WHO guidelines on core components of infection prevention and control programmes. Geneva: World Health Organization; 2018 (<https://iris.who.int/handle/10665/279788>, accessed 17 April 2024).

Infection prevention and control core components and multimodal strategies (OpenWHO). Geneva: World Health Organization; 2020 (<https://openwho.org/channels/ipc>, accessed 17 April 2024).

WHO multimodal improvement strategy. Geneva: World Health Organization; 2017 (<https://www.who.int/publications/m/item/who-multimodal-improvement-strategy>, accessed 17 April 2024).

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Guidelines on core components of infection prevention and control programmes at the national and acute health care facility level. Geneva: World Health Organization; 2016 (<https://iris.who.int/handle/10665/251730>, accessed 17 April 2024).

Guide to implementation: a guide to the Implementation of the WHO multimodal hand hygiene improvement strategy. Geneva: World Health Organization; 2009 (<https://iris.who.int/handle/10665/70030>, accessed 17 April 2024).

Improving infection prevention and control at the health facility: interim practical manual supporting implementation of the WHO guidelines on core components of infection prevention and control programmes. Geneva: World Health Organization; 2018 (<https://iris.who.int/handle/10665/279788>, accessed 17 April 2024).

◆ 3.4 General concepts of antimicrobial resistance prevention and antimicrobial stewardship

AMR occurs when bacteria, viruses, fungi and parasites do not respond to antimicrobial medicines. As a result of the acquisition of AMR, antibiotics and other antimicrobial medicines become ineffective and infections become difficult or impossible to treat, increasing the risk of disease spread, severe illness, disability and death. Most HAIs are caused by antimicrobial-resistant microorganisms and, thus, are difficult to treat.

There are several strategies and activities that can be implemented to reduce and prevent the occurrence of AMR in health care settings. These strategies include IPC measures, such as appropriate hand hygiene and environmental cleaning, triaging and isolating/cohorting patients with infections that are drug-resistant, appropriate use of antimicrobials through antimicrobial stewardship (AMS), and conducting surveillance of resistant infections.

Learning aims

On completion of this section, the learner will be able to explain the concepts of the evolution and spread of AMR, effective approaches for its control, including the basic principles of AMS and the appropriate use of antimicrobials and apply these as relevant to their role in the health care setting.

Learning outcomes

Knowledge

The learner will be able to:

1. explain the development and main causes of AMR;
2. explain why AMR is a threat to human health (for example, morbidity, mortality and economic impact);
3. explain strategies to prevent AMR in health care facilities as relevant to the HCW's role;
4. describe the basic principles of AMS and appropriate use of antimicrobials as relevant to their role.

Skills

The learner will be able to:

1. promote awareness of AMR and appropriate antimicrobial use amongst all HCWs, patients and the general public;
2. act to protect the effectiveness of antimicrobials as an ethical imperative and a public good;
3. apply AMS principles to their role and promote activities that assist in the prevention and control of AMR;
4. obtain cultures and send the cultures to the microbiology laboratory, if relevant to their role;
5. monitor culture results and report results, if relevant to their role;

6. assess the implementation status of AMS in health care facilities using standard checklists and guidance;

Recommended tools and resources

Antimicrobial resistance and infection prevention and control (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-AMR-EN>, accessed 17 April 2024).

Antimicrobial stewardship programmes in health-care facilities in low- and middle-income countries. A practical toolkit. Geneva: World Health Organization; 2019 (<https://iris.who.int/handle/10665/329404>, accessed 17 April 2024).

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Infection prevention and control education framework. NHS England, 7 March 2023 (<https://www.england.nhs.uk/long-read/infection-prevention-and-control-education-framework/>, accessed 16 April 2024).

Promoting antimicrobial stewardship to tackle antimicrobial resistance. Copenhagen: World Health Organization Regional Office for Europe; 2024 (<https://www.who.int/europe/activities/promoting-antimicrobial-stewardship-to-tackle-antimicrobial-resistance>, accessed 17 April 2024).

The WHO AWaRe (access, watch, reserve) antibiotic book. Geneva: World Health Organization; 2022 (<https://iris.who.int/handle/10665/365237>, accessed 17 April 2024).

◆ 3.5 Prevention of bloodstream and other infections associated with peripheral vascular catheters

Peripheral vascular catheters (PVCs) are commonly used in health care delivery worldwide. Use of these devices increases a patient's risk for developing bloodstream infections (BSIs) and other local infections in and around the insertion site. It is important for HCWs to learn about these specific types of infections, recommended best practices for insertion, maintenance and removal, as well as ways to achieve the effective implementation of infection prevention measures.

Learning aims

On completion of this section, the learner will be able to discuss the principles and practices for the prevention of BSI and other infections associated with PVCs and apply these in practice.

Learning outcomes

Knowledge

The learner will be able to:

1. outline the infection risks associated with the use of PVCs;
2. describe the role of an aseptic technique and other evidence-based practices for the prevention of BSI and other infections associated with PVCs, relevant to their role and workplace;
3. discuss signs and symptoms of BSI and catheter site infection to help initiate early treatment;
4. describe multimodal strategies, bundles and checklists to effectively implement best practices for the prevention of BSI and other infections associated with PVCs.

Skills

The learner will be able to:

1. apply techniques for the prevention of BSI and other infections associated with PVCs during insertion, access, maintenance and removal;
2. teach patients/families/visitors the importance of safe handling of the PVC to prevent infections, as well as signs and symptoms of infection and how to report them;
3. participate in the implementation of multimodal strategies, including bundles and checklists to effectively prevent BSI and other infections associated with PVCs.

Recommended tools and resources

Bloodstream infections (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/BSI-EN>, accessed 17 April 2024).

Guidelines for the prevention of bloodstream infections and other infections associated with the use of intravascular catheters. Part 1: peripheral venous catheters. Geneva: World Health Organization; 2024 (<https://iris.who.int/handle/10665/376722>, accessed 13 May 2024).

My 5 moments for hand hygiene. Focus on caring for a patient with a peripheral venous catheter. Geneva: World Health Organization; 2015 (<https://www.who.int/multi-media/details/my-5-moments-for-hand-hygiene-focus-on-caring-for-a-patient-with-a-peripheral-venous-catheter>, accessed 17 April 2024).

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Infection prevention and control education framework. NHS England, 7 March 2023 (<https://www.england.nhs.uk/long-read/infection-prevention-and-control-education-framework/>, accessed 16 April 2024).

◆ 3.6 Catheter-associated urinary tract infection prevention

Catheter-associated urinary tract infections (CAUTI) are one of the most common HAIs. These infections are most likely caused by bacteria entering the body during catheter insertion as a result of the prolonged or unnecessary use of urinary catheters, or due to a disruption in the closed drainage system. CAUTI, like all HAIs, can be prevented. Given the high frequency of urinary catheters use and the fact that CAUTI are common HAIs, it is important for all HCWs to learn about CAUTI frequency, risk factors, causes, indications for the use of a urinary catheter, and CAUTI preventive measures.

Learning aims

On completion of this section, the learner will be able to explain the principles and practices of CAUTI and apply these in practice to prevent HAI.

Learning outcomes

Knowledge

The learner will be able to:

1. identify the infection risks from urinary catheters and risk factors for CAUTI;
2. describe how an aseptic technique and other evidence-based practices for preventing CAUTI are relevant to their role and workplace;
3. describe how microorganisms can enter the urinary tract and cause infection;
4. explain appropriate and inappropriate indications for catheter use;
5. explain the principles and practices of CAUTI prevention interventions;
6. describe the appropriate procedures for catheter insertion, maintenance and removal;
7. describe urine sampling and testing procedures;
8. describe multimodal strategies, bundles and checklists to effectively implement best practices for CAUTI prevention.

Skills

The learner will be able to:

1. recognize signs and symptoms of CAUTI;
2. apply infection prevention practices for catheter insertion, maintenance and removal;
3. apply best practices for the collection and handling of urine specimens;
4. participate in the implementation of multimodal strategies, including bundles and checklists to effectively prevent CAUTI;
5. teach patients/families/visitors the importance of safe handling of the urinary catheter to prevent infections, as well as signs and symptoms of infection and how to report them.

Recommended tools and resources

Catheter-associated urinary tract infections (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-CAUTI-EN>, accessed 17 April 2024).

My 5 moments for hand hygiene. Focus on caring for a patient with a peripheral venous catheter. Geneva: World Health Organization; 2015 (<https://www.who.int/multi-media/details/my-5-moments-for-hand-hygiene-focus-on-caring-for-a-patient-with-a-peripheral-venous-catheter>, accessed 17 April 2024).

Urinary catheter observation. Atlanta, GA: Centers for Disease Prevention and Control (<https://www.cdc.gov/infectioncontrol/pdf/QUOTS/Urinary-Catheter-Observation-P.pdf>, accessed 23 April 2024).

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Patel PK, Advani SD, Kofman AD, Lo E, Maragakis LL, Pegues DA, et al. Strategies to prevent catheter-associated urinary tract infections in acute care hospitals: 2022 update. *Infect Control Hosp Epidemiol*. 2023;44(8):1209-1231 (DOI: <https://doi.org/10.1017/ice.2023.137>, accessed 17 April 2024).

Saint S, Greene MT, Krein SL, Rogers MAM, Ratz D, Fowler KE, et al. A Program to Prevent Catheter-Associated Urinary Tract Infection in Acute Care. *N Engl J Med* 2016; 374(22):2111-9. (<https://doi.org/10.1056/NEJMoa1504906>, accessed 17 April 2024).

◆ 3.7 Introduction to HAI surveillance and monitoring of IPC indicators

The purpose of HAI surveillance is to provide data on HAI occurrence to understand the local situation and risks. It is also an important activity to detect clusters and outbreaks. Monitoring of specific practices (for example, hand hygiene practice, vascular catheter insertion) helps understand whether procedures and care are delivered safely. Performance feedback and providing information on the local situation of HAIs and AMR to all HCWs helps them to understand the challenges/problems and motivates them to participate in improvement interventions. They are also key activities to document change and practice improvement and provide feedback to HCWs and decision makers.

Learning aims

On completion of this section, the learner will be able to explain the principles of HAI surveillance and monitoring of IPC indicators as a means to understand the local situation and clinical practices and apply these practices within their scope of work, to enable accurate surveillance and improve the quality of care provided.

Learning outcomes

Knowledge

The learner will be able to:

1. explain the goals, principles and methods for HAI surveillance and monitoring of IPC indicators;
2. provide examples of the most frequent types of HAIs and IPC indicators;
3. explain the risk factors for HAIs, in particular those associated with device use and procedures occurring in their setting and role;
4. identify MDRO that are prevalent in health care settings and understand their implications for patient care and outbreak potential.


