Ministry of Health and Social Protection of the Population
Republic of Tajikistan

NATIONAL GUIDELINES ON INFECTION PREVENTION AND INFECTION CONTROL IN THE REPUBLIC OF TAJIKISTAN

Dushanbe 2023

Ministry of Health and Social Protection of the Population Republic of Tajikistan

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Dushanbe 2023

ВАЗОРАТИ ТАНДУРУСТӢ ВА ҲИФЗИ ИҶТИМОИИ АҲОЛИИ ҶУМҲУРИИ ТОҶИКИСТОН

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Ф А Р М О И Ш

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Дар бораи пурзӯр намудани чораҳо
оид ба пешгирии сироятҳои ба расонидани
кӯмаки тиббӣ вобаста дар муассисаҳои
тандурустӣ, косметологӣ ва иҷтимоии
Ҷумҳурии Тоҷикистон

Бо мақсади пурзӯр намудани фаъолият дар самти пешгирии сироятҳои ба расонидани кӯмаки тиббӣ вобаста дар муассисаҳои тандурустӣ, косметологӣ ва иҷтимоӣ, дар асоси банди 10 Низомномаи Вазорати тандурустӣ ва ҳифзи иҷтимоии аҳолии Ҷумҳурии Тоҷикистон, ки бо қарори Ҳукумати Ҷумҳурии Тоҷикистон аз 3 марти соли 2014, №148 тасдиқ гардидааст,

ФАРМОИШ МЕДИҲАМ:

1. Дастурамали миллӣ “Оид ба пешгирӣ ва назорати сироятҳо дар Ҷумҳурии Тоҷикистон” тасдиқ карда шавад (замима мегардад).

2. Ба сардорони раёсатҳои дастгоҳи марказии Вазорати тандурустӣ ва ҳифзи иҷтимоии аҳолии Ҷумҳурии Тоҷикистон, сардорони раёсатҳои тандурустии Вилояти Мухтори Кӯҳистони Бадахшон, вилоятҳои Суғду Хатлон, ш. Душанбе, директорони марказҳои назорати давлатии санитарию эпидемиологии вилоятҳо ва шаҳру ноҳияҳо, сартабибони беморхонаҳои марказӣ ва роҳбарони шабакаи муассисаҳои кӯмаки аввалияи тиббию санитарии шаҳру ноҳияҳои тобеи ҷумҳурӣ супориш дода шавад, ки иҷрои фармоиши мазкурро таъмин намоянд.

3. Сардорони хадамотҳои назорати давлатии санитарию эпидемиологӣ, тандурустӣ ва ҳифзи иҷтимоии аҳолӣ назорати талаботҳои фармоиши мазкурро дар муассисаҳои тандурустӣ, косметологӣ ва иҷтимоӣ новобаста аз шакли моликият ва тобеъияти идоравиашон таъмин намоянд.

4. Ба сардори Раёсати амнияти санитарию эпидемиологӣ, ҳолатҳои фавқулодда ҳиза кӯмаки фаврии тиббии Вазорати тандурустӣ ва ҳифзи иҷтимоии аҳолии Ҷумҳурии Тоҷикистон супориш дода шавад, ки фармоиши тасдиқгардидаро тибқи тартиби муқараргардида дар Вазорати адлия аз қайди давлатӣ гузаронад.

5. Фармоиши Вазорати тандурустӣ ва ҳифзи иҷтимоии аҳолии Ҷумҳурии Тоҷикистон аз 27 декабри соли 2014, №1119 “Дар бораи пурзӯр намудани чораҳо оид ба пешгирии сирояти дохилибеморхонагӣ дар

муассисаҳои тандурустии Ҷумҳурии Тоҷикистон" аз эътибор соқит дониста шавад.

6. Назорати иҷрои фармоиши мазкур ба зиммаи муовини якум ва муовинони вазир гузошта шавад.

Вазир Ҷ. Абдуллозода



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PREFACE

Infection prevention and control (IPC) refer to measures aimed at preventing and combating infections and the transmission of infections in medical settings in healthcare institutions. Infections associated with the provision of medical care are recorded in medical, social, and cosmetological institutions (MSCIs) at any stage of service delivery.

The Ministry of Health and Social Protection of the Population of the country has approved national recommendations on the prevention of infections and infection control, aiming to strengthen measures for infection control in the medical, social, and cosmetological institutions of the country.

Healthcare-associated infections (HAIs)are one of the most common complications in the provision of medical care. This poses a serious health risk, as many of them are caused by antibiotic-resistant bacteria, leading to prolonged hospital stays, associated costs, and may even result in adverse outcomes. Nevertheless, the vast majority of Health care-associated infection (HAI) can be prevented through effective infection prevention and control measures.

Health facilities are high-risk environments for the development and spread of drug resistance and often have the greatest burden of multidrug-resistant microorganisms (MDRs). Infection prevention and control measures and methods reduce the likelihood of the spread of resistant pathogens in medical institutions. Therefore, they are crucial in our efforts to contain antimicrobial resistance.

The proposed recommendations will be useful for improving the quality of infection prevention and infection control services in institutions providing medical, preventive, and diagnostic procedures. They have been revised following several meetings and consultations with experts in various fields of infection prevention and infection control. These recommendations will be relevant for all medical, social, and cosmetological institutions in Tajikistan. This document provides a detailed examination of the fundamental requirements and actions related to Infection prevention and control (IPC)in healthcare facility (HF).

The Ministry of Health and Social Protection of the Population of the Republic of Tajikistan has taken the initiative to review all components of Infection prevention and control (IPC)in collaboration with the World Health Organization (WHO) and the Country Office of UNICEF. These recommendations are intended to support medical and technical professionals in effectively implementing infection prevention and control (IPC) measures in accordance with the World Health Organization (WHO) guidelines on the core components of IPC programs aimed at improving the quality and safety of health care and delivering quality and safe care at the level of medical, social, and cosmetological institutions.

At present, the country does not have an official IPC (Infection Prevention and Control) program. Thus, the need to review the national guidelines on Infection Prevention and Control (IPC) was considered urgent and essential, not only to ensure a coordinated national policy but also to integrate standardized IPC measures throughout the country.

It is envisaged that these guiding principles should be reviewed every five years to update them in light of the latest information and events. Healthcare institutions need to adapt them

according to their needs, context, and resources without altering the fundamental principles of infection prevention and control (IPC).

Infection prevention and control (IPC) recommendations are applicable to all those providing medical, social, and cosmetological services, and I am confident that they will contribute to establishing global standards for healthcare-associated infection control and will be beneficial to all stakeholders.

The use of this document as a reference material intended for infection prevention and control (IPC) in medical, social, and cosmetological institutions is aimed at improving and implementing IPC practices nationwide to protect clients, ensure patient safety, and safeguard healthcare workers.

Abdullozoda Jamoliddin Abdullo
Minister of Health and Social Protection of the Population
of the Republic of Tajikistan

Statement by the WHO Representative in the Republic of Tajikistan

WHO is proud of its participation in the review of the National Infection Prevention and Control (IPC) Recommendations in medical, social, and cosmetological institutions, where infection prevention and control (IPC) are identified as a strategic priority.

Effective infection prevention and control are crucial for ensuring high-quality medical care for patients and safe working conditions for those employed in medical, social, and cosmetological institutions. It is important to minimize the risk of infection spread among service recipients and staff by implementing a reliable infection control program.

The first principle of patient safety is 'Do no harm – and prevention is better! Infection prevention forms the foundation of public health and is also the best way to regulate the use of antimicrobial agents, consequently reducing the development of antimicrobial resistance.

The overall goal of this document is to provide scientifically grounded information on infection prevention and control (IPC) and Health care-associated infection (HAI) in institutions providing medical, social, and cosmetological services.

Epidemiological surveillance, monitoring, and assessment of Health care-associated infection (HAI) in relevant institutions are important tools for measuring the burden of HAIs. The implementation of this guidance will enhance the collection and registration of national data on Health care-associated infection (HAI) with the aim of improving the quality of service delivery in the Republic of Tajikistan.

We hope that this guidance will be implemented in all medical, social, and cosmetological institutions across the country. I affirm the unwavering commitment and support of the WHO towards infection prevention and control, as well as the containment of antimicrobial resistance.

Dr. Victor Olsavszky
WHO Representative in the Republic of Tajikistan

Statement by the UNICEF Representative in the Republic of Tajikistan

Infection Prevention and Control (IPC) is an important component for enhancing the quality of health care in all settings. A well-functioning Infection Prevention and Control system reduces healthcare-associated infections ensuring patient safety, health worker protection and overall health care costs reduction that could arise from additional treatments including with expensive antibiotics and extended hospital stays. In Tajikistan, many newborn deaths are attributable to preventable causes related to poor quality of care and health care-associated infections (HAI) resulting from an unsafe environment, including inadequate water, hygiene, and sanitation at medical facilities. The inadequate status of IPC in the country's health facilities was further validated by the 2021 Baseline Assessment of the Infection Prevention and Control program.

UNICEF is excited to have contributed in this effort to address this major gap in provision of quality healthcare and join other stakeholders and health professionals to present the revised "National Guideline for Infection Prevention and Control" in Tajikistan. The significance of a robust Infection Prevention and Control (IPC) framework cannot be overstated, particularly in safeguarding the health and well-being of our most vulnerable – children and mothers. As we stand at the intersection of healthcare excellence and preventive measures, this guideline leads the way towards enhanced infection control within health facilities.

UNICEF appreciates the tireless efforts of the technical working group consisting of experts from the Ministry of Health and Social Protection of the Population and its subordinate institutions, whose unwavering dedication has been instrumental in the revision and updating of this comprehensive document. Their effective coordination, coupled with the technical support from UNICEF and WHO, underscores the strength of collaborative partnerships in advancing public health initiatives.

This endeavor has been made possible through the generous financial support extended by the European Union, a testament to their commitment to fostering resilient healthcare systems in Tajikistan. Their investment resonates not only in this document but also in the lives that will be positively impacted by the improved infection prevention and control measures within our health facilities.

This Guideline should now be used comprehensively and earnestly by all health workers at all service delivery levels and points to enhance the quality of medical services, ensuring a safer and healthier environment for every child, every mother, and every resident of Tajikistan.

UNICEF in Tajikistan looks forward to continued collaboration with the Government and to support the health system in achieving the laudable goals of the National Strategy of Health and Welfare of the Population for a healthier and more resilient nation through the year 2030 and beyond, including the right of the child to the enjoyment of the highest attainable standard of health.

Arthur van Diesen
Representative, UNICEF Tajikistan

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This national guidance is the result of comprehensive and extensive consultations with various stakeholders who have a keen interest in providing high-quality medical services, especially in the field of infection prevention and control in Tajikistan. The Ministry of Health and Social Protection expresses sincere gratitude to all individuals and organizations who have made a valuable contribution to the development of this highly valuable guidance and essential recommendations.

We express our gratitude to the multi-professional technical working group of the Ministry of Health and Social Protection of the Population of the Republic of Tajikistan for their invaluable contribution and time spent in reviewing this important document and developing key recommendations in the field of infection prevention.

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Ministry of Health and Social Protection
of the Population of the Republic of Tajikistan

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List of Abbreviations

VAP	Ventilator-Associated Pneumonia
HAI	Hospital-Acquired Infection
HBV	Hepatitis B virus
HCV	Hepatitis C virus
HIV	Human Immunodeficiency Virus
WHO	World Health Organization
DS	Disinfectants
AVL	Artificial Ventilation of Lungs
MP	Medical products
HAI	Healthcare-Associated Infections
SSI	Surgical Site Infections
CIP	Commission for Infection Prevention
CFU	Colony-forming unit
MOHSP RT	Ministry of Health and Social Protection of the Population of the Republic of Tajikistan
ICD-10	International Classification of Diseases, 10th Revision
MW	Medical Waste
HF	Health Facility
RLA	Regulatory Legal Acts
ICU	Intensive Care Unit
IPC	Infection Prevention and Control
MDRM	Multidrug-Resistant Microorganisms
PSC	Pre-sterilization Cleaning
RT	Republic of Tajikistan
PPE	Personal Protective Equipment
ABHS	Alcohol-based antiseptic hand sanitizer
LC	Labor Code
UV	Ultraviolet rays
AMR	Antimicrobial Resistance
MRSA	Methicillin-resistant Staphylococcus aureus
CVC	Central Venous Catheter
ES	Epidemiological surveillance
UNICEF	United Nations Children's Fund

CHAPTER I. INTRODUCTION

Infection Prevention and Control (IPC) is a specialty in the field of clinical and public healthcare based on a practical, scientifically grounded approach that protects patients, healthcare workers, and visitors of medical institutions by preventing avoidable infections. This includes those caused by microorganisms resistant to antimicrobial agents acquired during the provision of healthcare services. Infection Prevention and Control (IPC) holds a unique position in the field of safety and quality of medical care for patients and healthcare workers, as it has universal significance for every healthcare worker and patient in every interaction with healthcare professionals (WHO2023)[1].

The provision of quality medical care and the creation of a safe environment for patients and staff in healthcare institutions are guaranteed by the Health Code of the Republic of Tajikistan [2].

Healthcare-Associated Infection (HAI), also known as 'nosocomial' or 'hospital-acquired infection': An infection that develops in a patient during the course of treatment in a hospital or other healthcare facility, which was not present or in the incubation stage at the time of hospitalization. Infections associated with healthcare can also occur after discharge. They represent the most common adverse event associated with patient care[3].

Health care-associated infection (HAI) are increasingly recognized as one of the main problems affecting the mortality and morbidity of hospitalized patients. According to estimates, in developed countries, Health care-associated infection (HAI) are diagnosed in 7 to 10% of hospitalized patients. The risk of serious complications due to Health care-associated infection (HAI) is particularly high in patients requiring intensive care. This problem is likely influenced by several factors, including the increasing level of resistance to antimicrobial drugs, the development and implementation of increasingly complex medical procedures and invasive medical technologies that expose patients to the risk of procedure- or device-related infections, as well as the progressively older age and weakened immunity of patients[4].

Antimicrobial resistance (AMR) occurs when bacteria, viruses, fungi, and parasites change over time and no longer respond to drugs, making the treatment of infections more challenging and increasing the risk of disease spread, severe illness, and death. As a result of drug resistance, antibiotics and other antimicrobial drugs become ineffective, and the treatment of infections becomes increasingly difficult or impossible[5].

Inadequate infection prevention and control measures, as well as the absence of safe water, non-compliance with sanitation, hygiene, and water supply measures (WASH), open up more opportunities for the spread of resistant bacteria and other microorganisms, increasing the risk of infections and the need for antimicrobial drugs, consequently also increasing the risk of antimicrobial resistance. Infection Prevention and Control (IPC) is recognized as one of the most effective approaches to combat the spread of antimicrobial resistance AMR. Improving hygiene practices and behaviors in healthcare facilities, including hand hygiene and hospital

1 Global Report on Infection Prevention and Control. Geneva: World Health Organization; 2022 License: CC BY-NC-SA 3.0 IGO.
2 Health Code of the Republic of Tajikistan, 201
3 Guidance on the core components of infection prevention and control programmes at the national and acute health care facility level. Geneva: World Health Organization; 2019 Licence: CC BY-NC- SA 3.0 IGO
4 World Health Organization, 2021, Guidelines on core components of infection prevention and control programmes. https://apps.who.int/iris/bitstream/handle/10665/251730/9789240036291-rus.pdf
5 Key WHOfacts, 2020. https://www.who.int/ru/news-room/fact-sheets/detail/antimicrobial-resistance

hygiene, more than halves the risk of death and infections associated with healthcare, and reduces the burden of antimicrobial resistance on health by approximately 40%.

Prevention of infections and fighting against them is everyone's —responsibility. Understanding how infections are transmitted and knowing when and how to apply basic principles of infection prevention and control is crucial for the success of an infection control program. This responsibility extends to everyone working and visiting medical, as well as social and cosmetic institutions, including administrators, staff, patients, and care providers. Successful approaches to prevent and reduce harm from Health care-associated infection (HAI) include the application of a risk management system to address 'human' and 'systemic' factors associated with the transmission of infectious agents. Such an approach ensures that infectious agents, whether common (e.g., gastrointestinal viruses) or evolving (e.g., influenza or multidrug-resistant microorganisms), can be effectively controlled.

This guide is a revised edition of the current country guide, incorporating new factual data, international experience and practices, as well as World Health Organization (WHO) recommendations in the field of infection prevention and control.

In their daily activities, healthcare, social, and cosmetic institutions of the country must adhere to national standards of healthcare delivery, infection control in institutions, and continuously improve the quality of services provided with a safety-first approach.

To prevent, detect, monitor, and control the spread of infections in healthcare, social, and cosmetic institutions, it is necessary to apply comprehensive methods of infection prevention and control. The consistent use of this infection prevention and control (IPC) guide will ensure the standardized implementation of IPC measures and practices in all healthcare, social, and cosmetic institutions in the country.

The Ministry of Health and Social Protection of the Population of the Republic of Tajikistan (MoHSPP-RT) has identified infection prevention and control (IPC) standards as key indicators for improving the quality of healthcare, social, and cosmetic services in the country. This guide is intended to provide comprehensive and standardized information on infection prevention and control.

1.1 THE PURPOSE OF THE GUIDE

The purpose of this guide is to provide information on key measures and practices in the field of infection prevention and control (IPC) that need to be continuously implemented in the operations of all healthcare, social, and cosmetic institutions, including both private and public entities. These practices are an integral part of standard precautions and are aimed at ensuring safe care for all patients and medical personnel.

1.2 TARGET AUDIENCE

The guide is intended for all categories of healthcare workers, both in public and private medical, social, and cosmetic institutions, including cosmetologists. It is also designed for the leaders of medical institutions and all healthcare workers in public and private medical establishments for use in their daily work. Although the primary focus is on secondary and tertiary levels of healthcare facilities (HF), the principles and practices of infection prevention and control (IPC) are applicable to all medical, social, and cosmetic institutions.

Users of this guide include:

- Policymakers, leaders, and administrators of institutions;
- Medical and social workers, as well as instructors/trainers;
- Public and private medical, social, and cosmetic institutions, as well as educational establishments;
- Individuals, NGOs, and international organizations dealing with issues related to the provision of medical services.

At the national level, this document will serve as a guide for policymakers responsible for the development, monitoring, and implementation of infection prevention and control (IPC) measures within various national programs. It will be used to establish epidemiological surveillance of infectious diseases, develop national action plans for pandemic management, and strengthen infection control.

In addition, this document will have practical significance for senior healthcare leaders at the national level and in organizations involved in the regulation and accreditation of medical institutions, both before and after obtaining diplomas, as well as for professional medical communities.

1.3 SITUATION WITH HEALTH CARE-ASSOCIATED INFECTION (HAI)

Health care-associated infection (HAI) are one of the most common side effects of medical care and a serious public health problem, ultimately affecting morbidity, mortality, and quality of life. Health care-associated infection (HAI) can occur during the provision of medical care at any level of healthcare services (for example, in hospitals, long-term care facilities, outpatient facilities, social or cosmetic institutions). Hospital-acquired infections (HAI) are a part of Health care-associated infection (HAI).

The issue of Health care-associated infection (HAI) has become extremely relevant for all countries worldwide in recent years. The rapid growth of medical institutions, the creation of new types of medical (treatment and diagnostic) equipment, the use of the latest drugs with immunosuppressive properties, artificial suppression of immunity during organ and tissue transplantation—these, as well as many other factors, increase the threat of infection spread among patients and healthcare personnel in institutions.

Patients with Health care-associated infection (HAI) stay in the hospital 2-3 times longer than similar patients without signs of infection. This is the cause of a 3-4 times increase in the cost of treatment and a 5-7 times higher risk of mortality.

According to the WHO, the four most common Health care-associated infection (HAI) in low- and middle-income countries are surgical site infections (SSI), catheter-associated urinary tract infections (CAUTI), central line-associated bloodstream infections (CLABSI), and ventilator-associated pneumonia (VAP) during mechanical ventilation.

Among the most common microorganisms causing Health care-associated infection (HAI) are Staphylococcus aureus, especially methicillin-resistant Staphylococcus aureus (MRSA), vancomycin-resistant enterococci (VRE), gram-negative bacteria with multidrug resistance (producing extended-spectrum β-lactamase [ESBL]), and carbapenem-resistant Enterobacteriaceae (CRE), such as Klebsiella spp., Escherichia coli, Acinetobacter baumannii,

and Pseudomonas aeruginosa. Otherwise, the list is extensive, and recent additions include drug-resistant tuberculosis and yeast infections such as Candida auris.[6]

According to the Centers for Disease Control and Prevention (CDC) estimates, at any given time, about 5% of hospitalized patients in the United States suffer from Health care-associated infection (HAI). For example, hospital-acquired Health care-associated infection (HAI) alone account for potentially preventable healthcare expenditures ranging from 28 to 33 billion U.S. dollars annually. Despite organized measures to prevent the spread of infection and adequate architectural-planning solutions, the incidence of Health care-associated infection (HAI), for example, in the United States, remains relatively high, reaching 1.7 million cases per year, which constitutes 5% of hospitalizations or 9.3 cases per 1000 patient-days, with a mortality rate of about 6%[7].

The European Centre for Disease Prevention and Control reports that approximately 4 million patients acquire Health care-associated infection (HAI) each year in the European Union [8].

The economic damage from Health care-associated infection (HAI) in Russia can amount to at least 10-15 billion rubles per year. These infections significantly reduce the quality of life for patients and lead to the loss of the healthcare institution's reputation. According to official statistics in Russia, around 30,000 cases of Health care-associated infection (HAI) are registered annually (≈ 0.8 per 1000 patients); however, according to experts' estimates, their true number is at least 2-2.5 million people[9].

According to some published scientific studies, Health care-associated infection (HAI) affect an average of 5-15% of hospitalized patients, and in high-risk units, the rate can reach up to 40%. The social and economic damage caused by Health care-associated infection (HAI) amounts to approximately $55-60 billion annually in the United States, 13-24 billion euros in European countries, and around £10 billion in the United Kingdom[10].

According to official statistics (Form No. 1; Section 6), medical organizations in the Republic of Tajikistan report an unrealistically low number of cases of Health care-associated infection (HAI) in hospitals, both in absolute terms and in terms of the number of hospitalizations.

Prevention of infections and infection control at the level of medical, social, and cosmetic institutions remains an urgent problem, requiring significant improvement. The main problem directly related to infection prevention and control (IPC) is the rapid growth of antimicrobial resistance (AMR), as antimicrobial agents remain widely available for purchase by all.

Antibiotic resistance is currently one of the most serious threats to human health, food security, and development. Antibiotic resistance is rising to dangerously high levels worldwide. New mechanisms of resistance are emerging and spreading everywhere, threatening our ability to treat common infectious diseases. More and more infections, such as pneumonia, tuberculosis, bloodstream infections, gonorrhea, and foodborne illnesses, are becoming harder, and sometimes impossible, to treat due to the reduced effectiveness of antibiotics.

Where antibiotics for humans or animals can be purchased without a prescription, the emergence and spread of resistance are exacerbated. Similarly, in countries where there are no standard treatment guidelines, antibiotics are often prescribed excessively by doctors and veterinarians and are used excessively by the population. (More detailed information in Chapter 8).

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6 WHO2023, Central Asian and European Surveillance of Antimicrobial Resistance (CAESAR) https://www.who.int/europe/groups/central-asian-and-european-surveillance-of-antimicrobial-resistance-(caesar)

7 Centers for Disease Control and Prevention (CDC).The Global Health Security Agenda. Drives Years Of Progress; Threats Remain. March. 20. 2020. https://www.cdc.gov/nchs/fastats/deaths.htm

8 European Centre for Disease Prevention and Control (ECDC) 2014 Annual Epidemiological Report - Antimicrobial Resistance and Healthcare-Related Infections

9 Concept of the Russian Federation on the prevention of infections associated with the provision of medical care, 2011

10 https://www.rospotrebnadzor.ru/about/info/news/news_details.php?ELEMENT_ID=7576&sphrase_id=1342589&ysclid=limu7b4ab488801

PART II. ORGANIZATIONAL STRUCTURE FOR INFECTION PREVENTION AND CONTROL (IPC)

For the successful implementation of an effective infection control program, a designated person with special competencies at the Ministry level is necessary, supported by a highly qualified team.

Article 25 of the Health Code of the country recommends that each healthcare organization establish a commission on the quality and safety of medical care. The main task of this commission is to conduct ongoing analysis of the organization of medical care, clinical activities of the healthcare institution, and identify factors that disrupt the provision of medical care and standards.

Standards for Infection Prevention and Control (IPC) and healthcare quality are essential for the well-being and safety of patients, their families, healthcare workers, and society as a whole. A well-organized IPC program is a fundamental requirement in every healthcare facility to assist healthcare workers in delivering high-quality medical services.

The provided organizational chart (Figure 1) lists the institutions and organizations involved in the preparation and implementation of activities in the field of infection prevention and control.

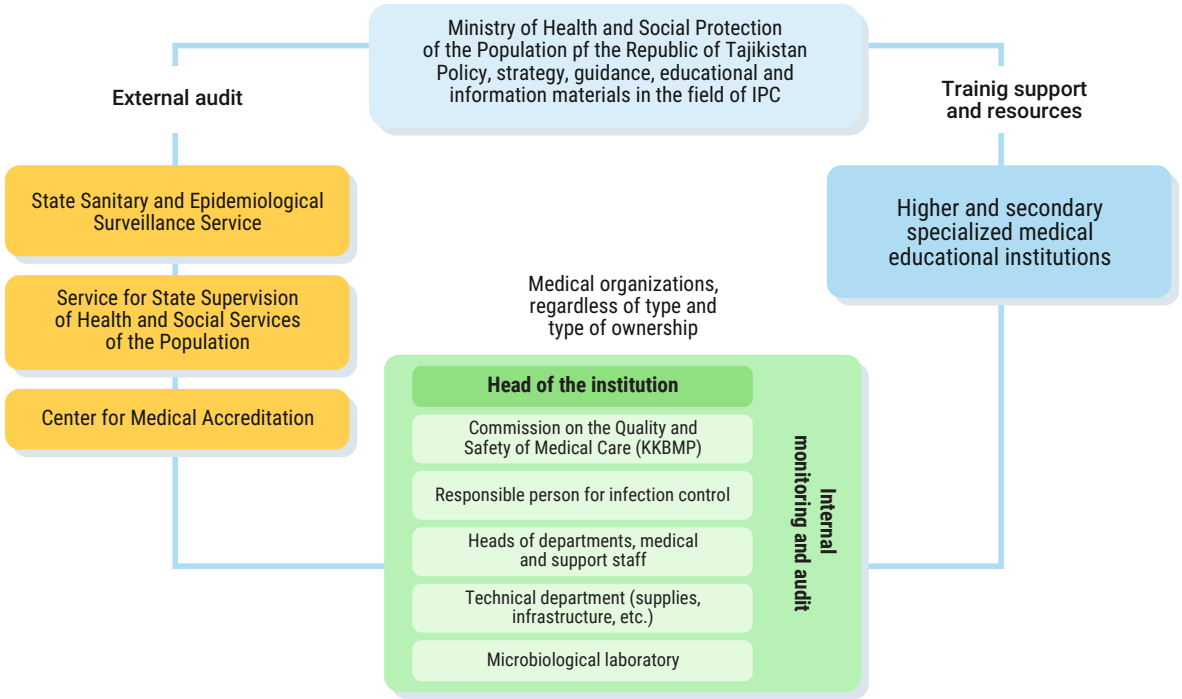


Figure 1. Organizational chart of management and implementation of the infection control program

The success and efficiency of infection control measures depend directly on the organization of structures responsible for developing policies, strategies, guidelines, and coordinating activities in the field of infection prevention and control (IPC) at the level of healthcare institutions in the country.

BOX 1: Necessary Conditions for an Effective Infection Prevention and Control Program:

- Presence of policies and leadership, including standard operating procedures (SOP)
- Adequately trained and motivated human resources
- Constant and adequate supply of personal protective equipment (PPE)
- Policy on the use of antimicrobial agents and its connection with the antimicrobial stewardship program
- Integration of infection prevention and control with the activities of the healthcare facility quality and safety commission
- Epidemiological surveillance of healthcare-associated infections (HAI) and investigation of outbreaks
- Microbiological laboratory support
- Connections with other patient safety programs in a medical institution
- Evaluation of program performance: monitoring and feedback
- Dedicated budget for the implementation of IPC measures

Key organizational structures and their tasks in the implementation of infection control are briefly described below.

2.1 NATIONAL LEVEL

The Ministry of Health and Social Protection of the Population is responsible for developing policies, guidelines, and standards, as well as protocols and educational materials in the field of Infection Prevention and Control (IPC). They ensure the availability of these materials at all healthcare and social institutions, accompanied by training for the staff of these institutions. At the national level, a Central Coordination Committee (CCC) for Infection Prevention and Control (IPC) is established to coordinate activities related to IPC. This committee should be represented by leading specialists from various sectors under the chairmanship of the Deputy Minister of Health and Social Protection of the Population of the Republic of Tajikistan. The person responsible for implementing infection control measures is appointed from among the trained employees of the Ministry of Health and Social Protection of the Population of the Republic of Tajikistan or the State Sanitary and Epidemiological Service of Tajikistan WHOhave undergone training in infection prevention and control.

The Central Coordination Committee (CCC) should consist of leading specialists or representatives from relevant fields, such as epidemiologists, infectious disease specialists, surgeons, obstetricians-gynecologists, microbiologists/bacteriologists, nurses, dentists, environmental hygiene specialists, water supply and sanitation experts, quality of healthcare professionals, healthcare system development, public and private pharmacists, regulatory bodies/councils, scientists, and educators. The committee should be responsible for developing national infection prevention and control (IPC) policies, a strategic IPC plan, and

IPC standards. It should provide technical consultations and support monitoring of IPC activities in all healthcare, social, and cosmetic institutions in both the public and private sectors in Tajikistan.

The role of the Central Coordination Commission for Infection Prevention and Control:

- To facilitate and coordinate the development of the national system for Infection Prevention and Control (IPC), including Antimicrobial Resistance (AMR).
- Develop national guidelines for IPC in collaboration with other stakeholders and partners in the country.
- Develop/adapt a standard IPC curriculum and establish a monitoring, evaluation, and reporting system for key IPC, AMR indicators, and improvements in water supply, sanitation, and hygiene (WASH).
- Act as an advisory body on all activities related to IPC and AMR.
- Coordinate and monitor all activities related to IPC/IPC in all sectors to ensure alignment with a systematic approach to the goals and strategic priorities of the national IPC plan.
- Develop a standardized program for surveillance of healthcare-associated infections (HCAIs).
- Implementation of activities for monitoring and assessing the implementation of infection control measures.
- Facilitate targeted budgeting to support infection control measures at both central and regional levels.
- Promote the improvement of equipment and the enhancement of the capacity of microbiological and bacteriological laboratories.

A functional IPC programme with at least one in-house IPC-trained focal point should be established at the national level. Responsible for IPC at the national level (full-time) is a specialist (doctor) with a certain professional experience, WHOhas undergone formal postgraduate training in IPC, WHOhas a certificate or diploma. The IPC focal point should be a staff member of the Ministry of Health.

Role and Responsibilities of the Responsible Employee for Implementing Infection Prevention and Control (IPC) at the National Level:

- Develop IPC objectives, functions and action plan in collaboration with other national programmes and institutions as well as external partners.
- Plan and organize an advanced training program for all health care workers on IPC issues.
- Support and guide the development and approval of curricula, as well as the delivery of training.
- Support and coordinate training at all levels, for example (academic institutions, including universities and other institutions authorized to train health personnel).
- Coordinate efforts to standardize IPC guidelines, standard operating procedures (SOPs), and activities across all healthcare facilities and at all levels of the healthcare system.
- Serve as a key focal point for interdisciplinary Hai and AMR surveillance and IPC monitoring.

- Facilitate the development of a strategic HAI surveillance plan (with a focus on priority infections tailored to the local context) and IPC monitoring.
- Advise health care personnel on the implementation of multimodal strategies to prevent transmission and antimicrobial resistance, as well as on improving water, sanitation and hygiene (WASH) and waste management.
- Participate in the development of monitoring and audit tools for infection prevention and control measures.
- Coordinate and participate in regular monitoring, assessment and reporting of key IPC indicators, including water, sanitation and hygiene (WASH).
- Coordinate and prepare a comprehensive annual analytical report on IPC activities at the country level, including financial costs, assess the results of monitoring and propose ways to improve the implementation of IPC measures.
- Coordinate the national assessment study once a year and report to the MoHSP.
- Provide technical input to policy, legislation and IPC budgeting at national, sub-national and facility levels.

2.2 REGIONAL LEVEL

The regional commission for infection prevention and control is responsible for monitoring medical, social, and cosmetic institutions at the regional and district levels regarding the implementation and adherence to infection prevention and control practices.

The composition of the commission is as follows: The regional commission for infection control consists of leading specialists at the regional level with experience in infection control, including epidemiologists, clinicians, pharmacists, microbiologists, and public health experts. At the oblast level, a responsible person will be appointed to coordinate all IPC activities.

The role and tasks of the responsible person for infection prevention and control include:

- Participate in the development and revision of IPC guidance documents initiated by the Ministry of Health and Social Protection of the Republic of Tajikistan.
- Ensure the implementation of national IPC guidelines, policies and standards in all health facilities.
- Coordinate and regularly participate in training activities for health care personnel.
- Establish effective linkages with relevant regional programmes (TB, hepatitis and HIV/AIDS).
- Support and coordinate the establishment of basic IPC structures at the district level and health facilities required at the hospital/health facility level.
- Establish a monitoring/audit system and assess key indicators of infection prevention and control, waste management, and water, sanitation, and hygiene (WASH).
- Coordination of IPC to support any outbreak response measures related to IPC breaches (community and hospital outbreaks).
- Prepare and disseminate periodic and annual reports, including financial costs, gaps and constraints, as well as a management assessment of the results of monitoring the activities of the commission at the regional and district levels.

2.3 DISTRICT/CITY LEVEL

Issues related to the management of Hai and IPC are coordinated by the commission on the quality and safety of medical care, including infection control issues.

The commission is established based on the order of the head of the medical organization. The chairman of the commission is appointed by the head or deputy head of the medical organization.

The IEC includes an epidemiologist, chief (senior) nurse, heads of structural units, bacteriologist, infectious disease specialist, pathologist, and other staff of the medical organization, including representatives of water supply and sanitation specialists, and cleaners.

Meetings of the IEC are held in accordance with a plan approved by the head of the medical organization. The format of IEC meetings is determined by the head of the medical organization. The IEC is a permanently functioning structure.

For the purpose of implementing its tasks and fulfilling its functions, the IEC has the right to request written and oral explanations from the employees of the medical organization regarding the substance of the issues under consideration, make proposals to reduce the risk of HAIs, carry out necessary epidemiological measures, and provide logistics for the prevention of HAIs. The IEC plays a supervisory role and contributes to the implementation, monitoring, and auditing of infection control policies and procedures at the institutional level. The district IPC coordinator is appointed by the management of the district institution. The main task of the responsible person includes coordinating the implementation of the IPC program in all medical institutions of the district, including private institutions.

The coordinator at the district level performs the following functions:

- Adapt local SOPs based on national standards and within the approved IPC guidelines.
- Analyzes the incidence and risks of Hai, forms recommendations for the prevention of Hai in a medical organization.
- Evaluation of the quality, completeness, and timeliness of preventive and epidemiological measures.
- Develops an action plan to enhance infection prevention and control measures, improve water, sanitation, and waste management for the institution and individual units within the institution, identifying priorities based on risk assessment and relevant analysis.
- Evaluates the causes and conditions of individual or group cases of HAIs.
- Implements a set of necessary measures to eliminate the epidemic situation and prevent the occurrence of HAIs cases.
- Monitors IPC materials (personal protective equipment, liquid soap, hand drying agent, excluding electric hand dryers, alcohol-based hand disinfectant) in all healthcare delivery points and ensures uninterrupted availability of essential items. Provides basic services: electricity, safe drinking water, adequate toilets and wastewater collection, as well as safe waste management.
- Ensures compliance and enforcement of intellectual property policy and practices, as well as conducts regular audits and oversight.
- Controls the rational use of antimicrobial agents at the institutional level and provides information and recommendations to healthcare workers.
- Regularly conducts educational and informational events among the institution's staff.

2.4 AT THE LEVEL OF MEDICAL, COSMETIC, AND SOCIAL INSTITUTIONS

At the primary health care level: at least one trained **IPC specialist** working part-time (part-time) in each primary health care facility.

At the secondary care level: one trained **IPC health worker should be trained and assigned** full-time according to the recommended ratio of 1:250 beds with time allocated for IPC activities in all facilities (e.g. if the facility has 120 beds, one dedicated employee equivalent to 50% of full-time employment).

At the tertiary care level: a minimum **of one trained full-time IPC coordinator** with a defined 250-bed capacity.

Role and responsibilities of the responsible person for infection control at the level of medical, social and other facilities (the responsible person is appointed by the head of the institution from among the trained IPC specialists):

Role and responsibilities:

- Visiting all departments of the institution to monitor the adherence to infection control practices and to identify and register Healthcare-Associated Infections (HAIs) and infectious diseases for assessing health risks (related to IPC, WASH, and waste management).
- Working as a consultant-specialist and taking a leading role in the effective functioning of Infection Prevention and Control (IPC).
- Support a programmatic approach based on coordination, oversight and accountability through monitoring and evaluation.
- Promote patient safety and quality of care, and foster community relations and dissemination of the basic principles of prevention among families, as well as interaction between patients and families.
- Liaise with relevant IPC focal points at the next administrative level on the implementation of IPC activities.
- Liaise with the Regular Disease Reporting System to report unusual events.
- Organize training of SOP personnel and monitor adherence to recommended procedures in collaboration with others WHOmay be responsible for training and evaluation at the local level.
- Training of IPC professionals, frontline health workers and cleaners in primary health care facilities in accordance with a plan and strategy developed at the national level.
- Participation in the development of monitoring tools and conducting audits and epidemiological surveillance for WASH and HAIs.
- Coordinate, plan, and conduct Hai/AMR surveillance by analyzing, interpreting, and disseminating the collected data.
- Internal self-assessment of the facility once a year and reporting at the national level.
- Provide technical input to budget development at the agency level.
- Regularly monitor food hygiene and the health of food handlers.