Skills

The learner will be able to:

1. consult with an IPC professional (or designate) regarding the local HAI situation and compliance with best practices and/or precautions;
2. provide and/or document information to enable surveillance and monitoring practices as appropriate to their role;
3. perform risk-based screening activities as relevant to their role.

Recommended tools and resources

Improving infection prevention and control at the health facility: interim practical manual supporting implementation of the WHO guidelines on core components of infection prevention and control programmes. Geneva: World Health Organization; 2018 (<https://iris.who.int/handle/10665/279788>, accessed 17 April 2024).



Infection prevention and control core components and multimodal strategies (OpenWHO). Geneva: World Health Organization; 2020 (<https://openwho.org/channels/ipc>, accessed 17 April 2024).

WHO multimodal improvement strategy. Geneva: World Health Organization; 2017 (<https://www.who.int/publications/m/item/who-multimodal-improvement-strategy>, accessed 17 April 2024).

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Guidelines on core components of infection prevention and control programmes at the national and acute health care facility level. Geneva: World Health Organization; 2016 (<https://iris.who.int/handle/10665/251730>, accessed 17 April 2024).

4.



Competency level:

Advanced



4. Competency level: advanced

◆ 4.1 The core components and minimum requirements of IPC programmes

Based on scientific evidence and expert consensus, WHO identified the core components for effective IPC programmes at the national and health care facility level, aimed at preventing infections among those providing and accessing health care. Recommendations, strategies and practical approaches are available for the implementation of the IPC core components. There are six core components for IPC programmes at both the national and health care facility level: 1) IPC programmes; 2) IPC guidelines; 3) IPC education and training; 4) HAI surveillance; 5) MMIS; and 6) monitoring/audit of IPC practices and feedback. There are two additional components at the facility level: 7) workload, staffing and bed occupancy; and 8) the built environment, materials and equipment for IPC.

Based on the core components for IPC programmes, WHO also defined the minimum requirements for IPC standards that should be in place at the national and facility level to provide protection and safety to patients, HCWs and visitors.

HCWs need to understand that IPC programmes and their core components and minimum requirements should be in place in their facility to support them in delivering clean and safe care.

This content is particularly relevant to facility managers, and IPC link nurses and doctors.

Learning aims

To explore the core components and minimum requirements of effective IPC programmes and apply these as relevant to their role and health care setting, to support HCWs' efforts to deliver clean and safe care by preventing risks related to HAIs.

Learning outcomes

Knowledge

The learner will be able to:

1. identify the core components and minimum requirements for effective IPC programmes;
2. disseminate information among HCWs about the IPC core components that should be in place in the health care facility;
3. discuss how the IPC core components can support HCWs' efforts to deliver clean, safe, quality care and promote their own safety in the workplace.

Skills

The learner will be able to:

1. apply the IPC core components and minimum requirements in the health care setting as relevant to their role;

2. identify IPC core components and minimum requirements that need improvement in practice;
3. communicate to the IPC focal point or team about their need for support in delivering clean and safe care.

Recommended tools and resources

Guidelines on core components of infection prevention and control programmes at the national and acute health care facility level. Geneva: World Health Organization; 2016 (<https://iris.who.int/handle/10665/251730>, accessed 17 April 2024).

Improving infection prevention and control at the health facility: an interim practical manual supporting implementation of the WHO guidelines on core components of infection prevention and control programmes. Geneva: World Health Organization; 2018 (<https://iris.who.int/handle/10665/279788>, accessed 17 April 2024).

Minimum requirements for infection prevention and control programmes. Geneva: World Health Organization; 2019 (<https://iris.who.int/handle/10665/330080>, accessed 17 April 2024).

What are the core components for effective infection prevention and control? Geneva: World Health Organization; 2017 (<https://www.who.int/multi-media/details/what-are-the-core-components-for-effective-infection-prevention-and-control>, accessed 17 April 2024).

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◆ 4.2 Health care facility built environment, infrastructure and building requirements to support IPC

The built environment, equipment and materials are a core component for effective IPC programmes in health care facilities. Indeed, there is a critical relationship between the physical structure of health care settings and the effectiveness of IPC measures. The built environment, including architectural design, water, sanitation and hygiene (WASH) and ergonomics, has a foundational role in enabling IPC practices. Key considerations include the importance of designing health care facilities to support hygiene practices, such as hand hygiene, environmental cleaning and waste management, as well as the significance of ergonomics and human factors in facilitating compliance with IPC measures and in preventing HAIs and AMR. In addition, some HAIs (such as Legionellosis and invasive aspergillosis) can derive from risks associated with the construction, renovation and maintenance of health care buildings. Therefore, in construction, renovation, maintenance and design projects, consideration needs to be given on how and when to incorporate IPC measures to reduce potential HAI risks.

This content is applicable to facility managers, IPC link nurses, and doctors and staff responsible for supervising and/or performing facility maintenance.

Learning aims

On completion of this section, the learner will be able to explain the importance of how having the right equipment and a well-planned and maintained built environment is essential to the effective implementation of IPC practices and advocate for and/or apply these considerations to enable the provision of quality care and prevention of HAIs.

Learning outcomes

Knowledge

The learner will be able to:

1. examine the relationship between the built environment and IPC;
2. assess how the design and infrastructure of health care facilities impact on the implementation and effectiveness of IPC measures, including the prevention of HAIs and AMR;
3. discuss the critical importance of equipment, WASH infrastructure and ergonomic design in supporting IPC practices, enhancing HCW compliance, and promoting patient and staff safety;
4. evaluate current health care facility designs and infrastructure for IPC efficacy.

Skills

The learner will be able to:

1. apply principles of IPC-friendly design in planning and maintaining health care environments, (including heating, ventilation and air conditioning systems) and propose role-relevant interventions or modifications to the physical environment of health care

settings that enhance IPC practices, including improvements in WASH facilities, ergonomic adjustments, and spatial reconfigurations;

2. advise on the need for appropriate materials, equipment and supplies relevant for IPC practices and their continuous procurement;
3. identify areas that support or hinder IPC efforts and suggest improvements as relevant to their role;
4. support the implementation of ergonomic solutions that facilitate the adherence to IPC protocols by HCWs, such as optimizing the layout of medical equipment and supplies for safer, more efficient use.

Recommended tools and resources

ASHE ICRA 2.0™ toolkit. Chicago: American Society for Hospital Engineering; 2024 (<https://www.ashe.org/icra2>, accessed 17 April 2024).

Guide to local production: WHO-recommended handrub formulations. Geneva: World Health Organization; 2010 (<https://iris.who.int/handle/10665/332005>, accessed 17 April 2024).

Public Health Ontario. Construction, Renovation, Maintenance and Design (CRMD). 2023 (<https://www.publichealthontario.ca/en/Health-Topics/Infection-Prevention-Control/CRMD>, accessed 17 April 2024).

WASH FIT training modules. WASH in health care facilities. World Health Organization; United Nations Children's Fund; 2024 (<https://www.washinhcf.org/wash-fit-training-modules/>, accessed 17 April 2024).

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Adams J, Bartram J, Chartier Y, editors. Essential environmental health standards in health care. Geneva: World Health Organization; 2008 (https://iris.who.int/bitstream/handle/10665/43767/9789241547239_eng.pdf, accessed 24 April 2024).

Guidelines on core components of infection prevention and control programmes at the national and acute health care facility level. Geneva: World Health Organization; 2016 (<https://iris.who.int/handle/10665/251730>).

Improving infection prevention and control at the health facility: interim practical manual supporting implementation of the WHO guidelines on core components of infection prevention and control programmes. Geneva: World Health Organization; 2018 (<https://iris.who.int/handle/10665/279788>).

Infection prevention and control core competencies for health care providers. Updated consensus document. Winnipeg: Infection Prevention and Control (IPAC) Canada; 2022 (https://ipac-canada.org/photos/custom/pdf/IPAC_CoreCompetencies_2022_web.pdf, accessed 17 April 2024).

Infection prevention and control education framework. NHS England, 7 March 2023 (<https://www.england.nhs.uk/long-read/infection-prevention-and-control-education-framework/>, accessed 16 April 2024).

Minimum requirements for infection prevention and control programmes. Geneva: World Health Organization; 2019 (<https://iris.who.int/handle/10665/330080>, accessed 17 April 2024).

Natural ventilation for infection control in healthcare settings. Geneva: World Health Organization; 2021 (<https://apps.who.int/iris/handle/10665/44167>, accessed 17 April 2024).

Prevention of hospital-acquired infections: a practical guide. 2nd ed. World Health Organization Department of Communicable Disease, Surveillance and Response; 2002 (https://iris.who.int/bitstream/handle/10665/67350/WHO_CDS_CSR_EPH_2002.12.pdf, accessed 24 April 2024).

Roadmap to improve and ensure good indoor ventilation in the context of COVID-19. Geneva: World Health Organization; 2021 (<https://iris.who.int/handle/10665/339857>, accessed 24 April 2024).

Technical report. Infectious disease treatment center. Geneva: World Health Organization; 2022 (https://cdn.who.int/media/docs/default-source/documents/emergencies/initiate-idtm-technical-report_20231016.pdf?sfvrsn=954ada81_1&download=true, accessed 24 April 2024).

◆ 4.3 Medical device reprocessing

The effective decontamination and reprocessing of instruments and medical devices plays a very important role in the prevention of HAIs. The processes of medical device reprocessing are complex, requiring specific infrastructure, equipment, knowledge and processes. Some key considerations include the use of proper PPE, dedicated decontamination areas, adherence to SOPs, and regular validation of sterilization methods to maintain a clean and safe environment. It is critical for staff working in these areas to be knowledgeable about the overall procedures for managing decontamination and reprocessing of medical devices in order not only to provide safe patient care, but also for the safety of staff performing these duties.

This content is applicable for those working in and/or supervising/managing departments where decontamination and reprocessing of medical instruments takes place, as well as IPC link nurses and doctors.

Learning aims

On completion of this section, the learner will be able to explain the principles and procedures involved in medical device reprocessing and apply these practices to provide safe equipment for use in the delivery of patient care.

Learning outcomes

Knowledge

The learner will be able to:

1. describe decontamination and the Spaulding classification;
2. explain the process of reprocessing single-use medical devices;
3. describe the layout and flow of the decontamination unit;
4. describe the importance of, and appropriate methods for cleaning medical devices;
5. outline best practices for the inspection, assembly and packaging of medical devices;
6. explain the various elements of the validation process for sterilization;
7. describe the various methods of disinfection and sterilization;
8. explain the process for the receipt, storage and transportation of clean and sterile medical devices.

Skills

The learner will be able to:

1. perform appropriate cleaning and disinfection or sterilization of reusable equipment to prevent cross-contamination;
2. conduct thorough inspections, accurately assemble, and securely package medical devices for sterilization following best practices to ensure that devices are safe for patient use;
3. perform quality assurance procedures appropriate to the type of reprocessing procedure and equipment, according to best practice and local policy;

4. perform a risk assessment to determine if and how to reprocess single-use medical devices.