Microbiologist and microbiology department

The microbiologist heads the microbiology laboratory and plays a key role in the Infection Control Program. She/he is responsible for the identification and characterization of the causative agent responsible for the infection, and provides recommendations for appropriate antimicrobial treatment. The goal is to improve patient treatment outcomes and limit the spread of infection and healthcare-associated infections.

Duties

The microbiology laboratory contributes to the Infection Control Program by fulfilling its technical responsibilities and conducting high-quality microbiological research:

- Working with clinical samples to maximize the likelihood of a microbiological diagnosis.
- Development of guiding principles for clinical departments on proper selection, collection, processing, and transportation of samples.
- Ensuring safe laboratory practices to prevent infections among laboratory personnel.
- Ensuring rapid diagnosis of infections, identification of causative agents, and testing the sensitivity of isolated pathogens to antimicrobial agents using standardized procedures.
- Immediate notification of the Infection Control Committee about suspected cases of Health care-associated infection (HAI).
- The analysis and presentation of antibiotic susceptibility testing results for relevant pathogens in different units and from various samples; and
- In accordance with the microbiological surveillance policy, conducts microbiological testing of drinking water, dialysis water, biological testing of sterilizers, and epidemiological investigations of outbreaks, including organism typing to identify the source, reservoirs, and transmission of infection.

The laboratory should monitor clusters of pathogens that may indicate an outbreak, emergence of multi-resistant organisms, and the isolation of highly infectious, unusual, or virulent pathogens. Any unusual events or trends should be reported in advance to the Infection Control Committee.

The microbiological laboratory should not conduct selective, non-directed microbiological sampling of air, water, and environmental surfaces in healthcare facilities. Such cultivation should be coordinated with the Infection Control Committee to ensure that it is carried out only when necessary and that samples are processed appropriately.

Cultures of the environment, including staff cultures, should be conducted only when clear epidemiological data indicate a potential source of the pathogen in the environment.

The microbiological sampling and testing of the environment must comply with existing standards[11].

[11] Guidelines for Environmental Infection Control in Health Care Facilities (2003).Scf

Storage of isolates of epidemiological significance

In collaboration with the Infection Control Program, the laboratory should develop a system for storing epidemiologically significant strains of healthcare-associated infection-causing agents. The collection should be regularly reviewed, and isolates should be discarded when they are no longer needed.

2.5 ROLE AND RESPONSIBILITIES OF VARIOUS CATEGORIES OF MEDICAL AND TECHNICAL PERSONNEL IN THE IMPLEMENTATION OF THE INFECTION CONTROL AND INFECTION CONTROL PROGRAM

Physicians

Physicians (of all categories) play a crucial role and are responsible for implementing preventive measures and infection control at the level of medical institutions and in society.

Duties

- Provides high-quality medical care to patients in accordance with recommended Infection Prevention and Control (IPC) practices as per the policies and guidelines of the Ministry of Health of the Republic of Tatarstan (e.g., hand hygiene, standard precautions, aseptic procedures, isolation).
- Closely collaborates with the Infection Prevention and Control (IPC) team.
- Controls the collection of relevant microbiological samples in cases of suspected infection.
- Timely informs the management and the Infection Control Committee of the healthcare facility about cases of infection/Health care-associated infection (HAI).
- Strictly adheres to the antibiotic policy and supports the antimicrobial stewardship program.
- Provides consultation to patients, visitors, and staff on measures to prevent the transmission of infection.

Nursing Staff

Infection Prevention and Control (IPC) practices related to infections, prevention, and control are primarily implemented by nursing staff. Nurses should be familiar with methods of preventing, detecting, and controlling infections, and adhere to appropriate methods for various types of patients under their care.

The responsibilities of the Chief Nursing Officer of the institution include:

- The organization of work for middle and junior medical staff to comply with sanitary and epidemiological requirements in the healthcare institution including improvements in water supply, sanitation, hygiene, facility cleaning, safe management of medical waste, and adequate provision of supplies.
- Monitoring the completeness and timeliness of the medical examinations conducted by the staff.
- Presenting issues related to compliance with sanitary and epidemiological regulations at the nurses' council.

- Monitoring compliance with pre-sterilization cleaning and sterilization procedures for medical devices, sterilization of linens, dressings, and equipment.
- Organization and supervision of the sanitary treatment of patients (washing and changing bed linen at least once every 7 days).
- Quality control of room cleaning, availability of disinfectants, compliance with established standards for disinfection and sterilization methods.
- Monitoring the organization of patient meals (providing dishes, utensils, the sanitary condition of the food block, including adherence to dishwashing and disinfection regimes, and storage of food items).

The responsibilities of the senior nurse of the department include:

- Organizing the work of ward and junior nurses to comply with sanitary and epidemiological requirements in the department.
- Ensuring the accurate execution of disinfection, pre-sterilization cleaning, and sterilization of medical devices.
- Monitoring the placement of thermoindicators in cassettes before sending them for sterilization.
- Organizing patient washes and changing of bed linen, inspecting for pediculosis at least once every 7 days.
- Control of patients' catering, compliance with washing and disinfection regimes, food storage.
- Organizing the cleaning of premises and ensuring the department has an adequate supply of disinfectants and cleaning agents.
- Control of the use of gloves, overalls and personal protective equipment by medical personnel.
- Directing bed linens for chamber disinfection after the discharge (death) of patients, and in the infectious diseases department - also personal belongings of patients.
- Monitoring the correctness of actions during emergency situations.

The responsibilities of the ward nurse include:

- Performing all medical procedures and manipulations with strict adherence to aseptic conditions.
- Conducting disinfection of medical instruments after each patient.
- In the absence of a Central Sterile Service Department (CSSD)[12], Performing pre-sterilization cleaning and sterilization of instruments in accordance with applicable standards in the absence of a Central Sterile Service Department (CSSD).
- Quality control of the disinfection carried out by sanitary workers.
- Conducting inspections for pediculosis in patients once every 7-10 days.
- Monitoring the adherence of patients to personal hygiene rules.

[12] Central Sterile Service Department (CSSD)

The duties of the operating, dressing, and procedural nurse include:

- Ensuring compliance with rules of asepsis and antisepsis.
- Ensuring compliance with rules for disinfection, pre-sterilization cleaning, and sterilization.
- Monitoring the work of operating room attendants in handling sterile materials.
- Ensuring the labeling of tubes when directing patients' blood to the laboratory for testing for HIV and hepatitis.
- Disinfecting all surfaces with a disinfectant at the end of the working day.

The responsibilities of the junior nurse in patient care (ward attendant):

- Responsibility for the cleanliness of the premises and the disinfection of patient care items.
- Ensuring the reliability of patient care measures.
- Performing routine cleaning (disinfection) of premises no less than 2 times a day using designated cleaning equipment.
- Ventilation of the room while maintaining the temperature regime.

2.6 CENTRAL STERILE SERVICE DEPARTMENT (CSSD)

The Central Sterile Supply Unit/Central Sterilization Unit (CSU) serves all departments of the hospital, including the OT. It plays a crucial role in Infection Prevention and Control (IPC) and patient safety.

Duties of the Central Sterile Service Department (CSSD)

Obtain contaminated tools and items (or after washing laundry), carry out pre-sterilization cleaning, packaging followed by sterilization and storage prior to release for use.

Collaborate with the Committee on Infection Control (CIC) and other relevant departments in the institution to develop and monitor policies for cleaning, disinfecting, and sterilizing reusable and contaminated patient care devices, including:

- wrapping procedures depending on the type of sterilization;
- sterilization methods depending on the type of device/equipment;
- sterilization conditions (e.g., temperature, duration, pressure, humidity); and
- control of sterilization procedures.

A qualified individual should be responsible for managing the Central Sterile Service Department (CSSD). The responsibility for day-to-day management may be delegated to an individual with the appropriate qualifications, experience, and knowledge in the field of medical device sterilization.

Duties of the Central Sterile Service Department (CSSD) Manager

- Use approved SOPs for all processes performed in the CSO in the work of the CSSD.
- Oversee various processes conducted in the department, namely cleaning, disinfection, sterilization, packaging, storage, and distribution.

- Monitor disinfection processes using various methods, such as physical, chemical, and bacteriological, in accordance with the healthcare institution's policies.
- Ensure the maintenance of equipment in accordance with national standards and manufacturers' recommendations.
- Report any defects to the administration, technical support, infection control, and other relevant personnel.
- Ensure appropriate separation of 'clean' and 'dirty' zones.
- Maintain a complete record of each sterilizer cycle and keep records in accordance with standard recommendations.
- Organize the collection of all expired sterile units at regular intervals.
- If necessary, liaise with the Committee on Infection Control (CIC), nursing service, operating room, hospital transportation service, pharmacy service, technical support, and other relevant departments.

2.7 LAUNDRY SERVICES

In accordance with the healthcare policy of the Ministry of Health of the Republic of Tatarstan, the laundry is responsible for:

- Issuing workwear, and if necessary, managing changing rooms.
- Collecting and transporting soiled/clean laundry.
- Providing appropriate containers/bags in the rooms for separating used and soiled laundry.
- Disinfection of soiled laundry within the laundry facility.
- Protecting clean laundry from contamination during transportation from the laundry to the point of use.
- Ensuring proper flow of laundry, segregating 'clean' and 'soiled' areas.
- Maintaining and monitoring the recommended laundry conditions (e.g., temperature, duration); and
- Ensuring the safety of laundry staff by preventing contact with sharp objects or linen potentially contaminated with pathogens.

2.8 FACILITY/BUILDING OPERATIONS RESPONSIBLE PERSON

Duties of the Maintenance Manager

- Ensure regular maintenance of the building, including plumbing, heating, refrigeration equipment, electrical system, heating, ventilation, and air conditioning systems, as well as keeping records of their maintenance.
- Collaborate with the Committee on Infection Control (CIC), maintenance staff, medical personnel, or other relevant groups in selecting equipment and ensuring its uninterrupted operation.
- Ensure the environmental safety of the community from hospital activities, such as waste disposal and protection of water sources.

Additional responsibilities

- Participate in the selection of equipment if technical assistance is required for equipment maintenance.
- Inspect, clean, and regularly replace the filters of all ventilation devices and air humidifiers; maintain records for joint use with the Joint Occupational Health and Safety Committee (JOSH).
- Regularly inspect all surfaces of walls, floors, ceilings to ensure they are smooth and washable, and monitor the maintenance of the facility.

CHAPTER III. INFECTION PREVENTION AND INFECTION CONTROL PROGRAM

Standards for Infection Prevention and Control (IPC) and healthcare quality are essential for the well-being and safety of patients, their families, healthcare workers, and society as a whole. The well-organized IPC (Infection Prevention and Control) program is a fundamental requirement in every healthcare institution to assist healthcare professionals in providing quality medical services.

3.1 THE MAIN COMPONENTS OF THE INFECTION PREVENTION AND CONTROL PROGRAM

In 2016, the World Health Organization (WHO) released evidence-based guiding principles incorporated into the guidelines for implementing the core components of Infection Prevention and Control (IPC). The first step towards implementation is the development of an Infection Prevention and Control (IPC) program at the healthcare facility level[13].

Based on eight principles, the World Health Organization (WHO) has published recommendations on the minimum requirements for Infection Prevention and Control (IPC) needed at the primary, secondary, and tertiary levels of healthcare institutions.

The eight recommended core components for implementing Infection Prevention and Control (IPC) measures at the healthcare facility level:

Component 1: Infection Prevention and Control Program. To prevent Health care-associated infection (HAI) and control Antimicrobial Resistance (AMR) based on evidence-based medicine and practice, it is necessary to develop an effective standalone national Infection Prevention and Control (IPC) program with clearly defined goals, functions, and activities, as well as a dedicated budget.

Component 2: Infection Prevention and Control Guidance — To reduce Health care-associated infection (HAI) and Antimicrobial Resistance (AMR), evidence-based guidance should be developed and implemented. Regular training for relevant healthcare professionals on the recommendations outlined in the guidelines should be provided, and their adherence should be monitored.

Component 3: Training and Education in Infection Prevention and Control — Ensure continuous updating of knowledge and skills in accordance with evidence-based approaches in the prevention and control of infections.

Component 4: Infection Surveillance — Surveillance of infections associated with healthcare includes national surveillance programs and networks for Health care-associated infection (HAI). These will incorporate mechanisms for timely feedback and may potentially be used for comparative analysis to reduce HAI and Antimicrobial Resistance (AMR).

Component 5: Multicomponent Strategies for Implementing Infection Prevention and Control Measures — This is a WHOmethodology based on the combination of various tools and

[13] Guidelines for the Core Components of Infection Prevention and Control Programmes at the National and Emergency Health Facility Level, 2021

approaches to achieve effective implementation of measures at the national or subnational levels within the framework of Infection Prevention and Control (IPC).

Component 6: Monitoring/Audit and Feedback on Infection Prevention and Control Practices – It is necessary to develop a national monitoring and evaluation program for Infection Prevention and Control (IPC) to assess the degree of compliance with standards and the implementation of activities in line with the goals and objectives of the program. For example, hand hygiene. This program should inform participants and facilitate decision-making through IPC programs.

Direction 7: 3workload, staffing, and bed occupancy – a component ensuring the necessary conditions for the effective implementation of infection prevention and control (IPC) at the healthcare organization level.

Component 8: Creating Safe Conditions in Healthcare Facilities and Providing Materials and Equipment for Infection Prevention and Control - This component involves ensuring safe conditions in healthcare facilities, including water supply, sanitation, environmental hygiene, waste disposal, and environmental cleaning. It also emphasizes the availability of necessary materials and equipment for Infection Prevention and Control (IPC) measures.

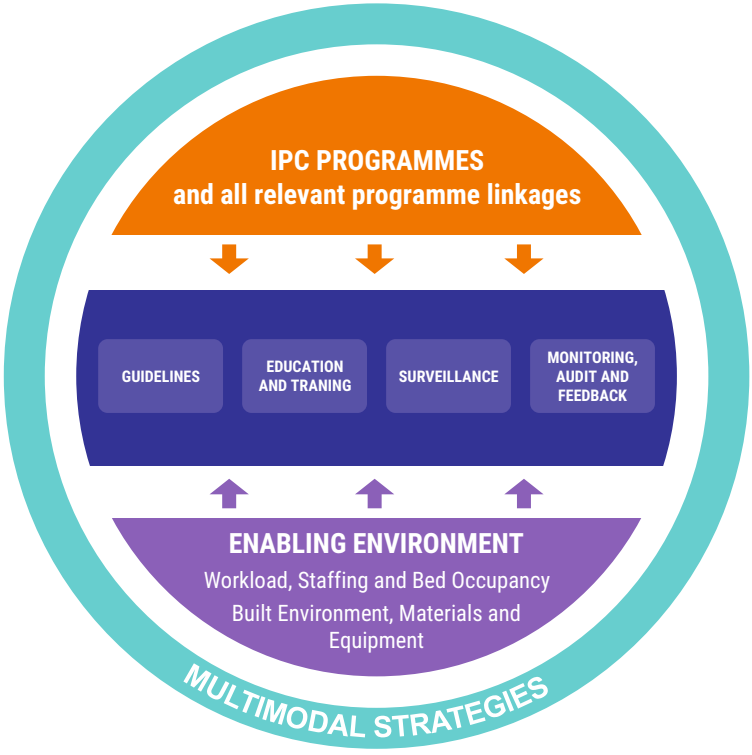


Figure 2. The main components of infection prevention and control

3.2 INFECTION PREVENTION AND CONTROL PROGRAM

In every institution providing medical, social, and cosmetic services, an Infection Prevention and Control (IPC) program should be implemented with a specialized, trained team dedicated to preventing Health care-associated infection (HAI) and combating Antimicrobial Resistance (AMR) through advanced IPC practices.

The adherence to and implementation of all components of the Infection Prevention and Control (IPC) program in every institution providing medical, social, and cosmetic services are mandatory. Each institution must have a specifically trained team in the field of IPC.

The goal of the program is to minimize the risk of Health care-associated infection (HAI) for patients, healthcare workers, and visitors. This is achieved through:

- Providing opportunities and assistance to all categories of healthcare workers in adhering to comprehensive Infection Prevention and Control (IPC).
- Practices at all levels of healthcare delivery; and
- Ensuring safe and quality healthcare services and improving outcomes through the reduction of morbidity and mortality.

Goal of the IPC program

Prevention and control of infections at the level of medical, social, and cosmetic institutions pursue two main goals:

- Preventing the transmission of infections during the provision of medical, cosmetic, and social services, including all surgical and invasive procedures (such as injections, intravenous infusions, catheterization, wound care, administration of medical devices, as well as surgical and cosmetic procedures).
- Minimizing the risk of infection transmission (such as Hepatitis B and C and HIV) not only to patients but also to healthcare workers and support staff, including domestic workers.

This goal is achieved through the implementation of the following components of the program:

- The presence of a trained and responsible IPC coordinator (one trained IPC staff member [nurse or doctor]) in accordance with the recommended ratio of 1:250 beds with allocated time for IPC activities in all facilities (for example, if there are 120 beds in a facility, one dedicated staff member, equivalent to 50% full-time employment).
- Dedicated budget for the implementation of Infection Prevention and Control (IPC).
- Interdisciplinary committee/team.
- Access to the microbiological laboratory.
- Creating conditions for all categories of workers in medical, social, and cosmetic institutions and providing comprehensive assistance to them in adhering to integrated Infection Prevention and Control (IPC) measures at all levels of medical, social, and cosmetic care.
- Ensuring safe and quality healthcare services and improving outcomes by reducing morbidity and mortality.

3.3 INFECTION PREVENTION AND CONTROL GUIDANCE

The Infection Prevention and Control (IPC) guidance should be developed by the technical working group on IPC at the national level, based on the WHOIPC policy, taking into account materials from relevant disciplines, followed by review and approval by the MOHSP. These national recommendations should form the basis of the Infection Prevention and Control (IPC) guidance and can be adapted to local conditions, the type of institution, services provided, infrastructure, and the availability of human resources.

The Infection Prevention and Control (IPC) guidance should be accessible and adapted at all levels of medical, social, and cosmetic care. Training programs for staff should be based on the procedures and methods outlined in the Infection Prevention and Control (IPC) guidance. It should be regularly reviewed and updated, preferably on an annual basis.

The Infection Prevention and Control (IPC) guidance should include the following protocols, policies, guides, standard operating procedures (SOPs), and recommendations tailored for specific institutions.

- IPC Practice.
- Environmental control.
- Surveillance of Health care-associated infection (HAI) and outbreak control.
- Recommendations for Infection Prevention and Control (IPC) in special areas/situations (depending on the services provided by the institution).
- Prevention of infections among healthcare workers.
- Monitoring and evaluation.

3.4 EDUCATION AND TRAINING IN INFECTION PREVENTION AND CONTROL (IPC)

The goal of the Infection Prevention and Control (IPC) education and training program is to enhance the knowledge, competency, and practical skills of healthcare workers in the prevention and control of infections. Understanding the importance of Infection Prevention and Control (IPC) practices can enhance healthcare workers' commitment to infection prevention and control measures, encouraging their integration into their daily practice.

For the effectiveness of the educational component, each institution should have:

- Infection Prevention and Control (IPC) training should be conducted for all staff using team-based and task-based strategies, involving hands-on training and simulation exercises to reduce the risk of Health care-associated infection (HAI) and Antimicrobial Resistance (AMR).
- All clinical staff and janitors must undergo training and orientation on the guiding principles/Standard Operating Procedures (SOPs) of Infection Prevention and Control (IPC) upon employment and annually.
- All designated Infection Prevention and Control (IPC) personnel should undergo specialized IPC training.
- A standardized package of informational and educational materials should be prepared and approved by the Ministry of Health and Social Protection of the Population of the Republic of Tajikistan. It should be periodically updated based on new data and evidence-based medicine.
- Relevant educational materials on the core components of Infection Prevention and Control (IPC) should be accessible to all healthcare workers, patients, and visitors.
- Interactive educational programs and awareness-raising events should be conducted periodically (at least once a year).

- It is necessary to organize awareness-raising programs on the prevention and control of specific infectious diseases for the staff of medical institutions at different levels and the general population.

3.5 SURVEILLANCE OF HEALTHCARE-ASSOCIATED INFECTIONS

Surveillance of Health care-associated infection (HAI) in medical institutions should be conducted to guide Infection Prevention and Control (IPC) measures and detect outbreaks, including surveillance of Antimicrobial Resistance (AMR), with timely provision of results to healthcare workers and stakeholders, as well as through national networks. This includes national programs and networks for the surveillance of Health care-associated infection (HAI), which will incorporate mechanisms for timely feedback and potentially can be used for comparative analysis to reduce HAI and Antimicrobial Resistance (AMR).

3.6 MULTIMODAL STRATEGIES

Infection Prevention and Control (IPC) measures using multimodal strategies should be implemented to enhance practices and reduce Health care-associated infection (HAI) and Antimicrobial Resistance (AMR).

Utilizing multimodal strategies to implement interventions aimed at improving each of the standard precautions and transmission-based precautions, sorting, and measures aimed at reducing specific infections (e.g., injection safety, surgical site infections, or catheter-associated infections) in high-risk zones/patient groups according to local priorities.

WHOidentifies five elements of multimodal Infection Prevention and Control (IPC) strategies in the context of healthcare:

- System change (availability of appropriate infrastructure and materials for effective prevention and control of infectious diseases).
- Training and education of healthcare workers and key stakeholders (e.g., managers).
- Monitoring and feedback, healthcare practice, processes, outcomes, and providing feedback.
- Reminders and messaging.

Culture of safety, changing the culture within a healthcare institution, or strengthening the safety environment.

3.7 MONITORING/AUDIT AND FEEDBACK ON INFECTION PREVENTION AND CONTROL (IPC) PRACTICES

Regular monitoring/audit and timely feedback should be conducted in accordance with Infection Prevention and Control (IPC) standards to prevent and control Health care-associated infection (HAI) and Antimicrobial Resistance (AMR) at the level of the healthcare institution. All individuals being audited and the relevant personnel should be provided with feedback aimed at improving the practices of healthcare delivery.

- Regular monitoring/audit of Infection Prevention and Control (IPC) practices and feedback (individual/group/department-specific) contribute to the effective

implementation of infection control measures and stricter adherence to key IPC practices.

- To ensure sustainability and consistency of assessment and monitoring, standard monitoring tools should be used to track achievements or shortcomings at the institutional level.
- The data collected in the field of Infection Prevention and Control (IPC) will enable monitoring the implementation of IPC practices at the level of healthcare institutions by healthcare workers and tracking changes.
- Based on the risk assessment at the end of each year, the institution should develop an annual infection control action plan, which must be approved by the chief medical officer.

Assessment is an episodic analysis of indicators collected during regular monitoring, aimed at evaluating the degree of achievement of the ultimate result (results) and hypothesizing possible reasons related to underperformance and/or exceeding expected indicators.

In accordance with the key component of Infection Prevention and Control (IPC) for monitoring, audit, self-assessment, and feedback at the level of healthcare institutions in the country, the following indicators are recommended:

- The presence of guidelines and Standard Operating Procedures (SOPs) for key components and measures of Infection Prevention and Control (IPC).
- The availability of safe and functional toilets, separate for staff and patients, and wastewater collection.
- The presence of an active infection control committee or an alternative committee.
- Supervision of hand hygiene compliance (using the WHOHand Hygiene Observation Tool or a similar method).
- The presence of sinks, running water, and soap.
- The presence of safe and functional toilets, separate for staff and patients, and wastewater collection.
- The percentage of staff WHOhave undergone infection prevention and control training in the last 12 months.
- Incretion and/or care of an intravascular catheter.
- Incretion of a urinary catheter and/or care for it.
- Basic measures for preventing infection of a postoperative wound.
- Cleaning in the wards.
- Disinfection and sterilization of medical equipment/instruments.
- Consumption/use of alcohol-based hand sanitizer or soap.
- Consumption/use of antimicrobial drugs.
- Aseptic incretion and management of a peripheral or central intravascular device.
- Adherence to hand hygiene by healthcare workers and the methods they use.
- Pre-surgical and intraoperative methods, such as antibiotic prophylaxis, normoglycemia, and appropriate hair removal.
- Performance indicators of the process: hand hygiene compliance, care sets.

- Key indicators (outcomes): *frequency of HAI (Healthcare-Associated Infections), mortality, and morbidity*.

Observation/monitoring of hand hygiene at the institutional level should be conducted regularly using the WHO(World Health Organization) tool. WHOrecommends that each hospital conduct comprehensive hand hygiene monitoring using the WHOtool at least once a year. At the level of a medical institution, hand hygiene monitoring should be conducted monthly or quarterly.

3.8 WORKLOAD, STAFFING, AND BED OCCUPANCY

To reduce the risk of HAIs (Healthcare-Associated Infections) and the spread of UPP (Unplanned Patient Positioning), it is necessary to observe the following elements:

- The number of beds should not exceed the standard capacity of the institution; the distance between bed edges should be at least one meter, and only one patient per bed.
- The staffing of medical personnel should be adequately distributed according to the patient workload.

3.9 SUPPORTING ENVIRONMENT, MATERIALS, AND EQUIPMENT

Activities for patient care should be carried out in clean and hygienic conditions that facilitate practices related to the prevention and control of Healthcare-Associated Infections (HAIs) as well as Unplanned Patient Positioning (UPP), including all elements related to infrastructure and healthcare services. Adequate materials and equipment for infection prevention and control procedures (PIIC) should be available. Hygiene supplies must be easily accessible at each point of care.

- Safe and sufficient water should be available for all necessary infection prevention and control (PIIC) measures and specific medical procedures, including drinking.
- For outpatient departments, there should be at least two functioning improved sanitary facilities that safely manage waste, and one per 20 beds for inpatient departments; all of them should be equipped with hygiene facilities for menstruation.

The institution should have proper single isolation rooms or, at least, one ward for grouping patients with similar pathogens or syndromes if the number of isolation rooms is insufficient.

3.10 GUIDELINES AND STANDARD OPERATING PROCEDURES (SOP)

In each institution, infection prevention and control (IPC) guidelines and standard operating procedures (SOP) should be developed and approved.

At a minimum, at the level of a medical institution, there should be standard operating procedures (SOP) covering the following aspects:

- Hand hygiene.
- Disinfection of medical devices and instruments, as well as equipment used for patient care.
- Cleaning of premises, environmental sanitation.

- Meeting key requirements for ensuring safe and continuous water supply, sanitation and hygiene services, proper cleaning of surfaces and premises, and environmental sanitation to enhance infection prevention and control (IPC).
- Collection, sorting, storage, processing, and disposal of medical waste.
- Injection Safety.
- Adherence to aseptic principles during manipulations.
- Observance of basic principles of adherence to standard precautions and precautions considering.
- Protection of healthcare workers (for example, at least post-exposure prophylaxis, vaccination).

At the secondary and tertiary levels of the healthcare system, in addition to the SOPs listed above, the following should be developed:

- Standard precautions and transmission-based precautions for specific modes of transmission (in detail).
- Adherence to aseptic principles during invasive procedures, including surgical interventions.

Separate SOPs for the prevention and surveillance of the most common Healthcare-Associated Infections (HAIs) and their issues, considering the local context/epidemiology.

3.11 RISK ASSESSMENT AND RISK MANAGEMENT

Risk Assessment (RA) is a process that identifies hazards, assesses the risk associated with those hazards, and determines appropriate ways to eliminate or control the hazard.

In other words, risk assessment is a detailed examination of potential or existing hazards in the healthcare system:

- Identifying factors (policy, environment, practices, processes) that may cause harm to patients, staff, and/or visitors.
- Evaluate the probability of an event occurring and the severity of the hazard.
- Then decide which steps should be taken to prevent or limit harm.

Risk assessment is a process that identifies, assesses, and establishes ways to eliminate or control medical hazards.

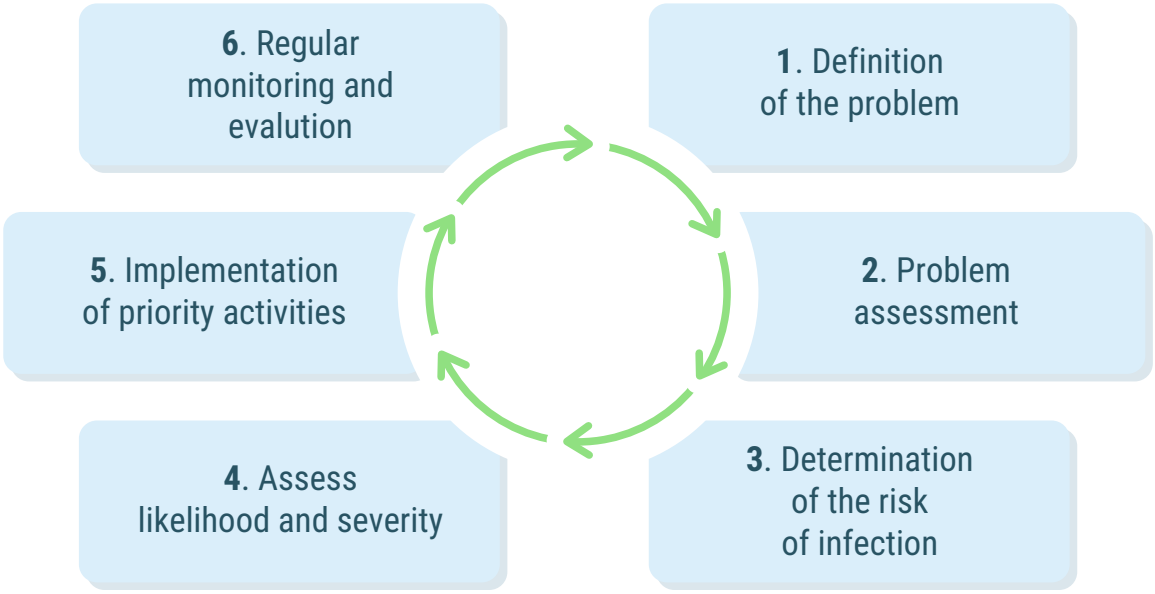


Figure 3. Stages of risk assessment

The main goals of risk management are:

- Improvements in clinical practice.
- Enhancing the safety of patients, healthcare workers, and visitors.
- Reducing the level of healthcare-associated infections.

To conduct an infection prevention and control risk assessment, the following steps should be taken:

1. Identifying the issue, its hazards, or threats

   For example, a high level of needlestick injuries among the staff.

2. Assessing the issue (to determine the size and context of the problem)

   For example, obtaining data on the frequency of injuries, types of injuries, which staff members experienced injuries, when, where, and how the injuries occurred (e.g., in the operating room while capping a needle).

3. Determining the risk of infection (using a structured approach)

   For example, identifying all points of risk for injuries, such as during blood collection from uncooperative patients, in cases of staff fatigue, lack of eye protection for the injured, etc.

4. Assessing the probability of occurrence and consequences of infection

   For example, in the institution, tuberculosis infection is prevalent, and among patients, there is a high prevalence of HIV and hepatitis B, so the consequences of infection can be severe.

5. Identifying and implementing priority measures for risk management

For example, priority actions for your institution may include training all staff in the handling of sharp objects, installing containers for sharp objects in all rooms, or ensuring the availability of protective goggles in the emergency/obstetrics department.

6. Ongoing monitoring of risks and assessing the effectiveness of interventions

For example, keeping records of all technical specifications before, during, and after interventions, tracking how well interventions were implemented, improving policies, and periodically retraining staff.

Risk assessment should always be conducted when:

- A new service is being introduced at the institutional level (with a focus on standard precautions, transmission-based precautions, surveillance, cleaning, laundry, waste management, reusable instrument sterilization, and construction projects).
- New clinical equipment or instruments have been acquired.
- A new procedure or diagnostic test has been implemented.
- A problem has been identified in infection prevention and control (IPC) practice, policy, or a related issue.

The risk can be classified as high **medium, or low risk** depending on the severity of the consequences of a specific hazard. For example, not wearing gloves during blood collection will reduce the risk of infection for the healthcare worker. Working with a patient's central venous catheter without proper hand hygiene is associated with a moderate risk. A high risk of infection occurs when a doctor performs an aseptic procedure without proper hand antiseptic measures.

Risk management is a structured method of identifying, assessing, preventing, or reducing hazards in the provision of medical services. Risk management helps prioritize risks and is an integral part of the healthcare quality management program.

Improving the patient safety culture is a crucial prerequisite for ensuring infection prevention and control. WHOhas developed a risk assessment-based tool for improving the quality of healthcare facilities in managing WASH services. It covers essential needs: water; sanitation; hand hygiene; environmental cleaning; medical waste management; and some aspects of building and facility management.

We propose to highlight this tool here and include relevant measures for its implementation and expansion at the healthcare facility level to identify and manage risks related to WASH in the healthcare facility[14].

[14] WHO tool is available at WASH FIT: A practical guide for improving quality of care through water, sanitation and hygiene in health care facilities. Second edition https://www.who.int/publications/i/item/9789240043237

CHAPTER IV. BASIC PRINCIPLES OF INFECTION PREVENTION AND CONTROL (IPC)

Prevention and control of infections take a central place in providing clinical care in all healthcare institutions. With the emergence of new types of infections and multi-drug resistant bacteria, there is an urgent need for all healthcare workers to be aware of and actively apply scientifically based methods of infection prevention and control. These methods contribute to protecting patients, clients, and medical personnel from infections associated with medical practice.

4.1 KEY CONCEPTS OF HEALTHCARE-ASSOCIATED INFECTION PREVENTION

Healthcare-associated infections can be prevented by interrupting one of the chains of the infectious process transmission (Figure 4). The most effective way to prevent healthcare-associated infections is to create a barrier between the susceptible host and the organisms causing infection. Most healthcare-associated infections can be prevented with easily accessible and relatively inexpensive strategies, such as adherence to recommended standard precautions for infection prevention and control, such as:

- Hands hygiene.
- Proper use of personal protective equipment (PPE).
- Strict adherence to the principles of asepsis.
- Disinfection of contaminated instruments, cleaning followed by either sterilization or high-level disinfection.
- Meeting key requirements to ensure safe and continuous water supply for providing quality sanitation and hygiene services.
- Medical waste management.
- Cleaning and disinfection of the environment.
- Maintaining a safe working environment and safe working practices.
- Respiratory hygiene and cough etiquette.
- Safe injection practices.
- Laundry management.

4.2 TRANSMISSION CHAIN AND FACTORS INFLUENCING THE ISMP

The chain of infection transmission is a sequence of events and factors that allow microorganisms (bacteria, viruses, fungi, and others) to be transmitted from one person or object to another. In Figure 4, the chain of infection transmission is visually represented, and essential factors contributing to the transmission of microorganisms are highlighted. It comprises several key elements.

Infectious agents: The source of infection is a living organism or an inanimate object in the surrounding environment where (or on the surface of which) the causative agent of the infectious disease is not only able to persist but also to reproduce, increasing its numbers. These can be bacteria, viruses, fungi, or parasites, and the transmission of infection depends on the type, virulence, and infectious dose of the microorganism.

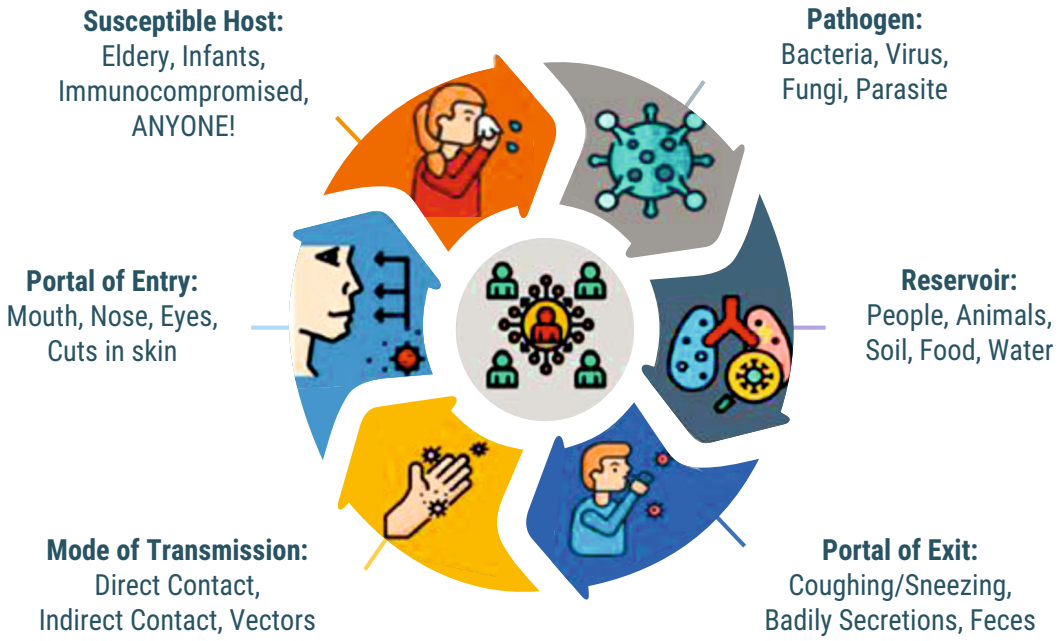


Figure 4. Chain of transmission

Reservoir: The reservoir is the source of the infectious agent where it lives and multiplies. This is a biological and ecological source of infectious microorganisms. They can be living (humans, animals) or non-living (environment, contaminated food, and water). This is a place where microorganisms can reproduce and/or survive. These can be people, animals, dust, water, contaminated food, and medical equipment and tools. It is also important to note that a person can remain a carrier, meaning that microorganisms may stay in their body without showing any signs or symptoms of infection.

Output portal: The exit points can include discharges/secretions from the respiratory tract, gastrointestinal tract, genital tract, blood, or any other biological fluids (via the mouth, respiratory tract, and gastrointestinal tract, aerosols from contaminated water, etc.).

Transmission routes: ways in which people, the environment, and medical equipment spread disease in healthcare facilities. This is the method of transferring the causative agent of an infectious or parasitic disease from an infected organism to a susceptible one. Microorganisms are transmitted from one person to another through contact, via hands, fecal-oral, contact-household, airborne-droplet, and parenteral routes (by entering through contaminated food and water, respiratory secretions during coughing and sneezing, contact with blood and biological fluids, as well as through injections, instruments, equipment, blood

transfusions, organ and tissue transplantation, or mosquito bites) and airborne-dust (if the resistance of the causative agent is high).

Entry gates: Similar to exit portals, these are the points where microorganisms enter the body. For example, mucous membranes of the respiratory tract, genitals, gastrointestinal tract, or urinary tract, as well as the conjunctiva and skin. Entry points for microorganisms to access a susceptible host

Susceptible host: A susceptible organism is one that can become infected—responding to the entry of a specific pathogen by developing an infectious condition (disease or carrier state). Susceptibility to infectious and parasitic diseases is heterogeneous and depends on several factors, including age, nutrition, environment, immune status, presence of chronic diseases, chemotherapy, radiation therapy, and alterations in the normal intestinal microflora (prolonged use of antibiotics, steroid hormones).

Table 1. Sources of pathogens related to the provision of medical care

Source	The epidemiological significance of the source
Patients	Primary source of infection: Among them can be individuals with infectious diseases (including resistant forms) and carriers (for example, of hepatitis B, C, D, salmonella, shigella, etc.), as well as individuals with developed infectious and parasitic diseases
Healthcare workers	Additional source of infection: More commonly, carriers of hospital strains, resistant to multiple antimicrobial agents (carrier frequency can reach 50%), and less frequently, individuals with mild forms of respiratory infections.
People involved in caring for the sick	It is not of great importance; they can be carriers of staphylococci, streptococci, respiratory tract infections, and gastrointestinal infections.
Visitors	The significance is very limited; they can be sources of infection during an epidemic surge in diseases, such as influenza and acute respiratory viral infections (ARVI).

Figure 5 illustrates the main pathways of infection transmission during therapeutic and diagnostic procedures.

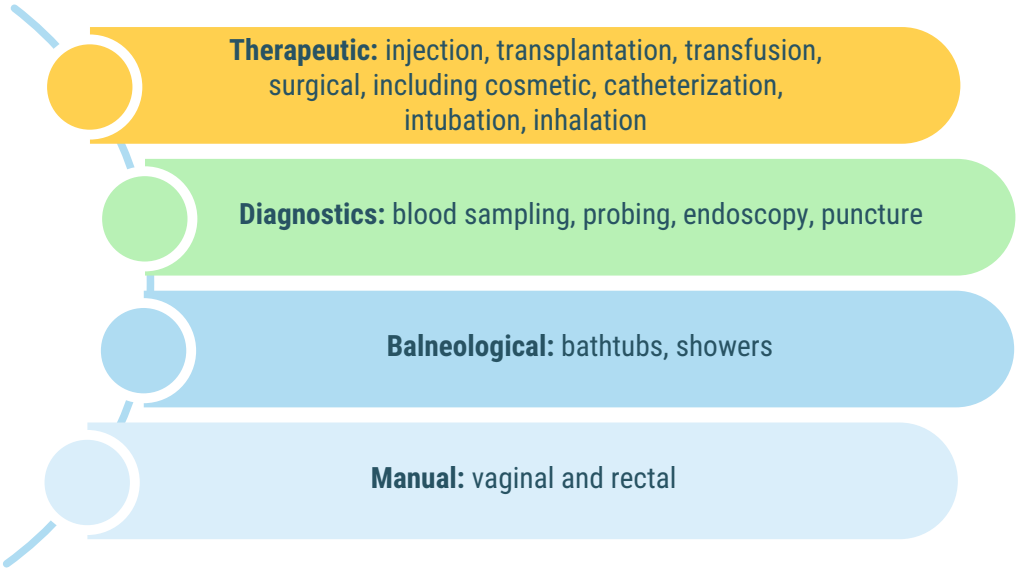


Figure 5. Transmission pathways of infection during therapeutic and diagnostic procedures

4.3 COLONIZATION AND INFECTION

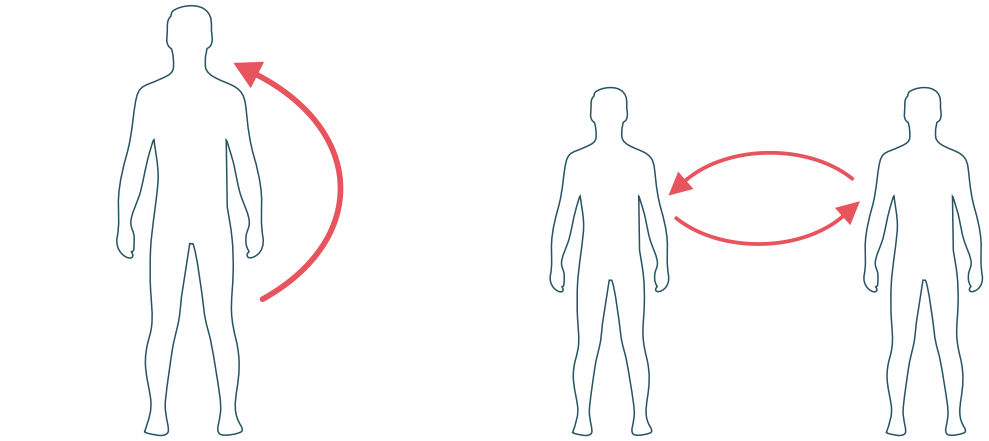
Colonization is the process of microorganisms reproducing at an attachment site without causing any damage to cells or eliciting any response from the host. Colonization ensures the accumulation of microorganisms to a critical concentration that can lead to a pathological effect. Colonizing microorganisms may be part of the normal flora in a specific area of the body but can cause infection in other parts of the body. For example, Escherichia coli is a normal flora of the gastrointestinal tract but can cause urinary tract infections.

The removal of normal flora can lead to the colonization of a body site by abnormal organisms. For instance, antibiotics can kill antibiotic-sensitive microorganisms, such as Escherichia coli, allowing drug-resistant microorganisms to colonize the area. Colonization can precede infection if the host's immune defenses are somehow altered or compromised. This can occur if a patient is taking immunosuppressive drugs, undergoes surgical procedures, or experiences interventions such as catheterization and intubation.

The infectious dose of a pathogen is the minimum quantity of microbial cells capable of initiating an infectious process. The infective dose depends on the virulent properties of the pathogen. The higher the virulence, the lower the infectious dose.

The epidemic process is a continuous chain of sequentially occurring and interconnected infectious states (cases, carriers), manifested as epidemic foci with one or several affected individuals and carriers.

Infections can be acquired from two sources: (I) endogenous, where the microbial source is the patient's own microbiota, for example, from the intestine due to the disruption of the intestinal mucosal barrier caused by chemotherapy in cancer patients; (II) exogenous, where microbes originate from external sources, such as contaminated hands of healthcare workers, objects, equipment, and/or the environment.



The endogenous route of infection

The exogenous or cross-infection route

Figure 6. Sources of contamination

4.4 FACTORS INFLUENCING INFECTIOUS AND PARASITIC DISEASES (ISMP)

Factors related to microorganisms

Each microorganism has an infectious dose, defined as the quantity of microorganisms required to cause an infection. Microorganisms with low infectious doses spread more rapidly. Additionally, if a person's immune system is weakened, the infectious dose required for infection decreases. Pathogenicity of microorganisms or virulence is the ability of a microbial strain to cause disease.

Factors related to the host

The human body has numerous natural defense mechanisms to resist the invasion and proliferation of pathogens. When these mechanisms function normally, infection does not occur. However, infection can occur with any disruption of the protective mechanisms, as seen in patients with immunosuppression and weakened immunity.

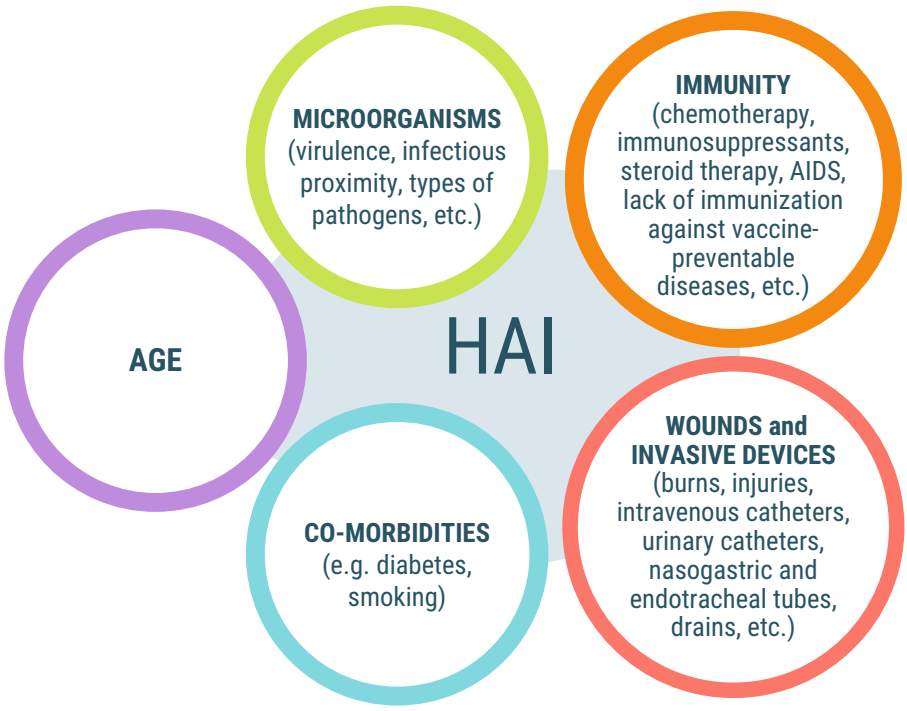


Figure 7. Susceptibility of individuals to healthcare-associated infections

The susceptibility of individuals to infection increases at later ages. Infants, especially premature ones, and elderly individuals, particularly those with underlying health conditions, are at a higher risk of infection. Additionally, patients with suppressed immunity, undergoing chemotherapy, individuals with AIDS, and transplant recipients receiving immunosuppressive therapy or high-dose steroid therapy are also highly susceptible to infections.

It should be emphasized that even a healthy individual, WHOhas not been previously exposed to vaccines for preventable infections or lacks immunization, can become infected, especially, for instance, with new and emerging microbial agents. Dengue fever, Crimean-Congo hemorrhagic fever (CCHF), Ebola, MERS-CoV, and Zika virus. Additionally, changes in the characteristics of pathogens, such as the flu virus and norovirus (SARS-CoV-2 virus), can lead to increased susceptibility to infections.

The group of healthcare-associated infections includes cases of infections not only related to the primary illness of hospitalized patients but also associated with the provision of any type of medical care, including outpatient clinics, cosmetic procedures, sanatoriums, social care institutions, emergency medical services, and others.

The main factors contributing to the occurrence of Healthcare-Associated Infectious and Parasitic Diseases (HAIPD) are as follows:

- **Human susceptibility** - the ability of a person to respond to the introduction of a specific infectious agent into the body by developing a disease or becoming a carrier.
- **Invasiveness of infectious agents** - the ability of microorganisms to penetrate into the organs and tissues of the host and spread within them.
- **Pathogen doses** - the quantity of infiltrating microorganisms.

- **Pathogenicity** - the ability of a microorganism to cause an infectious disease under natural conditions.
- **Virulence** - the degree of pathogenicity of a particular microorganism under standard conditions of natural or artificial infection.

For an infection to develop, the pathogen needs to be transmitted from the reservoir or source of infection to the susceptible host in a sufficient (infectious) dose. Most agents of Healthcare-Associated Infectious are transmitted through contact mechanisms—either direct or indirect contact.

Transmission path

Transmission path refers to the transmission of microorganisms by carriers such as mosquitoes and can be prevented through proper construction and maintenance of medical institutions, the presence of closed or screened windows, and proper household management. Examples of transmissive diseases include malaria, dengue fever, and others.

Hemotransmissive mechanism of transmission of blood-borne infectious diseases, where the transmission factor is objects containing blood particles due to microtrauma, cuts, bleeding gums, etc.

Vertical transmission pathway (during intrauterine infection during pregnancy).

Other transmission pathways

Transmission can also occur through common sources such as contaminated food, water, medications, instruments, or equipment.

4.5 TYPES OF HEALTHCARE ASSOCIATED INFECTIONS (HAI)

Infection associated with HAI is any clinically significant microbial disease affecting a patient as a result of admission to a hospital or seeking medical care, regardless of the appearance of disease symptoms – during hospitalization or after discharge. - As well as an infectious disease of a healthcare worker resulting from their infection during work in that organization. The common criterion for classifying infection cases as associated with the provision of medical care is their direct connection to the delivery of medical care (treatment, diagnostic investigations, immunization, etc.).

According to the World Health Organization (WHO), the four most common healthcare-associated infections in low- and middle-income countries are:

1. Surgical site infections (SSI).
2. Catheter-associated urinary tract infection (CAUTI).
3. Central Line-Associated Bloodstream Infection (CLABSI).
4. Ventilator-Associated Pneumonia (VAP).

The most commonly identified microorganisms causing bloodstream infections include Escherichia coli, various Enterococcus species, Staphylococcus aureus, various Klebsiella species, various Salmonella species, various Candida species, various Pseudomonas species, various Corynebacteria species, various Acinetobacter species, and coagulase-negative staphylococci (COS).)

4.5.1 Healthcare-Associated Bloodstream Infections (BSIs)

Infections associated with the provision of medical care, particularly those involving the bloodstream, are serious infections that can be associated with high mortality rates, exceeding 50% for some organisms. These infections are often linked to intravascular catheters. Infection can occur at the catheter entry site or along the subcutaneous tract (line) of the catheter, known as tunnel infection. This type of infection largely depends on caution during the incretion of the intravascular catheter and its handling. The duration during which catheters remain in place is also crucial, as both central and peripheral catheters can be a potential source of infection. The diagnosis is established through blood cultures and semi-quantitative cultures of the catheter tip and lumen.

4.5.2 Catheter-Associated Bloodstream Infections (CABSI)

These are nosocomial infectious complications associated with the use of intravascular catheters. Clinically, it manifests as local inflammatory changes (swelling, pain, redness at the catheter site) or generalized infection (febrile fever, chills, bacteremia). Catheter-related bloodstream infections (angiogenic or 'catheter' infections) constitute a group of nosocomial infections that develop as a result of vascular catheterization. The frequency of angiogenic infections in intensive care units ranges from 3 to 7 cases per 1000 catheter-days. The placement of an intravascular device is an invasive procedure involving the disruption of skin and vascular wall integrity, as well as the introduction and retention of a foreign object in the vessel lumen. In most cases, bloodstream infections associated with the catheter are related to the incretion of a central venous catheter (CVC), infusion port system, or peripheral venous catheters. CABSI more frequently develops during catheterization of the femoral vein, less commonly - the subclavian and internal jugular veins.

4.5.3 Urinary Tract Infections (UTIs)

Urinary Tract Infections (UTIs) are the most common, constituting 35–45% of all Health care-associated infection (HAI). Most of these infections are associated with the use of indwelling urinary catheters.

The diagnosis is based on clinical symptoms such as fever, suprapubic tenderness, increased frequency of urination, and dysuria, as well as the presence of significant bacteria in the urine. The patient's urine culture reveals no more than two identified species of organisms, at least one of which represents bacteria at 105 CFU/ml. The presence of a permanent catheter in the urinary tract can cause bacteriuria, a mild infection, or even lead to severe infections such as pyelonephritis and septicemia. The source of microorganisms can be the patient's own flora (endogenous infections) or exogenous through the hands of healthcare personnel or

contaminated instruments. Contamination of the drainage bag and retrograde reflux of contaminated urine into the bladder can also lead to Urinary Tract Infections (UTIs).

It is important that the urine sample for culture be collected under aseptic conditions. The rule to be followed is that when collecting urine for bacteriological examination from a patient with a urinary catheter, it is necessary to catheterize the bladder again using a new sterile catheter. If it is not possible to implement such an approach, urine for analysis is obtained by catheter puncture, while observing all aseptic requirements. It is not permissible to collect urine for analysis from urine collection containers.

Risk factors

- Indwelling urinary catheter
- Treatment of urinary tract
- Poor aseptic preparation during catheter incretion
- Poor catheter care
- Old age
- Female
- Serious underlying medical condition

4.5.4 Surgical Site Infections (SSIs)

Surgical Site Infection (SSI) is an infection of the surgical incision, organ, or cavity that occurs within the first 30 days of the postoperative period (up to 1 year in the presence of an implant). This is an infection of the surgical site, formerly known as a wound infection. The frequency of surgical site infections varies from 0.5% to 15%, depending on the type of surgery and the overall health condition of the patient. The primary risk factor is the degree of contamination during the procedure (clean, clean-contaminated, contaminated, dirty), which largely depends on the location of the surgery, the duration of the operation, and the overall health condition of the patient.

All surgical site infections are categorized into wound infections and organ (cavity) infections. Surgical wound infections are divided into superficial (involving only the skin and subcutaneous tissue) and deep (involving muscles and fascia).

Superficial Surgical Site Infection

Infection can occur within 30 days after the procedure or within one year if there is an implant or a foreign body, such as a heart valve prosthesis or joint prosthesis.

Symptoms:

- drainage of pus from a superficial incision;
- pain, tenderness, local swelling, redness, or warmth.

Microorganisms causing Surgical Site Infections:
Staphylococcus aureus, E. coli, Klebsiella spp., Enterococcus faecalis, Pseudomonas spp., and anaerobic bacteria such as Bacteroides spp.

Deep Surgical Site Infection

Infection occurs within 30 days after the procedure or within one year if there is an implant or a foreign body, such as a heart valve prosthesis or joint prosthesis.

Symptoms:

- purulent discharge from a deep incision (muscular and fascial layers);
- spontaneous separation of stitches or «gaping» of the wound;
- fever >38°C, local pain, or tenderness;
- Positive culture from a sample collected under aseptic conditions.

Surgical Site Infection of an Organ (Cavity)

The infection appears in the organ or space within 30 days after a procedure in the organ/space that is opened or manipulated during the operation.

Symptoms:

- microorganisms are identified from the fluid or tissue in the organ/space through culturing;
- abscess or other signs of infection affecting the organ/space are detected during macroscopic or histopathological examination or during imaging studies, indicating an infection.

Risk factors

Key variables include age and gender. A systematic review of studies in both high-income and low- to middle-income countries identified the following factors associated with an increased risk of Surgical Site Infections in adjusted analysis.

- Elderly age and the neonatal period.
- Low body weight.
- Diabetes.
- Obesity.
- Associated infection in a different site.
- Nasopharyngeal colonization of Staphylococcus aureus (golden staph).
- Immunosuppression.
- High duration of pre-surgical hospital stay.

Below are other potential factors that can be improved to increase the likelihood of a positive surgical outcome.

- Features of pre-surgical preparation, for example, there is no need to shave the surgical field.
- Surgical technique - young doctors.
- Non-compliance with aseptic and antiseptic principles.
- Prolonged duration of the surgery.
- Degree of intraoperative wound contamination.
- Significant blood loss due to surgical intervention.
- Lack of perioperative antibiotic prophylaxis.
- Wound drainage.
- Infections in the surgical personnel (including S.aureus colonization).
- Bacterial resistance to antimicrobial therapy.

CHAPTER V. PROCEDURES AND PRACTICES OF IPC

In this section, key procedures and practical aspects of infection prevention and control (IPC) will be presented, considered to be the most effective. These measures are distinguished by their affordability and ease of implementation.

It is important to always adhere to the two fundamental approaches to infection prevention listed below:

1. **Standard Precautions:** These are methods of work applied to all patients receiving care in medical, social, and cosmetic facilities, regardless of their diagnosis or presumed infectious status, to minimize the risk of transmitting infectious agents in all situations. Standard precautions minimize the likelihood of transmission of infectious agents between healthcare workers and patients and from patient to patient.
2. **Precautionary measures based on the mode of transmission:** Precautionary measures based on transmission are measures that need to be taken depending on the mode of transmission of organisms, such as contact precautions, airborne precautions, droplet precautions, etc.

In the case of successful application, standard precautions and precautions based on the mode of transmission of infection prevent the transmission of any infection.

5.1 STANDARD PRECAUTIONS

Standard precautions are the minimum infection prevention measures applicable to all patient care, regardless of the suspected or confirmed infectious status of the patient, in any healthcare setting. These methods are intended both to protect healthcare workers and to prevent them from spreading infections among patients, especially bloodborne infections.

These measures also reduce the likelihood of transmission from both known and unknown (unrecognized) sources of infection. Standard precautions should be applied to all patients in all circumstances, regardless of whether it is known whether they pose an infection risk. All healthcare workers should be trained in standard precautions.

The use of standard precautions is the primary strategy to minimize the risk of microorganism transmission in healthcare settings (Figure 8).

Standard precautions should be observed for all patients, regardless of their infectious status. They should be used to avoid contact with blood, bodily fluids, secretions, and excretions, regardless of whether they are heavily soiled with blood; intact skin; and mucous membranes.

In Figure 8, the key components of standard precautions are clearly presented:

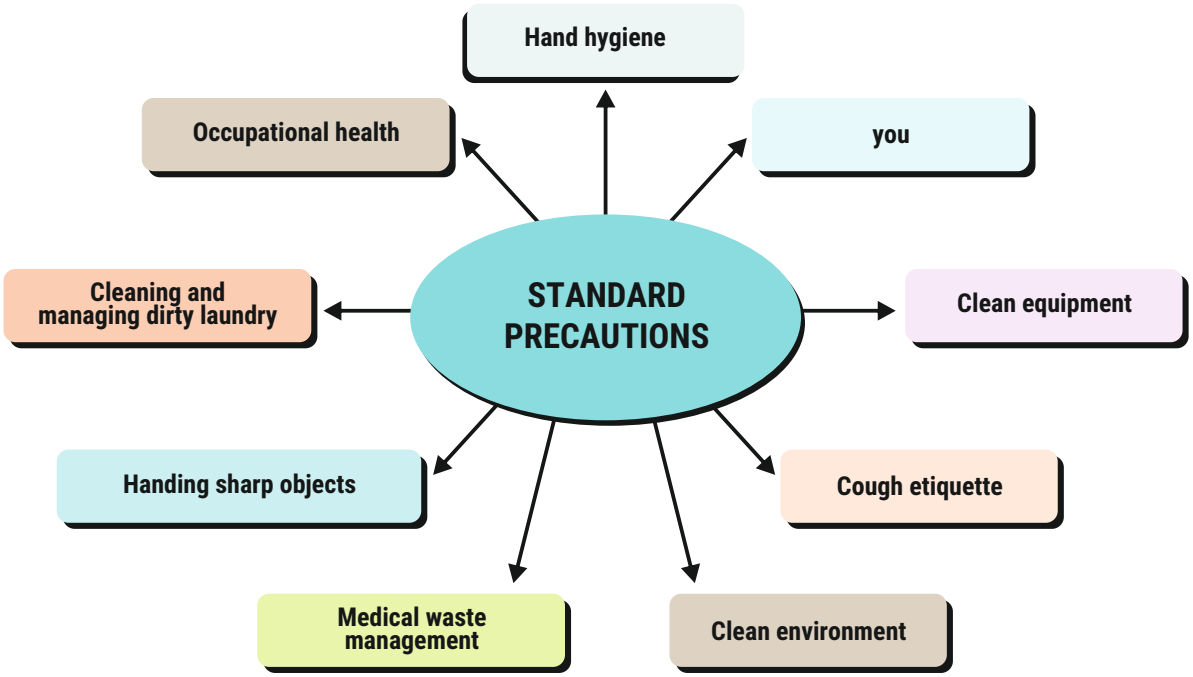


Figure 8. Elements of standard precautions

Standard precautions:

- **Consider every person** (patient or medical personnel) as potentially infected and susceptible to infection.
- **Wash your hands** - this is the most important procedure for preventing cross-contamination (from person to person or from contaminated object to person).
- **Wear gloves** (on both hands) before touching anything wet – such as skin wounds, mucous membranes, blood, or other biological fluids, as well as contaminated instruments and infectious waste, and before performing invasive procedures.
- **Use physical barriers** (protective goggles, face masks, and aprons) if there is a possibility of splashing or secretion of any biological fluids (such as secretions and excrements) from the body, for example, when handling instruments and other objects.
- **Use antiseptics** for the treatment of patients' skin or mucous membranes and for the hands of medical personnel before surgical procedures or wound treatment.
- **Use safe work methods,** for example: avoid re-capping or bending needles, utilize safe transfer techniques for sharp instruments, and suture with blunt-ended needles when appropriate.
- **Safely dispose of infectious,** waste to protect those handling it and to prevent injuries or the spread of infection among the local population.

- **Process instruments and other items** after use by first performing pre-sterilization cleaning, then either sterilize or perform deep disinfection using recommended procedures.

5.2 HAND HYGIENE

Hand hygiene significantly reduces the number of pathogenic microorganisms on hands and can minimize cross-contamination (e.g., from healthcare worker to patient).

The WHOguidelines on hand hygiene in healthcare suggest that hand[15], hygiene is the single most important measure for preventing infection. Hands can become contaminated with infectious agents through contact with a patient, their environment, the surrounding area, or other healthcare workers.

The goal of hand hygiene is to remove dust/dirt, organic substances, and transient microorganisms from the skin, thereby reducing the risk of cross-contamination. Available data indicates that the hands of healthcare workers are the most common means of transmitting pathogens associated with healthcare delivery, from patient to patient and within the healthcare environment. Studies show a direct correlation between increased adherence to hand hygiene and a reduction in Health care-associated infection (HAI).

Hand hygiene is a general term that applies to both handwashing and hand treatment (for example, by disinfecting hands with an alcohol-based hand sanitizer) or surgical hand preparation and the use of a hand antiseptic. Hand hygiene is a simple but important procedure, yet its significance is often overlooked even by healthcare workers. Timely and effective hand hygiene protects the patient, healthcare workers, and the environment from infection by microorganisms that may be harmful pathogens.

It is important to note that, despite the introduction of alcohol-based hand sanitizers being a key factor in improvement in almost all studies, the enhancement of hand hygiene compliance and reduction in Health care-associated infection (HAI) rates are associated with the overall effect of a multimodal approach to improving hand hygiene promotion strategies. This includes the introduction of alcohol-based hand hygiene products, a noticeable and sustained increase in hand hygiene compliance, and a significant reduction in Health care-associated infection (HAI).

Hand hygiene can be achieved by:

1. Regular (routine) handwashing

Washing hands with soap and water is preferable if hands are visibly dirty or soiled with blood or other biological fluids.

Hands should be washed **before**:

- examination (direct contact) of the patient and before an aseptic procedure;
- wearing **sterile gloves** before surgery, or exam gloves for routine procedures such as examining mucous membranes in dentistry, gynecology, etc.

[15] WHO guidelines on hand hygiene in health care: Summary 2013

Hands should be washed after:

In any situations where hands may have been contaminated, such as:

- handling contaminated instruments and other objects;
- touching mucous membranes, blood, and other biological fluids of the body (secretions or excrements);
- after contact, prolonged and intensive contact with the patient;
- taking off gloves;
- After using the toilet;
- before and after eating.

Remember: *In addition to the above, hand hygiene should also be performed when entering/leaving work, before examinations and any medical procedures, before eating/drinking, after contact with a patient, visiting the restroom, handling waste and laundry, before putting on gloves, after using a computer keyboard, tablet, or mobile device in the clinical process*

The steps for routine handwashing (Figure 9):

- Thoroughly wet your hands.
- Soap your hands with regular soap (no need for an antiseptic).
- Rub all areas of your hands and fingers vigorously, for at least 40-60 seconds, paying special attention to the areas under the nails and between the fingers.
- Thoroughly rinse your hands with clean water.
- Dry your hands with a disposable towel and use the towel to turn off the faucet.

Remember*, that liquid soap has cleansing properties and mechanically removes dirt, organic matter, and loosely adhered transient flora. While water is considered a 'universal solvent,' it is not suitable for washing dirty hands on its own, as soap is needed with water to remove fats and oils that are often present on dirty hands. To avoid allergic reactions, you can use regular soap with a neutral pH.*

Note*: If disposable (cloth or paper) towels are not available, air dry your hands. You should not use shared towels as they lead to cross-contamination!!!*

Remember*: Air or jet hand dryers operate slowly, loudly, require power, and pose a potential risk of spreading airborne microorganisms into the environment; therefore, their use in medical facilities is not recommended.*



Figure 9. Stages of routine handwashing with soap and water

2. Rubbing (treating) hands with an alcohol-based product is the preferred method of routine hygienic antisepsis if hands are not visibly soiled or tap and flowing water are not available.

The goal of hand antiseptic is to remove dirt and traces of contamination, as well as to reduce both transient and resident microflora. The technique of antiseptic hand treatment is similar to simple handwashing. Alcohol-based hand sanitizers should be used for hand rubbing when hands are not visibly soiled or when running water is unavailable.

According to research findings, alcohol-based disinfectants prove to be more effective and time-efficient than regular handwashing. In cases where hands are physically clean, it is recommended to use such disinfectants.

Advantages:

- Easy access in the healthcare setting.
- Excellent antimicrobial activity against both Gram-positive and Gram-negative vegetative bacteria, M. Tuberculosis and a broad spectrum of fungi.
- Overall, good antimicrobial activity against enveloped viruses.

Drawbacks:

- Lesser and/or variable antimicrobial activity against non-enveloped viruses (such as norovirus).
- Does not act on the oocysts of protozoa and bacterial spores (such as Clostridium difficile).

Hand antiseptic should be performed before:

- Examinations or care of particularly susceptible patients (e.g., premature infants, elderly patients, or those with AIDS).
- Performing invasive (i.e., aseptic) procedures, such as the incretion of intravascular devices, and others.
- After contact with a patient and exiting a room where Contact Precautions are in place (e.g., hepatitis A or E) or from patients with drug-resistant infections (e.g., methicillin-resistant Staphylococcus aureus).

"Hand antiseptic treatment is more effective in eliminating both transient and resident flora than washing with antimicrobial agents or regular soap and water, takes little time, is convenient to use, and provides greater initial reduction of microbial flora on hands." Hand antiseptic agents also contain a small amount of emollients, such as glycerin, propylene glycol, or sorbitol, which protect and soften the skin.

The technique for performing hand antiseptic treatment (Figure 10):

- Apply a sufficient amount of antiseptic product to cover the entire surface of the hands and fingers, approximately 5 mL (about 1 teaspoon).
- Vigorously rub the solution into your hands, especially between your fingers and under your nails, until your hands are completely dry, for 20-30 seconds.

To achieve the desired effect, it is important to apply a sufficient amount of the solution for hand treatment. For example, when increasing the amount of product to 5 ml for one application (approximately 1 teaspoon), the effectiveness significantly increases.



Figure 10. Stages of hand antiseptic rubbing

Since hand antiseptics do not remove dirt or organic substances, in cases where hands are visibly soiled or contaminated with blood or biological fluids, it is recommended to first wash hands with soap and water. Additionally, to reduce the 'buildup' of emollients on the hands, it is recommended to wash hands with soap and water after every 5-10 applications of the antiseptic solution. Finally, hand treatment solutions containing only alcohol as the active ingredient have limited residual effects (i.e., the ability to prevent bacterial growth after application) compared to those that include alcohol with the addition of an antiseptic, such as chlorhexidine.

Preparation of an alcohol-based hand treatment solution:

A non-irritating skin antiseptic solution for hand disinfection can be prepared by adding softening agents such as glycerin and hydrogen peroxide. Use 5 ml (approximately 1 teaspoon) for each application and continue rubbing the solution until your hands are completely dry (20-30 seconds). Glycerin is often sold in cosmetic departments because it is used as a softening agent for hands.

Table 2. Preparation of an antiseptic solution for hand hygiene (WHO/IER/PSP/2010.5)

The formula for an alcohol-based hand hygiene product		
Preparation method for 10 liters		
Formula 1	Ethanol 96% - 8333 ml. Hydrogen peroxide 3% - 417 ml Glycerin 98% - 145 ml.	*Final product:* Ethanol 80% Hydrogen Peroxide 0.125 % Glycerin – 1.45%
Formula 2.	Isopropyl alcohol 99.8% - 7515 ml. Hydrogen peroxide 3% - 417 ml Glycerin 98% - 145 ml.	*Final product :* Isopropyl alcohol 75% Hydrogen Peroxide 0.125 % Glycerin – 1.45%

Table 3. Microbiological activity and possible applications

	ANTIBACTERIAL EFFECT										
	Gram-positive	**Most gram-negative**	**Tuberculo-sis**	**Viruses**	**Fungal**	**Endospores**	**Comparative speed of action**	**Impact of organic substances**	**Surgical washing**	**Skin processing**	**Notes**
Alcohol (60–90% ethyl or isopropyl)	Excellent	Excellent	Excellent	Excellent	Excellent	No	Fast	Moderate	Yes	Yes	Do not apply to mucous membranes Not suitable for physical skin cleansing, does not have a prolonged effect
Chlorhexidine (2–4%) (Hibitane, Hibiscrub)	Excellent	Good	Satisfactory	Excellent	Satisfactory	No	Average	Light	Yes	Yes	Has a good prolonged effect Toxic to ears and eyes
Tincture of iodine (3%)	Excellent	Excellent	Excellent	Excellent	Good	Satisfactory	Average	Meaningful	No	Yes	Do not apply to mucous membranes May cause skin burns, do not keep for more than a few minutes
Iodophors (7.5–10%) (Betadine)	Excellent	Excellent	Satisfactory	Good	Good	No	Average	Moderate	Yes	Yes	Can be used on mucous membranes
Parachlorometaxylenol (PCMX) (0.5–4%)	Good	Excellent	Good	Good	Satisfactory	Unknown	Slow-paced	Minimum	No	Yes	Penetrates through the skin and should not be used for newborns
Triclosan (0.2–2%)	Excellent	Good	Satisfactory	Excellent	No	Unknown	Average	Minimum	Yes	No	Acceptance on hands differs

Adapted from: Boyce and Pittet 2002; Olmsted 1996.

5.2.1 Surgical hand preparation (see. CHAPTER VI. 6.1. Prevention of infections in surgical departments)

The goal of surgical hand preparation is to mechanically remove contaminants, transient microorganisms, and reduce resident microflora for the duration of the surgery. Hand antiseptic treatment before surgery reduces the number of microorganisms and suppresses the growth of microorganisms on hands under gloves. The goal is to prevent the wound from being infected by microorganisms from the hands of the surgeon and assistants. The soap containing chlorhexidine or povidone-iodine is the most commonly used product for surgical hand preparation. The antimicrobial effectiveness of alcohol-based preparations surpasses the effectiveness of all other currently available methods for pre-surgical surgical hand preparation.

The application of antiseptic minimizes the number of microorganisms on the hands under gloves and reduces the growth of microflora during the operation. This is important because gloves may have unnoticed holes or tears, or they may get damaged during the operation.

As an alternative approach, hand washing followed by hand antiseptic application containing chlorhexidine is used, which has been proven to significantly reduce the number of microbes on hands, improve skin health, and reduce time and resource requirements.

Guidelines for hand antisepsis using a chlorhexidine-containing antiseptic:

- Remove rings, watches, and bracelets.
- Thoroughly wash your hands and forearms up to the elbows with soap and water, paying special attention to the areas between your fingers. (Refer to the handwashing technique illustration).
- Treat the nails with a special brush or tool.
- Rinse your hands and forearms with water and thoroughly dry your hands and forearms with a clean dry towel or air.
- Apply 5 ml (approximately 1 teaspoon) of antiseptic solution to the palms and forearms, rub until hands are completely dry. Repeat the application and rubbing of the antiseptic two more times, totaling at least 2 minutes, with a total amount of antiseptic being approximately 15 ml (3 teaspoons).
- Keep your hands up and away from your body, do not touch any surfaces or objects before putting on sterile surgical gloves on both hands.

Measures aimed at reducing the adverse effects of antiseptics on the skin of the hands.

Potential strategies to reduce the risk of developing contact dermatitis associated with handwashing include:

- Reducing the frequency of using irritating agents (especially anionic detergents).
- Replacing highly irritating products with those that cause less damage to the skin.
- Training medical staff on the risks of contact dermatitis and the implementation of protective measures (using moisturizing and protective creams and lotions).
- Providing medical personnel with skincare products for hands.

One way to reduce the frequency of exposure to irritating substances (soaps and detergents) on the skin of personnel is the widespread introduction of alcohol-based antiseptics with various emollients.

Medical personnel should remember that there is no need to wash hands with soap and water after using an alcohol-based hand antiseptic. Washing hands with soap and water after using a hand disinfectant can lead to the development of dermatitis.

Measures to reduce the likelihood of dermatitis development:

- Adequate rinsing and drying of hands.
- Use of creams.

Hand care

- Intact skin is natural protection against infection.
- Medical personnel should cover all cuts and abrasions with a waterproof dressing (if possible, replace the doctor with injured hands for performing the surgery).
- It is recommended to use hand cream (moisturizing), as hands can become dry from frequent handwashing.
- It is advisable to avoid hand creams containing oil, as they may lead to latex glove breakage.

lotions and creams

To reduce the risk of contact dermatitis associated with frequent handwashing (>30 times per shift), the use of irritating skin cleansers, and the application of antiseptics (60-90% alcohol solutions are less irritating to the skin than any other antiseptic or non-antiseptic cleansers), healthcare workers should use lotions, creams, and moisturizing products for skin care.

Regular use (at least twice a day) of such products can prevent and treat contact dermatitis. In addition, moisturizing agents can prevent drying, damage, and defatting of the skin. Emollients, such as glycerin and sorbitol, with or without antiseptics, can reduce cross-contamination as they decrease the spread of bacteria from the skin for up to 4 hours.