Recommended tools and resources

Decontamination and reprocessing of medical devices for health care facilities: aide-memoire. Geneva: World Health Organization; 2022 (<https://iris.who.int/handle/10665/364587>, accessed 17 April 2024).

Decontamination and sterilization of medical devices (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-DECON-EN>, accessed 17 April 2024).

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Decontamination and reprocessing of medical devices for health-care facilities. Geneva: World Health Organization; Pan American Health Organization, 2016 (<https://iris.who.int/handle/10665/250232>, accessed 17 April 2024).

◆ 4.4 Central venous catheter- associated bloodstream infection prevention

Central venous catheters (CVCs) are commonly used in health care delivery worldwide. Use of these devices increases a patient's risk for developing BSIs and other local infections at the insertion site. It is important for HCWs to learn about these specific types of infections, recommended best practices for insertion, maintenance and removal, and ways to achieve effective implementation to prevent HAIs.

This content is relevant to HCWs providing direct care to patients, with responsibilities for inserting, maintaining and removing CVC, those in supervisory positions in direct care areas and IPC link persons.

Learning aims

On completion of this section, the learner will be able to describe evidence-based best practices required for the insertion, access, maintenance, and removal of CVCs and apply them to prevent BSI and other associated infections.

Learning outcomes

Knowledge

The learner will be able to:

1. discuss the infection risks associated with the use of CVCs;
2. describe the role of an aseptic technique and other evidence-based practices for the appropriate insertion, access, maintenance, and removal of CVCs to prevent BSI and other infections associated with these catheters as relevant to their role and workplace;
3. discuss signs and symptoms of BSI and catheter site infection to help early identification and treatment;
4. describe multimodal strategies, bundles and checklists to effectively implement best practices for the prevention of BSI and other infections associated with CVCs.

Skills

The learner will be able to:

1. conduct risk assessments for infections associated with CVCs and implement preventive measures that align with their specific role and workplace guidelines;
2. apply aseptic techniques and other evidence-based practices in the insertion and maintenance of CVCs to prevent the risk of BSIs and related complications;
3. demonstrate the ability to recognize the early signs and symptoms of BSI and catheter site infections and initiate prompt, appropriate interventions to manage these infections;
4. actively participate in the implementation of multimodal strategies, bundles and checklists for the prevention of BSI and other infections associated with CVCs;
5. teach patients/families/visitors the importance of safe handling of the CVC to prevent infections, as well as signs and symptoms of infection and how to report them.

Recommended tools and resources

Bloodstream infections (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/BSI-EN>, accessed 17 April 2024).

Central venous catheter-observation. Atlanta, GA: Centers for Disease Control and Prevention (<https://www.cdc.gov/infectioncontrol/pdf/QUOTS/Central-Venous-Catheter-Observation-P.pdf>, accessed 23 April 2024).

My 5 moments for hand hygiene. Focus on caring for a patient with a peripheral venous catheter. Geneva: World Health Organization; 2015 (<https://www.who.int/multi-media/details/my-5-moments-for-hand-hygiene-focus-on-caring-for-a-patient-with-a-peripheral-venous-catheter>, accessed 17 April 2024).

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Buetti N, Marschall J, Drees M, Fakhri MG, Hadaway L, et al. Strategies to prevent central line-associated bloodstream infection in acute care hospitals. 2022 update. *Infect Control Hosp Epidemiol.* 2022; 43(5): 553-569 (DOI: <https://doi.org/10.1017/ice.2022.87>, accessed 17 April 2024).

◆ 4.5 Ventilator-associated pneumonia prevention

Ventilator-associated pneumonia (VAP) is a lung infection that develops in a patient who is under mechanical ventilation. A ventilator is a machine that is used to help a patient breathe by giving oxygen through a tube placed in a patient's mouth or nose, or through a hole at the front of the neck. VAP is one of the most frequent types of HAIs, and leads to increased mortality, morbidity, hospital stay, economic and psychological costs for patients and their families. The use of evidence-based best practices for the insertion of ventilation tubes, the functioning of ventilation machines and care of patients who are under mechanical ventilation through implementation of multimodal strategies, including bundles and checklists, prevents VAP.

This content is relevant to HCWs providing direct care to patients requiring mechanical ventilation, those in supervisory positions in direct care areas and IPC link persons.

Learning aims

On completion of this section, the learner will be able to discuss the role of HCWs workers in VAP prevention and apply best practice interventions to prevent its occurrence.

Learning outcomes

Knowledge

The learner will be able to:

1. discuss the risk factors, clinical presentation and complications of VAP;
2. describe the clinical and laboratory diagnosis of VAP;
3. explain key IPC measures to prevent VAP;
4. describe multimodal strategies, including bundles and checklists to effectively implement best practices for the prevention of VAP.

Skills

The learner will be able to:

1. conduct risk assessments for VAP and implement VAP preventive measures that align with their specific role and workplace guidelines;
2. demonstrate the ability to recognize the signs and symptoms and other criteria identifying VAP;
3. actively participate in the implementation of multimodal strategies, bundles and checklists for the prevention of VAP;
4. teach patients/families/visitors the importance of preventing VAP.

Recommended tools and resources

Klompas M, Branson R, Cawcutt K, Crist M, Eichenwald EC, Greene LR, et al. Strategies to prevent ventilator-associated pneumonia, ventilator-associated events, and nonventilator hospital-acquired pneumonia in acute-care hospitals: 2022 update. *Infect Control Hosp Epidemiol.* 2022; 43(6):687-713 (DOI: <https://doi.org/10.1017/ice.2022.88>, accessed 17 April 2024).

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Healthcare-associated infections (HAI): ventilator-associated pneumonia (VAP). Atlanta, GA: Centers for Disease Control and Prevention; 2010 (<https://www.cdc.gov/hai/vap/vap.html>, accessed 17 April 2024).

◆ 4.6 Surgical site infection prevention

Surgical site infections (SSI) are a serious problem globally. They are the most frequent type of HAI reported in low- and middle-income countries and approximately one in 10 patients who have surgery in these countries acquire an SSI. Notably, SSI is reported as the second most common HAI in Europe and the United States of America. Therefore, it is crucial to implement SSI prevention activities in all surgical departments and clinics, including outpatient settings.

This content is relevant to HCWs performing surgical procedures, providing direct care to pre- and postoperative patients, those in supervisory positions in direct care areas and IPC link persons.

Learning aims

On completion of this section, the learner will be able to explore topics related to SSI, describe evidence-based best practices for SSI prevention and apply them as relevant to their role.

Learning outcomes

Knowledge

The learner will be able to:

1. understand the risk factors that contribute to determine SSI;
2. discuss the signs and symptoms of an SSI;
3. describe the potential complications of an SSI;
4. describe the WHO SSI prevention recommendations and understand the evidence supporting the recommendations.
5. describe multimodal strategies, including bundles and checklists to effectively implement best practices for the prevention of SSI.

Skills

The learner will be able to:

1. conduct risk assessments for SSI;
2. demonstrate the ability to recognize signs and symptoms and other criteria identifying SSI;
3. select appropriate antimicrobials for the prophylaxis and treatment of SSI when indicated;
4. apply WHO-recommended SSI prevention measures and integrate them into daily procedures according to their specific role and practices;
5. actively participate in the implementation of multimodal strategies, bundles and checklists for the prevention of SSI;
6. teach patients/families/visitors the importance of appropriate management of the surgical wound to prevent infections, as well as signs and symptoms of infection and how to report them.

Recommended tools and resources

Do the right thing at the right time to stop surgical site infections [Infographic]. Geneva: World Health Organization; 2018 (<https://www.who.int/multi-media/details/do-the-right-thing-at-the-right-time-to-stop-surgical-site-infections>, accessed 18 April 2024).

Implementation manual to support the prevention of surgical site infections at the facility level - turning recommendations into practice (interim version). Geneva: World Health Organization; 2018. (<https://www.who.int/publications/i/item/WHO-HIS-SDS-2018-18>, accessed 23 April 2024).

Surgical site infections. Geneva: World Health Organization; 2024 (<https://www.who.int/teams/integrated-health-services/infection-prevention-control/surgical-site-infection>, accessed 18 April 2024).

Surgical site infections (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-SSI-EN>, accessed 18 April 2024).

Toolkit to improve safety in ambulatory surgery centers. Rockville, MD: Agency for Healthcare Research and Quality; 2023 (<https://www.ahrq.gov/hai/tools/ambulatory-surgery/index.html>, accessed 18 April 2024).

Toolkit to promote safe surgery. Rockville, MD: Agency for Healthcare Research and Quality; 2017 (<https://www.ahrq.gov/hai/tools/surgery/index.html>, accessed 18 April 2024).

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Allegranzi B, Aiken AM, Kubilay NZ, Nthumba P, Barasa J, Okumu G, et al. A multimodal infection control and patient safety intervention to reduce surgical site infections in Africa: a multicentre, before–after, cohort study. *Lancet Infect Dis* 2018;18: 507-515 (DOI: [https://doi.org/10.1016/S1473-3099\(18\)30107-5](https://doi.org/10.1016/S1473-3099(18)30107-5), accessed 18 April 2024).

Calderwood MS, Anderson DJ, Bratzler DW, Dellinger EP, Garcia-Houchins S, Maragakis LL, et al. Strategies to prevent surgical site infections in acute care hospitals: 2022 update. *Infect Control Hosp Epidemiol.* 2023;44(5):695-720 (DOI: <https://doi.org/10.1017/ice.2023.67>, accessed 18 April 2024).

Global guidelines for the prevention of surgical site infection. 2nd ed. Geneva: World Health Organization; 2018 (<https://iris.who.int/handle/10665/277399>, accessed 18 April 2024).

◆ 4.7 Prevention of other specific HAIs

This section covers additional specific HAIs, such as hospital-acquired pneumonia (HAP) and infectious gastroenteritis, such as those caused by *Clostridioides difficile* and norovirus, which are of concern not only in hospital settings, but also in, long-term care and other congregate living facilities.

Norovirus infections spread very rapidly, with health care facilities and other institutional settings being particularly at risk for outbreaks due to increased person-to-person contact. *C. difficile* is similarly of concern in health care settings (hospital and long-term care) and is linked to antibiotic use, environmental contamination and poor hand hygiene practices. Early detection and an effective response to cases and outbreaks of *C. difficile* and norovirus are essential to ensure the rapid containment and prevention of further spread.

Pneumonia is another commonly occurring infection acquired during hospitalization, often due to older age, depressed consciousness, aspiration and colonization of the oropharynx, as well as other risk factors.

There are prevention strategies that can be implemented for each of these commonly occurring HAIs to help identify those at risk and to minimize the risk to the patient of acquiring these infections while receiving health care.

This content is relevant to HCWs providing direct care to patients, those in supervisory positions in direct care areas, and IPC link persons.

🎯 Learning aims

On completion of this section, the learner will be able to explore specific HAIs, including the epidemiology of hospital-acquired pneumonia, infections due to *C. difficile* and norovirus, the related specific IPC measures, and the impact of AMS on the incidence of *C. difficile*, and apply IPC practices to decrease the risk to acquiring these infections.

🧩 Learning outcomes

⚙️ Knowledge

The learner will be able to:

1. describe the epidemiology of hospital-acquired pneumonia, *C. difficile* and norovirus, including modes of transmission and high-risk populations;
2. discuss specific measures to prevent respiratory infections, including pneumonia;
3. discuss specific IPC measures to prevent *C. difficile* and norovirus;
4. explain the role of AMS in reducing the incidence of *C. difficile* infection and discuss strategies to promote its implementation;
5. identify the steps for the early recognition and response to suspected outbreaks of *C. difficile* and norovirus;

Skills

The learner will be able to:

1. apply preventive measures for pneumonia, such as hand hygiene, oral care, early mobilization interventions, treatment of dysphagia and influenza prevention;
2. apply preventive measures for C. difficile and norovirus, such as hand hygiene and the use of PPE, and carry out environmental decontamination techniques;
3. contribute to and promote AMS initiatives within their health care setting/s;
4. inform patients/families/visitors about the signs and symptoms of these infections and how to report them and teach them to perform relevant prevention measures.

Recommended tools and resources

Guideline for the Prevention and Control of Norovirus Gastroenteritis Outbreaks in Healthcare Settings. Atlanta, GA: Centers for Disease Control and Prevention; 2011 (<https://www.cdc.gov/infectioncontrol/guidelines/norovirus/index.html>, accessed 23 April 2024).

Klompas M, Branson R, Cawcutt K, Crist M, Eichenwald EC, Greene LR, et al. Strategies to prevent ventilator-associated pneumonia, ventilator-associated events, and nonventilator hospital-acquired pneumonia in acute-care hospitals: 2022 update. *Infect Control Hosp Epidemiol.* 2022; 43(6):687-713 (DOI: <https://doi.org/10.1017/ice.2022.88>, accessed 17 April 2024).

Kociulek LK, Gerding DN, Carrico R, Carling P, Donskey CJ, Dumyati G, et al. Strategies to prevent *Clostridioides difficile* infections in acute-care hospitals: 2022 update. *Infect Control Hosp Epidemiol.* 2023;44(4):527-549 (DOI: <https://doi.org/10.1017/ice.2023.18>, accessed 18 April 2024).

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Jarvis WR, editor. *Bennett & Brachman's hospital infections*, seventh edition. Lippincott Williams & Wilkins; 2022.

Wiegand PN, Nathwani D, Wilcox MH, Stephens J, Shelbaya A, Haider S. Clinical and economic burden of *Clostridium difficile* infection in Europe: a systematic review of healthcare-facility-acquired infection. *J Hosp Infect.* 2012;81(1):1-14 (DOI: <https://doi.org/10.1016/j.jhin.2012.02.004>, accessed 18 April 2024).

◆ 4.8 Additional concepts of antimicrobial stewardship

Antimicrobial resistance (AMR) poses a significant challenge to global health, threatening our capability to effectively manage infections and jeopardising human progress. As the efficacy of treatments against HAIs diminishes due to a rise in AMR, the implementation of IPC measures becomes ever more critical. When coupled with AMS programmes, these measures are crucial in preventing HAI and reducing AMR. AMS ensures the optimal use of antimicrobials to improve patient outcomes, while limiting the risk of adverse events (including AMR). One of the elements to sustainably reduce inappropriate antimicrobial use is to achieve a correct diagnosis of the microorganisms causing the infection. Therefore, diagnostic stewardship is critical to support AMS.

This content is applicable to facility managers responsible for supporting AMS activities, as well as prescribers and clinical practitioners supporting AMS activities.

Learning aims

On completion of this section, the learner will be able to explain the concepts of AMS, apply various AMS interventions in their health care setting, and contribute to monitor them.

Learning outcomes

Knowledge

The learner will be able to:

1. discuss the implications of AMR across global, national and facility levels and to understand the relation between AMS and IPC, including a wider knowledge of the “OneHealth” approach and its importance;
2. discuss the core elements of an AMS programme, including the key players to create an AMS team and the main interventions that can be implemented to decrease AMR, in a way that is contextually relevant to their role (for example, the difference between broad- and narrow-spectrum antimicrobials and/or the role broad-spectrum antibiotics play in AMR);
3. describe various AMS interventions possible in their own health care facility;
4. identify the main barriers to the implementation of AMS activities, including basic concepts of behavioural change theories to increase compliance among HCWs;
5. explain the basic principles of antibiograms and other reporting tools for informing treatment decisions and IPC strategies;
6. identify relevant antimicrobial treatment guidelines at the national or health care facility level;
7. as relevant to their role, describe the principles and practice of diagnostic stewardship (such as, appropriate choice of investigations, collection, transportation and reporting of microbiological samples, and accurate test results) and referring to feasible laboratory investigations in their setting to sustainably contribute to reducing inappropriate antimicrobial use.

Skills

The learner will be able to:

1. consistently apply the principles of good practice in the use and stewardship of antimicrobials, as relevant to their role;
2. support the AMS team in conducting point prevalence surveys and performing audits for antimicrobial use in healthcare facilities;
3. detect barriers to AMS and seek advice and support from the AMS team;
4. support training programmes for various cadres of HCWs on AMR and AMS.

Recommended tools and resources

Antimicrobial resistance and infection prevention and control (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-AMR-EN>, accessed 18 April 2024).

Antimicrobial stewardship: A competency-based approach (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/AMR-competency>, accessed 18 April 2024).

Antimicrobial stewardship programmes in health-care facilities in low- and middle-income countries: a WHO practical toolkit (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/practical-toolkit-for-AMS>, accessed 18 April 2024).

WHO policy guidance on integrated antimicrobial stewardship (AMS) activities (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/policy-guidance-on-AMS>, accessed 18 April 2024).

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Antimicrobial stewardship programmes in health-care facilities in low- and middle-income countries. A practical toolkit. Geneva: World Health Organization; 2019 (<https://iris.who.int/handle/10665/329404>, accessed 24 April 2024).

Core elements of human antibiotic stewardship programs in resource-limited settings: national and hospital levels. Atlanta, GA: Centers for Disease Control and Prevention; 2023 (<https://www.cdc.gov/antibiotic-use/core-elements/resource-limited.html>, accessed 18 April 2024).

Courtenay M, Castro-Sánchez E, editors. Antimicrobial stewardship for nursing practice. CABI; 2020.

Nampoothiri V, Bonaconsa C, Surendran S, Mbamalu O, Nambatya W, Ahabwe Babigumira P, et al. What does antimicrobial stewardship look like where you are? Global narratives from participants in a massive open online course. JAC-Antimicrobial Resistance. 2022;4(1):dlab186. (<https://doi.org/10.1093/jacamr/dlab186>, accessed 18 April 2024).

Promoting antimicrobial stewardship to tackle antimicrobial resistance. Copenhagen: World Health Organization. Regional Office for Europe; 2024: (<https://www.who.int/europe/activities/promoting-antimicrobial-stewardship-to-tackle-antimicrobial-resistance>, accessed 24 April 2024).

The WHO AWaRe (access, watch, reserve) antibiotic book. Geneva: World Health Organization; 2022 (<https://iris.who.int/handle/10665/365237>, accessed 24 April 2024).

◆ 4.9 Leadership

Leadership is a prerequisite for the successful implementation of IPC practices and interventions, related ultimately to improving the quality of health service delivery and the outcomes of those receiving care. Strong leadership skills enable health care professionals to develop and enforce evidence-based IPC guidelines, ensure the provision of training, and make data-driven decisions. Leadership is necessary to advocate for necessary resources, such as adequate WASH facilities and supplies, fostering a culture of safety and quality in health service delivery.

This content is applicable to facility managers and/or supervisors who are responsible for making decisions related to financial and resource investments as well as to IPC link doctors and nurses. It is also applicable to those with responsibilities for taking a lead in advocating for IPC programmes and/or patient safety and quality of care programmes that impact on the prevention of infections among patients and HCWs.

Learning aims

On completion of this section, the learner will be able to explore the knowledge and skills required to be a leader who ensures that the quality of health service delivery remains high and to play a leadership role to support implementation of IPC interventions, as applicable to their role, in health care settings.

Learning outcomes

Knowledge

The learner will be able to:

1. develop leadership competencies for IPC in order to support IPC programmes effectively, ensuring the development, enforcement and continual improvement of evidence-based IPC guidance and interventions;
2. foster the skills necessary for HCWs to advocate for and secure critical resources and supplies, including adequate WASH facilities;
3. analyze the role of leadership in enhancing the quality and safety of health service delivery;
4. train HCWs to utilize leadership skills for making informed, data-driven decisions that improve IPC practices, patient outcomes, and overall health care quality.

Skills

The learner will be able to:

1. demonstrate skills in guiding teams towards the achievement of IPC goals and fostering a culture of safety and excellence in health service delivery;
2. develop advocacy skills to effectively secure the necessary resources for IPC, using leadership to negotiate and ensure the availability of a critical infrastructure and supplies;
3. apply data-driven leadership skills in IPC, making informed decisions that enhance the effectiveness of IPC measures and contribute to overall health care quality;

4. champion IPC initiatives, tailoring their messaging to effectively convey the critical role of IPC in improving patient safety and health care outcomes.

Recommended tools and resources

IPC leadership. Geneva: World Health Organization; 2028 (<https://www.who.int/multi-media/details/ipc-training-video---with-keywords>, accessed 22 April 2024).

IPC training: leadership and programme management in infection prevention and control module. Geneva: World Health Organization; 2018 (<https://www.who.int/teams/integrated-health-services/infection-prevention-control/core-components>, accessed 18 April 2024).

Leadership and programme management in Infection Prevention and Control (IPC) (OpenWHO). Geneva: World Health Organization; 2021 (<https://openwho.org/courses/IPC-leadership-EN>, accessed 23 April 2024).

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Infection prevention and control training package. Application of IPC: leadership and programme management. World Health Organization; United States Centers for Disease Control and Prevention; University of Washington Global Health E-Learning Program; 2024 (<https://ipc.ghelearning.org/courses>, accessed 18 April 2024).

IPC training: leadership and programme management in infection prevention and control module. Geneva: World Health Organization; 2018 (<https://www.who.int/teams/integrated-health-services/infection-prevention-control/core-components>, accessed 18 April 2024).