Healthcare workers should be encouraged to use hand lotions, creams, and moisturizing skincare products. These products should be packaged either in small, individually used bottles that are easy to carry or in pump dispensers that cannot be refilled to reduce the possibility of contamination. To avoid confusion, these dispensers should not be placed next to dispensers with antiseptic agents.

It is not advisable to use oil-based protective agents, such as those containing Vaseline (Vaseline®) or lanolin, as they can damage latex gloves.

Lesions and Skin Breaks

The cuticles, palms, and forearms should be free from damage (dermatitis or eczema) and skin defects (cuts, abrasions, and cracks). Cuts and abrasions should be covered with a waterproof dressing. If such dressing is not possible, surgical personnel should not operate until the injury is healed.

Nails

The study showed that nail beds (subungual areas) contain the highest amount of microbes on the hand. In addition, several recent studies have shown that long nails can serve as a reservoir for gram-negative bacilli (*P. aeruginosa*), yeast fungi, and other pathogenic microorganisms. Moreover, long nails, whether natural or artificial, can puncture gloves. As a result, it is

recommended to keep nails relatively short—no longer than 3 mm from the fingertip. **Artificial nails, nail polish,** and **decorations are not recommended.**

The improvement of hand hygiene practices

The practice of hand hygiene can be improved by implementing a **multimodal strategy recommended by the WHO,** along with regular monitoring and self-assessment.

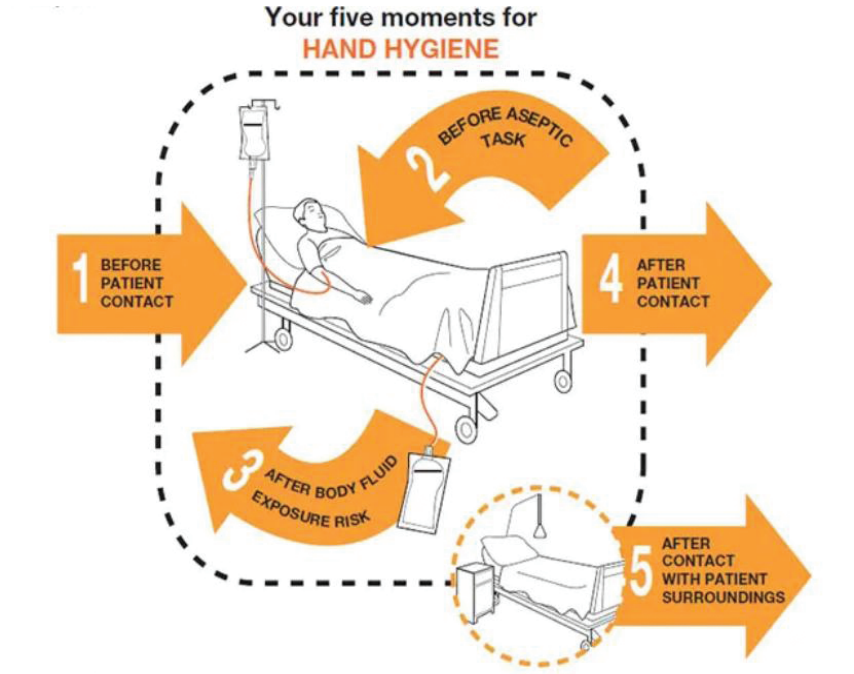
Table 4. KEY COMPONENTS

System Change	To ensure the availability of the necessary infrastructure that allows healthcare workers to practice hand hygiene. It consists of two main elements: - Access to safe and uninterrupted water supply, as well as soap and clean, disposable, or personal towels. - The availability of alcohol-based hand sanitizer in healthcare facilities.
Education/ Training	Regular training of all healthcare workers on the importance of hand hygiene based on the 'My 5 Moments for Hand Hygiene' approach and the correct steps for handwashing and disinfection.
Evaluation and feedback	Monitoring the practice and infrastructure of hand hygiene, as well as proper understanding and knowledge among healthcare workers, providing personnel with feedback based on monitoring results.
Reminders in the workplace	Posters and reminders for healthcare workers about the importance of hand hygiene and the relevant methods and procedures for it. Thanks to these reminders, patients and visitors also learn about the care standards they should expect from their healthcare providers regarding hand hygiene. Reminders can be visual, such as posters, videos, or audio.
Institutional Safety Climate	Creating an environment and perceptions that contribute to increasing patients' awareness of safety issues, while simultaneously ensuring improved hand hygiene, is a top priority at all levels, including: - active participation at both institutional and individual levels. - awareness of individual and institutional capacity to change and improve (self-efficacy); as well as - collaboration with patients and patient organizations.

The use of the WHOself-assessment tool acts as a diagnostic instrument, identifying key areas that require attention and improvement in hand hygiene. Conducting internal monitoring of compliance with the 5 points of hand hygiene according to the checklist quarterly in all departments of healthcare facilities. Monitoring should be carried out by responsible individuals responsible for infection control in the medical facility. The results of internal monitoring should be discussed with the staff at a general intra-hospital meeting, and appropriate decisions and recommendations for improvement should be made.

The concept of the «5 moments of hand hygiene» is aimed at:

- Promoting positive outcomes by associating specific hand hygiene actions with specific infectious outcomes for both patients and healthcare workers (creating a belief in the benefits).
- Increasing self-efficacy by providing healthcare workers with clear guidance on how to integrate hand hygiene into the overall care task (building beliefs in positive control).



1	BEFORE PATIENT CONTACT	WHEN? Clean your hands before touching a patient when approaching him or her WHY? To protect the patient against harmful germs carried on your hands
2	BEFORE AN ASEPTIC TASK	WHEN? Clean your hands immediately before any aseptic task WHY? To protect the patient against harmful germs, including the patient's own germs, entering his or her body
3	AFTER BODY FLUID EXPOSURE RISK	WHEN? Clean your hands immediately after an exposure risk to body fluids (and after glove removal) WHY? To protect yourself and the healthcare environment from harmful patient germs
4	AFTER PATIENT CONTACT	WHEN? Clean your hands after touching a patient and his or her immediate surroundings when leaving WHY? To protect yourself and the healthcare environment from harmful patient germs
5	AFTER CONTACT WITH PATIENT SURROUNDINGS	WHEN? Clean your hands after touching any object or furniture in the patient's immediate surroundings, when leaving - even without touching the patient WHY? To protect yourself and the healthcare environment from harmful patient germs

Figure11. Five moments of hand hygiene in clinical conditions

Moment 1. Before touching the patient

Wash your hands before touching the patient upon approaching them to protect the patient from harmful microbes on your hands.

Moment 2. Before a clean/aseptic procedure

Wash your hands immediately before accessing critical areas with an infectious risk for the patient to protect them from harmful microbes, including his own, entering their body.

Moment 3. Risk after contact with body fluids

Wash your hands immediately after contact with biological fluids (and after removing gloves). This will protect both you and the healthcare environment from pathogens in blood and biological fluids.

Moment 4. After touching the patient

Wash your hands after touching the patient and being in close proximity to them, as well as when leaving the patient, to protect yourself and the healthcare environment from harmful microorganisms.

Moment 5. After touching the patient's surroundings

Wash your hands after touching any object or furniture in close proximity to the patient when leaving, even if you did not touch the patient, to prevent the spread of harmful microorganisms from the patient's area to the rest of the healthcare facility.

The World Health Organization's tool for direct observation of hand hygiene is provided in the Appendix №8. Healthcare facilities can adapt and use this tool at the local level for hand hygiene audits.

Table 5. Handwashing Audit Rules

Rules	Definition
Moment 1	**Moment 1** is recorded only once before contact with patients
Moment 2	**Moment 2** is recorded immediately before the execution of any procedure - After handwashing is completed, healthcare personnel should not touch any objects before performing a procedure
Moment 3	**Moment 3** is recorded immediately after contact with a patient's secretions. - Hands should not touch anything before handwashing is performed - Any touch by hands to catheters, urine collection devices, and similar items, even in the absence of visible damage, is considered a risk of infection - Even after cleaning patient secretions without direct contact (e.g., removing vomit), handwashing is recorded as Moment 4
Moment 4	**Moment 4** is recorded after contact with the patient - Contact with the environment of patients after touching the patient is recorded as **MOMENT 4** - If after **MOMENT 3**, the HCW touched the patient's surroundings, the procedure is recorded as **MOMENT 4**
Moment 5	**Moment 5** is recorded when a healthcare worker moves away from the patient's zone after contact with the surroundings without touching the patient. - Contact with multiple items in the patient's environment, all of them are recorded as **MOMENT 5**
Before and after the moments	In general, for each moment, there should be a record 'after the moment' if the observer did not witness these actions directly - After Moment 1, typically follows Moment 3 or Moment 4 - Moment 2 is usually followed by moment 3

	- Moment 5 is a separate action as there is no contact with the patient There are several situations where two 'after' instances may be sequentially recorded, but you never register M1 and M2 in the same line
Action skipped	Healthcare professionals should perform handwashing before examining the patient If you did not observe this action, record it as 'missed' (i.e., not performed)
Record only what you observe:	No recording 'BEFORE' the moment if the observation begins after the healthcare worker has started examining the patient or performing procedures. Or AFTER» the moment if you were unable to directly observe the process
Bed linen	The patient's bed linen remains the most contaminated item in the patient's environment. Touching the patient's bed linen is considered equivalent to leaving the patient's zone. Hand hygiene should be performed between touching clothing and examining the patient, and vice versa.
Secondment	In most cases, hand hygiene is observed to be performed simultaneously, for example, if a healthcare professional moves from one patient to another without touching other objects. In such cases, a single moment can cover both hand hygiene moments, as Moment 4 and Moment 1 coincide
When there is no need to record handwashing	The hand hygiene procedure is checked for compliance with the '5 moments,' but it is not verified by healthcare workers performing hand hygiene (HH) actions. Hand hygiene actions that do not correspond to the recognized moment are not recorded. For example, when a healthcare worker enters a patient's room, performs hand hygiene, and leaves without touching anything, in this case, there was no specific Moment, even though hand hygiene took place, so no Moment can be recorded.

5.3 PERSONAL PROTECTIVE EQUIPMENT

Protective barriers, referred to as Personal Protective Equipment (PPE), have been used for many years. In recent years, with the spread of HIV and hepatitis C, as well as the epidemic of the new coronavirus infection worldwide, the use of Personal Protective Equipment (PPE) to protect healthcare personnel has become a crucial task for every healthcare worker.

Personal protective equipment includes gloves, masks/respirators, eye protection (face shields, various types of protective eyewear), gowns, aprons, closed-toe shoes that can be washed, and more.

Personal Protective Equipment should be used by:

- Medical workers WHOprovide direct assistance to patients and may come into contact with blood, biological fluids, excrement, and other bodily secretions.
- Support staff, including orderlies and laundry personnel, in situations involving the risk of contact with blood, biological fluids, secretions, and excrement.
- Laboratory personnel working with patient samples (blood, secretions, etc.).
- Family members providing care to patients and facing situations with the risk of contact with blood, biological fluids, secretions, and excrement.

Under no circumstances should paper caps, masks, or surgical sheets be reused, as they cannot be properly processed.

If they cannot be laundered, do not reuse them!

Understanding the principles of microbial transmission, along with effective risk assessment and proper selection of Personal Protective Equipment (PPE), can help avoid unnecessary use of PPE and reduce its wastage. Before using any Personal Protective Equipment (PPE), it is important to regularly assess the risk of contact with blood, biological fluids, or contaminated surfaces before any medical intervention.

5.3.1 Gloves

Gloves protect hands from contaminated materials and protect patients from microorganisms on the hands of healthcare personnel. They serve as the most crucial physical barrier to prevent the spread of infection, but they need to be changed when moving from one patient to another to prevent cross-contamination. For example, examination gloves should be worn when handling blood, biological fluids, secretions, and excrement (excluding sweat), contaminated surfaces or equipment, and when touching damaged skin and mucous membranes.

In medical institutions, three types of gloves are used: surgical gloves, examination gloves, and utility gloves:

Surgical gloves should be used during invasive medical or surgical procedures;

Examination gloves provide protection to healthcare workers during many routine duties;

Utility gloves should be worn when handling instruments, equipment, and other items; when dealing with contaminated waste and its disposal; and when handling contaminated surfaces.

Gloves & Hand Hygiene

The use of gloves is an important part of protecting hands from contamination.

If a healthcare worker wears gloves, it does not mean that hand hygiene can be neglected. In other words, wearing gloves does not replace the need for hand hygiene.

When using gloves, the following rules should be observed:

- Gloves should be worn when anticipating contact with blood or other body fluids, mucous membranes, damaged skin areas, potentially infectious materials, or chemicals (e.g., cleaning solutions).
- Hand hygiene is performed before putting on gloves.
- Gloves should be removed after caring for a patient. It is prohibited to wear the same pair of gloves for caring for more than one patient.
- Hands should be washed or another alcohol-based antiseptic should be used after removing gloves.

Remember!!! The use of gloves does not replace the need for hand hygiene.

Assessment of the protective properties of gloves

The use of gloves is not an alternative to handwashing and antiseptic hand treatment. Gloves alone are not the sole and reliable means of preventing infection.

Gloves do not protect the skin from needlesticks and cuts with medical instruments, and if they are contaminated with blood and other biological fluids, it poses a risk of infection to healthcare personnel with hepatitis B, C, and HIV.

As statistics show, 20–30% of surgical gloves get damaged during surgeries, and depending on the manipulations, glove damage can range from 6.35% to 41.7% of case. At the same time, surgeons only notice damages (tears, punctures) to gloves in about 15–20% of cases.

No gloves are completely impermeable to microbes; according to various studies, 4–63% of tested vinyl gloves and 3-52% of latex gloves were found to be permeable.

In assessing the performance of different gloves, it was found that when healthcare workers performed procedures and their hands in gloves came into contact with Gram-negative microorganisms and enterococci, in 70% of cases, these pathogens were detected on the gloves. In 13% of cases, the hands of healthcare workers were contaminated with the same pathogens. This was observed in 24% of cases when using vinyl gloves and in 2% with latex gloves.

The penetration of fluids into gloves was also more frequently observed with vinyl gloves (43%) than with latex gloves (9%). Leaks were most often localized in the area of the thumb and fingertips, and users noticed these leaks in only 32% of cases. Since glove leaks are not easily recognized by healthcare workers, handwashing after removing gloves should be mandatory.

The penetration of chemicals or microorganisms into gloves can occur through their entry through pores, small openings in the material whose sizes are comparable to the sizes of the molecules of the penetrating substances. This can lead to uncontrolled contact with hazardous chemicals or infectious material.

In healthcare facilities, disinfectants are widely used for surface cleaning and various objects, as well as for the sterilization of medical instruments, especially in situations with an increased risk of infection transmission through blood. Therefore, gloves should protect healthcare workers both from infection penetration and from the harmful effects of disinfectants themselves. However, various chemicals (such as ethanol, isopropyl alcohol, chlorhexidine, glutaraldehyde, etc.) used by healthcare workers in their daily practice, can cause damage to gloves. For example, a 15-minute contact with 75% ethanol causes significant changes in the structure of glove material. Penetrating through gloves, these substances have an allergic and/or damaging effect on the skin of the hands.

Cytostatic drugs can penetrate through the material of the gloves. Currently, the quality of gloves used in this case is not regulated. From the perspective of the ability of cytostatics to penetrate through gloves, they can be divided into three groups:

- Non-penetrating (for more than 4 hours);
- Slowly penetrating (penetration time from 2 to 4 hours);
- Quickly penetrating (within less than 15 minutes).

This should be taken into account when choosing gloves for working with cytostatics.

Handwashing during intervals between assisting patients or between performing clean and dirty procedures with the same patient is prohibited! In such a case, it is necessary to change gloves!

In addition to the fact that this increases their permeability, which is unsafe for the staff, there is data that even with proper handwashing technique in gloves (rubbing, using a cleansing agent, drying), it is not always possible to completely remove the existing flora.

When gloves are not processed adequately, the risk of cross-contamination among patients increases. Moreover, extending the duration of glove wear leads to the accumulation of «glove juice», which contains a large number of microorganisms. After removing gloves, hands should be thoroughly washed and dried.

Requirements for gloves for clinical procedures

In Table 6, common medical and surgical procedures are listed for which the use of protective gloves may be required. It also includes the types of gloves and/or required processing.

Table 6. Requirements for gloves for routine medical and surgical procedures

Manipulation or action	What should be done is	Preferably[16]	Acceptable
Measuring of blood pressure	No	-	-
Temperature measurement	No	-	-
Intravenous injection, subcutaneous, intramuscular	No	-	-
Patient care: changing clothes, washing, transportation if there is no contact with biological fluids	No		
Blood Collection	Yes	Inspection [17]	Surgical [18,]
Any surgical procedures, childbirth, invasive radiological procedures, access to blood vessels, and manipulations with them.	Yes	Surgical sterile	–
Placement and removal of intravenous devices, disconnecting devices for intravenous infusions	Yes	Surgical diseases with nursing care	–
Administration of intravenous infusions	Yes	Surgical diseases with nursing care	Surgical diseases with nursing care
Examination, inspection of mucous membranes without damage (nose, mouth, eyes, vagina, rectum)	Yes	Observations	Surgical [18,]
Examination, inspection of damaged skin, contact of the skin with biological fluids, secretions, excrements, and objects clearly contaminated by them	Yes	Observations	Surgical sterile
Treatment of uncomplicated postoperative wounds Management of complicated wounds and drains	Yes Yes	Observations Sterile	Surgical [18,]
BOXion and removal of intrauterine devices (using the 'no-touch' «technique»)	Yes	Observations	Surgical [18,]

[16] Although sterile gloves can be used during any surgical procedure, they are not always required. in some cases, inspection or where surgical gloves are just as safe, and at the same time cheaper

[17] This includes new, previously unused, individually or in a box packaged inspection gloves (provided the boxes are properly stored)

[18] When sterilization equipment (autoclave) is not available, the only acceptable alternative is deep disinfection

Manipulation or action	What should be done is	Preferably[16]	Acceptable
BOXion and removal of implants (Norplant)	Yes	Sterile surgical [18]	Surgical
Vaginal delivery	Yes	Sterile surgical	Surgical diseases with nursing care
Laparotomy, cesarean section	Yes	Sterile surgical	Surgical diseases with nursing care
Laparoscopy	Yes	Sterile surgical	Surgical diseases with nursing care
Handling of instruments and their sterilization	Yes	Household	Inspection or surgical
Handling of infectious waste	Yes	Household	Inspection or surgical
Cleanup of blood spills and other biological fluids. Environmental cleaning. Washing and processing of laundry	Yes	Household	Inspection or surgical

Reuse / reprocessing!

Due to the fact that medical gloves are single-use items, disinfection and their reuse are not recommended. This should be avoided even if it is a common practice in many low-resource medical facilities with limited supplies of gloves.

The «Gloves» pyramid (12) will help make a decision on when to (or not to) wear gloves.

- Gloves should be worn in accordance with standard and contact precautions. The pyramid provides detailed descriptions of certain clinical situations where the use of gloves is necessary, as well as examples where there are indications for the use of sterile and non-sterile gloves;
- Hand hygiene should be performed in those cases when it is necessary, regardless of the indications for using gloves.

Gloves should be worn in accordance with standard and contact precautions. The pyramid details some clinical examples where gloves are not indicated, and others where examination or sterile gloves should be worn.

Wearing two pairs of gloves

The World Health Organization recommends wearing double gloves for surgical procedures lasting more than 30 minutes. It also recommends using two gloves in countries with a high prevalence of HCV (Hepatitis C), HBV (Hepatitis B), and HIV/AIDS. https://medrux.com/double-gloving/

While wearing two pairs of gloves provides little benefit in preventing needlesticks or other injuries, it may reduce the risk of hand contact with blood.

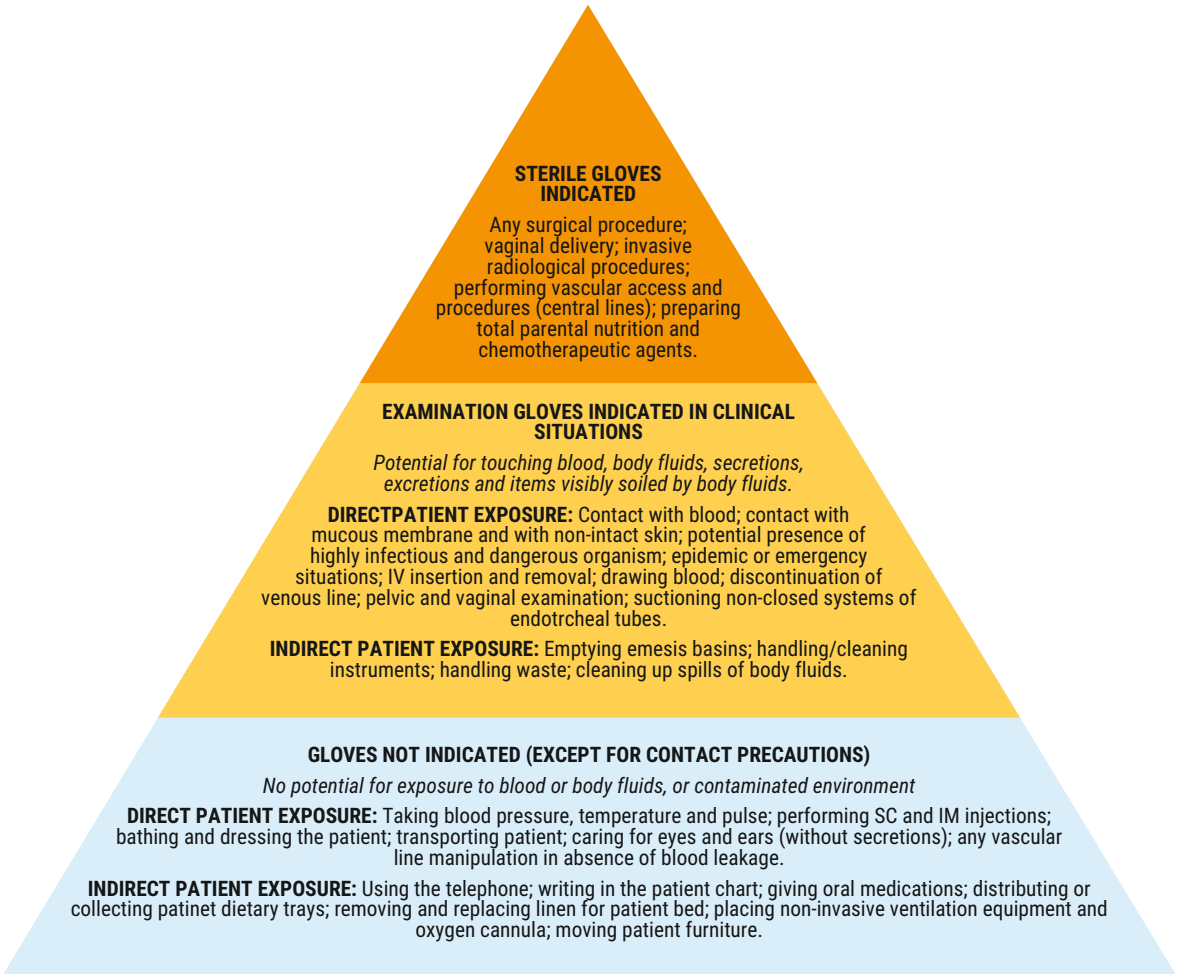


Figure 12. The pyramid of indications for types of gloves.

Indications for wearing **two pairs of gloves** include:

- Anticipated contact with a large amount of blood or other biological fluids from the body (e.g., cavity surgeries, peritonitis);
- Orthopedic procedures involving anticipated work with sharp bone fragments, wire ligatures, and other sharp objects.

In general, for short-duration surgical procedures (30 minutes or less) involving minimal contact with blood or mucous secretions (e.g., laparoscopy or laparotomy), wearing two pairs of gloves is not deemed necessary. The question of whether a surgeon, assistant, or operating nurse should wear two pairs of gloves should be considered carefully, especially in cases of increased risk of infection with bloodborne pathogens such as HIV (prevalence >5%).

The healthcare worker should change the outer glove when necessary and after two hours of use during surgery.

Rules for putting on and taking off gloves

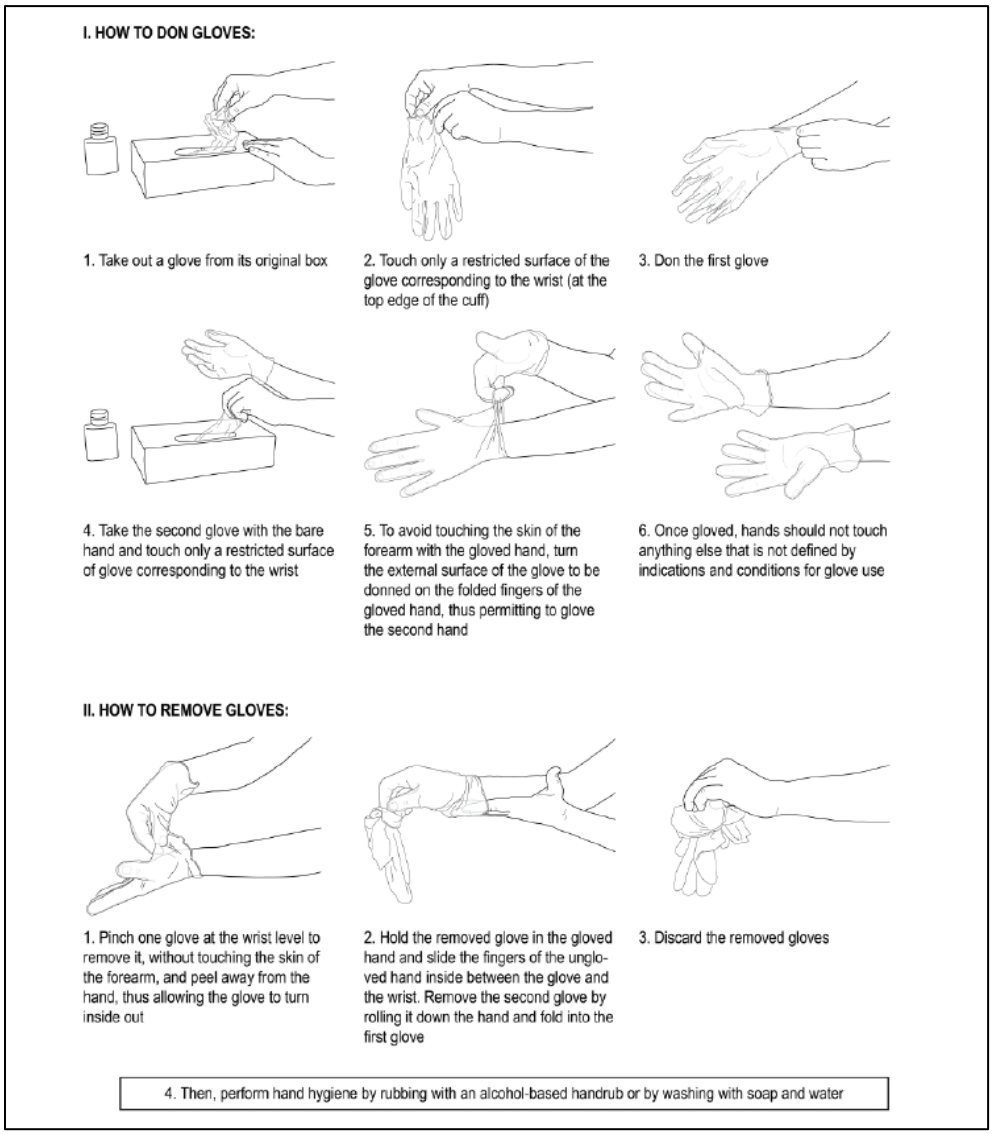


Figure 13. Rules for putting on and taking off gloves

Rules for handling gloves

- **Wear gloves of the correct size,** especially when it comes to surgical gloves. Fitting gloves can limit your ability to perform manipulations and are more prone to damage (tearing or cutting).
- Periodically **change surgical gloves during prolonged** procedures, as the protective effect of latex gloves decreases over time, and unnoticed tears may occur.
- **Nails on** the hands should be trimmed short (less than 3 mm or 1/8 inch) to reduce the risk of glove tears.
- **Pull the gloves** over the cuffs of the gown (if worn) to protect the wrists.

- **Apply** water-soluble (non-greasy)**lotions** and moisturizers for hands to prevent dryness, peeling, and cracking of the skin due to frequent washing and glove use.
- Do not **use oil-based lotions or creams, as they can damage latex surgical or examination gloves.**
- **Use unscented lotions and moisturizers for hands, as scented ones can irritate the skin under gloves.**
- **Store gloves in places with significant temperature impact (e.g., in the sun, near heating devices,** air conditioner, ultraviolet radiation source, fluorescent lamps, or X-ray equipment). These conditions can damage the gloves (break down the material they are made of), thereby reducing their effectiveness as a barrier.

5.3.2 Other personal protective equipment

Masks are physical barriers that prevent the entry of splashes or biological fluids, respiratory emissions, and chemicals onto your mucous membranes (your nose and mouth). Masks also block respiratory emissions from your mouth to the patient (for example, during surgery or lumbar punctures, as well as in cases where healthcare workers are advised to practice source control, such as during sporadic, cluster, or community transmission of COVID-19).

Masks should be large enough to cover the nose, lower part of the face, jaw, and facial hair. They are designed to capture moisture droplets released by healthcare workers or surgical staff during talking, coughing, sneezing, and also to prevent accidental splashes of blood or other biological fluids from entering the nose or mouth of healthcare workers.

Remember: *When removing the mask, hold it by the ear loops, as the center of the mask is the most contaminated.*

Rules for wearing masks

Before putting on a mask, it is advisable to perform a hand hygiene procedure. The mask should cover the mouth and nose. After putting on the mask, it is recommended to avoid touching the mask during use. The mask should be changed as soon as it becomes moist. To remove the mask, it is advisable to use the appropriate technique: do not touch the front of the mask and take it off from behind or by the fastening straps. After removing or accidentally touching the used mask, it is recommended to clean your hands using an alcohol-based hand sanitizer. The used mask should be disposed of in a container for contaminated waste.

Masks are made from various materials, ranging from lightweight cotton fabric, gauze, and even paper, to synthetic fabrics, some of which are water-resistant. Masks made of cotton fabric or paper are very convenient, but they are not water-resistant or effective as filters. Masks made of synthetic materials can provide protection against large droplets (> 5 μm in size) emitted during coughing or sneezing by a nearby healthcare worker (within 1 meter) towards the patient.

Remember: *if masks are not made of waterproof materials, they do not provide an effective barrier.*

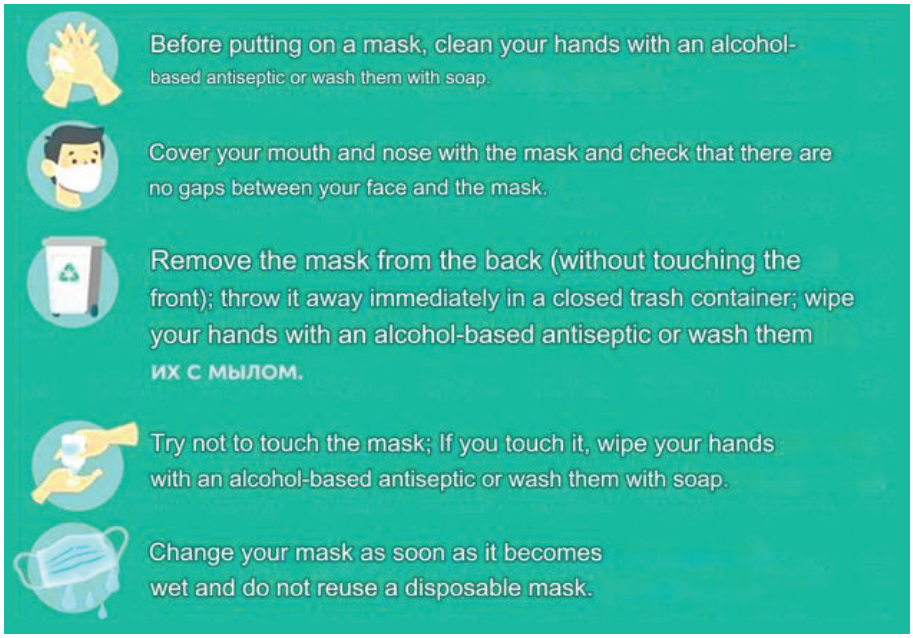


Figure 14. Rules for putting on, taking off, and disposing of the mask

Respirators

The difference between a medical mask and a respirator lies in their purpose. The primary task is to prevent the contact of saliva and respiratory secretions from one person to another. The second (respirator) should not allow even the finest fraction of dust to enter the human body. Based on this, it can be concluded that respirators are more reliable protectors against various particles.

Respirators are a type of mask that filters particles from the air, significantly reducing the quantity of particles or microorganisms inhaled by the wearer of the respirator. Various types of respirators are used depending on the activity and potential threat. Particle-filtering respirators (N95, FFP2, KN95, etc.), also known as face-filtering respirators, are the most common type of respirators used in medical conditions.

It comes in three types: FFP1, FFP2, FFP3. Indeed, the higher the number following the «FFP» designation, the greater the level of protection.

Respirators used in healthcare facilities traditionally represent a special type called a surgical respirator (surgical mask). They may also be labeled as «Surgical N95» or «medical respirators». The difference lies in the additional moisture-resistant outer layer, usually colored in blue.

Wearing respirators is strongly recommended when there is a risk of inhaling infectious microorganisms in aerosols while caring for a patient or being in the same room with them. This is especially relevant for patients with diseases like tuberculosis or measles, or when performing aerosol-generating procedures on a patient with suspected or confirmed respiratory infectious diseases. Examples include: (a) performing aerosol-generating procedures such as intubation, bronchoscopy, or sputum induction; (b) caring for patients for whom airborne precautions are applied.

Remember: *if masks are not made of waterproof materials, they do not constitute an effective barrier!*

Eye Protection

These means protect medical personnel in case of splashing blood or potentially infected biological fluids from the body by covering the eyes. Means for eye protection include transparent plastic safety goggles, protective glasses, face shields, and masks with shields (Figure 15). Prescription glasses and glasses with plain lenses are also acceptable. Masks and goggles or face shields should be worn during any procedures where accidental splashes to the face are possible (for example, during manipulations, instrument cleaning, etc.). If face shields are not available, protective goggles or glasses can be used together with a mask.

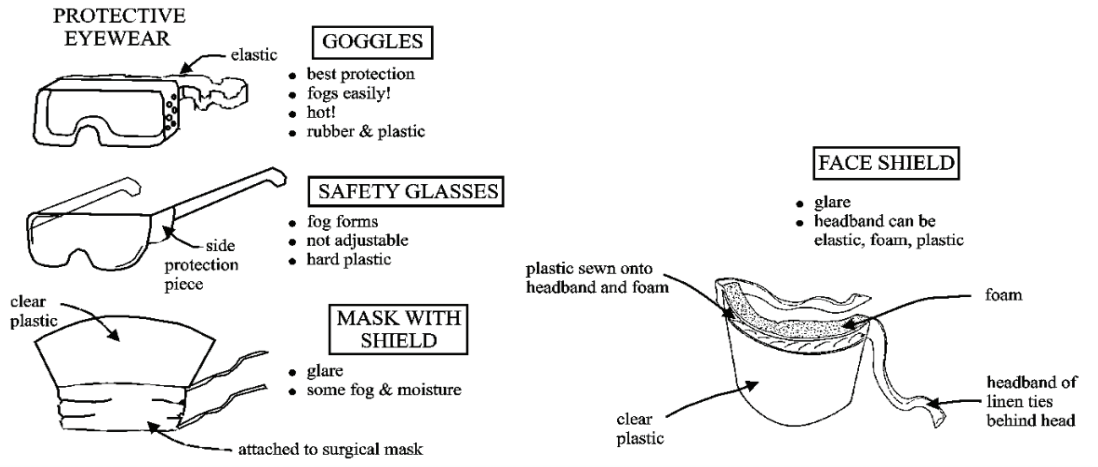


Figure 15. Eye protection means

Caps

They are used to cover the hair and scalp, preventing skin flakes and hair from entering a wound during surgery. Caps should be large enough to cover all hair. While caps provide some protection for the patient, their main purpose is to protect the wearer from splashes and sprays of blood or potentially hazardous biological fluids from the body. Wearing caps in the surgical area, intensive care unit, delivery room, and central sterilization department is mandatory.

Medical Robes & Suits

They are worn over or instead of personal clothing. Suits typically consist of drawstring pants and shirts. The V-neck of the shirt should not be too deep to prevent the shoulders from slipping and exposing chest hair in men.

Surgical gowns

Such gowns, made of waterproof materials, indeed play a specific role in shielding the skin of medical personnel from blood and other fluids, especially during surgeries, deliveries, and emergency care. However, gowns made of lightweight cotton fabrics provide insufficient protection. In such a situation, if significant splashes occur, it is best to take a shower or bathe as soon as possible after the completion of the surgery or procedure.

Aprons

They are worn to protect clothing from contamination. Aprons made of rubber or plastic provide a waterproof barrier, protecting the front of the medical worker's body. An apron should be worn when adhering to contact precautions, especially during cleaning.

Footwear

It is worn to protect the legs from injuries caused by sharp instruments or heavy objects that may accidentally fall on them. For this reason, sandals, flip-flops, open-toe shoes, or shoes made of soft materials (fabric) should not be worn. Rubber or leather boots or shoes provide greater protection, but they should be kept clean and uncontaminated by splashes of blood and other biological fluids from the body. Overshoes are not necessary if you have sturdy shoes that are worn only in the surgical area. During surgery or procedures, including childbirth, even simple disposable plastic covers (shoe covers) can protect healthcare workers from contact with blood and biological fluids from the body.

If resources are limited and disposable personal protective equipment is unavailable, use reusable items (such as cotton gowns) and properly disinfect them after each use. To avoid losses, critically assess situations where personal protective equipment is indicated and maximize the provision of clinical care at each entry into the patient's room. However, use disposable personal protective equipment only when working with organisms of risk group 4 (RG 4) or infections caused by them.