◆ 4.10 Importance and basic principles of HAI and AMR surveillance and feedback

Surveillance provides essential data for decision-making, policy development and tailoring IPC interventions based on the occurrence and microbiological profiles of pathogens.

Conducting HAI and AMR surveillance is crucial to establish baseline infection rates, identify increases or outbreaks, evaluate the efficacy of IPC measures, reinforce proper IPC practices, engage in problem-solving, measure the impact of recommendations, enhance performance, and reduce risks associated with HAI and AMR.

Health care professionals in specific clinical areas should understand the importance of conducting HAI and AMR surveillance and consult with IPC practitioners to stay informed about the local situation and need for reducing specific HAIs and/or AMR spread, thereby contributing to reduce the risk of harm to patients.

It is also important to understand how this information can be used to inform decision-making and policy.

This content is applicable to IPC link doctors and nurses, as well as facility managers and supervisors with responsibilities for making decisions to support surveillance data collection and sharing and interventions to reduce HAI and AMR risk in the facility.

Learning aims

On completion of this section, the learner will be able to explore the importance of both HAI and AMR surveillance and acquire the basic principles of surveillance and feedback opportunities in order to use surveillance data to improve quality of care in their health care setting.

Learning outcomes

Knowledge

The learner will be able to:

1. explain key principles and methods for HAI and AMR surveillance;
2. explain the role of surveillance in identifying clusters, outbreaks, new or emerging infectious threats, and for quality improvement;
3. consult with an IPC professional (or designate) regarding the local HAI and AMR situation and implementation of related preventive practices and/or precautions.

Skills

The learner will be able to:

1. consult with the IPC professional (or designate) to identify the HAI rates for their facility/ unit(s)/area(s), as applicable;

2. explain indicators of infection and report unusual occurrences;
3. articulate their role in HAI surveillance within their facility;
4. provide feedback related to HAI surveillance activities as relevant to their role;

Recommended tools and resources

Guidelines on core components of infection prevention and control programmes at the national and acute health care facility level. Geneva: World Health Organization; 2016 (<https://iris.who.int/handle/10665/251730>)

Health-care-associated infection surveillance (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-HAI-EN>, accessed 18 April 2024).

Improving infection prevention and control at the health facility: interim practical manual supporting implementation of the WHO guidelines on core components of infection prevention and control programmes. Geneva: World Health Organization; 2018 (<https://iris.who.int/handle/10665/279788>, accessed 24 April 2024).

Protocol for surgical site infection surveillance with a focus on settings with limited resources. Geneva: World Health Organization; 2018 (<https://www.who.int/publications/i/item/protocol-for-surgical-site-infection-surveillance-with-a-focus-on-settings-with-limited-resources>, accessed 24 April 2024).

Surgical site infection monitoring tools. Geneva: World Health Organization (<https://www.who.int/teams/integrated-health-services/infection-prevention-control/surgical-site-infection>).

Surgical site infection training tools. Geneva: World Health Organization (<https://www.who.int/teams/integrated-health-services/infection-prevention-control/surgical-site-infection>).

WHO multimodal improvement strategy. Geneva: World Health Organization; 2017 (<https://www.who.int/publications/m/item/who-multimodal-improvement-strategy>, accessed 24 April 2024).

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Health-care-associated infection surveillance (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-HAI-EN>, accessed 18 April 2024).

Infection prevention and control core competencies for health care providers. Updated consensus document. Winnipeg: Infection Prevention and Control (IPAC) Canada; 2022 (https://ipac-canada.org/photos/custom/pdf/IPAC_CoreCompetencies_2022_web.pdf, accessed 16 April 2024).

Infection prevention and control education framework. NHS England, 7 March 2023 (<https://www.england.nhs.uk/long-read/infection-prevention-and-control-education-framework/>, accessed 16 April 2024).

◆ 4.11 Facility outbreak investigation and response

When an outbreak occurs within the facility, it is the responsibility of the outbreak management team to help identify and investigate the source of that outbreak, mitigate transmission, and prevent its recurrence. Health care professionals need to be aware of and adhere to local outbreak protocols, recognize infection indicators and clusters, investigate sources/causes, and effectively implement control measures within their scope of practice.

This content is relevant to IPC link doctors and nurses, as well as facility managers and supervisors who have a role in leading and/or supporting outbreak management.

Learning aims

On completion of this section, the learner will explain the principles of outbreak investigation, management and response and apply them in practice.

Learning outcomes

Knowledge

The learner is able to:

1. identify local protocols and practices used to manage outbreaks and unusual clusters of microorganisms;
2. identify their role in the outbreak response;
3. list indicators of infection and report unusual disease occurrences or clusters and disease outbreaks.

Skills

The learner is able to:

1. apply practices in local outbreak protocols for the identification, investigation and management of outbreaks and unusual clusters of microorganisms;
2. implement control measures within their scope;
3. manage line listing that contains key information about each case in an outbreak.

Recommended tools and resources

Disease outbreak toolboxes. Geneva: World Health Organization; 2024 (<https://www.who.int/emergencies/outbreak-toolkit/disease-outbreak-toolboxes#cleter>, accessed 18 April 2024).

Outbreak investigations in health facilities (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-outbreak>, accessed 18 April 2024).

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Outbreak investigations in health facilities (OpenWHO). Geneva: World Health Organization (<https://openwho.org/courses/IPC-outbreak>, accessed 18 April 2024).

◆ 4.12 Importance and basic principles of monitoring of IPC indicators and feedback

Effective monitoring and reporting of IPC indicators are crucial for ensuring adherence to clinical practice standards, identifying areas for improvement, and enhancing overall patient safety.

Health care professionals should be adept at conducting regular compliance evaluations, such as hand hygiene audits, and consult with IPC practitioners to stay informed about compliance gaps and the need for practice improvements, contributing to the quality of health care services.

This content is applicable to IPC link doctors and nurses, as well as facility managers and supervisors with responsibilities for making decisions to support IPC indicators' monitoring and feedback including interventions to improve compliance with best practices.

Learning aims

On completion of this section, the learner will be able to explain the basic principles of monitoring IPC indicators to assess compliance with standards and best practices as well as the importance of understanding, communicating, and presenting the results through feedback and implementing targeted interventions for improvement.

Learning outcomes

Knowledge

The learner will be able to:

1. identify tools and methods to evaluate compliance with specific best practices to prevent and control HAI and AMR;
2. discuss the importance of feedback to achieve practice change or other process modification;
3. consult with an IPC professional (or designate) regarding compliance with best practices and the implementation of interventions for improvement.

Skills

The learner will be able to:

1. collect data for the relevant monitoring activities as required by their role ;
2. share the data collected with relevant audiences (for example, individuals being audited, hospital management and administration) and identify actions to achieve practice change or other process modifications for quality improvement as relevant to their role.

Recommended tools and resources

Guidelines on core components of infection prevention and control programmes at the national and acute health care facility level. Geneva: World Health Organization; 2016 (<https://iris.who.int/handle/10665/251730>, accessed 18 April 2024).

Hand hygiene monitoring tools. Geneva: World Health Organization (<https://www.who.int/teams/integrated-health-services/infection-prevention-control/hand-hygiene/monitoring-tools>, accessed 18 April 2024).

Hand hygiene training tools. Geneva: World Health Organization (<https://www.who.int/teams/integrated-health-services/infection-prevention-control/hand-hygiene/training-tools>, accessed 18 April 2024).

Improving infection prevention and control at the health facility: interim practical manual supporting implementation of the WHO guidelines on core components of infection prevention and control programmes. Geneva: World Health Organization; 2018 (<https://iris.who.int/handle/10665/279788>).

Surgical site infection monitoring tools. Geneva: World Health Organization (<https://www.who.int/teams/integrated-health-services/infection-prevention-control/surgical-site-infection>, accessed 18 April 2024).

WHO multimodal improvement strategy. Geneva: World Health Organization; 2017 (<https://www.who.int/publications/m/item/who-multimodal-improvement-strategy>, accessed 18 April 2024).

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WHO multimodal improvement strategy. Geneva: World Health Organization; 2017 (<https://www.who.int/publications/m/item/who-multimodal-improvement-strategy>, accessed 18 April 2024).

◆ 4.13 Cost of HAIs and cost-effectiveness of IPC interventions

Infection and AMR spread in health care settings leads to an incalculable burden in terms of human suffering, health impact and economic losses. Thus, preventing infection and its spread has potentially huge benefits in reducing this impact and producing economic advantages.

This section will delve into the economic impact of HAIs on health care systems and patients, highlighting how these infections significantly increase health care costs due to prolonged hospital stays, additional treatments, and other related expenses. It explores the cost-effectiveness of IPC interventions, demonstrating how strategic IPC measures can not only mitigate the risk and incidence of HAIs, but also result in substantial savings for health care facilities by preventing costly complications and enhancing patient outcomes.

This content is especially relevant for facility managers and those who are responsible for making decisions related to financial and resource investments, as well as for those having a leading role in advocating for IPC programmes and/or patient safety and quality of care programmes that impact on the prevention of infections among patients and HCWs. It may also be applicable to IPC link persons interested in learning about this topic.

Learning aims

On completion of this section, the learner will be able to discuss the cost and the cost-effectiveness of IPC interventions and use the related evidence strategically to improve IPC implementation.

Learning outcomes

Knowledge

The learner will be able to:

1. discuss the economic impact of HAIs, that is, the direct and indirect costs associated with HAIs, including prolonged hospital stays, additional treatments, disability, and other related health care expenses;
2. discuss the financial benefits of implementing IPC measures in health care settings, understanding how these interventions lead to cost-effectiveness and savings and better health outcomes;
3. plan to strategically implement effective IPC interventions that can reduce the incidence of HAIs and demonstrate a positive return on investment.

Skills

The learner will be able to:

1. contribute to develop and implement strategic IPC plans that are tailored to their health care settings, aiming at reducing the prevalence of HAIs and their associated costs;
2. communicate the importance of IPC measures to stakeholders and advocate for the allocation of resources towards IPC initiatives based on their cost-effectiveness and potential to improve patient outcomes;

3. evaluate the effectiveness of IPC interventions, making data-driven decisions to adapt strategies in order to optimize both health outcomes and cost savings.

Recommended tools and resources

Addressing the burden of infections and AMR associated with health care. Geneva: Organisation for Economic Co-operation and Development; World Health Organization; 2022 (<https://www.oecd.org/health/Addressing-burden-of-infections-and-AMR-associated-with-health-care.pdf>, accessed 16 April 2024).

Embracing a One Health framework to fight antimicrobial resistance. Paris: Organisation for Economic Co-operation and Development. 2023 (<https://www.oecd.org/els/embracing-a-one-health-framework-to-fight-antimicrobial-resistance-ce44c755-en.htm>, accessed 18 April 2024).

Global report on infection prevention and control. Geneva: World Health Organization; 2022 (<https://iris.who.int/handle/10665/354489>, accessed 18 April 2024).

Global strategy on infection prevention and control. Geneva: World Health Organization; 2023 (<https://iris.who.int/handle/10665/376751>, accessed 13 May 2024).

Resource considerations for investing in hand hygiene improvement in health care facilities. Geneva: World Health Organization. 2021 (<https://iris.who.int/handle/10665/341128>, accessed 18 April 2024).

WHO costing and budgeting tool for national action plans on antimicrobial resistance. Geneva: World Health Organization. 2023 (<https://www.who.int/teams/surveillance-prevention-control-AMR/who-amr-costing-and-budgeting-tool>, accessed 18 April 2024).

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Drug-resistant infections: a threat to our economic future. Vol. 2. Final report. Washington, DC: International Bank for Reconstruction and Development/The World Bank. 2017 (<https://documents1.worldbank.org/curated/en/323311493396993758/pdf>, accessed 18 April 2024).

ECDC. Economic evaluations of interventions to prevent healthcare-associated infections. Stockholm: European Centre for Disease Prevention and Control; 2017. (<https://www.ecdc.europa.eu/en/publications-data/economic-evaluations-interventions-prevent-healthcare-associated-infections>, accessed 18 April 2024).

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Özçelik E, Lerouge A, Cecchini M, Cassini A, Allegranzi B. Estimating the return on investment of selected infection prevention and control interventions in healthcare settings for preparing against novel respiratory viruses: modelling the experience from SARS-CoV-2 among health workers. *EclinicalMedicine*. 2024;68:102388 (DOI: <https://doi.org/10.1016/j.eclinm.2023.102388>, accessed 18 April 2024).

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;23:E228-E239 (DOI: [https://doi.org/10.1016/S1473-3099\(22\)00877-5](https://doi.org/10.1016/S1473-3099(22)00877-5), accessed 18 April 2024).

5.

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**Teaching strategies
and methods**

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5. Teaching strategies and methods

Adult learners often seek out learning when they identify a need to enhance their knowledge or skills and there are clear objectives to meet as noted in each section of this curriculum. They prefer to learn through experiential learning and specific scenarios, in parallel with independent learning so they can engage with this at times that suit their needs (8).

Adult learners thrive with the use of a variety of teaching and learning approaches using a blended learning format where training is delivered both in-person and/or through live online delivery (actively engaging with others at the same time [synchronous learning]) or through independent study at times that suit participants (asynchronous learning). Through using formative assessment activities in parallel to the teaching, learning can be assessed as participants progress.

There are some principles that should underpin the choice of approaches.

Inclusivity – it is important that the teaching and learning approaches used support all individuals to engage and enable learning in a manner that most suits them. This does mean using the full range of teaching approaches and resources that are available.

Accessibility – it is important that training and education is made available and accessible to all those working in health care settings.

Authenticity – where possible, the teaching and learning approaches used should reflect “real-world” practice to ensure that those engaging with learning see the relevance of the teaching and learning approaches they engage in.

Collaboration – where appropriate, approaches that support group work should be used so that participants can share experiences, learn from each other, and practise working with new people and thus encounter new perspectives on problems.

Engagement – the approaches used need to engage participants actively in learning and reflecting on their practice.

Evidence based – the curriculum should provide the evidence to underpin the knowledge and skills needed by participants and give them the confidence to disseminate their learning with a variety of audiences including colleagues, patients and the wider public.

Table 5.1 outlines an overview of possible teaching activities, as well as formative assessment approaches. An additional explanation of each is provided. It is important to remember that for any in-person or live online teaching sessions, the learners’ attention does tend to tire and so changing the activities in these sessions supports maintaining their engagement and attention. This type of learning is known as “synchronous” learning where all students are learning together at the same time. The independent learning activities need to be provided with very clear instructions as students will be doing these on their own and so cannot seek clarification of the activity. This approach to learning is known as “asynchronous” learning.

Table 5.1. Teaching methods

| Activity type | In-person or live online learning activities (synchronous learning) | Independent learning activities (synchronous learning) | Formative assessment tool |
|--|---|--|---|
| <p>Lectures are useful for providing large amounts of information to a whole group, but these should be kept to a limited time and have integrated active learning to keep participants engaged. This should be no more than 15 minutes at a time to ensure that students can focus. Including activities such as quizzes, polls and question and answer sessions enable participants to reflect on learning and assess their knowledge as they progress.</p> | | | |
| Lecture | <p>Face-to-face or online teaching interactive lectures which enable theoretical input.</p> <p>Advantages: all HCWs are together and gain the same information. but can also ask questions to clarify understanding.</p> <p>Limitations: all HCWs need to be available at the same time. which may be expensive in terms of resources and coverage for practice.</p> <p>Resources: lecture materials, usually PowerPoint, use of technology if online (for example, Teams or Zoom), which also may enable the ability to set up quizzes and polls. Materials in terms of case studies/ scenarios.</p> | <p>Review of videos, individual reading, preparation for in-class activities, collecting academic literature or policy documents, using online materials.</p> <p>Advantages: HCWs can do this at times that suit them and can review the materials multiple times to support learning.</p> <p>Limitations: takes longer to gain clarification if unsure. It is not possible to monitor how much learning they are engaging in.</p> <p>Resources: an online learning environment is needed to house these. Videos will need to be made or sourced, and suggested resources to be found. If online materials need to be prepared, the time to do this should be taken into account.</p> | <p>Quizzes, polls, question and answer sessions.</p> <p>Advantages: responses to issues that are unclear can be provided easily and are not time consuming in terms of marking.</p> <p>Limitations: if HCWs are doing these online asynchronously, then clarifying issues is more difficult.</p> <p>Resources: setting up the quizzes/polls can be time consuming and there is a need for an online learning environment to house these.</p> |
| <p>Whole class discussions are useful for brainstorming points, concepts and ideas. They also enable the whole group to share information and learn from each other's experiences or to debate different points of view.</p> | | | |
| Whole class discussions | <p>Brainstorming exercises, sharing information and experiences, debates.</p> <p>Advantages: they provide opportunities for all to share experiences. Do not take much time to prepare and require limited resources.</p> <p>Limitations: HCWs may not be forthcoming in contributing to these. However, the facilitator can encourage contributions using chat functions as well.</p> <p>Resources: A whiteboard to record responses and key points.</p> | <p>Online forums.</p> <p>Advantage: HCWs can contribute at times to suit them. Do not take long to set up.</p> <p>Limitation: need a lot of encouragement and reminders from the facilitator.</p> <p>Resources: resources to encourage engagement and requires an online learning environment to set these up.</p> | <p>Question and answer sessions and posting questions on forums.</p> <p>Advantages: easy to set up and does not require much resources.</p> <p>Limitations: HCWs are often reluctant to use them.</p> <p>Resources: online learning environment.</p> |

| Activity type | In-person or live online learning activities (synchronous learning) | Independent learning activities (synchronous learning) | Formative assessment tool |
|--|--|--|---|
| <p>Group work provides an opportunity for participants to work together in smaller groups, sharing ideas and experience. With smaller groups, there is more opportunity for all to contribute and feel fully engaged.</p> | | | |
| <p>Group work</p> | <p>Group discussions in person or through break-out rooms. Focus on case studies or scenario-based discussions, articles, and sharing practice examples.</p> <p>Advantages: they encourage all HCWs to participate due to the smaller groups and this provides an opportunity to share experiences.</p> <p>Limitations: if the groups are too large, a few participants may dominate the discussions.</p> <p>Resources: case studies and articles need to be sourced, which can take time, but otherwise facilitation is the time spent in the session.</p> | <p>Group work via an online forum or wiki.</p> <p>Advantages: HCWs can do this at times to suit them, but still collaborate with others.</p> <p>Limitations: some HCWs may not engage with this.</p> <p>Resources: need to have an online learning environment to set these up. There is also an accountability for the facilitator to monitor engagement and remind HCWs.</p> | <p>Feedback from group activities.</p> <p>Advantage: easy to do in person or online when this is done synchronously.</p> <p>Limitations: when groups are asked to provide feedback asynchronously and HCWs do not engage.</p> <p>Resources: an online approach needs to be set up and then monitored.</p> |
| <p>Presentations as an individual or group provide an opportunity to summarize learning and present key points from a review of learning materials and sharing of experiences.</p> | | | |
| <p>Presentations</p> | <p>Group/individual presentations in person or through break-out groups focused on a topic or article.</p> <p>Advantages: easier to assess progress in learning, with the possibility to ask questions and clarify points.</p> <p>Limitations: if HCWs do not work on their presentations or do this at the last minute, there is limited information that others can gain.</p> <p>Resources: clear instructions for the presentations.</p> | <p>Preparation for presentations via online communication using an online forum where the presentations can then be recorded and submitted.</p> <p>Advantages: HCWs and groups can work and prepare the videos at times that suit them.</p> <p>Limitations: some HCWs do not contribute to either the preparation work or presentation if in groups.</p> <p>Resources: setting up the forum, but also providing instructions on marking the video, including which technologies they might use and how to submit these.</p> | <p>Group/individual presentations.</p> <p>Advantages: can provide some clear insight into what HCWs have learnt.</p> <p>Limitations: where participants and/or groups do limited work for their presentation or lack valuable information.</p> <p>Resources: facilitator time to listen to the presentations, set up for in-person or online synchronous activity. However, asynchronous presentations will require time to watch the presentations.</p> |