Before putting on personal protective equipment (PPE)

- Healthcare workers should be trained in the use of personal protective equipment (PPE) as part of infection control training.
- Training should cover the protocols adopted in a specific institution and include practicing the procedures for putting on and taking off PPE, as well as performing care-related actions while wearing personal protective equipment.
- The competence of healthcare workers in the use of personal protective equipment should be assessed, verified, and ideally properly documented.
- The necessary resources (human, material, and financial) must be available.
- Resource management should include inventory management, availability of personal protective equipment (PPE) of various sizes and forms, arrangement of items for easy access, quality of acquired items, and linear management for reporting shortages.
- There should be written protocols for step-by-step procedures for donning and doffing personal protective equipment (PPE), handling used and potentially contaminated PPE, and related medical devices, including safe disposal and decontamination.
- Designated areas should be allocated for the donning and doffing of personal protective equipment at different locations.
- It is crucial to utilize trained observers to monitor the procedures for the correct donning and doffing of personal protective equipment.
- The use of personal protective equipment should be limited to areas where it is necessary and serves a specific purpose.
- Any protective clothing worn by healthcare workers in high-risk infection areas, such as a laboratory or operating room, should be removed upon exiting that zone.

- Protective clothing or personal protective equipment that has come into contact with patients should not be worn outside the patient care zone.

When putting on personal protective equipment (PPE)

- PPE must be donned in the correct order, as it cannot be changed while in the patient care zone. The observer should check the integrity of personal protective equipment (PPE), ensure that they fit well, and write the person's name and position, as well as the time of entry into the high-risk area, on the gown.
- The sequence for doffing PPE should be the reverse of the sequence for donning PPE. The eye protection should be worn in such a way that it can be removed as late as possible during the process of removing personal protective equipment (PPE).
- Information and posters about personal protective equipment (PPE), demonstrating the sequence of putting on and taking off PPE, should be displayed in all patient care areas.
- Personal protective equipment (PPE) should be donned and doffed in the correct sequence and disposed of in accordance with the Rules for the Management of Medical/Biomedical Waste.

Table 7. Personal protective equipment (PPE)

Type of PPE	It should be used	Primarily protects
Apron	Situations where spills or splashes of blood or physiological body fluids are possible.	A healthcare worker
Closed shoes or boots (open sandals are not acceptable)	Situations where sharp instruments are used or when the spillage of infected substances is possible (e.g., childbirth, surgical procedures).	A healthcare worker
Caps, gowns, masks, aprons, wipes	Invasive procedures during which tissues beneath the skin surface are exposed (e.g., surgical procedure)	Healthcare worker and patient
Goggles or face shields, masks, aprons	Situations where spills or splashes of blood or physiological body fluids are possible.	A healthcare worker
Masks	Situations requiring precautions against infections transmitted through the air or droplet transmission	Healthcare worker and patient
Sterile drapes	Large or small surgical procedures.	Patient *protection is limited because even sterile wipes do NOT create a sterile field*

5.3.3. Respiratory hygiene and cough etiquette

Respiratory hygiene and cough etiquette are measures taken by a person with signs and symptoms of a respiratory infection to contain respiratory secretions and prevent the transmission of infection to other individuals. They should be used in the practice of infection prevention within the framework of standard precautions.

Rules of behavior when coughing

For everyone with symptoms of a respiratory infection, the following methods are recommended to reduce the spread of respiratory secretions:

- Cover your nose and mouth with a tissue when a person sneezes or coughs.
- Use disposable tissues to protect the respiratory organs and dispose of them in the nearest trash bin as soon as possible after use.
- Maintain hand hygiene (i.e., wash your hands with soap and water, use alcohol-based hand sanitizers, or antiseptic solutions) after contact with respiratory secretions and contaminated objects or materials.
- When possible, medical facilities should provide an adequate supply of disposable materials to maintain respiratory hygiene in waiting areas for patients and visitors.
- Provide tissues and containers that do not need to be manually opened for used tissues.
- Place bottles of alcohol-based hand sanitizer or antiseptic solution in convenient locations for patients and visitors. If you have access to a sink, make sure that soap and disposable towels are always available.
- Posters explaining cough etiquette and hand hygiene should be displayed. Posters in the local language should be placed in appropriate locations, such as the entrance to the department, the emergency department, and medical offices, with instructions for patients and their companions to inform medical staff of their respiratory infection symptoms and how to observe respiratory hygiene and cough etiquette.

Visual warnings

At the entrance to healthcare facilities visited by patients and the general population (emergency department, outpatient clinics, doctors' offices), display instructions for patients and their companions stating that if they develop symptoms of a respiratory infection, they should: (1) inform the clinic staff at registration and (2) observe cough etiquette rules.

The following information should be displayed in patient care areas for the education of patients, staff, and visitors.

Respiratory infections such as the flu (influenza), whooping cough, and severe acute respiratory syndrome (SARS), as well as the coronavirus, are spread through coughing, sneezing, or dirty hands.

5.4 SAFE INJECTION METHODS, HANDLING SHARP OBJECTS, AND PREVENTING INJURIES

A safe injection is an injection that does not harm the patient, does not subject healthcare workers to any preventable risks, and does not create waste that is hazardous to the community. The practice of life-threatening injections can lead to the transmission of

bloodborne pathogens with associated disease burden. Some studies have shown that up to 70% of injections are not medically necessary.

According to the WHO, each year, there are no less than 16 billion injections administered worldwide. Approximately 90% of these injections are for treatment, 5% — for immunization, and 5% — for other indications. Unnecessary and unsafe injections are widespread, especially in low and middle-income countries, and are associated with the transmission of not only bloodborne viruses (HIV, hepatitis B and C) but also other infections.

Injection safety is an important component of standard precautions.

The use of injection devices

Practical recommendations for the use of injection devices are:

- Use a new injection device for each procedure, including unit-dose recovery of medication or vaccine.
- Carefully inspect the packaging of the injection device to ensure that the protective barrier is not breached.
- Immediately dispose of the device if the packaging has been punctured, torn, or damaged due to moisture exposure or has expired.

Single-dose and multi-dose vials

- Whenever possible, use a single-dose vial for each patient to reduce cross-contamination between patients.
- Only open one vial of a specific medication at a time in each patient care area.
- If possible, keep one multi-dose vial for each patient and label it with the patient's name on the vial in a separate procedural or medication room.
- Do not store multi-dose vials in an open ward or shared patient care area where they can be accidentally contaminated.
- Before use, inspect the bottle for any cloudiness, solid particles, or discoloration, and dispose of it if any are present.
- Never leave the needle or cannula inserted into the medication vial's rubber stopper.

Multi-dose vials should be discarded:

- When the sterility of the contents is compromised.
- If the expiration date has passed.
- If they are found to have no specific date or time, are stored improperly, or are contaminated, regardless of the expiration date.

Auto-retractable syringes

Healthcare facilities are beginning to use auto-retractable syringes and needles (such as SoloShot FX™ or Uniject™). These syringes cannot be reused, and while they reduce the risk for patients, they do not reduce the needlestick risk for healthcare workers, janitors, cleaners, and the general population. After use, they should be disposed of in a sharps container (SCB).

How a new needle can become contaminated and a source of infection is shown in the figure. 16.

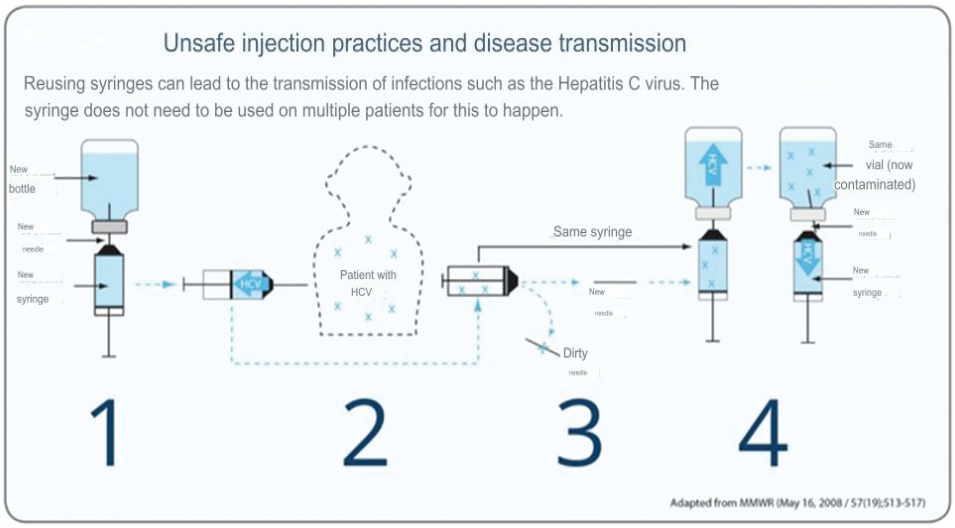


Figure 16. A diagram of possible infection transmission during safe injection practices (using hepatitis C virus infection as an example)

Unsafe injection practices, including the reuse of injection equipment, increase the risk of transmitting infectious diseases such as viral hemorrhagic fevers, malaria, hepatitis (B and C), HIV, as well as skin abscesses, nerve damage, and paralysis at the injection site. Some viruses can survive for extended periods outside the human body (for example, in a syringe). Similarly, there have been many outbreaks of bacterial infections associated with injections. It's important to remember that the risk of transmission increases when the route of administration is intravenous or when contaminated drugs are reused.

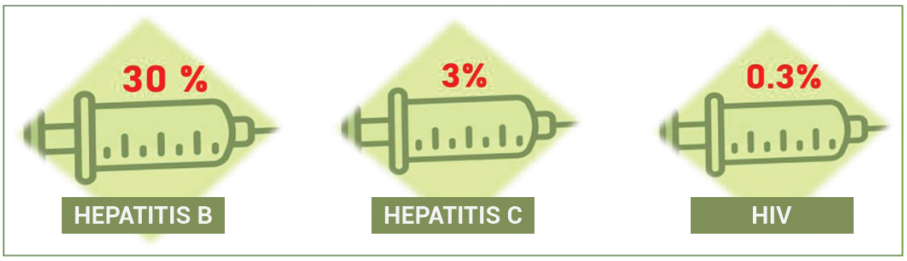


Figure 17. The estimated risk of infection through contaminated syringes or needles

Every healthcare facility should implement a program for the prevention of sharp object injuries. It is crucial for the institution to provide practical training and education to all staff (including new or temporary employees) on injection safety and the prevention of improper use of multi-dose vials during injections.

The seven key steps recommended by WHOto ensure injection safety and reduce the risk of infection are:

Step 1. Clean workspace

Step 2: hand hygiene

Step 3: Sterile syringe, manufactured using special safety technology

Step 4: Sterile vial with medication and solvent

Step 5: Skin disinfection

Step 6: Proper disposal of sharp objects after injection or vaccination

Step 7: Proper waste management

Safe handling of needles and syringes

The practice of safe handling of needles and syringes protects healthcare workers, cosmetologists, patients, and those around them from unnecessary risks.

Rules for safe handling of needles and syringes:

- All single-use items (syringes, catheters, gloves, etc.) should be opened in the presence of the patient.
- Use each needle and syringe only once.
- Do not disassemble the needle and syringe after use.
- Do not cover, bend, or break the needle before disposing of it.
- Dispose of used needles and syringes in a puncture-resistant or a safe disposal container (SDC).
- Never leave the needle in the rubber stopper of a multi-dose vial. This can lead to the introduction of microorganisms, including HIV, into the vial, contaminating the medication between doses.
- For injections (subcutaneous, intradermal, intramuscular), gloves are not required as there should be no direct contact with blood, biological fluids, secretions, or excrement. Provide a cotton (gauze) pad to the patient (or a family member if the patient is a child) to cover the injection site.
- Gloves are recommended for BOXing an intravenous needle, drawing blood, or handling other bodily fluids.

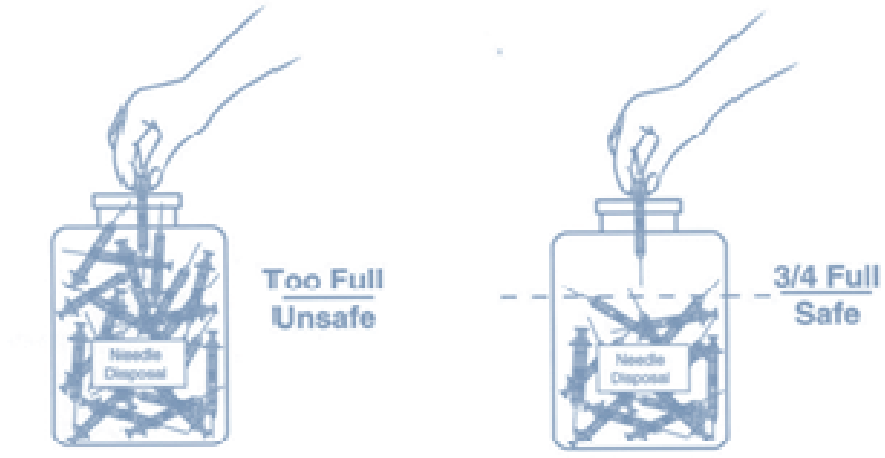


Figure 18. The rule is to fill safe disposal containers up to three-quarters (¾) of their capacity

- Do not overfill sharp containers - filling them more than three-quarters full can lead to needlestick injuries. When a puncture-resistant container or a safe disposal box for waste is filled to three-quarters, they should be disposed of through incineration, burial, or autoclaving, and then sent for recycling (fig. 18).
- As a general rule, the cap should never be put on the needle!
- Sharp objects should be collected and disposed of in a puncture-resistant container (SHARPS container)

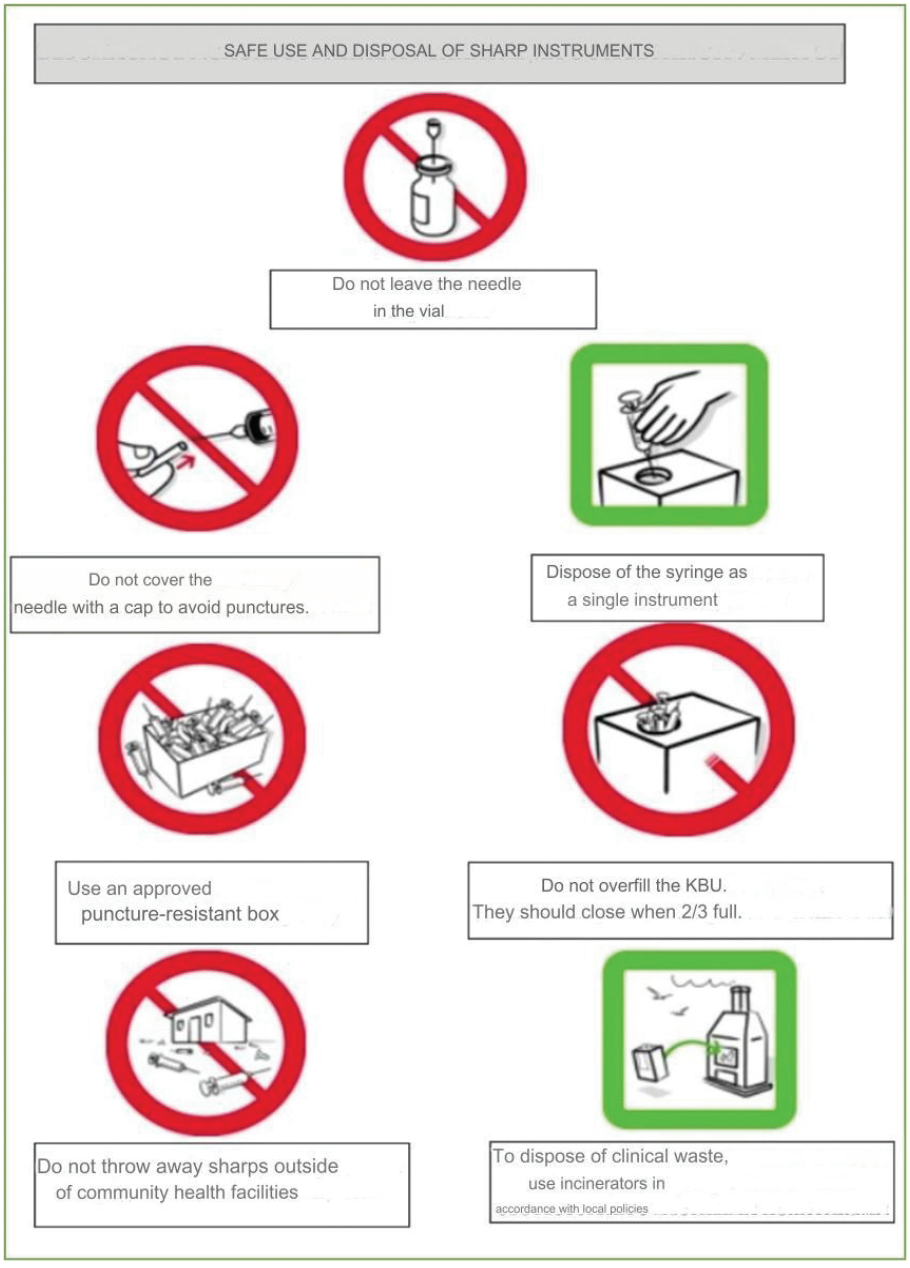


Figure 19. Safe handling of sharp objects

When using containers for sharp objects, YOU SHOULD:

- **Place** containers as close as possible to the areas where sharp objects are used, preferably labeled and within arm's reach. They should also be easily visible, recognizable, and accessible for use.
- **Mark them**, so that people do not mistake them for trash bins or cigarette receptacles.
- **Place** them at a convenient height so that the staff can easily use and replace them.
- **Mark** the fill line at three-quarters capacity, indicate the start date and fill date, and also mark the name of the department.
- **Do not shake** the container to make its contents fit and leave space for sharper objects.
- **Do not place** containers in high-traffic areas (corridors, leading to reception or procedural rooms) where people may accidentally collide with or be punctured by someone carrying sharp objects for disposal.
- **Do not place** containers on the floor or in any other location where someone, including a child, can tip them over or easily reach them.

Skin preparation and disinfection

Skin preparation before injection

According to the World Health Organization (WHO) and its Safe Injection Global Network (SIGN), "wiping clean skin with an antiseptic solution before injection is not necessary" because controlled trials have not shown any infections resulting from this practice. Furthermore, a review of microbiological studies did not find evidence that skin disinfection before intradermal, subcutaneous, or intramuscular injections reduces the risk of infection.

Table 8. Rules for skin preparation for injections

Skin preparation and disinfection		
Type of injection	**Liquid soap and water**	**70% alcohol solution (isopropyl or ethyl alcohol)**
Intradermal	Yes	No
Subcutaneous	Yes	No
Intramuscular - immunisation - treatment	 Yes Yes	 No Yes
Intravenous therapy	No (rinse if visible contamination is present)	Yes

If the injection site is visibly dirty, wash it with soap and water and dry it with a clean towel before administering the injection.[19]

When disinfecting the skin, it is necessary to follow the following steps:

1. Moisten a disposable cotton or gauze pad with a 70% alcohol solution (isopropyl or ethyl alcohol). USING methanol or methyl alcohol is PROHIBITED as they are unsafe for humans.
2. Wipe the skin surface with the solution, then allow the skin to dry.

DO NOT moisten the swab in the container - in this case, swabs can quickly become contaminated with bacteria from hands and the environment.

3. If the injection site is visibly dirty, wash it with soap and water, allow it to dry, disinfect it with an antiseptic, and then proceed with the injection.
4. Skin preparation for vaccination according to the vaccine's instructions.

Skin preparation before the introduction of intravascular devices

Over the last decade, the use of intravascular devices, both venous and arterial, has significantly increased for the administration of sterile fluids, medications, and food products, as well as for monitoring CVP and other hemodynamic functions. The risk of infection associated with the use of intravascular devices can be reduced by following recommended infection prevention methods during device BOXion (e.g., aseptic technique) and by handling the device correctly after BOXion.

In the absence of single-use sterile wipes, it is recommended to use sterile cotton swabs. The skin should be treated with the alcohol antiseptic in circular motions from the center to the periphery. Do not reuse sterilized cotton swabs!

Pre-surgical skin preparation	While skin cannot be sterilized, the use of an antiseptic solution minimizes the number of microorganisms around the surgical wound, reducing the risk of contamination and infection.

Instructions

Step 1: Do not shave hair in the surgical field. Shaving increases the risk of infections 5-10 times because tiny skin abrasions create ideal conditions for the growth and multiplication of microorganisms (Nichols 1991; Seropian and Reynolds 1971). If necessary, **trim** hair close to the skin immediately before surgery.

Step 2: Ask the patient about any **allergic reactions** (e.g., to iodine) before selecting an antiseptic solution.

Step 3: In case of visible contamination, thoroughly wash the skin or the external genital area with soap and clean water, and then dry it before applying the antiseptic.

Select one of the recommended antiseptic solutions below:

- Alcohol solutions (tinctures) of iodine 3% or chlorhexidine 0.5%

[19] Patients receiving regular injections (e.g., Depo-Provera contraceptive injection) should be advised to wash the injection site (shoulder or buttocks) with soap and water immediately before coming to the clinic or receiving the injection at home.

- Alcohols (60–90% ethyl, isopropyl) (see Appendix B)
- Chlorhexidine gluconate (2-4%) (e.g., Hibitane, Hibiscrub, Hibiclens®)
- Chlorhexidine gluconate and cetrimide, at various concentrations, at least 2% (e.g., Savlon)
- Iodophors (aqueous iodine solution) (7.5-10%), various other concentrations (e.g., Betadine)
- Chloroxylenol (Para-chloro-meta-xylenol or PCMX) (0.5-3.75%), various other concentrations (e.g., Dettol)

***Note: Do not allow** the antiseptic to drip under the patient's body - this can cause burning or skin irritation.*

Step 4: Using a dry sterile forceps and a cotton or gauze pad moistened with antiseptic, thoroughly wipe the skin.[20] Move from the center to the periphery of the surgical field by a few centimeters. Circular motions from the center help prevent secondary contamination of the surgical field by local skin bacteria.

Step 5: Allow enough time for the antiseptic to effectively take action before beginning the procedure. For example, when using iodophors, it is necessary to wait for two minutes or until the skin is dry before starting the procedure because the active substance, free iodine, is released.

5.5 SAFE HANDLING, CLEANING, AND DISINFECTION OF PATIENT CARE EQUIPMENT

All medical devices (MD) used for invasive procedures in sterile tissues, cavities, and vessels must be sterile. Instruments can be disposable and purchased in sterile packaging. However, reusable instruments and equipment require special handling - cleaning, disinfection, and sterilization.

The main principles of handling medical devices include the following:

- All reusable medical devices and patient care items must be processed according to the manufacturer's instructions.
- Only those reusable medical devices that are officially approved in healthcare should be used; before purchasing, ensure the availability of the manufacturer's processing instructions.
- Disposable medical devices are not subject to reprocessing.

Assessment of the risk of contaminated medical instruments.

To assess the risk of reusing a medical device, consider the following four factors:

- Factor **Type of element or device**: critical, semi-critical, or non-critical.
- Factor **Type of microorganism:** bacteria, spores, viruses, or prions.

20 Cotton or gauze swabs are not necessarily made of sterile materials. Clean new (not reprocessed) cotton or gauze swabs can be used as they do not contain harmful microorganisms and will only touch non-critical (intact skin) or semi-critical (mucous) membranes (Spaulding 1968).

- The presence of microorganisms in quantity **(bioburden)** and their ability to cause infection.
- **The patient's susceptibility** (regardless of whether the procedure is invasive or non-invasive).

The Spaulding classification system was developed in the 1968 to assist in determining which method of disinfection is suitable for various types of reusable medical devices, based on the potential risk of patient infection. Spaulding divided medical devices into three risk categories: **high risk (critical), medium risk (semi-critical), and low risk (non-critical).**

This classification has stood the test of time and still serves as a good foundation for determining priorities in any infection prevention program. Medical devices were divided into three categories based on the risk of infection when in contact with different types of devices.

Table 9. The classification of medical devices according to Spaulding

Room	Definition	Examples	Risk of infection
Critical group	Medical devices that penetrate vascular structures, sterile tissues, and body cavities	Surgical instruments, implants, tips, needles, dental burs, forceps, scalpels, dental drills, endodontic instruments, angle probes, hooks, excavators, and others fall under this classification	High risk, sterilization
Semi-critical group	Medical devices that come into contact with mucous membranes or damaged skin surfaces of the patient. These items should not contain any microorganisms on their surface (excluding spores)	Endoscopes, respiratory equipment, anesthesia equipment, etc.	High/Medium Risk High-level sterilization or disinfection
Non-critical group	Items and instruments that only come into contact with healthy skin and do not come into contact with mucous membranes	Axillary thermometers, sphygmomanometers, stethoscopes, light-curing lamps, dental glasses, spatulas for preparing filling materials, instrumental and bedside tables, furniture items, walls, and floors	Low risk Cleaning and low-level disinfection

All instruments and patient care items are classified into three categories depending on the risk of infection transmission during their use: ***critical*** semi-critical, and non-critical.

Category	Examples of hospital instruments and items	Classification of processes.	Methods and tools
Critical Group (High Risk). These items or methods affect normally sterile tissues or the bloodstream and represent the highest level of infection risk. The inability to provide items as sterile or, where applicable, deeply disinfected (e.g., surgical instruments and gloves) is more likely to lead to the most serious infections.	Implants and other surgical instruments	**Sterilization or chemical sterilization**	Steam sterilization under pressure Dry Heat X-ray Chemical sterilization (glutaraldehyde solution (Cidex®) or Orthophthalaldehyde (OPA) 2-4% or Peracetic acid or 8% formaldehyde solution).
Semi-critical group (MEDIUM RISK) These items and methods occupy the second most important place and affect the mucous membrane and small areas of damaged skin. The management needs are significant and require knowledge and skills	Many invasive instruments (such as gastrointestinal endoscopes or vaginal specula), except for dental instruments	**Chemical sterilization** **Deep disinfection** High-level disinfection	A solution of glutaraldehyde (Cidex®) or Ortho-phthalaldehyde (OPA) 2-4%, or acetic acid, or an 8% solution of formaldehyde and 0.5% chlorine.
Non-critical group LOW RISK The use of items and methods that involve intact skin and represent the lowest level of risk.	Stethoscope, thermometer, bedpan, and other patient care equipment	**Low-level disinfection**	Quaternary ammonium compounds: Diascept, Amiflynn,. Tetramine, Lyzaphin, Special, and others that are permitted

5.5.1 Disinfection / Decontamination

Disinfection / decontamination – is a general term that refers to the process of treatment that removes infectious agents, making the treated item safe for use.

Reusable medical devices are subject to sequential: **cleaning, disinfection/sterilization, and subsequent storage** in conditions that prevent secondary contamination with microorganisms.

Disinfection — is the process of removing dirt and pathogenic microorganisms from items such as medical instruments, making them safe to handle, whether they are to be processed (sterilized), used, or disposed of. Disinfection consists of three components: **cleaning, disinfection, and/or sterilization.**

The life cycle of disinfection/decontamination is presented in Figure.

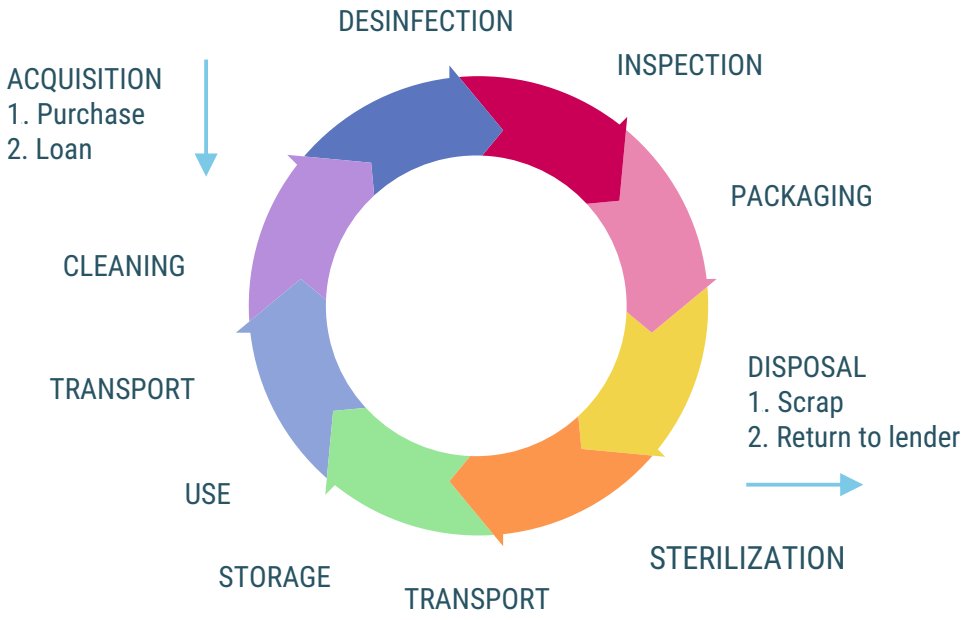


Figure 20. The cycle of disinfection of medical instruments according to the WHO

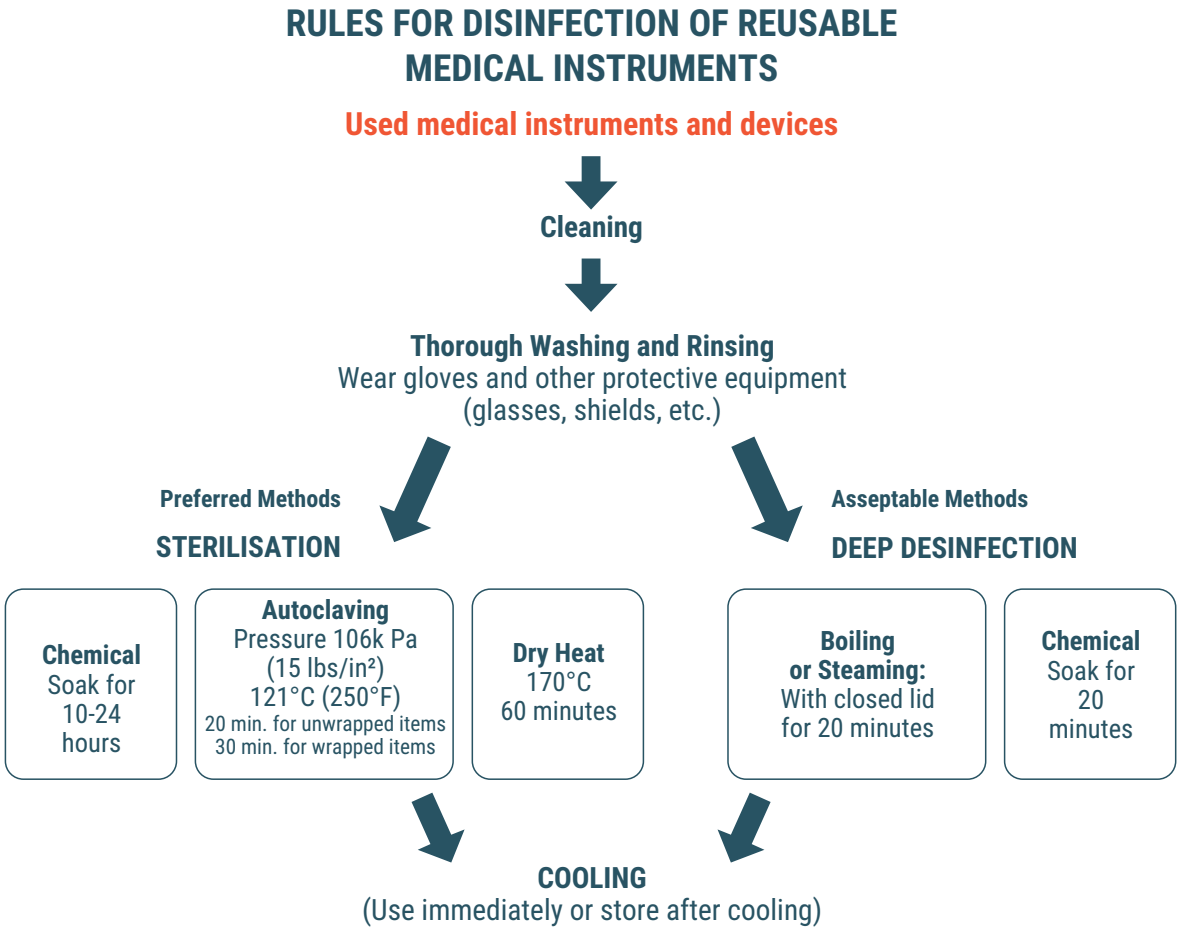


Figure 21. The stages of disinfection of medical instruments and devices

Reprocessing: All the stages necessary to prepare a soiled reusable medical device for its intended use. These stages may include cleaning, functional testing, packaging, labeling, disinfection, or sterilization. After disinfection, the product should not come into contact with clean (potable) water, as this would require re-disinfection.

In the disinfection area, there should be a section for inspection, assembly, and packaging. This area is used for inspecting and functionally testing cleaned medical devices before reassembly and packaging for sterilization, as well as for maintaining records of quality/traceability.

PRE-STERILIZATION CLEANING

↓

Rinsing under running water in the washing unit:
- With running water
- Cleaning

↓

Washing each item in the washing unit:
- With running water
- Cleaning

↓

Drying in a dry heat oven



Stage 1: Pre-sterilization – the process of removing visible dust, dirt, organic, and other foreign materials. This is the first step required for the physical removal of foreign materials, such as dust and soil. It also removes organic materials such as blood, bodily secretions, excrements, and microorganisms to prepare the medical device for disinfection or sterilization.

The settling of dust, dirt, and microbial residues on equipment can contribute to the development of health-related infections. Cleaning agents remove organic, inorganic, and microbial contaminants. No single composition possesses all the properties necessary to remove all types of dirt deposits. The first step in cleaning involves the use of **surfactants or surface-active** agents to reduce surface tension, which helps in keeping dirt in the cleaning solution.

Enzymatic detergents (proteolytic)

First, you should remove the heavy dirt by washing it with detergent and water. If blood or exudates have dried or hardened, they should be soaked in a warm solution of enzymatic detergent. Cleaning agents containing enzymes that break down protein substances can be used for sensitive equipment if the equipment manufacturer approves their use.

***Remember**: if an item cannot be washed, it should not be reused, and it should be discarded.*

- Wash the instruments with a soft brush in soapy water (using an enzyme-containing detergent) to remove all traces of dirt until they appear clean.
- Do not use abrasive cleaning agents (such as Comet®) or steel wool, as these products can scratch metal or stainless steel. These scratches then become a breeding ground for

microorganisms, making cleaning more difficult and increasing the likelihood of corrosion (rust).

After washing the tool, it should be carefully examined under a magnifying glass (magnifier), perform repairs if necessary, treat localized rust spots, check functionality, and carry out a second cleaning. Afterward, it should be rinsed, dried, packaged, and labeled. Thorough rinsing with clean water removes any soap residue that may affect the effectiveness of sterilization or disinfection. After rinsing, the items should be thoroughly dried, especially if sterilization or deep disinfection using chemical disinfectants is planned. Water remaining on objects (e.g., on surgical instruments) dilutes the solution and can make the process ineffective.

- When working with instruments and equipment, wear gloves (thick household or rubber gloves will suffice). Torn or damaged gloves should be discarded; after use rubber gloves should be washed, disinfected, and left to dry at the end of the day for use the next day.
- Wear protective goggles (plastic face shields, safety glasses) and plastic aprons, if available, when washing tools and equipment to reduce the risk of splashes of contaminated liquids getting into the eyes and onto the body.
- To avoid splashing, keep items to be washed below the water's surface.
- Tools should be washed with a soft brush (old toothbrushes will work) in soapy water until they become clean. Special attention should be given to tools with teeth, joints, or screws where organic materials can accumulate. After washing, tools should be thoroughly rinsed with clean water to remove any residues of detergents that may interact with the chemical disinfectants used for deep disinfection or sterilization.

***Remember**: when cleaning non-critical instruments, such as blood pressure cuffs or stethoscopes, use appropriate disinfectants.*

- Rubber and plastic tubes and hoses, such as neonatal nasogastric aspiration tubes, can be reused only if they can be thoroughly washed, rinsed, and dried if they are intended for multiple uses.
- Oral and rectal thermometers should never be stored together, even after cleaning. Store them in separate containers.

***Remember**: many cleaning agents contain ammonia, which can react with disinfectants (chlorine) to produce toxic fumes. Check the label of the cleaning product to make sure it does not contain ammonia. (Sometimes you may smell ammonia when you open the packaging.)*

Cleaning of objects should always precede sterilization

Cleaning before disinfection and/or sterilization is necessary because it physically removes microorganisms, but also ensure full contact with the surface during further deactivation procedures.

The purpose of pre-sterilization cleaning (PSC) – is to remove protein, fat, pharmaceutical, mechanical contaminants, including invisible ones (blood, mucus), disinfectants, and detergents from medical devices, ensuring the effectiveness of subsequent sterilization and safe use of sterilized instruments. Currently, there are products that combine disinfecting and cleaning **properties,** allowing for simultaneous disinfection and pre-sterilization cleaning of instruments in a single step.

Pre-sterilization cleaning of medical devices is carried out **in centralized sterilization departments** (CSD); in the absence of centralized sterilization departments, this stage of processing is performed in specially designated areas (dirty zones) of healthcare facilities.

Stages of cleaning	**CLEANING MODE**		
	Concentration of the working solution, %	Working solution temperature , °C	Exposure/Processing Time, min.
Soaking in a cleaning solution with complete immersion of the item	According to the instructions for use	According to the instructions for use	According to the virucidal (tuberculocidal) mode
Wash each item in the same solution used for soaking, using a brush, cotton gauze swab, or cloth, and clean channels using a syringe	According to the instructions for use	Not regulated	0.5 or 1.0 minutes
Rinsing with clean (potable) running water after using the cleaning agent	Not regulated		0.5 or 1.0 minutes
Rinsing with distilled water	Not regulated		
Hot air drying		85oC	Until complete evaporation of moisture

Disinfection

High-level disinfection destroys certain types of spores, tuberculosis mycobacteria, lipid and non-lipid viruses, fungi, and vegetative forms of bacteria but is not very effective against most bacterial spores. It is used for disinfecting semi-critical items when sterilization is not possible.