5. Teaching strategies and methods

| Activity type | In-person or live online learning activities (synchronous learning) | Independent learning activities (synchronous learning) | Formative assessment tool |
|---|---|---|---|
| <p>Problem-based learning provides participants with an opportunity to focus on real-world examples of issues and work with others to develop possible solutions.</p> | | | |
| <p>Problem-based learning</p> | <p>Problem-solving exercises that may include exploring case studies' data analysis, gap analysis, and video clip analysis.</p> <p>Advantage: problems can be focused on practice and real-world experiences they may encounter.</p> <p>Limitations: lack of familiarity with the problems or cases used.</p> <p>Resources: need to source the problems or cases and other materials.</p> | <p>Individual reading focused on a problem so that the participants collect information to provide solutions.</p> <p>Advantages: the participant can be exploring the problem at times that suit them and focus on practice and real-world problems.</p> <p>Limitations: if the HCWs work on this alone, they miss out from hearing from others who have different experiences.</p> <p>Resources: need to source the problems or cases and other materials with suggested reading.</p> | <p>Group work and class presentation problem-solving exercises.</p> <p>Advantages: this can provide some clear insight into what participants have learnt.</p> <p>Limitations: where HCWs and/or groups do limited work for their presentation and they lack information. This also needs to be undertaken at timetabled hours so less flexible.</p> <p>Resources: facilitator time to listen to the feedback.</p> |
| <p>Work-based learning enables the skills to be practised and competence with these to be developed. It also provides an opportunity to reflect on the knowledge acquired and its application to practice. Individuals can use the practice to reflect upon their development of skills, but also to gain feedback from peers.</p> | | | |
| <p>Work-based learning</p> | <p>On-site projects and skills training.</p> <p>Advantages: based in practice and so any skills can be practised in the real world.</p> <p>Limitations: there is no opportunity to practise these skills in a safe environment first and this might require an additional practitioner to provide feedback.</p> <p>Resources: need to have an additional practitioner to provide feedback.</p> | <p>Online projects and virtual skills training or simulation.</p> <p>Advantages: possibility to practise skills in a safe environment with an opportunity for feedback.</p> <p>Limitations: need to have feedback provided from others.</p> <p>Resources: a facilitator may be needed to provide feedback.</p> | <p>Colleague feedback or a written or audio reflection on the activity.</p> <p>Advantages: gaining facilitator feedback and/or reflecting on skills personally and assessing ability.</p> <p>Limitations: the facilitator may not have time to provide constructive feedback and/or individuals are not confident.</p> |

| Activity type | In-person or live online learning activities (synchronous learning) | Independent learning activities (synchronous learning) | Formative assessment tool |
|---|---|--|---|
| <p>Reviewing the evidence from articles, research and reports enables participants to develop their knowledge and use this to underpin and inform their practice.</p> | | | |
| <p>Reviewing the evidence base</p> | <p>Use of articles for preparation of in-person sessions and to discuss in sessions.</p> <p>Advantages: HCWs accessing evidence for their practice.</p> <p>Limitations: HCWs may lack the skills to find the right evidence.</p> <p>Resources: make some appropriate suggestions for the evidence that can be used.</p> | <p>Individual reading of articles and reports.</p> <p>Advantages: HCWs accessing evidence for their practice-</p> <p>Limitation: HCWs may lack the skills to find the right evidence.</p> <p>Resources: make appropriate suggestions for the evidence that can be used.</p> | <p>Written summaries of articles and quizzes about evidence.</p> <p>Advantages: HCWs can self-assess and reflect on their own learning-</p> <p>Limitations: the responsibility is on HCWs to complete this.</p> <p>Resources: facilitator to review the summaries, but also to take the time to develop the quizzes.</p> |
| <p>Gamification can be undertaken individually or in teams. It is more usual to have teams that come together to use their shared knowledge to tackle a problem or review existing practice in order to enhance that practice by drawing on the collective experiences. It also provides an element of motivation.</p> | | | |
| <p>Gamification</p> | <p>Team exercises, simulation games, interactive exercises, role play, using frameworks, “hackathon”-type group challenges, escape rooms.</p> <p>Advantages: these approaches bring a sense of competition and active learning alongside working in groups and sharing learning.</p> <p>Limitations: these activities take longer to set up and may have cost implications linked to their development.</p> <p>Resources: facilitators to run these and the costs of setting these up and, possibly, technology tools.</p> | <p>Online forum participation, online quiz, online “hackathon”-type group challenges.</p> <p>Advantages: HCWs communicating with others and accessing and sharing evidence for their practice.</p> <p>Limitation: HCWs may lack the skills to find the right evidence.</p> <p>Resources: appropriate suggestions for the evidence that can be used.</p> | <p>Virtual forum, presentations from interactive exercises or “hackathon” challenges or simulation de-briefs.</p> <p>Advantages: opportunities to share the outcome of these activities and experiences in the group.</p> <p>Limitations: some HCWs may not engage in the virtual forums or simulations.</p> <p>Resources: need for technology to run these and the time to develop these.</p> |

For the facilitators planning to deliver the curriculum, consider where opportunities to deliver some of this might exist in other training and development activities, such as wound care and other clinical learning sessions.

6.

Assessment methods

6. Assessment methods

It is important that as well as providing training, there is an assessment of learning to ensure that all HCWs demonstrate an acquisition of knowledge as expected and its appropriate application. It is also important to assess that any skills can be competently undertaken. Formative assessment should be undertaken throughout the curriculum delivery so that learning can be assessed. In Chapter 5.0 on teaching strategies and methods, there are suggestions for formative assessment tools, which include online quizzes, online forums, class discussions and group work. The above principles related to inclusivity, accessibility, authenticity, collaboration, engaging and evidence-base also apply to the assessment methods used.

Inclusivity and accessibility in assessment - ensuring that instructions to are clear and can be followed by all. There may also be occasions where an alternative mode of assessment needs to be considered, for example, for a short answer examination questions can be asked in a “mini viva”.

Authenticity – assessments need to be as closely related as possible to the real-world tasks that learners engage in; so for example skills being assessed either through simulation or with patients.

Collaboration – some activities require teamwork and thus, some assessment tasks may require group work.

Engaging – the assessment method used should be interesting and relevant to the learner to make it more meaningful to them.

Evidence-Based – where appropriate, assessments should require students to provide the evidence underpinning their actions, for example, policies or literature referenced.

There is also a need to assess learning on completion of the training to ensure that knowledge and skills have been acquired and/or enhanced. The various sections of the curriculum have both knowledge and skills learning outcomes, which can then be used to assess achievement of these. Final or summative assessment is when a judgement is made about the learning achieved. Below are some assessment tools to consider for use to evaluate learning summatively on completion of sections.

6.1 Knowledge assessment

There are different tools you can use to assess knowledge, depending upon the focus of the assessment. A range of these are outlined below in Table 6.1.

Table 6.1. Tools for knowledge assessment

| Tools to assess the breadth of knowledge | | | |
|--|--|---|--|
| <ul style="list-style-type: none"> Quizzes, multiple-choice questions and short answer exam type questions can be helpful for this as you can cover a broader range of material Reports summarising a range of literature or research is another option to assess breadth. | The advantages of these methods are that they can assess a range of knowledge. | <p>The limitations are that they assess the breadth of knowledge but not the depth and application.</p> <p>Short answers type questions can be challenging to grade and introduce bias.</p> <p>There may be barriers in language / literacy for some students.</p> | The resources implications are that the quizzes and multiple-choice questions can take time to develop. |
| Tools to assess the depth of knowledge | | | |
| <p>Long answer exam questions or essays focused on a specific topic will enable participants to provide the depth of their knowledge and, in the case of an essay, include reference to the evidence such as articles and research.</p> <ul style="list-style-type: none"> A critique of one or two articles would enable depth for one topic to be assessed. Individual or group presentations can be used focused on a specific topic. | The advantages of these assessment methods are that they assess the depth of knowledge related to specific aspects. | <p>The limitations are that they can lead to a focus on specific knowledge and miss other areas that may also be relevant.</p> <p>Long answers type questions can be challenging to grade and introduce bias.</p> <p>There may be barriers in language / literacy for some students.</p> | In terms of resource these do take more time for the individual to complete and assess competency. |
| Tools to assess the application of knowledge to practice (requires being able to discuss how to recognise signs and symptoms and how to follow protocols and procedures) | | | |
| <p>This can be assessed using case study exam questions, case study essays, the development of clinical protocols or policies</p> <ul style="list-style-type: none"> Individual or group presentations can be used focused on case studies | The advantage of these assessment methods is that they assess the application of knowledge to specific case studies or patient scenarios. | The limitations may be that without any practical experience of specific case examples HCWs may find these more difficult to focus on. | In terms of resources these do take time to assess. |

6.2 Skills assessment

There are two main approaches to assessing skills. The skills can be assessed in clinical practice or using simulation. Some skills will need to be practised more than once in order to develop competence. Skills that are needed for the above curriculum include patient-focused skills, the use of equipment, and following policies and processes or procedures.

Assessing skills and the ability to use equipment might be undertaken through simulation in a practice

or education setting and without any patient contact. The focus here is on the correct use of the equipment (for example, PPE) and where required, and its disposal. It is possible that a range of skills may be assessed through the same activity or using different stations in a simulated environment. The simulation can be undertaken in the clinical setting if it is a skill such as hand hygiene, but it might be that more complex skills require a simulation centre with specific equipment. The use of simulation needs to be planned ahead, but the advantage is that skills can be practiced safely without any risk to patients. However, a limitation might be that a specific setting is needed with specialized equipment. This then places a resource implication on the assessment that requires a specific space to be provided, but also eventual funding for specialist equipment.

The second approach is patient-focused where the skills being assessed actually involve contact with a patient. These can be assessed either through a simulation or through direct patient contact. If using direct patient contact, actual practice can be assessed, but also the use of a workbook to support this can be useful and allow participants to reflect on their skills. The advantage of this is the opportunity to apply knowledge to practice in a real-world setting. The limitations may be where HCWs feel less confident about these skills. Resource implications are the need for an experienced practitioner to observe the skills and provide feedback.

To demonstrate that HCWs have achieved the skills needed to be competent, the skills-based learning outcomes should be used as the criteria for achievement. They require the HCW to undertake a specific action in practice.

For example, when referring to Section 4.7, the learner will be able to:

- apply preventive measures for pneumonia, such as hand hygiene, oral care, early mobilization interventions, treatment of dysphagia and influenza prevention;
- apply preventive measures for *C. difficile* and norovirus, such as hand hygiene, use PPE and carry out environmental decontamination techniques;
- contribute to and promote AMS initiatives within their health care setting/s;
- inform patients/families/visitors about the signs and symptoms of these infections and how to report them and teach them to perform relevant prevention measures.

These can be observed by another practitioner and feedback provided in relation to the HCW's performance.

6.3 Evaluation of the IPC in-service education and training programme

The evaluation of the IPC education programme is aimed at enhancing the effectiveness and impact of the training module or programme through an evaluation of the teaching strategies or methods, the learning resources provided, and the effectiveness of the delivery of the curriculum.

Evaluation purpose

- Assess the delivery and content of the training programme.
- Assess training effectiveness: learn about the strengths and weaknesses of the course design.

- Improving patient outcomes: learn about the long-term impact and effectiveness of IPC education and training.

The purpose of this evaluation is to learn about the longer-term results of the IPC education and training, both in changing individual's professional practice around IPC and in affecting larger scale organizational change within health care facilities. Ultimately, the aim is to understand the impact of training to prevent HAIs and AMR. The evaluation also serves to learn about the strengths and weaknesses of the training/module design in relation to achieving these longer-term outcomes. These allow to provide adjustments and improve future IPC education and training courses and to evaluate what type of changes can result from this type of capacity development activity.

The proposed evaluation methodology is the Kirkpatrick's Model (Kirkpatrick partners) (9), which is a globally recognized framework for assessing the effectiveness of training programmes and allows comprehensive evaluation of the education curriculum at four levels.