***Note**: If the manufacturer's instructions for a product state that it is a sporicide, it can be used for high-level disinfection and, with longer exposure, for chemical sterilization.*

Intermediate-level disinfection kills tuberculosis mycobacteria, most viruses, fungi, and vegetative forms of bacteria but is not effective against spores.

***Note**: for intermediate-level disinfection (taking into account the sensitivity of microorganisms to disinfectant solutions), a bactericide that kills tuberculosis mycobacteria can be used.*

Low-level disinfection kills some viruses, fungi, and vegetative forms of bacteria but is not effective against resistant bacteria and spores.

***Note**: Many bactericidal agents that are effective against Salmonella choleraesuis, Staphylococcus aureus, Pseudomonas aeruginosa belong to the category of intermediate and low-level disinfectants.*

DO NOT SOAK INSTRUMENTS IN DISINFECTANT WITHOUT CLEANING THEM FIRST

- Soaking instruments in a 0.5% hypochlorite (bleach) solution or any other disinfectant solution during transportation or before cleaning is NOT RECOMMENDED for the following reasons:
- This can lead to damage/corrosion of the instruments.
- Disinfectants can be inactivated by blood and biological fluids, which can be a source of microbial contamination and biofilm formation.
- Transporting contaminated items soaked in chemical disinfectant into the decontamination area can pose a danger to healthcare workers and lead to mishandling and accidental injuries.
- Soaking can contribute to the development of antimicrobial resistance to disinfectants.

Source: WHO. Guidelines for disinfection and processing for medical institutions. Geneva: 2016.

High-level disinfection

The physical method of disinfection involves the use of mechanical and thermal disinfection agents, radiant energy, and radioactive radiation. The following heat sources can be used as disinfection agents: fire, water, dry or moist hot air, steam. The destruction of microorganisms under the action of high temperatures is associated with protein coagulation. High-temperature water quickly denatures the protein of microorganisms.

Fire, as a heat source, is used for burning or destroying contaminated objects. Thermal disinfection is the simplest, most effective, and economical method of disinfection. It can be carried out in an automatic thermal disinfector by selecting the appropriate cycle. Concerns about the toxicity of solutions used in chemical disinfection, their negative impact on patients and staff, and their effect on the environment have led to the preference for thermal treatment in developed countries when possible, for example, when processing instruments and equipment for mechanical ventilation (IVL).

While sterilization is the safest and most effective method of instrument processing, **sterilization equipment is often either unavailable or unsuitable. The process of high-level disinfection** destroys all microorganisms, including vegetative bacteria, tuberculosis bacteria, yeast, and viruses, except for some bacterial endospores.

A high level of disinfection can be achieved by boiling in water (although not recommended), steam sterilization (moist heat), or soaking instruments in various chemical disinfectants. To achieve effectiveness, all stages of implementation of each method must be carefully controlled.

The main stages of high-level cleaning and disinfection are

1. Pre-cleaning of
2. Leak test
3. Pre-sterilization cleaning
4. Rinsing

5. Disinfection
6. Rinsing
7. Drying
8. Storage

Chemical method of disinfection

Chemical disinfection is carried out using a registered disinfectant. Disinfectants are divided into the following groups: halogen-containing compounds, oxygen-containing compounds, surface-active agents, alkalis, acids, guanidines, aldehydes, alcohols, phenols.

The choice of disinfectant, its concentration, form (solution, aerosol, emulsion, suspension, powder, paste, varnishes, paints, coatings), and exposure time depend on the required level of disinfection, the spectrum and sensitivity of the microorganism, the type and object of disinfection, and the conditions in which disinfection takes place, especially the temperature of the solution, which can affect the effectiveness of disinfection as it increases. The temperature of the disinfectant solution should be at least 20 C.

For disinfection of products, disinfectants from domestic and foreign manufacturers belonging to the following major chemical groups are allowed: chlorine-containing compounds, active oxygen-based agents, alcohol-based agents, aldehydes, cationic surfactants (CAS), tertiary amines, guanidine derivatives.

For high or medium-level disinfection, typically four of them are commonly used: glutaraldehyde, ortho-phthalaldehyde (OPA), hypochlorite and other chlorine compounds, peracetic acid, hydrogen peroxide, and formaldehyde. However, formaldehyde is used only for the histology of human tissues (it is a carcinogen).

It is used for high-level sterilization or disinfection when steam sterilization or alternative methods are unavailable or unsuitable, such as for thermosensitive equipment.

High-level disinfection using these chemicals can be achieved by thoroughly cleaning the items before immersing them in the disinfectant solution. The choice of deep disinfection agents should be based on the nature of the items to be disinfected, the physical space (such as the presence of well-ventilated rooms), and the ability of the staff to perform these procedures.

Table 10. Preparation and use of chemical disinfectants

Chemical Agents for Sterilization and High-Level Disinfection										
Disinfectant (household solution or brand)	*Efficient reached*	*How to dilute*	*Skin irritation*	*Eye irritation*	*respiratory Irritant*	*Corrosive.*	*Leaves a residue*	*Deep disinfection time*	*Sterilization times*	*Active shelf life*
Chlorine solution	0.1%	According to the formula for preparing a chlorine solution.	Yes (with prolonged contact)	Yes	Yes	Yes	in the yeah	20 minutes	Not used	Change every 8 hours:
Precept Sodium Dichloroisocyanurate (NaDCC) It is supplied in tablets or granules 	Intermediate-level disinfectant	The tablets, when mixed with water, produce a solution of chlorous acid with an optimal pH for biocidal effectiveness.	No	NO	NO	No. It does not leave toxic residues	NO	Effect within 5 minutes	Not used	More effective as a biocide than a 0.1% chlorine solution
More effective as a biocide than a 0.1% chlorine solution. Change every 14-28 days: earlier if it becomes cloudy. 	Various (2.2-2.5% glutaraldehyde, (pH 3.0-4.5)	Powdered activator: colorant, buffering agent, corrosion inhibitor system.	Yes	Yes (vapors)	Yes	No	Yes	20 minutes at 25°C	10 hours for Cidex	Cancel if below 1.5% before 14 days

CIDEX* OPA (ortho-phthalaldehyde) High-Level Disinfectant Solution 	0.55% ortho-phthalaldehyde	Ready for use - no need to mix	- ##$_09$##skin staining - ##$_09$##Gray or black spots - ##$_09$##It will disappear within 2-3 days	No	No	No	Yes	5 minutes	10/12 minutes depending on the regulatory authorities in each country	14-day reuse period
Hydrogen peroxide (30%)	6%	1 part of a 30% solution to 4 parts of boiling water	Yes	Yes	No	Yes	No	20 minutes	Do not use	Change daily; earlier in case of cloudiness
CHEMICALS FOR DISINFECTION (alcohols and iodophors are not deep disinfectants)										
Alcohol (ethyl or isopropyl)	60-90%	Use concentrated	Yes (dries the skin)	Yes	No	No	No	Do not use	Do not use	If the container (bottle) remains closed, use it until it is empty.
Iodophores (10% povidone-iodine) (PVI)	Approximately 2.5%	1 part 10% PVI to 3 parts water	No	Yes	No	Yes	Yes	Do not use	Do not use	If the container (bottle) remains closed, use it until it is empty.

b. Instructions for preparing chlorine solution see. In the table.

в. Erodes only with prolonged (> 20 minutes) contact at concentrations > 0.5%, unless washed off with boiling water.

d. Various commercial preparations of Cidex and other glutaraldehydes are effective at lower temperatures (20°C) and have a longer shelf life. Always refer to the manufacturer's instructions.

e. Formaldehyde, iodophores, hypochlorite, phenolic compounds, and quaternary ammonium compounds are unpopular and prohibited. Formaldehyde can cause cancer and strongly irritates the skin, eyes, nose, and respiratory tract. In addition, its effectiveness is considered insufficient, and for this reason, the regular use of formaldehyde for the sterilization of instruments and other items is not recommended.

***Remember**: Chemical disinfection of needles and syringes is not recommended because residues of the chemical, even after repeated rinsing with boiling water, can interact with the administered medication.*

How to prepare a container for high-level disinfection.

- For small containers, boil water in a closed container for 20 minutes. Pour out the water that can be used for other purposes, cover it again, and let it dry.
- Otherwise, and for larger containers, fill a plastic container with a 0.5% chlorine solution and also immerse the lid in the solution. Soak for 10 minutes (then the chlorine solution can be poured into another container and reused). Rinse the lid and the inner surfaces of the container three times with boiling water and let them air dry.

Storage of disinfectants

- Chemical disinfectants should be stored in a cool, dark, well-ventilated place.
- Do not store chemical substances in direct sunlight or in excessive heat (e.g., on upper shelves in a building with a metal roof).

The disposal of used chemical containers

- Glass containers can be washed with detergent, rinsed, dried, and reused. Or rinse thoroughly (at least three times) with water and dispose of by burial.
- Plastic containers used for toxic solutions such as glutaraldehyde or formaldehyde should be rinsed (at least three times) with water and disposed of by incineration or burial.

The disposal of used chemicals

Carefully drain liquid waste into the sewer for disposal in the workroom and flush. Avoid splashing. Rinse the toilet or sink with water to completely remove waste.

Antiseptics that **should not be** used as disinfectants do not kill bacteria, viruses, and endospores with sufficient reliability.

- Derivatives of acridine (for example, gentian violet)
- Cetrimide (for example, Cetavlon®)
- Chlorhexidine gluconate and cetrimide in various concentrations (for example, Savlon)
- Chlorhexidine gluconate (for example, Hibiscrub®, Hibitane®)
- Chlorine and boric acid (for example, Eusol®)
- Chloroxylenol (for example, Dettol®)
- Hexachlorophene (for example, pHisoHex®)
- Compositions containing mercury

Mercury solutions (for example, mercuric lauryl), although considered low-level disinfectants, can cause congenital defects and are too toxic to be used as either disinfectants or antiseptics.

Other products commonly used for equipment disinfection include 1-2% phenol (for example, Phenol®), 5% carbolic acid (Lysol®), and benzalkonium chloride, quaternary ammonium

(Zephiran®). These are weak disinfectants and should only be used for disinfecting surfaces (for example, floors and walls).

***Note**: When choosing a method for disinfecting equipment, it is also important to consider the manufacturer's recommendations.*

5.5.2 Sterilization

Sterilization: it is a validated process used to eliminate viable microorganisms from an object, including viruses and bacterial spores, but not prions. The choice of the appropriate level and method of disinfection depends on several factors, including the material from which the instrument is made, the type of medical procedure, financial considerations, and so on.
It is important for equipment manufacturers to provide written and approved disinfection instructions for the devices they supply, and all medical devices must have a written disinfection procedure in accordance with the manufacturer's recommendations. Sterilization should be applied to all instruments and items that come into direct contact with the bloodstream or typically sterile tissues. Since sterilization is a process, not a single action, all components must be properly executed to achieve sterilization.

Steam sterilization: steam is the best sterilizer for thermally stable devices. It can be heated to a temperature higher than 100 °C only by increasing the pressure above normal atmospheric pressure at sea level. When air (which is necessary) is removed from the chamber (either by gravity or by vacuum), saturated steam under pressure enters from the packets into the chamber and is held there (dwell time). Steam is removed by reintroducing air into the chamber.

Currently, at the level of healthcare institutions in Tajikistan, several forms of sterilization organization are practiced:

- decentralized;
- centralized (carried out in a Central Sterilization Department).

Decentralized (local, room-based) sterilization - the organization of sterilization at workstations manually or in specially designated rooms (sterilization) in different departments of a medical institution. Cleaning of items is also done manually.

Advantages of decentralized sterilization:

- low maintenance cost of sterilization equipment, as instrument processing is part of the hospital staff's responsibilities as an additional task.

Disadvantages of decentralized sterilization:

- Sterilization rooms are often located far away (in the courtyard) from the places where sterile items are used, which does not allow for quick access to them and efficient organization of sterilization.
- Instruments are mainly processed in places not intended for this purpose.
- At the same time, there is a high level of manual labor, especially in pre-sterilization processing, which reduces the quality of both pre-sterilization preparation and sterilization itself, and also takes up to half of the working time of medical personnel WHOdo not have time (as they also have their main functional duties).

- Medical personnel performing sterilization do not always have a sufficient level of qualification, do not follow the sterilization technology, and also disregard loading rules for products. As a result, the control over the effectiveness of sterilization becomes more complicated (both by medical personnel and by the relevant authorities).
- In air sterilizers, packaging is usually not used, and sterilized medical items are stored on sterile tables without packaging, which increases the risk of recontamination (which is unacceptable).

Centralized sterilization – the organization of sterilization in specially equipped rooms with division into zones (dirty, clean, sterile, and storage zones), where qualified (trained) personnel work.

Disadvantages: a large amount of investment at the stage of creating the Central Sterilization Department (CSD).

Advantages of centralized sterilization:

- High reliability of sterilization due to the centralized organization of all stages of sterilization.
- In the sterilization department, there is specially trained personnel capable of ensuring effective pre-sterilization cleaning, the importance of which cannot be overstated.
- In the centralized sterilization department, expensive equipment is used more efficiently. The quality of equipment maintenance is higher.
- At the same time, the cost of sterilization in such a department is approximately three times lower compared to the local method because it simplifies equipment control, reduces operational expenses, and sterilization costs.
- The use of medical materials is becoming more rational, and modern sterilization methods also allow extending the service life of medical and diagnostic equipment, such as thermolabile equipment sensitive to temperature increases.
- The most effective control of sterilization.
- Freeing up medical personnel for more productive work.

Below are the main sterilization methods used at the level of medical institutions.

- Steam sterilization is used for general surgical and special instruments, parts of instruments, devices made of corrosion-resistant metals, glass, fabrics, dressings, products made of rubber, latex, and some types of plastics.
- Air sterilization is used for surgical, gynecological, and dental instruments, parts of instruments and devices, including those made of corrosion-resistant metals, and products made of silicone rubber. Before air sterilization, products, after pre-sterilization cleaning, must be dried in a drying cabinet at a temperature of 85 C until visible moisture disappears. The use of drying cabinets (such as type Specialized Drying Cabinet) for air disinfection is prohibited.
- The chemical method of sterilization using solutions of chemical agents is usually applied for the sterilization of products in which thermolabile materials are used in their construction, which do not allow the use of other officially recommended available methods of sterilization.

- Sterilization must be carried out in a strictly designated place (Central Sterilization Department), i.e., the presence of a centralized room and a person directly responsible and trained for the sterilization process is required.
- Sterilization requires time, contact, temperature, and, in the case of steam sterilization, high pressure to be effective.

Standard conditions for thermal sterilization

Steam sterilization (gravitational displacement, autoclaving):

- The temperature should reach 121°C (1.1 atm); pressure - 106 kPa; 20 minutes for unpackaged items; 30 minutes for packaged items. Or at a higher temperature of 132 C (2.2 atm); 15 minutes for packaged items.
- Allow all items to dry before removing them from the autoclave.

***Note**: Pressure parameters (kPa2) may vary slightly depending on the sterilizer used. Whenever possible, follow the manufacturer's recommendations.*

Sterilization by autoclaving

- Steam sterilization under high pressure is an effective method of sterilization but the most challenging to perform correctly. Autoclaving is usually chosen for sterilizing instruments and other items in medical institutions. Unless specifically indicated as safe by the manufacturer, do not place plastic or rubber instruments or items in the autoclave, as they will melt.
- Wrap the instruments in two layers of freshly laundered fabric or paper using the envelope or square packing technique.
- Place the packages on the shelf in a way that allows steam to circulate freely and penetrate all areas. In large sterilizers with carts, packages should be placed on the cart and then placed in the sterilizer.
- Sterilize packaged items for 30 minutes, and unpackaged items for 20 minutes. Use a timer to monitor the time. The temperature should be 121 C (250 0 F), pressure 106 kPa. (The sterilization time is considered accurate from the moment the temperature and atmospheric pressure reach 121 C and 1.1 atm).
- Wait for 30 minutes (or until the pressure gauge shows zero) to allow the sterilizer to cool sufficiently, then open the lid or door of the sterilizer to a distance of 15-16 cm.
- Allow the instruments to completely dry before removing them, which may take an additional 30 minutes. If wet items or damp packages come into contact with a non-sterile item or surface, they need to be autoclaved again. Packaged instruments are considered unsterilized if there are water droplets or visible moisture on the outer surface of the package after removal from the chamber.
- To prevent condensation, place the sterilized trays and packages removed from the chamber on a surface lined with paper or cloth.
- Allow the packages to reach room temperature before storing them.
- Record the sterilization conditions (start and end time of sterilization, temperature, and pressure) in the logbook.

- Each load should be monitored using mechanical (start and end time of sterilization, temperature, and pressure) and chemical (internal and external chemical indicator tapes) methods.
- Autoclaves should be daily tested for air removal using the Bowie-Dick test.

The effectiveness of sterilization equipment is monitored through physical, chemical, and biological (bacteriological) methods. The reliability of these methods is not the same.

Dry heat sterilization

A dry heat sterilizer is not suitable for sterilizing medical instruments that can be processed with steam. It is suitable for use with glassware, metal objects, heat-resistant powders, and non-aqueous liquids such as vaseline, kerosene, and grease. Although drying cabinets are convenient, they are not suitable for a range of medical instruments, including water-based liquids and materials made of plastic, rubber, and paper. One of the disadvantages of using hot air drying cabinets is the extended sterilization cycle: preheating is required before sterilization, and prolonged cooling is necessary after sterilization. Another disadvantage is that dense loads often cause issues because the convection/conduction method used for heating the chamber struggles to penetrate tightly packed items, and the absence of a fan results in poor heat distribution.

Time and temperature

To achieve the effectiveness of sterilization/disinfection by thermal methods, it is crucial to understand and adhere to the relationship between time and temperature. The process should be well-founded.

Table 11. Recommended combinations of temperature and time

Monitoring	Temperature (0)	Exposure time (minutes)	Commentary
Autoclave treatment	121	20	Sterilization
	126	10	Sterilization
	134	3	Sterilization
Dry heat*	160	120	Sterilization
	170	60	Sterilization
	180	30	Sterilization
Low-temperature steam and formaldehyde	73	180	Sterilization
Low-temperature steam	73	10	Disinfection
Boiling**	100	20	Disinfection
Pasteurization	70-100	varies	Disinfection

**All the mentioned temperatures and times for dry heat are minimum requirements.*

*** At higher altitudes, it requires more time because the boiling point of water becomes lower as you go higher above sea level.*

***Remember**: needles and other instruments with sharp edges should be sterilized at lower temperatures (160°C), as higher temperatures can dull the cutting edges.*

Chemical sterilization

- Prepare a fresh solution of the chemical sterilant according to the manufacturer's instructions or check the suitability of the prepared solution.
- Immerse the cleaned and dried instruments/items in a 2.2-2.5% solution of glutaraldehyde (Cidex®) or a 0.55% solution of ortho-phthalaldehyde (OPA) or peracetic acid, ensuring full coverage of all items. The use of formaldehyde is allowed but not recommended because it can strongly irritate the skin, eyes, and respiratory tract and is classified as a potential carcinogen.
- Cover the container and leave the soaked instruments/items for 10 hours in the glutaraldehyde solution or a minimum of 24 hours in formaldehyde.
- Remove the instruments/items from the chemical solution using sterile gloves or sterile forceps or clamps.
- Thoroughly rinse the instruments/items with distilled clean water to remove all traces of the chemical substance.
- Immediately use the tools/items or place them in a sterile closed container.

Quality control of the sterilization of medical instruments

There are four types of control **visual, physical, chemical,** and bacteriological.

Visual Inspection. They check the correctness of using packaging materials, the level of loading of packages and sterilization chambers, and the justification of the chosen sterilization method.

Physical checking. The physical method of control is intended for the operational control of parameters in the operation modes of steam and air sterilizers (sterilization temperature, pressure, sterilization exposure time).

Chemistry monitoring. The chemical method of control is intended for the operational control of one or several parameters in the operation modes of steam and air sterilizers.

Bacteriological control. The bacteriological method of control is intended to monitor the effectiveness of sterilizers based on the detection of the death of spores in test cultures.

It is very important to understand how each of these verification tests is applied and where they can or cannot be used.

1. **Air Removal Test**: Bowie-Dick Test for air removal (pay attention to the even change of color). If there are spots, it means that steam has unevenly penetrated the item, so sterilization is not complete



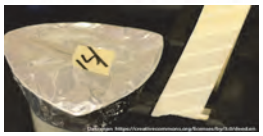
2. **Thermocouple Check**: for any sterilizer



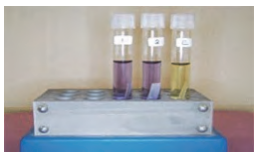
3. **Air Detector Check:** Pre-vacuum cleaning



4. **Chemical Indicators:** dry and steam (color-changing tape)



5. **Biological Indicators:** contain spores that should be destroyed as a result of the process (pay attention to the color change)



WHAT IS A BOWIE-DICK TEST PACK?

A disposable Bowie-Dick test pack consists of thermochromic (thermosensitive) paper pressed between a porous backing and mesh foam. By the color change on the sheets, you can determine whether steam has penetrated the porous load. Even color change indicates that the test has passed, and steam has penetrated throughout the packaging. Uneven color change indicates an unsuccessful test and may be a sign of insufficient vacuum or insufficient steam temperature.

Major high-level disinfectants

1. Glutaraldehyde (e.g. Cidex)

- It is effective against many microorganisms (including. TB)
- It is effective against bacterial endospores when soaked for 10 hours.
- Lethal! It can cause skin, eye, and respiratory tract irritation
- A new solution should be prepared every 14 days (or when it becomes cloudy)
- The disinfection time is 20 minutes at room temperature with >2% glutaraldehyde to destroy Mycobacteria
- Chemical test strips are used to determine the effective concentration of glutaraldehyde

2. Ortho-phthalaldehyde (OPA)

- The chemical composition with the formula C6H4(CHO)2

- The Minimum Effective Concentration (MEC) is 0.3%. To determine MEC above 0.3%, test strips are used
- It is effective against many microorganisms (including. TB)
- The solution can be used for a maximum of 14 days
- OPA has several advantages over glutaraldehyde:
  - Short disinfection time (5-10 minutes)
  - It has a stable pH level (pH 3–9)
  - It does not cause irritation of the eyes and nasal passages
  - It does not require exposure monitoring
  - It has a barely perceptible odor
  - It does not require activation

Hydrogen Peroxide

- Advantages
  - It does not require activation
  - Elimination of organisms
  - No disposal issues
  - No odor or irritations
  - It does not coagulate blood or tissues on the surface
- Deficiencies
  - Incompatibility with copper, zinc, and nickel/silver coating (cosmetic and functional damage)
  - Eye injury upon contact

3. Peracetic acid

- Advantages
  - It does not require activation
  - No odor or irritations
  - Effective in the presence of organic material
- Deficiencies
  - Incompatibility with lead, brass, copper, and zinc (cosmetic and functional damage for 1% HP with 0.08% PA)
  - Limited clinical use

The scheme of work of the centralized sterilization department (CSO)

The Central Sterile Service Department (CSSD) is a technical complex that operates under special conditions, ensuring timely and adequate measures for disinfecting instruments, dressings, sutures, linens, and medical equipment.

The organization of the Central Sterile Service Department (CSSD) addresses the tasks of creating sanitary zoning: achieving absolute sterility in the autoclave room and in the storage area prepared for issuing materials, as well as maintaining elevated sterility levels in conditionally clean areas. Dirty zones are separated from clean and sterile zones by sanitary checkpoints and operate without direct contact with them.

The CSO should have four zones:

1. Cleaning and Washing in the **«Dirty Zone»:** This is where used instruments and equipment are received and cleaned.
2. Assembly and Packaging Area in the **<Clean Zone>:** After cleaning, the instruments should be moved to the "clean zone" for drying, inspection, if needed, repairs, preventive maintenance, or functional testing/installation. Afterward, they undergo initial and final packaging.
3. Sterilization Zone: Packaged items are transferred to an autoclave for sterilization, and this zone is considered **«sterile»**.
4. Zone of storage: After sterilization, packaged items should be stored in a separate room– **on shelves or in cabinets in a «sterile»** area.

***Remember**: Access to this zone is granted only to authorized personnel.*

This is the area where instruments and equipment are processed, and it is staffed by personnel specially trained in handling, processing, and storing instruments, equipment, and other cleaned, sterile, or highly disinfected items. The Central Sterile Service Department (CSSD) is considered a semi-restricted area, so all recommendations regarding the flow of movement and appropriate attire, must be followed here.

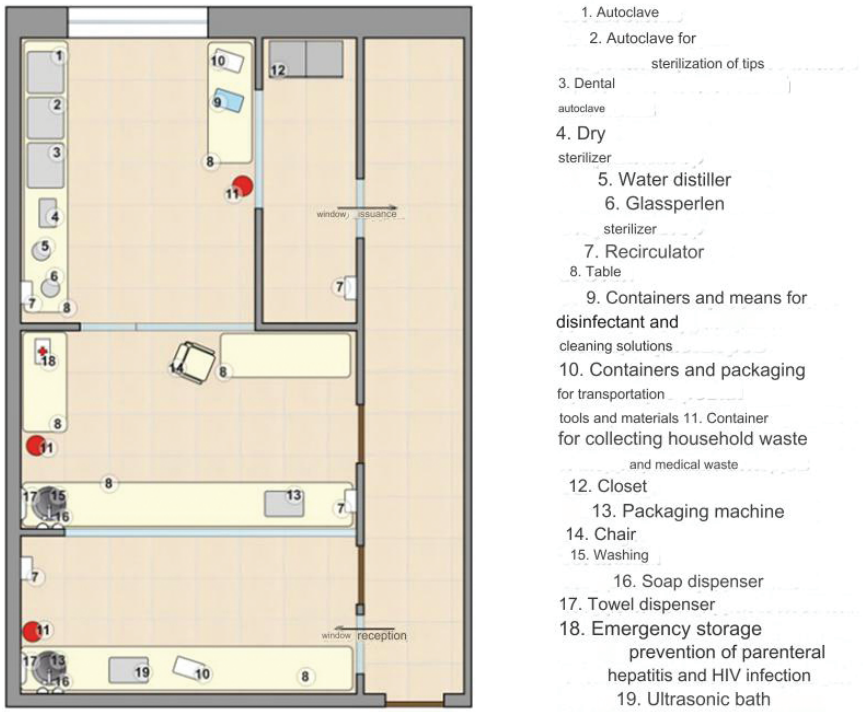


Figure 22. CSSD Layout

Approximate CSSD Layout

- The administration should develop a movement scheme that prevents contact between contaminated items and clean, washed, or sterile items.
- The personnel in the receiving/washing area should wear plastic aprons, utility gloves, and protective goggles or a face shield to protect themselves from splashes and drops.
- Personnel entering the clean working zone should be dressed in clean medical gowns.
- Room ventilation should start from the sterile zone and move towards the dirty zone.

If equipment is intended for use in the operating room, during delivery, one person located outside the operating room should pass it through the door to a person inside the operating room.

Storage of sterile or disinfected items

The shelf life of sterility depends on the following factors:

- The quality of the packaging or container.
- How many times the bag was touched before it was used.
- The number of people WHOhandled the package.
- Whether the packaging is on open or closed shelves.
- The conditions in the storage area (e.g., humidity and cleanliness).
- The use of plastic dust covers and the sealing method. An item remains sterile until something contaminates the packaging or container. The use of plastic dust covers and the sealing method. An item remains sterile until something contaminates the packaging or container. Such circumstances can include the breaking of the packaging, exposure to moisture, or anything else that may facilitate the entry of microorganisms into the bag or container. It could happen at anytime.
- Use and store instruments in accordance with the method of their processing, maintaining at least the same level of cleanliness.
- All items should be stored in a place and manner that protects all packaging and containers from dust, moisture, animals, and insects. It is best to organize a separate enclosed area with limited access for storing sterile and clean supplies for patient care and place this area near the sterilization area.
- Maintain the storage area as clean, dry, dust-free, and free from fibers as possible.
- Control the temperature and humidity (approximate temperature of 24°C and relative humidity <70%).
- Packages and containers with sterile (or deeply disinfected) items should be stored at a distance of 20-25 cm from the floor, 45-50 cm from the ceiling, and 15-20 cm from the external wall. Do not use cardboard boxes for storage. Cardboard boxes can release dust and debris, and they can be susceptible to insect infestations.
- Label the date and rotate supplies (use those that arrived earlier first). This process serves as a reminder but does not guarantee the sterility of the packages.
- Distribute sterile and deeply disinfected items from this area.
- Before using any sterile item, inspect the package to ensure that the wrapping is not damaged, the package is sealed, and it is clean and dry (without any wet spots).

- In some medical facilities where supply replacement is limited and low-quality fabric is used for wrapping, time as a limiting factor can also be used to determine safe limits. If plastic covers (bags) for storing sterile items are not available, limiting the storage time to a specific period (e.g., 1 month) can be an acceptable solution, provided that the packages remain dry and undamaged.

Centralized sterilization is organized in centralized sterilization departments (CSSD) within large multi-profile hospitals and clinical diagnostic centers. In this case, the entire medical technology process of sterilizing medical products is carried out in the CSSD. If there is no CSSD, preliminary processing and disinfection are conducted in the departments in a special room for instrument processing.

The organization of sterilization in a decentralized form is carried out directly in the offices or in specially designated rooms within the departments of a medical institution. Traditionally, it is used in operating rooms.

5.5.3 Disinfection of Endoscopes

Each year, the number of endoscopic procedures used for diagnosing and treating patients increases. Cross-contamination with endoscopes can only be avoided by maintaining the highest standards of disinfection after each use (see the chapter on high-level disinfection and chemical sterilization). This protects the patient from infection and is also necessary for extending the lifespan of the equipment.

Types of endoscopes

Rigid endoscopes are mainly heat-resistant, making them easier to clean, disinfect, and sterilize because they do not have the complex features, construction, channel configurations, and compatibility issues associated with flexible endoscopes.

Flexible endoscopes are complex and can be challenging to clean and disinfect. They *are sensitive* to heat and require chemical disinfection (or low-temperature disinfection). Therefore, effective disinfection of endoscopes requires expertise from the instrument manufacturer WHOis familiar with the product's design and functions, as well as its compatibility with heat and chemical disinfectants.

Ensure compatibility with existing hospital disinfection processes, chemical disinfectants, and compatibility with a washer-disinfector when purchasing *endoscopes*.

Accessories for endoscopy used in invasive procedures *should be sterilized* after each use; alternatively, disposable accessories can be used.

Table 12. Types of Endoscopes and Recommended Disinfection Level

Types of endoscopes	Rigid Endoscopes	Flexible Endoscopes	Level of Disinfection
Invasive - introduced into normally sterile body cavities or penetrates the body through a break in the skin or mucous membrane.	Arthroscope Laparoscope Cystoscope	Nephroscope Angioscope Choledochoscope	For example, with gas or plasma.
Non-invasive - comes into contact with intact mucous membranes but does not enter sterile body cavities.	Bronchoscope	Gastroscope Colonoscope Bronchoscope	High-level disinfection, for example, involves immersion in glutaraldehyde, peracetic acid, or chlorine dioxide.

Source: WHO. Disinfection and Processing Guidelines for Healthcare Facilities. 2016

A modern endoscope typically has:

- Two light channels for illuminating the required area.
- An image channel for the doctor to see what is happening.
- A channel for instruments through which tools can be inserted.
- A channel for air or water is intended for rinsing the surgical area.
- Control cables are used to control movement and operation.

The source of infection and/or contamination can include the following:

- The previous patient or inadequate disinfection of the endoscope before reuse can be a source of infection.
- Contaminated lubricants, dyes, irrigation fluid, or rinsing water.
- Insufficient deactivation of processing equipment.

The primary issues leading to inadequate deactivation include *inadequate cleaning,* which can result in the inability to remove deposits of blood, feces, tissue, mucus, microorganisms, or mucus. This can lead to infection, misdiagnosis, or device malfunction. Additionally, when using automated endoscope reprocessing equipment, many factors are associated with machine contamination, including: (a) improper cleaning and maintenance of the machine, leading to biofilm formation inside the machine, (b) improper cleaning of the endoscope, resulting in inadequate disinfection, (c) using stagnant water in the plumbing or reservoir, and (d) using water with poor microbiological quality and/or hard water.

Manual Cleaning

Manual cleaning *is necessary* to ensure that endoscopes and accessories are properly cleaned before undergoing automatic endoscope reprocessing or washer-disinfection. Thorough *manual cleaning* of the instrument and its internal channels with a cleaning solution through flushing is an *essential* part of the disinfection procedure. There are irrigation pumps (manual

devices operating under pressure) used for flushing the cavities of instruments and components.

Before flushing with a cleaning solution, brushes or similar devices should be used to clean the accessible channels. The brush should be of an appropriate length and diameter for the channel being cleaned. Without this, dry residual organic material such as blood or mucus can lead to the blockage of channels and hinder the penetration of the cleaning and disinfecting agent (containing enzymes and disinfecting components). This also ensures better contact between the cleaning, disinfecting agent (or «sterilant»), and the removal of any remaining microorganisms in subsequent disinfection steps. It is recommended to wash with warm water using a neutral or enzymatic cleaning solution. However, for advice on suitable cleaning agents, it is advisable to consult the manufacturer of the endoscope.

Table 13. Stages of manual endoscope cleaning

STAGES	SUITABLE USE
Bedside procedure (Pre-cleaning) in endoscopy procedure room	Removal of easily detachable organic matter. Bedside cleaning, rinsing, and flushing of all channels help reduce the possibility of drying and channel blockage, especially if there is a delay before manual cleaning. Transportation from the endoscopy department to the sterilization area and the start of manual cleaning steps takes approximately 30 minutes.
Leak test	Ensuring the integrity of the endoscope. Any damage to the external surface can lead to the penetration of biological fluids or chemicals into the internal system of the endoscope.
Manual Cleaning	Cleaning accessible channels and flushing all channels to remove organic compounds. This stage also helps in detecting channel blockages.
Flushing	Removing residues of cleaning agents that may affect the performance of the disinfectant.
Drying	Removing excess liquid that may dilute the disinfectant.
Disinfection	Destruction of potentially pathogenic microorganisms, including bacteria, mycobacteria, and viruses
Drying	Removing excess liquid before use on a patient or before storage.

Reproduced with modifications from N. Damani, Infection Prevention and Control Handbook. Oxford: Oxford University Press, 2019

Endoscopy department

The endoscopy department rooms where endoscopes are used and disinfected should be designed to provide a safe environment for healthcare workers and patients. Disinfection of flexible endoscopes should be carried out in a dedicated, well-ventilated room (with up to 12 air

exchanges per hour), *away* from the procedure room. Adequate ventilation should be provided to remove potentially harmful fumes from disinfectant agents. The room should be equipped with a sink of sufficient capacity for the largest endoscopes, as well as a separate handwashing sink with soap and disposable paper towels. The workflow direction inside the room should be organized from *dirty to clean*, to avoid the possibility of recontamination of disinfected endoscopes from those that were just used on a patient. It is necessary to provide a sufficient amount of consumables for use during the disinfection procedure, such as personal protective equipment (PPE), including chemicals and cleaning brushes. It is also necessary to ensure the availability of sufficient capacity for waste disposal.

Requirements for a room for endoscope processing:

- The area for this function should have: sufficient space, proper air circulation.
- This room should be separated from the place where endoscopic procedures are conducted.
- It should have adequate ventilation to remove toxic fumes generated after using cleaning and disinfecting agents – the vapor concentration of the chemical disinfectants used should not exceed permissible limits (for example. 0.05 parts per million for glutaraldehyde).
- Air exchange per hour in the processing area should be a minimum of 10-12.
- In the processing area, there should be access to plumbing and safe clean water, which is filtered through a 0.2-micron filter or water of similar quality.

Main recommendations:

- The process and means used for cleaning, disinfection, and/or sterilization of endoscopes should be compatible with the equipment being used.
- Any medical facilities where endoscopic procedures are performed should have detailed procedures for the cleaning and processing of endoscopes.
- The processing of contaminated instruments should be carried out in a designated and purpose-built area for this function.
- Accessories classified as critical (e.g., biopsy forceps) require sterilization. Critical items labeled for single-use should not undergo reprocessing and/or be reused.
- Manual cleaning should be carried out using a non-foaming, neutral pH enzymatic solution developed for endoscopes, containing enzymes to dissolve all components of microflora, including blood, fats, carbohydrates, uric acid, and starch.
- For the processing and transportation of contaminated endoscopes, closed containers with easily cleanable surfaces should be used.
- Rigid endoscopes should be transported along direct routes where cleaning will be performed.
- Containers used for transporting contaminated endoscopes should be cleaned after each use.

Personnel Protection

All personnel working in the endoscopy department must be informed about biological, chemical, and environmental threats. Personnel must also receive hepatitis B virus vaccination

and wear personal protective equipment (PPE) at all times, including gloves, disposable waterproof gowns, and eye protection. Gloves should be used for short-duration contact (15-20 minutes); nitrile gloves can be worn for longer periods of contact. Between procedures, gloves should be removed, and hands should be washed. In case of spills or other emergency situations, an approved respirator for protection against vapors should be available.

Storage of endoscopes

Endoscopes should be stored in a clean, well-ventilated, and dust-free area to keep them dry and free from microbial contamination. An endoscope that has not dried properly should be processed (cleaned and disinfected) before use. Endoscopes should be hung freely to prevent them from being damaged by physical contact or impact. Endoscopes should be stored in accordance with the manufacturer's instructions and in a dedicated storage cabinet.

Accounting, record-keeping, document management

It is necessary to maintain a journal to account for all the used endoscopes and disinfection equipment to ensure that the correct disinfection process is being followed. It is also important to document the procedure details, including the patient's name, medical record number, the name of the endoscopist performing the procedure, as well as the serial number or identifier of the used endoscope. This documentation ensures the tracking of all endoscopes throughout the entire disinfection process and allows for traceability back to the patients on whom they were used. The journal should also include confirmation of the disinfection procedure, equipment used, and the method employed. This is very important for verifying WHOperformed the disinfection and when it was conducted.

The following chemicals should never be used for disinfecting endoscopes!

- Benzalkonium chloride
- Iodophors
- Hexachlorophene
- Alcohol
- Chlorhexidine gluconate
- Cetrimide
- Quaternary ammonium compounds
- Glutaraldehyde (0.13%) with phenol

Note. Glutaraldehyde (2%), peracetic acid (0.35%), and ortho-phthalaldehyde (OPA) are the most commonly used chemical disinfectants for endoscope disinfection. Please follow the manufacturer's instructions for use. There are test strips available to check the concentration. Glutaraldehyde is not effective if its concentration falls below 1,5%

5.6 PRINCIPLES OF ASEPTICS

Since microorganisms are naturally present in the environment, achieving sterility in regular medical facilities is impossible.

The primary principle of asepsis is a set of measures aimed at preventing microorganisms from entering a wound, with the motto «everything that comes into contact with the wound must be sterile». Sterilization is the foundation of asepsis.

Purulent-inflammatory processes are the most common and often severe complications of open wounds, surgical incisions, closed injuries with damage to the integrity of hollow organs. The development of these complications is caused by microbial colonization of wounds - contamination - the entry of microorganisms into the wound.

Asepsis is ensured through the following measures:

1. Identification and prevention of situations where infection is possible.
2. Proper hand hygiene of healthcare personnel.
3. The use of sterile gloves by personnel.
4. The use of sterilized instruments.
5. Non-contact technique for medical procedures.
6. Creating a sterile surgical field.

Aseptic technique is used to protect patients during invasive clinical procedures such as inserting intravenous cannulas, placing central venous catheters, urinary catheterization, blood cultures, punctures, wound dressing, etc. Aseptic technique is employed for all invasive clinical procedures, as well as for maintaining and using invasive clinical devices.

***Note**: The duration of central venous catheterization should not exceed 21 days.*

Violation of asepsis can be caused by hand and surface contamination, as well as the use of non-sterile items, contaminated ointments, and solutions.

To achieve aseptic technique, it is important to follow these steps:

- It is very important that the person performing aseptic technique is well-trained and competent.
- Before the procedure, it is necessary to perform proper hand hygiene using approved products and methods.
- All items used during the procedure must be sterile.
- Never reuse single-use medical devices such as syringes, needles, central venous catheters, and urinary catheters.
- If you need to directly touch a critical part or critical area, it is best to use sterile gloves. Otherwise, non-sterile gloves should be used.

- Throughout the procedure, continue to use aseptic non-touch technique, partially open items, and keep items in their original sterile packaging. Do not wipe sterile items with a towel, as it may not be sterile!
- Use disposable antiseptic solutions for proper disinfection of critical areas (such as intravenous access sites, open or broken wounds, etc.).
- Improper use of multi-use antiseptic solutions, sterile saline, water, lubricants, and the use of multi-dose vials can lead to contamination and outbreaks.
- It is also important that during aseptic procedures, critical components (such as parts of instruments, equipment, or used solutions) remain sterile throughout the entire clinical process. For example, during intravenous therapy, critical components typically include those that come into direct contact, such as needles, syringe tips, open lumens, and intravenous catheter tips. Remember that critical components must always be identified and protected, and they should come into contact with other critical components and/or critical areas only in sterile conditions.
- If a breach of aseptic conditions occurred due to an emergency situation and/or uncontrollable environmental conditions, it should be documented and included for subsequent reporting, and contamination risks should be minimized as soon as possible.



Figure 23. Aseptic field for critical general (left) and surgical (right) instruments

5.6.1 Storage and Dispensing of Antiseptics

There have been cases of contamination of **each** antiseptic product. Among the microorganisms contaminating antiseptic solutions are *Staphylococcus epidermidis* and *Staphylococcus aureus*, Gram-negative bacilli, *Pseudomonas aeruginosa,* and some endospores. Contaminated antiseptics can lead to subsequent infection when used for handwashing or patient skin preparation. The following measures can prevent the contamination of antiseptic solutions:

- If the antiseptic is not supplied in small packaging, transfer the antiseptic into small containers for daily use. This prevents evaporation and contamination. Make sure that the correct name of the solution is labeled on the container each time you fill it. **Do not leave gauze or cotton in the antiseptic, as it can lead to contamination.**

- Establish a routine schedule for preparing new solutions and cleaning reusable containers. (The risk of solution contamination increases after 1 week of storage). **Do not "top off" dispensers of antiseptic agents.**
- **Wash** reusable containers for antiseptics with soap and clean water, rinse with boiled water if available, and **let them** dry before refilling.
- Label the containers with the time each time they are washed, dried, and refilled.
- Concentrated antiseptic solutions should be stored in a cool, dry place. Never store them in direct sunlight or at high temperatures (e.g., on high shelves in buildings with metal roofs).

5.7 SAFE HANDLING OF SOILED AND CLEAN LINEN (LAUNDRY)

Proper collection and storage of soiled and clean linen ensure the epidemiological and infectious safety of patients and medical staff.

Linen contaminated with biological secretions from patients should be replaced immediately.

When designing laundry facilities for healthcare institutions, the capacity should be calculated based on washing 2.3 kg of dry linen per day per hospital bed in the inpatient department and 0.4 kg of dry linen per day per outpatient visit.

The laundry facility should be divided into dirty and clean areas. The dirty area consists of a room for receiving and sorting soiled linen, a washing area with washing machines, and a bath or containers for disinfecting the linen. The clean area includes a drying area with drying cabinets, a linen repair area with a sewing machine, and a storage area for dispensing clean linen with shelves. Auxiliary facilities for staff should include a changing room, a restroom, a shower, an area for storage and processing of cleaning equipment, as well as a storage room for cleaning and disinfecting agents. There should be a separate entrance for dirty laundry and a separate exit for clean laundry. Ventilation and airflow should be from the clean zone to the dirty zone, and there should be a sink for handwashing in each zone.

5.7.1 Linen Regimen of the Department

This involves activities related to the collection, transportation, sorting, disinfection (in cases of linen contaminated with biological fluids), washing, and storage of linen.

Resources/Equipment:

- Clean protective gear (household gloves, mask, impermeable polyethylene apron, closed impermeable footwear) should be provided to the staff for working with dirty laundry, and they should use changeable sanitary clothing.
- Airtight bag/container labeled as «Soiled Bed Linen».
- Airtight bag/container labeled as «Linen with Patient Biomaterials».
- Airtight bag/container labeled as «Clean Linen».
- Wheeled cart (laundry cart) for collecting soiled linen.
- Racks.
- Container with a lid (plastic bin) for collecting and temporary storage of soiled linen.
- Antiseptic hand sanitizer.

- Disposable towels or single-use cotton towels.
- Cleaning supplies.
- Disinfectants, wipes, or cloths.

Documenting

- The schedule for collecting/dropping off dirty laundry and distributing clean laundry.
- Register for recording the submission of soiled linen to the laundry and the distribution of clean linen to the departments.

The main part of the procedure:

- To work with soiled linen, it is necessary to use personal protective equipment (PPE) such as a gown, apron, rubber gloves, mask, and closed footwear.
- Changing linen for patients is done once a week or as needed. If the linen is contaminated with a patient's bodily fluids, it should be replaced immediately.
- Soiled linen in the department is collected in special plastic or polyethylene bags or placed in designated carts for linen collection. These are then delivered to the central laundry facility in the room designated for receiving soiled linen. It is prohibited to disassemble or sort soiled linen in the department.. It is permissible to temporarily store laundry for up to 12 hours in sanitary or special rooms in airtight containers (metal bins, plastic boxes, or containers, etc.).
- Clean laundry should be stored in special linen rooms (storage areas for clean laundry). The department should have a daily supply of clean linen, which should be stored in a separate room or in clean rooms in special cabinets.
- Containers for laundry should be marked or labeled. Storage of unmarked linen is not allowed.
- All hospital linen is subjected to washing in centralized laundry facilities within the hospitals.
- The transportation of linen to the laundry and back to the department should be carried out using specialized vehicles, always in a packaged and closed container made of dense fabric, in special containers with wheels, and so on. The transportation of clean and soiled linen should be done in separate containers or packaging. Bags from soiled linen should be laundered together with the soiled linen.
- The transportation, loading, and unloading of linen should be maximally mechanized.
- After the discharge of each patient and when necessary, mattresses, pillows, and blankets should undergo disinfection through chamber or alternative methods.
- It is advisable to cover all mattresses and pillows with waterproof sheets or polyethylene covers to protect them from contamination with biological fluids and to facilitate easier cleaning and disinfection.

5.7.2 The main stages of working with linen.

Submitting soiled linen from the department to the laundry

- Before handling dirty laundry (changing linens, sorting, and other tasks), personnel are required to wear special clothing, gloves, masks, and impermeable closed footwear.
- dirty laundry should be collected in polyethylene bags (sacks).
- Polyethylene bags (sacks) containing dirty laundry should be placed in special marked containers (bins) with lids, which are installed in rooms for temporary storage in the designated area (sanitary rooms).
- Temporary storage of soiled linen in departments is allowed for a maximum of 12 hours.
- Soiled linen in polyethylene bags should be placed in transport bags labeled as «Soiled Linen».
- According to the schedule, dirty laundry is delivered to the room for collection, temporary storage, and subsequent submission of dirty laundry to the laundry facility on a linen cart.
- In the room designated for the collection and temporary storage of soiled linen, temporary storage is conducted until the linen is transported to the laundry.
- The ward nurses submit soiled linen according to the schedule for receiving soiled linen.
- After weighing the volume of soiled linen (in kilograms), it is recorded in a special journal in both the departments (wards) and the laundry taking into account the name and total weight of the submitted linen.

Receiving clean linen from the laundry in the departments (wards)

- Clean laundry from the laundry facility is delivered daily to the clean linen «storage room».
- Bed linen is changed in the departments once a week and as needed, depending on its level of soiling.
- Linens contaminated with bodily fluids should be replaced immediately.
- The ward sisters receive clean laundry from the laundry facility according to the schedule for the distribution of clean linen.
- The laundry is delivered to the department on a laundry cart in transport bags labeled «Clean laundry».
- In the departments, clean linen is stored in a specially designated room (clean linen storage) on shelves and in cabinets on shelves.

Table 14. Delivery of clean laundry from the laundry to Department

-	The delivery of clean laundry from the laundry to the temporary storage area labeled 'Clean Laundry' is carried out daily according to the clean laundry distribution schedule.
-	The change of bed linen in the departments is done once every seven days and as needed based on dirtiness.
-	Bed linen soiled with discharges should be replaced immediately.

-	Sister-hosts of departments receive clean laundry according to the clean laundry distribution schedule, with 1 sister-host for each department.
-	Laundry is delivered to the departments on laundry carts in transport bags labeled «Clean laundry».
-	In the departments, clean laundry is stored in a specially designated area on shelves and in cabinets on shelves.
The collection of soiled laundry from the department to the laundry	
-	Before working with soiled laundry, put on special clothing, gloves, and a mask (during changing of bed linen, sorting, etc.).
-	The collection of soiled laundry is carried out in polyethylene bags.
-	The polyethylene bags with soiled laundry are placed in special marked containers (bins) with lids, which are installed in the temporary storage areas within the department (sanitary rooms).
-	Temporary storage of soiled laundry in compartments is allowed for up to 12 hours.
-	Soiled laundry in plastic bags is placed in transport bags labeled «Soiled laundry».
-	According to the schedule, soiled laundry is transported from the temporary storage area and handed over to the laundry on a cart.
-	In the room for collecting and temporarily storing soiled laundry, the storage is carried out for a maximum of 12 hours before handing over the laundry to the laundry facility.
-	In the laundry, after weighing the volume of soiled laundry (in kilograms) and counting, the information is recorded in a special journal by departments, including the item names and the total weight of the laundry delivered.

Notes:

- *For timely replacement, departments must be supplied with bed linen in accordance with the requirements of the relevant regulatory documents (NPA).*
- *Disassembly and sorting of soiled laundry are not conducted in the departments.*
- *If the linen is soiled with biological fluids, it undergoes disinfection before washing. Disinfection is carried out in special marked containers.*

5.8 MEDICAL WASTE MANAGEMENT

According to the World Health Organization (WHO), approximately 15% of medical waste poses a risk to human health and the environment. They carry infectious, chemical, or radioactive threats and have the potential to harm people on a large scale and pollute the environment in the long term. That's correct. The management of medical waste of various classes is strictly regulated by law. There are ongoing developments to create new, safer methods for collection, transportation, and disposal. This issue is being addressed globally on an international level.

Medical waste includes everything generated as a result of the activities of personnel in providing medical, preventive, and cosmetic care. They include human or animal tissue remnants, biological fluids, medical care items, vaccines, pharmaceuticals, bandages, and plaster, among others. They pose a danger because they may contain pathogenic microorganisms, particles of toxic and radioactive substances, and in the case of uncontrolled

release outside of healthcare facilities, they can become a potential source of an epidemic. Proper management and disposal of medical waste are essential to mitigate these risks.

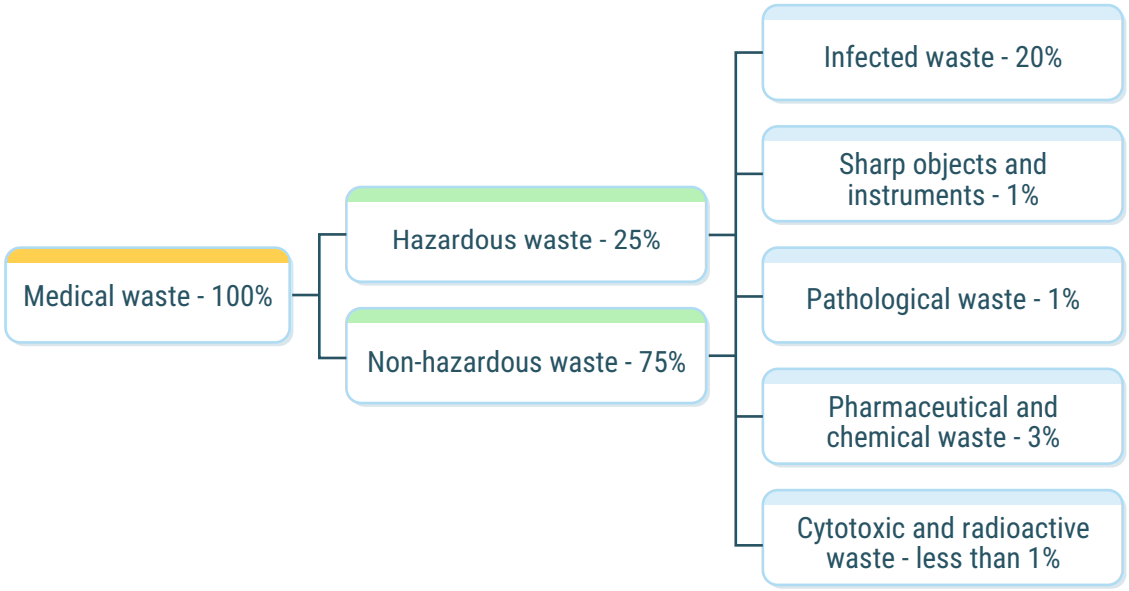


Figure 24. The average composition of medical waste

Medical waste poses a significant danger. Whether or not we can keep this "slow-burning bomb" under control depends on every participant in the chain – the institution's management, ordinary staff members, and the company responsible for waste collection and disposal. The largest amount of medical waste is generated in obstetric and gynecological departments.

The calculation of the volume of medical waste in each healthcare facility is carried out based on the number of patient beds/days as demonstrated in Table 15.

Table 15. Calculation of the volume of medical waste

The type of medical waste	Calculation
All types of waste	1.8-2.2 kilograms per bed
Infectious pathological waste	0.27-0.33 kilograms per bed
Sharp objects or sharp waste	0.018-0.022 kilograms per bed
Chemical pharmaceutical waste	0.054-0.066 kilograms per bed
Household waste	1.44-1.76 kilograms per bed

At the core of organizing effective and controlled waste management a **five widely recognized guiding principles that are used in many countries when developing policies**, legislation, and guidance.

These five principles are:

- «Polluter Pays»;
- «Precautionary Principle»;
- «Duty of Care»;
- «Proximity Principle»;
- «Prior Informed Consent».

The Ministry of Health and Social Development of the Republic of Tatarstan recommends that every medical, social, and cosmetological institution, regardless of ownership and departmental subordination, appoint a responsible person for the management of medical waste, with a defined scope of duties and tasks. This employee should undergo appropriate training. The responsible employee oversees the collection, segregation, and disposal of medical waste (MW) at the locations where they are generated and calculates the quantity of disposable containers (or other receptacles) in accordance with the waste classes.

Individuals WHOhave undergone a pre-training briefing and have been vaccinated against hepatitis B are allowed to work with medical waste (MW).

Persons under the age of 18 and employees WHOhave not undergone specific training are not allowed to work with medical waste.

All actions are carried out in accordance with the scheme adopted in the medical institution, which provides a detailed description of the process of collecting, temporary storage, and disposal of medical waste classes A, B, C, D, and E.

In each section of the healthcare facility where various types of medical waste are generated, it is necessary to ensure the availability of a sufficient number of appropriate containers for the collection, sorting, and transportation of medical waste.

The healthcare waste management system in accordance with WHOrecommendations includes the following stages[21] (staged collection, temporary storage, transportation and utilization):

- Collection of medical waste at the point of generation into single-use containers that match the threat class.
- Placing them into reusable containers for transportation to temporary storage areas.
- The waste remains in the accumulation areas for up to 24 hours in special or auxiliary rooms. If it exceeds this timeframe, it is stored in a refrigerated or freezer chamber.
- Transportation to the disposal site is done using specially equipped vehicles from companies with which the healthcare facility has a contract.

5.8.1 Rules for sorting medical waste

The sorting of medical waste must be carried out in a strict order at the location where they are generated.

[21] Safe management of healthcare waste. Brief information. Geneva: World Health Organization; 2017

The practice of segregating, packaging, and color-coding medical waste should be standardized and based on regulatory documents related to the disposal of medical waste. Such a system for sorting medical waste should be based on a unified coding system that ensures visual identification of potential risks associated with the waste. It facilitates the placement of medical waste into appropriate containers with color coding at the time of their generation and helps segregate them in a timely manner for transportation, storage, treatment, and disposal.

The simplest way of marking is by attaching a label to each filled bag indicating information about the location of the source in the healthcare institution, the date and time of bag closure, and the name of the staff member WHOfilled the label. It's better to separate the colors of the bags. Black for non-hazardous waste and yellow for hazardous waste. Red containers are used for highly infectious Class B waste.

All medical waste generated at the healthcare facility is divided into 5 classes.

Table 16. The category of medical waste

The categories of medical waste	**Parameter**
Class A	From an epidemiological perspective, these are safe, non-toxic waste materials that are compositionally similar to solid household waste and have not come into contact with biological fluids or infected patients. These include office supplies, packaging, furniture, equipment, items that have lost their consumer properties, waste from cleaning the premises, waste from central food service areas and departments of the healthcare facility, except for infectious and tuberculosis waste.
Class B	Wastes with the potential for infection that could lead to epidemics. To hazardous medical waste of class B belong: - materials and tools contaminated with biological fluids, such as blood; - pathological-anatomical waste and biomaterials; - organic post-operative waste (organs, tissues); - food waste from infectious and tuberculosis units.
Class C	Extremely hazardous from an epidemiological perspective are waste materials that have come into contact with infectious diseases and can trigger the spread of infection: - waste from laboratories and pharmaceutical production facilities dealing with microorganisms of 1st and 2nd group of pathogenicity; - waste from tuberculosis hospitals; - waste from microbiological laboratories working with tuberculosis-causing agents; - non-viable live vaccines; - waste from the use of genetically modified organisms for scientific and medical purposes; - waste from pharmaceutical production and from the storage of biomedical cell preparations.

The categories of medical waste	Parameter
Class D	Toxicologically hazardous waste, similar in composition to industrial waste. They include: - expired medications and antiseptics; - cytostatics and chemotherapy drugs; - items, instruments, and equipment containing mercury; - waste from pharmaceutical manufacturing; - waste from the operation of equipment, lighting systems, and others.
Class E	Nuclear waste. These include any materials, objects, or particles in which the content of radionuclides exceeds permissible norms for radioactive emissions.

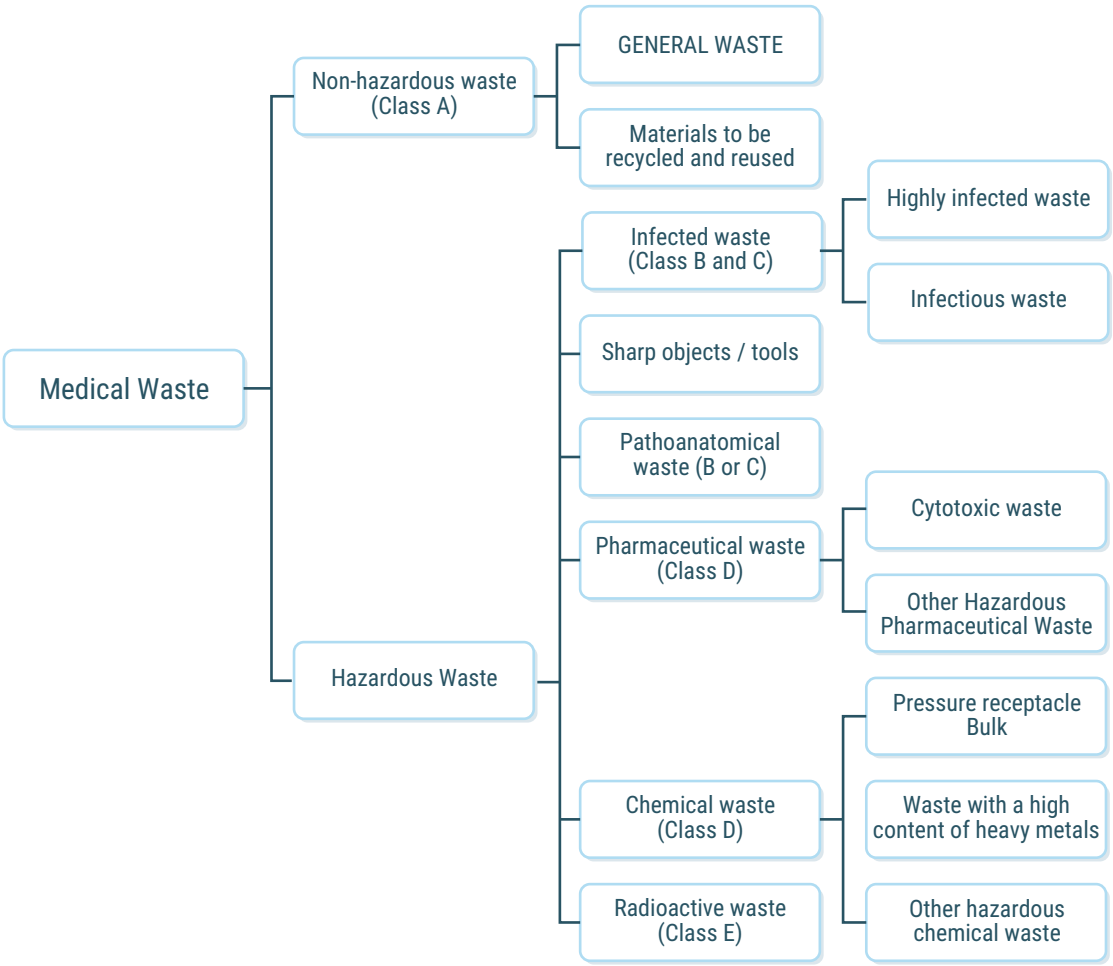


Figure 25. Classification scheme of medical waste

Table 17. Characteristics of packaging, color coding, and frequency of collection of medical waste

Classes	Category Waste	The color of the container/bag	Container type (preferably with a pedal)	Acquisition Frequency
A	General medical waste	**Black** color with a label on the container «Class A waste»	A black plastic bag is placed inside the container, or the container is disinfected after use	When the container is three-quarters full or at least once a day
B	Infectious waste 	**Yellow** with a symbol of biological hazard and labeled «Class B waste» on the container	A non-leaking rigid plastic bag is placed inside the container	When the container is three-quarters full or at least once a day
	Sharp and piercing waste	**Yellow with** a symbol of biological hazard and labeled «Class B waste»	Sharps containers, resistant to puncture	When the container is three-quarters full
	Pathological-anatomical waste	**Yellow with** a symbol of biological hazard and labeled «Class B waste»	A non-leaking rigid plastic bag is placed inside the container	When the container is three-quarters full or at least once a day
C	Highly infectious medical waste	**Red with a symbol** of biological hazard and labeled «Class B waste»	A non-leaking rigid plastic bag is placed inside the container	When the container is three-quarters full or at least once a day
D	Chemical and pharmaceutical waste	Any color, but with a hazard symbol	Plastic bag or container	On request
E	Nuclear waste 	Marked with a radiation safety symbol	Lead-lined container	On request

Handling of waste within healthcare, social, and cosmetic facilities

Table 18. Planning the work for the collection, storage, and disposal of waste in healthcare facilities

Work organization	- Order for a healthcare institution to approve rules for handling medical waste based on Sanitary Rules and Norms SanPiN. - Determining those responsible for the implementation and monitoring of the approved rules. - Definition of waste collection and storage locations, methods of disinfection / disposal. - Training of all personnel in the handling of medical waste. - Informing patients about the rules for handling waste. - Calculating and planning expenses for the disposal of medical waste and inventory. - Any procurement and selection of an organization that disposes of waste, and has a license for waste transportation, disinfection, or disposal of specific classes of waste, must be carried out in accordance with the legislation, including environmental protection laws.
Equipment	- Continuous provision of inventory includes: leak-proof bags of various colors (including yellow, red, and black), racks and trolleys, disposable containers of various colors (including yellow, red, and black), reusable bins, intra-facility transport trolleys, mini-containers, and protective equipment for personnel. - Waste labeling.
Volume down quantities of waste	- Acquisition of equipment, tools, instruments, medications, food products, and other items that generate minimal waste. - Purchase of reusable caregiving items that are subject to thermal treatment. - Efficient procurement of equipment, medications, disinfectants, and other items, along with monitoring their storage periods.

It is necessary to comply with waste management rules in healthcare facilities, even before they are collected for incineration, burial, or other methods of disposal (such as autoclaving), in order to ensure the protection of patients, medical personnel, and the general population.

The storage area for Class B waste should be marked with a biological hazard symbol, similar to the infectious waste zone. The floor and walls in these zones should be sealed with cement or tiled to allow for easy cleaning and disinfection. The storage time for infectious waste (the period between generation and processing) should not exceed 72 hours in winter and 48 hours in summer. If there is a refrigerated storage room available, infectious waste can be stored for more than a week, cooled to a temperature not exceeding3-8OC.

Liquid Class B waste (vomit, urine, feces) is discharged without prior disinfection into the centralized sewage system.

The transportation and disposal of Class D radioactive waste are carried out by specialized organizations holding a license for handling radioactive waste.

Pathological-anatomical organic waste and materials received from surgical and maternity departments should be collected in rigid, tightly-sealed bags. Depending on the disposal

methods to be used in the future, it is advisable to choose and use either durable airtight plastic bags that are placed inside containers, or airtight solid containers with lids that can be disinfected after use.

The transportation and collection plan for the MO (Medical Organization) is developed separately for each healthcare institution or other facilities providing medical, social, and cosmetological assistance. This plan is based on the qualitative composition and quantity of waste, as well as determining the required number of soft and hard containers.

The transportation of MO (Medical Organization) within the facility's territory should be carried out, if possible, during less busy times. To prevent contact with staff and patients and to minimize the passage of loaded carts through patient care areas and other clean zones. The personnel responsible for transportation must wear appropriate PPE - gloves, a coverall, goggles, and closed-toe shoes.

The transportation of MO (Medical Organization) directly depends on the waste class, and there are three different transportation systems:

- Trolleys for transporting general waste, which should be painted in black color and labeled as «general waste».
- Infectious waste can be transported together with used sharp objects waste.
- Infectious waste should not be transported with other hazardous waste to prevent the potential spread of infectious agents. The trolleys should be painted in a color corresponding to the class of infectious waste (yellow) and labeled with the «infectious waste» sign.

Other hazardous waste such as chemical and pharmaceutical waste should be transported separately in containers to the central storage area.

Rules for safe work for personnel involved in the MO management system – NOT ALLOWED:

- Manually breaking down, cutting waste of classes B and C, including used intravenous infusion systems, for the purpose of disinfection;
- Manually removing the needle from the syringe after use, and placing a cap on the needle after injection;
- Transferring (reloading) unpackaged waste of classes B and C from one container to another;
- Compacting waste of classes B and C;
- Performing any operations with waste without gloves or the required personal protective equipment and specialized clothing;
- Using soft disposable packaging for collecting sharp medical instruments and other sharp objects;
- Placing disposable and reusable waste containers at a distance of less than 1 meter from heating devices.
- Mixing waste of different classes in a common container.

5.8.2. Rules for temporary storage of medical waste

Waste of class A, which has not come into contact with patient biological fluids, is collected in containers and stored until disposal.

There should be a distance of at least 25 meters between the waste storage area for class A waste and the medical buildings or service providing areas.

Class A food waste is stored in reusable containers within disposable packaging for no longer than 24 hours. Class A food waste can be stored in the refrigerator for up to one week.

Non-disinfected waste of classes B and C can be stored for no longer than 24 hours, in the refrigerator for up to 7 days, and in the freezer for up to 1 month.

Class B medical waste can be stored in an area with a solid surface and a shelter.

Inside each healthcare facility (HF), a special area for storing medical waste should be designated, and it must comply with the requirements of sanitary norms (SanPiN). The space for waste storage should be included in the building project during new construction. The dimensions of these storage areas should correspond to the amount of waste generated and the frequency of waste collection. Such zones must be completely enclosed and separated from rooms where various supplies are stored or food is prepared. Only authorized personnel should have access to waste storage areas. Equipment necessary for addressing accidental spills/leaks should be stored in an accessible location.

General non-hazardous waste (Class A) should be collected and disposed of in regular metal containers for further disposal at a public landfill. The area for collecting general waste should be located at a distance of no less than 25 meters from the healthcare facility building and no less than 50 meters from the food block. General waste should be removed at least once a week. The waste collection area should be fenced and protected from access by animals, unauthorized individuals, and children.

Highly infectious class B waste should not be stored temporarily; they should be sorted immediately at the location of their generation. In cases where this class of waste needs to be stored for a certain period before disposal, they should be stored separately from other waste. In this case, the same requirements as for the storage of class B waste should be applied.

Inter-building platforms for temporary storage are intended exclusively for class A and B MO (Medical Organization).

When planning storage locations for hazardous chemical waste of class G, it is essential to consider the characteristics of various chemical substances that require storage and disposal (flammable, corrosive, explosive). The storage location should be enclosed and separated from the storage areas of other types of waste.

Pharmaceutical waste should be separated from other types of waste. When storing them, it is important to adhere to the applicable international and national regulations. In general, «pharmaceutical waste can be both hazardous and non-hazardous, as well as liquid or solid» which is why each type of waste should be handled differently. The classification should be provided by pharmacists or other experts in pharmaceuticals (WHO, 1999).

In each healthcare institution, the calculation of medical waste is conducted based on bed/days as follows:

- for all types of waste 1.8-2.2 kg/bed,
- domestic waste 1.44-1.76 kg/bed,
- infectious pathological waste 0.27-0.33 kg/bed,

- sharp waste 0.018-0.022 kg/bed,
- chemical pharmaceutical waste 0.054-0.066 kg/bed.

A system for collecting, temporary storage, and disposal of waste of different hazard classes is developed and approved in accordance with the requirements of current regulatory documents. Therefore, the institution must be equipped with the necessary technological equipment (racks, trolleys, intra-building transport trolleys, sealers, etc.), disposable packaging materials, and transport containers.

Temporary storage of medical waste is one of the stages of handling them that needs to be organized on the premises of healthcare institutions.

5.8.3 Autoclaving, incineration, and burial of waste

The disposal of medical waste at the institutional level must strictly adhere to the regulatory rules described in Sanitary Norms and Rules «On Sanitary Norms and Rules for the Collection, Disinfection, Transportation, Storage, and Disposal of Waste in Medical Institutions». Proper disposal of contaminated waste reduces the risks of transmitting infections to healthcare workers and the general population

Taking into account the Basel and Stockholm Conventions, healthcare institutions should promote environmentally sustainable and eco-friendly approaches to healthcare, considering technical resources, types and volumes of waste, and costs as well.

It is proposed to establish requirements for incineration facilities, such as two-chamber incinerators with a temperature range of 850-1100 degrees Celsius, and include emission limits for such incineration facilities.

The use of small, simple incineration facilities should be considered only as a temporary waste disposal option!

Both the incineration furnace and the burial site should be enclosed by a fence with gates that can be locked to prevent access by animals and children.

We should avoid dumping waste into open piles because they:

- Pose a risk of infections and fires.
- Emits foul odors.
- Attract insects.

Burning

Burning destroys microorganisms with high temperatures and is the best method for disposing of contaminated hazardous waste. Incineration also reduces the overall volume of waste destined for burial.

Simple trash incinerators can be constructed using local materials such as bricks, cement blocks, used barrels with flammable and lubricating materials, and so on. **(as a temporary measure!)**

Wastes that require incineration include:

- Anatomical parts and animal carcasses.
- Cytostatic drugs (residues or expired).
- Toxic laboratory chemicals, except for mercury.
- Non-plastic items contaminated by patients.
- Non-chlorinated plastics.

Wastes that should not be incinerated include:

- Chlorinated plastics.
- Volatile toxic waste, such as mercury.
- Plastics, non-plastic materials contaminated with blood and biological fluids, secretions, and excrements, as well as infectious laboratory waste.

Such waste should be processed through steam sterilization in autoclavable containers/bags or through microwave treatment. Both of these methods can be used for sterilization and shredding. If neither of the methods is available, a chemical disinfectant can be used in accordance with local rules based on international recommendations. However, excessive use of chemical disinfectants should be avoided, as it can pose risks to health and the environment.

Disposal of sharp objects:

- Sharp objects are collected in non-penetrable and airtight containers such as high-density polyethylene bins, metal drums, or barrels.
- Sharp objects should be incinerated whenever possible.
- When the container is three-quarters full, it is filled with a cement mixture, asphalt sand, foam, or clay until the container is completely filled (encapsulation).

Open burning is not recommended because it is unsafe and leads to the release of hazardous and persistent organic pollutants into the environment, posing a risk to human health. Open burning should not be encouraged under normal circumstances.

For medical facilities with limited resources where high-temperature trash incinerators are not available, **an interim solution is adapted trash incineration units** (Figure 26).

A brick incineration furnace is the simplest form of a two-chamber incineration furnace. It can be constructed with minimal cost, and it is a better alternative to open-air burning.

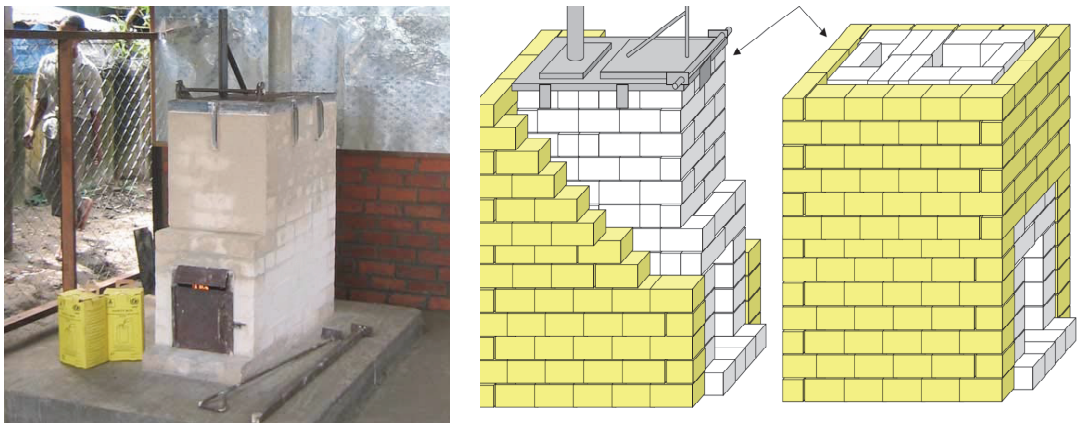


Figure 26. Diagram of a simple waste incinerator

Waste dumping

For medical institutions with limited resources, safe disposal on-site or near medical facilities may be the only available method for waste removal. To reduce health and environmental risks, it is essential to follow the following fundamental rules:

Access to this area should be restricted (a barrier should be constructed around the burial site to prevent entry by animals and children).

If possible, the burial site should be lined with a material of low permeability (such as clay).

One should choose a location at a distance of no less than 50 meters from a water source to prevent groundwater contamination.

The burial site should have a proper drainage system, be located below the level of any wells, have no stagnant water, and not be in a flood-prone area.

One should cover contaminated waste with a layer of soil, 10-15 cm thick, every day. The final layer of soil should be 50-60 cm thick and well compacted to prevent the spread of odors, attraction of insects, and to ensure that animals do not dig up the buried waste.