- **Reaction (Level 1). Immediate results.** Assessing learners' immediate reactions to the course, capturing learners' satisfaction and engagement. This phase involves surveys and feedback forms filled out by learners immediately post-training.
- **Learning (Level 2).** Evaluating the extent to which learners have acquired the intended knowledge, skills, and attitudes from the course. This is measured through pre- and post-tests, quizzes and practical assessments. These draw on the assessments used as part of the curriculum.
- **Behaviour (Level 3).** Behavioural changes when back on the job. Observing the transfer of learned skills to the workplace, identifying changes in participants' behaviour and practices in their clinical professional settings. This involves follow-up surveys, interviews, and direct observations over a period after course completion.
- **Results (Level 4). Positive change at the organizational level resulting at least partly from IPC training.** Examining the broader impacts of the training on institutional practices and policies within participants' organizations. This level seeks to measure and capture significant changes attributed to the training, such as the impact of training on reducing HAIs and AMR, ultimately improving patient safety and outcomes.

The evaluation ensures a holistic understanding of the curriculum's effectiveness and areas for improvement, facilitating evidence-based decisions for future programme enhancements.

Recommended tools and resources

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Annexes



Annex 1. Glossary

Antimicrobial resistance (AMR): AMR threatens the effective prevention and treatment of an ever-increasing range of infections caused by bacteria, parasites, viruses and fungi. AMR occurs when bacteria, viruses, fungi and parasites change over time and no longer respond to medicines, making infections harder to treat and increasing the risk of disease spread, severe illness and death. As a result, the medicines become ineffective and infections persist in the body, increasing the risk of spread to others. Antimicrobials, including antibiotics, antivirals, antifungals and antiparasitics, are medicines used to prevent and treat infections in humans, animals and plants. Microorganisms that develop antimicrobial resistance are sometimes referred to as “superbugs” (1).

Antimicrobial stewardship (AMS): refers to the effort to measure and improve how antibiotics are prescribed by clinicians and used by patients. Improving antibiotic prescribing and use is critical to effectively treat infections, protect patients from harm caused by unnecessary antibiotic use, and combat antibiotic resistance.

Asynchronous learning: a general term used to describe forms of education, instruction and learning that do not occur in the same place or at the same time. The term is most commonly applied to various forms of digital and online learning in which students learn from instruction that is not being delivered in person or in real time, such as prerecorded video lessons or game-based learning tasks that students complete on their own (2).

Attitude: a person’s feelings, values and beliefs, which influence their behaviour and the performance of tasks (3).

Behaviour: observable conduct towards other people or tasks that express a competency. Behaviours are measurable in the performance of tasks (2).

Bundles: Care bundles are a set of evidence-based, patient-focused practices or interventions (generally three to five) that aim to improve patient outcomes when done collectively and reliably. They can also be a tool to guide the delivery of a specific aspect of a patient’s care where the aim is to improve the care process and patient outcome in a structured manner or sequence, with the expectation that the impact will be greater than single interventions alone (4).

Competency: proven ability to use knowledge, skills and personal, social and/or methodological abilities in work or study situations and in professional and personal development – in other words, what a professional should be able to do (5).

Competency-based curriculum: a curriculum that emphasizes the complex outcomes of learning for real-world practice rather than the traditional focus on defined subject content. In principle, such a curriculum is learner centred and adaptive to the changing needs of students, teachers, and society (6).

Competency based education: an approach to preparing individuals for practice that is oriented to outcome abilities and organized according to competencies. It de emphasizes time-based training and facilitates greater accountability, flexibility and learner-centredness (7).

Formative assessment: the goal of formative assessment is to *monitor student learning* to provide

ongoing feedback that can be used by instructors to improve their teaching and by students to improve their learning (8).

Gamification: the process of applying gaming designs and concepts to learning or training scenarios in order to make them more engaging and entertaining for the learner (9).

Hand hygiene: a general term referring to any action of hand cleansing, that is, the action of performing hand hygiene for the purpose of physically or mechanically removing dirt, organic material, and/or microorganisms (10).

Health and care worker (HCW): see below, *health workers and care workers* (11).

- Care workers provide direct personal care services in the home, in health care and residential settings, assisting with routine tasks of daily life, and performing a variety of other tasks of a simple and routine nature.
- Health workers are all people primarily engaged in actions with the primary intent of enhancing health.

Health care-associated infection (HAI): an infection occurring in a patient during the process of care in a hospital or other health care facility, which was not present or incubating at the time of admission. HAIs can also appear after discharge. They represent the most frequent adverse event associated with patient care (12).

Infection prevention and control (IPC): a practical, evidence-based approach, which prevents patients and health workers from being harmed through acquisition of an infectious disease.

IPC minimum requirements: IPC standards that should be in place at both national and health facility level to provide minimum protection and safety to patients, health and care workers and visitors, based on the WHO core components for IPC programmes. The existence of these requirements constitutes the initial starting point for building additional critical elements of the IPC core components according to a stepwise approach based on assessments of the local situation (13).

IPC professional: health care professional (medical doctor, nurse, or other health-related professional) who has completed a certified postgraduate IPC training course, or a nationally or internationally recognized postgraduate course on IPC, or another core discipline including IPC as a core part of the curriculum, as well as IPC practical and clinical training (14).

IPC link person: nurse or doctor (or other health professional, such as, midwife) in a ward or within the facility (for example, staff working in clinical services such as an intensive care unit or maternal and neonatal care, or water, sanitation and hygiene or occupational health professionals) who has been trained in IPC and links to an IPC focal point/team at a higher level in the organization (for example, IPC focal point/team at the facility or district level). IPC is not the primary assignment of this professional but, among others, he/she may undertake tasks in support to IPC (for example, supporting the implementation of IPC practices, providing mentorship to colleagues, monitoring activities, and alerting on possible infectious risks) (15).

IPC focal point: IPC professional (according to the above definition) appointed to be in charge of IPC at the national, sub-national or facility/organization level (14).

In-service training: any structured learning activity for persons already employed in a service setting (16).

Knowledge: the recall of specifics and universals, the recall of methods and processes, or the recall of a pattern, structure or setting (17).

Learning aim: concise descriptions of the overall goals or purposes of a piece of learning (a programme, a module or even an individual lecture or seminar) (18).

Learning outcome: specific statements of what learners will be able to do when they successfully complete a learning experience (whether it is a project, course or programme). They should be written in a student-centred, measurable fashion that is concise, meaningful, and achievable (19).

Multimodal improvement strategy: a multimodal strategy comprises several elements or components (three or more, usually five, <http://www.ihl.org/topics/bundles/Pages/default.aspx>) implemented in an integrated way with the aim of improving an outcome and changing behaviour. It includes tools, such as bundles and checklists, developed by multidisciplinary teams that take into account local conditions. The five most common components include: (i) system change (availability of the appropriate infrastructure and supplies to enable IPC good practices); (ii) education and training of HCWs and key players (for example, managers); (iii) monitoring infrastructures, practices, processes, outcomes and providing data feedback; (iv) reminders in the workplace communications; and (v) culture change within the establishment or the strengthening of a safety climate (20).

Performance: a function of competence, motivation and opportunity to participate or contribute where competence reflects what a HCW can do; performance is what a HCW does do (21).

Pre-service education: any structured learning activity that takes place prior to and as a requisite for employment in a service setting (20).

Risk assessment: assessment of the risk of exposure to hazards and the selection of appropriate actions to reduce exposure risk (22).

Standard precautions: the minimum standard of IPC practices that should be used by all HCWs during the care of all patients, at all times, in all settings. When applied consistently, standard precautions can prevent the transmission of microorganisms between patients, HCWs and the environment (21).

Skill: a specific cognitive or motor ability that is typically developed through training and practice and is not context-specific (20).

Summative assessment: the goal of summative assessment is to *evaluate student learning* at the end of an instructional unit by comparing it against some standard or benchmark (23).

Surveillance: the ongoing, systematic collection, analysis, interpretation and evaluation of data closely integrated with the timely dissemination of these data to those who need it. Conducting high quality surveillance is crucial to identify how big a problem is and to assess the impact of any prevention or improvement intervention.

Synchronous learning: refers to all types of learning in which learner(s) and instructor(s) are in the same place at the same time in order for learning to take place. This includes in-person classes and live

online meetings when the whole class or smaller groups get together (24).

Transmission-based Precautions (TBP): TBP are used in addition to standard precautions for patients with known or suspected infection or colonization with transmissible and/or epidemiologically significant pathogens (25).

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Annex 2. Estimated duration of training for competencies

| # | Topic | Time |
|-------------------------|--|--|
| 1 | Chain of transmission | 15 min |
| 2 | Overview of HAIs epidemiology | 15 min |
| 3 | General concepts of microbiology | 60 min |
| 4 | General concepts of standard precautions <ul style="list-style-type: none"> • Hand hygiene • Respiratory etiquette • PPE • Environmental cleaning • Waste management | <ul style="list-style-type: none"> • 60 min • 10 min • 60 min • 30 min • 30 min |
| 5 | General concepts of TBP | |
| 6 | Prevention of infection in HCWs, including the role of occupational health, vaccinations, post-exposure evaluations and follow-up | |
| Foundational total time | | 7 academic hours (1 whole day or 2 days) |
| 7 | Standard precautions: deep dive <ul style="list-style-type: none"> • Risk assessment • Management of reusable medical equipment/devices • Linen management • Prevention of needlestick injury • Aseptic technique | <ul style="list-style-type: none"> • 30 min • 60 min • 30 min • 60 min • 30 min |
| 8 | TBP: deep dive | 120 min |
| 9 | Multimodal strategies for IPC interventions | 30 min |
| 10 | General concepts of AMR prevention and AMS | 60 min |
| 11 | Peripheral vascular CABSIs prevention | 30 min |
| 12 | CAUTI prevention | 30 min |
| 13 | General principles of HAI surveillance and monitoring of IPC indicators | 30 min |
| Intermediate total time | | 12 academic hours (3 whole days if count with Foundational topics) |
| 14 | The WHO core components of IPC programmes | 60 min |
| 15 | Health care facility built environment, infrastructure and building requirements to support IPC | 60 min |
| 16 | Medical device reprocessing | 60min |
| 17 | CLABSI prevention | 30 min |

| # | Topic | Time |
|---------------------|--|--|
| 18 | VAP prevention | 30 min |
| 19 | SSI prevention | 60 min |
| 20 | Prevention of other specific HAIs | 30 min |
| 21 | Additional concepts of AMS | 60 min |
| 22 | Leadership | 30 min |
| 23 | Importance and basic principles of HAI and AMR surveillance and feedback | 60 min |
| 24 | Facility outbreak investigation and response | 60 min |
| 25 | Importance and basic principles of monitoring of IPC indicators and feedback | 60 min |
| 26 | Cost of HAIs and cost-effectiveness of IPC interventions | 30 min |
| Advanced total time | | 15 academic hours (6 whole days if count with previous 2 trainings) |
| Total | | 34 academic hours |