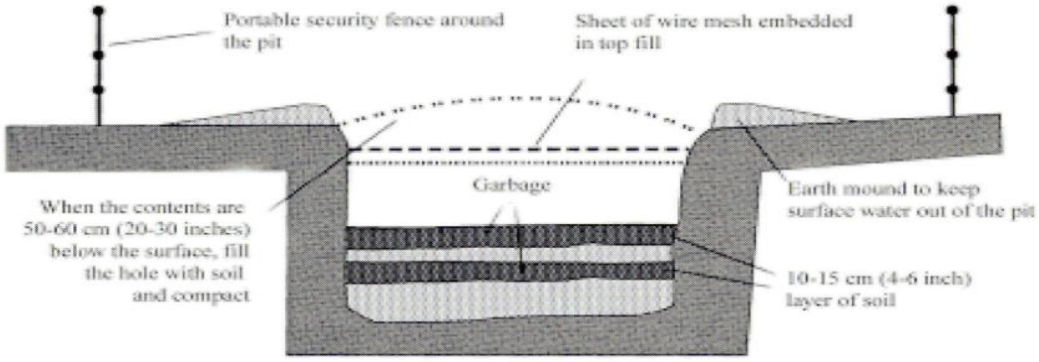


Figure 27. Plan for a small waste burial pit

Safe on-site burial within a medical facility's premises is practical only for a short period (1-2 years) and for a relatively small amount of waste.

Note: *Only contaminated and hazardous waste requires burial.*

Each healthcare institution should have a standard, dedicated pit for placentas on its premises, separate from medical departments. Placental pits should be located in specific areas on the healthcare facility's premises to prevent groundwater contamination. They should be covered and fenced off for safety purposes.

Pits for placentas can also be an effective solution in resource-limited conditions. They should be placed in specific locations to avoid groundwater contamination. The bottom of the pit should be at a height of no less than 1.5 meters above the groundwater level. The areas where placenta pits are located must be enclosed and fenced off for safety reasons. In cases where the groundwater level is high, the horizontal distance of the pit structure may be increased to

avoid reaching the groundwater level. If desired, the pits can also be elevated to maintain vertical distance from high groundwater levels.

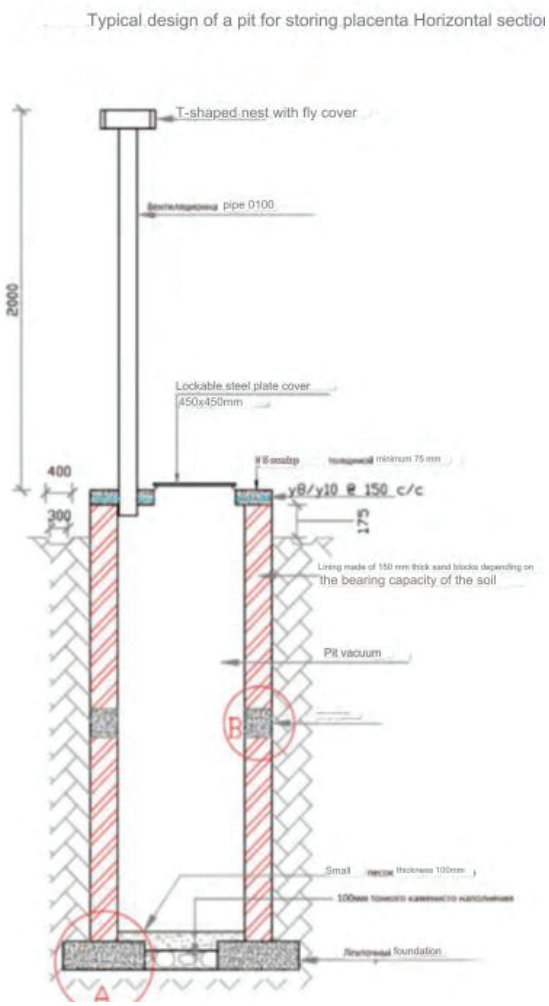


Figure 28. Standard design of a pit for placenta disposal

An approximate diagram of the pit structure is provided in Figure 28 (*Page: National Standards for Water Supply, Sanitation, and Hygiene (WASH) in healthcare institutions). Approved by the Ministry of Health of the Republic of Tatarstan in 2023)*

Disinfection of hazardous medical waste by autoclaving method

When choosing technologies for processing hazardous medical waste, it is essential to adhere to the principles of ensuring public safety, personnel safety, and environmental protection, as well as ensuring the reliability of processing and destruction, accessibility, effectiveness, and the prevention of the reuse of medical waste. At present, there are numerous alternative processing technologies being offered, such as autoclaving, microwave treatment, and so on.

The medical waste autoclaving system, i.e., the thermal processing method, is based on the use of saturated steam (at a temperature of 1340C and a pressure of 2.2 MPa for 10 minutes). In saturated steam systems, microorganisms are destroyed due to the high temperature (which leads to the denaturation of proteins). On the other hand, the deactivation process of

microorganisms occurs through the combined action of high temperature, moisture, and increased pressure. The preparation of waste for autoclaving requires sorting to remove unsuitable materials and shredding to increase the surface area of the waste.

Small autoclaves are typically used for sterilizing medical equipment, but an autoclave for waste treatment can be a relatively complex and costly system, requiring careful design, material separation, and a high level of operation and technical maintenance. The output from the autoclave is a non-hazardous material that can typically be disposed of in a landfill with household waste. Wastewater flow requires appropriate care and treatment. For large autoclaves, a boiler with smoke emissions may be required, which are subject to environmental control.

- In the autoclave room, the floors and walls should be constructed using materials with smooth surfaces (such as tiles) and have appropriate drainage connections for wastewater. It should be equipped with running water for washing containers and separately for handwashing.
- Shelves for containers and storage for disinfectants and cleaning supplies should be installed in them.
- An emergency kit should be provided for emergency situations.
- The autoclave room should be equipped with active supply and exhaust ventilation.
- The doors of the autoclave room should be marked with the appropriate color and a biological hazard sign.

5.8.4 Transportation of Medical Waste Inside and Outside the Facility

The transportation of waste from organizations engaged in medical and/or pharmaceutical activities is carried out by specialized companies to the location for subsequent disposal and the placement of medical waste, taking into account a unified centralized system for sanitary cleaning of the administrative territory.

Waste Class A:

- The transportation of waste is organized in accordance with the sanitary cleaning scheme adopted for the respective area, in compliance with sanitary legislation regarding the maintenance of urban areas and the handling of production and consumption waste.
- when transporting Class a waste, the use of vehicles intended for the transportation of solid household waste is permitted.
- reusable containers for transporting Class a waste must be cleaned and disinfected at least once a week. The organization responsible for waste transportation must have an area for washing, disinfecting, and disinsecting containers and vehicles.

Class B waste:

- reusable containers for transporting Class b waste must be washed and disinfected after each emptying.
- Specialized transport vehicles are used for the transportation of non-decontaminated Class B waste, and their use for other purposes is not allowed.

Sanitary and epidemiological requirements for vehicles intended for the transportation of non-decontaminated Class B waste:

- The driver's cabin should be separated from the vehicle's body.
- The vehicle body should be made of materials resistant to cleaning and disinfecting agents, mechanical impact, have a smooth internal surface, and be labeled with 'Medical Waste' on the outside.
- For transportation lasting more than 4 hours of waste stored in freezers, refrigerated transport should be provided.
- The vehicle body should have devices for securing containers and for loading and unloading them.
- The transport vehicle must be equipped with an emergency disinfection kit in case of spillage or leakage of medical waste (bags, gloves, water, disinfectants, rags, and other items).
- The transport engaged in waste transportation, as well as reusable (intermediate) containers for waste collection, must be washed and disinfected at least once a week. Disinfection is carried out by spraying from a hydraulic sprayer, atomizers, or by wiping with disinfectant solutions using cloths and brushes. During this process, it is necessary to follow the precautions provided in the instructions/methodological guidelines for the specific disinfectant (protective clothing, respirators, safety goggles, rubber gloves).
- The transport vehicle is equipped with mobile communication means.

Class C waste:

- The transportation and burial of Class G waste are carried out in accordance with the hygiene requirements applied to the accumulation, transportation, and burial of toxic industrial waste.

Waste Class D:

- The transportation of Class D waste is carried out in accordance with the legislation of the Republic of Tajikistan regarding the handling of radioactive substances.

5.8.5 Record Keeping

To keep track of medical waste disposal, the following documents are necessary:

Technical journals for each structural unit (in which the quantity of Class B and Class C waste packages is specified):

Date	The type and quantity of packages	The time of delivery for temporary storage	The surname of the responsible person	Person in charge, signature

The organization's technical journal (records the volume or weight of waste, information about the organization responsible for disposal):

The date of removal	The quantity of packaging units	The weight of the waste	The name of the organization responsible for the removal	Handed over (Last name and signature)	Accepted (Last name and signature)

Documents confirming the removal and disposal (issued by the company with which the contract is concluded):

The name of the organization _____

Receipt of waste					Waste treatment			
Date	Unit code	Date	Unit code	Date	Unit code	Date	Unit code	Date

5.9 ENVIRONMENTAL SERVICE

Housekeeping services involve general cleaning and maintenance of hospitals and medical facilities, including floors, walls, specific types of equipment, tables, and other surfaces.

The medical environment includes surrounding surfaces, such as patient beds and bathrooms, as well as medical equipment, such as equipment for measuring blood pressure and intravenous pumps. The survival and resilience of microorganisms in the environment depend on various factors, including the type of surface, the presence of organic substances, the microbial load, temperature, and humidity. Since it is known that several common healthcare-associated pathogens can persist on environmental surfaces for weeks and months, it is quite possible, though not necessarily obligatory, that surfaces play a role in disease transmission.

Ecological cleaning includes two main types of surfaces:

- Environmental surfaces: objects such as bedrails, countertops, and floors.
- Medical equipment: items necessary for patient care, such as monitors, intravenous pumps, and blood pressure measurement devices.

Patients and medical staff come into contact with some surfaces more frequently than others, which increases the risk of infection transmission. They are called high-touch surfaces. Surfaces that are **frequently touched** include: door handles, light switches, bed rails, bed ends, patient charts, monitor buttons, intravenous pumps and stands, as well as faucet handles. At a minimum, all patient care areas should be cleaned twice a day and more frequently if contamination becomes visible. Regular cleaning is done when a patient occupies the bed or room, while terminal cleaning is performed when a patient is discharged or transferred from the bed or room.

Continuous contamination of the environment with microorganisms occurs from infected and/or colonized patients, staff, and visitors in healthcare facilities. Their survival in the environment depends on various factors, such as humidity, temperature, moisture, and the type of material. Contaminated environmental surfaces play a crucial role in the spread of microorganisms in a healthcare facility. Dry conditions promote the growth of Gram-positive cocci (such as coagulase-negative staphylococci) in dust and on surfaces, while they thrive in moist fibrous material.

The purpose of general services is to:

- Reducing the number of microorganisms that patients, visitors, medical staff, and the general population may come into contact with.
- Ensuring a clean and pleasant environment for patients and healthcare workers.

Cleaning methods should be determined by the type of surface, the quantity and type of organic contaminants present, and the purpose of the room. Most areas in hospitals and clinics, such as waiting areas and administrative spaces, fall into the **low-risk category**, which can be cleaned with soap and water only. In **high-risk areas such as toilets and restrooms**, where heavy contamination is expected, or for cleaning blood or other biological fluids, a disinfectant should be added to the cleaning solution, such as a 0.5% bleach solution or a 1% phenol solution. Adding a disinfectant to a soap and water solution is also recommended when cleaning high-risk areas such as operating rooms, pre-surgical and postoperative rooms, as well as intensive care units.

Common principles of cleaning:

- Friction cleaning is the best method for physically removing dirt, debris, and microorganisms.
- Allocate separate inventory with color coding: 1. for routine and general cleaning; 2. for rooms of various functional purposes; 3. corridors; 4. bathrooms, toilets.

- **Prior** to carrying out any disinfection, cleaning is necessary **as dirt**, debris, and other materials can **reduce the effectiveness** of many chemical disinfectants.
- To prevent the entry of dust, debris, and microorganisms into the air and onto clean surfaces, it is advisable to avoid dry sweeping, dry **mopping, and dry dusting.**
- Cleaning solutions should be chosen based on their intended use, effectiveness, safety, and cost.
- Cleaning should always be performed from the least contaminated area to the most contaminated area and from top to bottom to ensure that the most contaminated areas and any debris that falls to the floor are addressed last.
- Mopping floors and dusting should be done to prevent the entry of dust, debris, and microorganisms into the air and onto clean surfaces.
- When using disinfectants, follow the instructions for preparing solutions. Too much or too little water can reduce the effectiveness of disinfectants.
- Cleaning methods and cleaning schedules in written form should be based on **the type of surface, the volume and type of present contamination** and **the intended use of the area**.
- Regular cleaning is necessary to maintain cleanliness standards. Cleaning schedules and procedures **should be coordinated** and should be posted for reference.

Types of cleanliness categories:

A. **Especially clean areas**: operating rooms, maternity wards, aseptic rooms, neonatal units, sterilization (clean room).

B**. Clean areas**: procedure rooms, dressing rooms, pre-surgical areas, intensive care units, pediatric wards.

C. **Semi-clean areas**: departmental wards, corridors adjacent to operating and maternity rooms, examination rooms, isolation units, dormitories, supply rooms, clean linen storage.

D. **Dirty areas**: corridors and administrative spaces, staircases, sanitary facilities, toilets, rooms for temporary storage of soiled linen and waste storage.

Requirements for technical personnel and personal hygiene

- In every institution, there should be written Standard Operating Procedures (SOPs) or protocols in accordance with this guidance, based on risk assessment and the surfaces to be cleaned, to ensure the proper implementation of standards and appropriate methods for preventing Healthcare-Associated Infections (HAIs).
- The personnel responsible for cleaning rooms undergo initial and periodic (once a year) medical examinations. Individuals with heightened sensitivity to the chemicals used in room cleaning are removed from work. The cleaning staff can include individuals without medical education, but it may also include nurses WHOperform certain cleaning tasks (such as cleaning medical devices or high-risk areas that require medical knowledge).
- Individuals WHOare at least 18 years old and have received appropriate training in their job duties, safety techniques, and precautions when working with disinfectants are eligible for employment. Cleaners must undergo two types of training related to sanitary and epidemiological regulations and cleaning: (1) regular on-the-job training; (2) annual hygiene education and certification.

- The personnel responsible for cleaning rooms should be knowledgeable about the rules for providing first aid in case of accidental poisoning with disinfectants, and first aid kits should be available in the department.
- Cleaning rooms should be done while wearing specialized protective clothing, including a gown, head cover, gloves, respirator, protective eyewear, and closed shoes.

When cleaning, be sure to install a sign that says «Caution! Wet floor!» until the floor surface is completely dry, and prevent water from getting on the floor to avoid accidents involving patients and staff!



Table 19. Types of cleaning

TYPES OF CLEANING		
Preliminary (preventive)	Before work start	Work surfaces are cleaned and disinfected
Current	At least 2 times during the working day and as needed based on contamination.	Cleaning and disinfection of previously used equipment
Final or concluding	At the end of the working day	Washing and disinfection of previously used equipment, wet cleaning of premises
General or final	1 Once per week	Conducted in 3 stages: - Washing with detergent. - Disinfection. - Rinsing of the disinfectant. The use of modern composite or enzymatic disinfectants with cleaning properties allows for the combination of the 1st and 2nd stages.

Cleaning solution. A cleaning solution is any combination of soap (or detergent) and water, with or without a chemical disinfectant, used for washing or wiping down environmental surfaces such as floors, chairs, bench seats, walls, and ceilings.

Soap or **detergent (the terms are interchangeable**). Cleaning agents (solid, liquid, gel, in the form of tablets, or powder) that reduce surface tension, thereby facilitating the removal of dirt, debris, and microorganisms that come into contact with hands. When using regular soap, friction (brushing) is necessary for the mechanical removal of microorganisms, while antiseptic soap kills or inhibits the growth of most microorganisms.

Disinfectant cleaning solution. A product that includes both a cleaning agent (soap) and a chemical disinfectant. Not all cleaning and disinfecting agents are compatible. Some combinations are available for purchase or can be prepared, such as alkaline cleaning agents

with chlorine compounds, alkaline cleaning agents with quaternary ammonium compounds (QUATs) or other nonionic surfactants, as well as acidic cleaning agents with iodophors.

Cleaning agents are used to remove a wide range of dirt, including microbial dirt/debris, and they often require the use of "chemicals" to facilitate their removal.

Cleaning agents, which include chemical substances and are typically used for hospital cleaning, are grouped into the following categories:

- Neutral cleaning agents are used for general cleaning of hard surfaces such as floors, walls, furniture, glass, etc. Neutral cleaning agents typically have a pH level of 6 - 8.
- Acidic cleaners are used to remove scale from plumbing equipment and stains from water and water deposits on toilets. Acidic cleaning agents typically have a pH level of less than 6.
- Alkaline cleaners are used to remove grease. Alkaline cleaners typically have a pH level ranging from 9-11. Any alkaline cleaning agent with a pH above 11 should only be used under strict supervision, as they are hazardous substances.
- Solvents are used for chemical cleaning and stain removal.
- Disinfectants are only used for disinfection and should not be used as chemical agents for general cleaning. However, for cleaning physiological body fluids, the use of a solution may be required.

All cleaning products should be properly labeled and stored to minimize the risk of infection, aspiration, skin contact, or accidents. Preference should be given to a dosing system rather than containers for bulk materials to ensure the accuracy of dilution and eliminate the need for decontamination.

Type of detergent. Cleaning agents available on the market (liquid or powder) that consist of hydrophilic (water-attracting) components and lipophilic (fat-attracting) components are categorized into four types: anionic, cationic, amphoteric, and nonionic detergents.

There are various types of cleaning agents, including liquid soaps and detergents, disinfectants, mixtures of detergents and disinfectants, each with different characteristics.

The ideal cleaning agent should perform the following:

- Emulsification of fats (suspending fats in water).
- Saponification of fats (fats become soluble in water).
- Surface activity (reduction of the surface tension of water, allowing a substance to penetrate dirt or stains more effectively).
- Dispersion (breaking down dirt into small particles).
- Protein breakdown (breaking down proteins).
- Water softening (removal of calcium and magnesium).

Instructions for preparing a cleaning and disinfecting solution:

STEP 1: From a liquid concentrate or dry chlorine powder (see formulas for preparing a chlorine solution from liquid concentrate or dry powder) or other chlorine compounds, prepare a 0.5% chlorine solution. As alternative disinfectants, solutions containing 1-2% phenols or 5% carbolic acid can be used.

STEP 2: In a 0.5% chlorine solution or another disinfectant, add a detergent to create a moderate, soapy cleaning solution of 5 grams per 1 liter of water (or adjust according to water hardness).

Table 20. Cleaning rules in procedural and dressing rooms (procedural and dressing areas)

At the beginning of the workday, a preliminary cleaning is conducted	At the beginning of the workday, all flat horizontal surfaces, including tables and chairs, should be wiped with a clean cloth (lint-free), dampened with a disinfectant solution (0.5% chlorine solution, 0.5% Septustin, or other approved disinfectant). - When cleaning, mark a starting line to ensure that all surfaces are wiped.
Routine cleaning is conducted daily during the working day, between procedures.	Routine cleaning is carried out during work, with any dropped ballsand wipes being picked up and collected in special containers. Areas contaminated with biological fluids (blood, exudate) are disinfected. - Waste is collected in a waterproof container. When the container is three-quarters full, take it out of the procedural room and place it in the temporary waste collection area. After each procedure, the procedure (dressing) table is treated with a 0.5% chlorine solution disinfectant. If necessary, perform wet floor cleaning using a disinfectant solution
At the end of each workday, a final (concluding) cleaning is carried out	- Waste is collected in special waterproof containers and sent for disposal. - To clean the office, prepare a cleaning solution (5 grams of detergent per 1 liter of water). - First and foremost, walls, doors, door handles, chairs, and shelves are wiped with a damp cloth moistened with a cleaning and then a disinfectant solution. Sinks are cleaned with a brush moistened in a cleaning and disinfectant solution, or by using disinfectant and cleaning agents. - Surface cleaning (e.g., walls) should be done from top to bottom so that debris falls onto the floor and is removed last. Finally, wash the floor with a cleaning solution and water, or if necessary (in case of suspected contamination with biological fluids), use disinfectants. Washing can be done using techniques: - The «single bucket» - method involves using one bucket for both purposes: first, the bucket is used for the cleaning solution, then it is rinsed and filled with clean water for a second wipe to remove the soap solution. - "Two-bucket method" - two separate buckets are used, one for the cleaning solution and the other for rinsing. - "Three-bucket method" - three buckets are used: one for the cleaning or disinfecting solution, the second for rinsing, and the third for wringing out the dirty cloth.

Routine cleaning and disinfection in areas where sterile endoscopic procedures are performed should be conducted after each intervention. Final cleaning at the end of each day. Deep cleaning - 1 time per week.

Cleaning of contact surfaces and spill cleanup

Surfaces that come into contact with patients, such as examination tables and hospital beds, should be kept clean and disinfected to prevent cross-contamination among patients and healthcare workers.

All surfaces that may come into contact with blood, physiological fluids, secretions, or excreta (e.g., gynecological chairs or operating tables) should be disinfected by wiping them with a disinfectant solution (0.5% chlorine solution) after each patient, even if they appear to be clean.

Any visibly soiled surface should be disinfected by wiping it with a disinfectant solution (0.5% chlorine solution or another approved disinfectant) immediately after the procedure is completed.

Cleaning the operating room

The operating room is cleaned at three different time periods:

Before the first surgery or procedure of the day: Before surgical materials are delivered to the operating room for the first procedure of the day, several tasks are recommended to be performed. All overhead lights (lamps), the operating table, and any other flat surfaces are wiped with a damp cloth. Any countertops (horizontal surfaces) should also be wiped with a damp cloth. Trays for surgical equipment should not be opened for the first case until the wet cleaning is completed.

Between surgical procedures: After a surgical procedure, surgical equipment, the floor, the immediate area around the surgical table, and any furniture are considered contaminated. Clean and disinfect them along with any other items identified by the institution. Remove dirty linens, trash, and infectious waste

After the last procedure of the day: Perform the final cleaning of the operating room. This is a detailed process that should adhere to the protocols of specific facilities. The final cleaning of the operating room includes the removal of infectious waste and dirty linens, cleaning all surfaces from top to bottom, including overhead lighting, cleaning the operating table, including the mattress, and mopping the floors.

1. Routine cleaning is conducted during the operation when medical personnel pick up any dropped balls and wipes from the floor, wipe up blood and exudate spills.
2. Cleaning is mandatory after each operation and includes wet mopping the floor, wiping the polyethylene sheet on the operating table (with a 0.5% chlorine solution or other approved disinfectant), and using a cloth moistened with a disinfectant. Used surgical materials and contaminated waste generated during the operation are collected in a Class B container and, after the operation, are taken to a temporary storage area. Cleaning equipment (buckets, basins, cloths) is washed and disinfected after cleaning. After removing the instruments for pre-sterilization cleaning, collecting laundry in a dirty laundry container, and finishing the cleaning, personal protective equipment is removed, and hands are thoroughly washed. Final, ultimate cleaning. Regardless of whether surgeries were performed or not, the final cleaning is carried out daily. In a scheduled operating room, this is done at the end of the working day, while in an emergency operating room, it is done before the shift change of the duty surgical team.

The final cleaning of the operating room includes washing the passageways and damp wiping of walls, windowsills, radiators, furniture, and equipment with a cleaning and disinfecting solution. Residue of the solution is removed with clean tap water. During cleaning, nurses should have two buckets or basins: one with a cleaning solution and the other with water for rinsing cloths. Cloths should be rinsed frequently, and the water should be changed as soon as it becomes dirty. In some operating rooms, there is a special valve for connecting a hose, which is used to wash the ceiling, walls, and floor with a stream of water. All furniture is moved to one half of the room, and the cleared half is cleaned. Then, the furniture and equipment are wiped down with a specifically designated clean cloth. Complete the cleaning by washing the second half of the operating room.

The daily cleaning of the operating room is carried out in a strict sequence: it begins with the operating room and ends with the areas located at the exit from the block (pre-surgical area, anteroom, corridor).

1. General, final cleaning (disinfection) of the operating room can be planned or unplanned.
2. Unplanned disinfection is carried out after surgery that involves heavy surgical contamination with pus, intestinal contents, or in cases of anaerobic infection.
3. Planned disinfection is carried out once a week on a day free from surgeries, and the schedule is determined by the head operating room nurse.

Requirements for the technology of general cleaning

1. The procedure for conducting general cleaning in each room depends on the specific sanitary requirements for that room.
2. In all treatment and treatment-diagnostic, laboratory rooms where parenteral interventions are performed, work is conducted with infectious patients or biological materials from patients, a general cleaning is carried out once a week in the operating room. In the rest of the auxiliary rooms of the hospital, general cleaning is conducted monthly.
3. For general cleaning, it is necessary to use broad-spectrum disinfectants in the appropriate dilution. The use of these disinfectants will help protect both you and your patients from various pathogens, including tuberculosis bacilli, hepatitis viruses, or HIV. It is crucial to have official guidelines on their usage.
4. First, all walls, windows, window sills, room doors, and door handles are cleaned. Then, furniture, drainage taps, switches, heating radiators, medical equipment, and similar items are cleaned. These surfaces are wiped twice with a 15-minute interval using a cloth soaked in a solution of one of the disinfectants (at a rate of 150-200 ml per 1 square meter), depending on the corrosion resistance of the surface. Finally, the floors are cleaned with the same solution. The deactivation time is 10 minutes.
5. Sanitary equipment such as sinks, bathtubs, etc., is washed and wiped with a cloth using cleaning and disinfecting agents.
6. When applying cleaning and disinfecting agents using a hydropanel or other spraying equipment, the recommended usage rate is 150-300 ml per 1 square meter of the treated surface.
7. After disinfection, residue may remain on the surfaces, which should be removed by wiping with a damp cloth.

8. During general cleaning, the interior window panes are wiped as needed but at least once a week, and the exterior is cleaned as needed but at least once a month.
9. It is crucial to strictly follow the sequence and ensure the precise execution of all stages of washing and disinfection, aiming for the maximum removal of residues of cleaning and disinfecting agents from the treated objects.

Table 21. Requirements for cleaning equipment

1	Color-coded labeling of cleaning inventory with indications for rooms and types of cleaning tasks
2	Use cleaning equipment strictly for its intended purpose and clean and disinfect it after use
3	To equip sanitary-technical rooms, you should include sinks for washing, drainage systems for disposing of contaminated and biological fluids, and shelves for storing cleaning equipment and drying cloths.

Use of personal protective equipment

Below is a list of personal protective equipment (PPE) recommended for use by maintenance personnel during cleaning operations (table. 22).

Table 22. Recommended personal protective equipment for cleaning

Type of PPE	WHEN TO USE IT
Gloves (rubber household)	- When working with disinfecting cleaning agents - During cleaning of premises and territory
Footwear that protects the feet from accidentally falling objects, blood, and biological fluids	- When cleaning heavily soiled areas - When handling dirty laundry - When working with contaminated tools and objects - When working with or disposing of waste
Polyethylene or rubber apron, protective goggles, or face shields	- When splashes and spills are expected

PPE is used:

- When working with disinfecting cleaning agents
- During room cleaning
- When cleaning heavily contaminated areas
- When working with dirty laundry
- When working with contaminated tools and objects

- When working with or disposing of waste
- When there is an expectation of splashes and spills of bodily fluids

Colour coding

The color-coding of cleaning supplies (cleaning inventory) and hospital equipment ensures that these items are not used in different zones, thereby reducing the risk of cross-infection. The colors should be designated for specific functional areas and should be applicable throughout the entire medical facility.

The method used for color-coding items should be clear, consistent, and in accordance with local practices and guidelines.

The following inventory and equipment that should be color-coded:

Zones	Color Code
Baths, toilets, showers, sinks and bathroom floors	Red
Common areas include wards, departments, offices, and sinks.	Blue
Hospital food service department, kitchen area, and food storage	Green
Isolation areas/zones	Yellow
Operational, manipulative	White

Mops in each area should have their own color: red - bathrooms, toilets, showers. Blue or light blue is used for rooms and offices, white is for operating and procedural rooms, yellow is for isolation areas, and green is for kitchens, dispensing areas, and dining rooms.

The buckets should have labeling such as #1 and #2 for the floor, for the walls, for the toilet, for the corridor, for the rooms, and for the operating room.

Separate rags for walls and surfaces, and for floors with markings in the corner using corresponding colors or special cleaning cloths with colors.

Labeling – on containers for storing disinfectants (including preparation time), collecting dirty laundry, and waste containers. It is necessary to indicate indicate the class A – for non-hazardous waste, class B, C, etc. (refer to the chapter 5.8 Management of health waste)

Bucket (container) technique: One bucket of cleaning solution is used. When the solution becomes dirty, it needs to be replaced. (The cleaning agent's effectiveness decreases as the amount of dirt and organic matter in it increases.)

Two-bucket technique: Two separate buckets are used, one containing the cleaning solution and the other containing water for rinsing. The cloth should always be rinsed and wrung out before immersing it in the cleaning solution. The two-bucket technique extends the lifespan of the cleaning agent (requiring fewer replacements), saving costs, labor, and materials.



The two-bucket method is recommended for cleaning medical facilities using the following methods:

- Wash your hands, put on personal protective equipment (PPE), and hang warning signs about slippery floors.
- Prepare the cleaning solution in one of the buckets according to the manufacturer's instructions provided during training. Do not mix chemical substances.
- Fill the second bucket halfway with clean water.
- Attach the mop head to the mop handle.
- Dip the mop into the cleaning solution and remove excess liquid by wringing it out, so the mop remains sufficiently dry.
- Wash the floor in square sections of 1-2 square meters each.
- Wipe the edges of the floor with straight strokes, and then continue working from side to side in the opposite direction, using a figure-eight pattern for the remaining part of the section, frequently turning. After finishing, the floor should be sufficiently dry.
- During the cleaning process, as the mop with a cloth gets dirty, immerse it in bucket #2 with water, wash and wring it out.
- When the cleaning solution becomes dirty, replace bucket #1 with a new cleaning solution.
- Move on to the next area and repeat the process.
- Replace the mop head and bucket with water as needed during the cleaning process, placing the mop head in a laundry bag.
- When you have finished cleaning, remove the last mop head and place it in the laundry bag. Transfer all cleaning equipment to the sanitary-technical room, and pour the dirty water into the sewage system for wastewater disposal. Clean the bucket, cloth, and mop head in a cleaning and disinfectant solution in the bathroom, dry all equipment, and store it in a safe place on shelves.
- Remove personal protective equipment (PPE) for washing and disinfection
- Remove your gloves and wash your hands.

Solutions in buckets become contaminated almost immediately during cleaning, and continued use of the solution leads to the transfer of an increasing number of microorganisms to each subsequent cleaned surface.

Three-bucket technique: The third bucket is used for wringing out the cloth before rinsing, which extends the lifespan of the rinsing water (where there is a water shortage, it conserves water)

Some bacteria can grow in both cleaning and disinfecting solutions. That's why it's important to prepare a fresh cleaning solution daily.



Another source of contamination during cleaning is the cloth or mop head, especially if they are soaked in dirty cleaning solutions. Therefore, it is important for the removable attachments of used mops to be laundered in a machine cycle that includes thermal disinfection and dried daily. When the buckets are not in use, they should be stored in a clean condition on shelves.

Rinse, dry, and store upside down to allow for complete liquid drainage. A simplified approach to cleaning involves replacing dirty cloths and attachments with clean ones every time the bucket with the cleaning solution is emptied and replaced with fresh cleaning solution.

Examples of approaches to cleaning surrounding surfaces, systematic movement within the patient care zone, and exit.

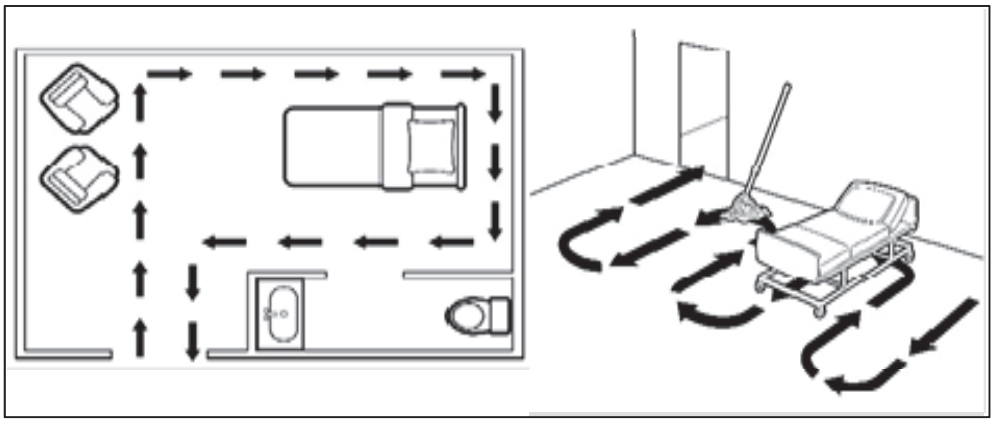


Figure 29. Room cleaning rule

Cleaning biological and pathological spills

Cleaning contact surfaces and cleaning biological and pathological spills:

- The surfaces that patients come into contact with, such as examination tables and hospital beds, should be kept clean and disinfected to prevent cross-contamination among patients and healthcare workers.
- All surfaces that may come into contact with blood, biological fluids, secretions, or excrement (e.g., gynecological chairs or operating tables) should be disinfected after

each patient by wiping them with a disinfectant solution (0.5% chlorine solution), even if they appear to be clean.

Any surface with visible contamination should be disinfected by wiping it with a disinfectant solution (0.5% chlorine solution) immediately after the procedure is completed.

For small spills (<10 ml) or for wiping surfaces when using a sodium hypochlorite solution, use a 0.5% chlorine solution (525-615 parts per million available chlorine). If a spill involves a large amount of blood or a spill of microbiological cultures in a laboratory, using a 0.5% sodium hypochlorite solution for initial application (before cleaning) reduces the risk of contamination during cleaning. After the initial use, remove visible organic matter with absorbent material (e.g., disposable paper towels), dispose of them in a sealed and labeled bag/container, and then dispose of them according to waste disposal instructions.

Cleaning and disinfecting agents for the environment

For daily and general cleaning, it is recommended to use a neutral cleaning agent and a solution of warm water. When a disinfectant is required for cleaning surfaces, such as after a spill or contamination with blood or biological fluids, as well as in special areas like the surgical department, dialysis unit, and intensive care unit, it is important to follow the manufacturer's recommendations for use as well as occupational health and safety guidelines for safety.

Cleaning agents and solutions

Cleaning solutions contain detergents that remove dirt and debris (organic materials) from surfaces. Detergents do not kill pathogenic microorganisms but help to remove them from surfaces. It's important to protect cleaning solutions from contamination, as they can easily become contaminated during the cleaning process. Ideally, the cleaning solutions used in the facility should be hospital-approved detergents.(See above cleaning agents).

Disinfectants

Disinfectants deactivate or kill microorganisms on cleaned surfaces. They are not intended for use as antiseptics. Similar to cleaning solutions, disinfectant solutions in buckets can easily become contaminated, potentially leading to the transfer of a higher quantity of microorganisms onto surfaces. Change them frequently.

Hypochlorite: Disinfectants containing hypochlorite can be easily found in resource-limited conditions. When using hypochlorite, a solution is prepared using the chlorine solution preparation formula and stored in a labeled container with a lid (refer to the preparation method in Appendix 2). If the hypochlorite's activity is unknown, it is impossible to prepare a chlorine solution of the required concentration. Nevertheless, in addition to the percentage indicated on the sodium hypochlorite certificate, it is necessary to determine the activity of dry hypochlorite powder in the laboratory of the Sanitary and Epidemiological Service (SES) every month. This is because chlorine loses its activity during storage, and if it is not determined, the working solution prepared according to the formula will not correspond to the required concentration.

When choosing a cleaning/detergent or disinfectant product, consider the following:

- **Intended Use:** Will it be used for cleaning (detergent), disinfection (disinfectant), or both?
- **Effectiveness:** Does it kill microorganisms in the environment? What is the recommended contact time?

- **Acceptability:** Does it damage the surface, leave a residue, or produce an odor?
- **Safety:** Does it have any side effects for those WHOcome into contact with it? What equipment is required for processing/usage?
- **Cost and Accessibility:** Does it fit within the budget? Is it easy to obtain what you need?
- **Volume:** Is it available in the required quantity based on the institution's needs?

5.10 ENVIRONMENT AND INFRASTRUCTURE

Air and Ventilation

Air is a source of airborne infections. The most common airborne infections are measles and chickenpox. Tuberculosis (TB) and other serious respiratory viral infections can be transmitted through airborne droplets during aerosol-generating procedures such as intubation and bronchoscopy. Airborne transmission can also occur with diseases such as chickenpox (including disseminated shingles), highly pathogenic influenza, and smallpox. Airborne transmission occurs through nuclei of droplets with a size of less than 5 micrometers. These particles can remain suspended in the air for various periods of time and may travel distances of more than 1 meter, sometimes even from one room to another.

Ventilation can reduce the risk of infection by diluting and removing infectious particles through air exchange. Improving ventilation in medical facilities is essential for preventing the transmission of tuberculosis and other airborne infectious diseases.

The specific nature of medical facilities imposes significant requirements on ventilation systems. The task is further complicated by the fact that within one hospital, there are numerous different types of rooms, each requiring its unique microclimate to be maintained. Proper ventilation installation is one of the most critical points of sanitary and hygiene standards that must be strictly adhered to when implementing national guidelines for Infection Prevention and Control (IPC).

The optimal amount of fresh air in a hospital room is 80 cubic meters per hour per bed, with a minimum of 40-50 cubic meters.

Proper ventilation installation provides - the comfort of 'fresh air'; heat removal; excess moisture removal; removal/dilution of odors, toxic/flammable gases; and control and dilution of airborne pathogens.

Table 23. Advantages and disadvantages of various ventilation systems

	Mechanical	Natural	Hybrid (mixed) ventilation
Advantages	• Suitable for any climate and weather • Can be controlled	• Suitable for mild and moderate climates • Low cost and maintenance • High ventilation speed capability • Patient monitoring	• Suitable for most climates and weather conditions • Energy-saving compared to mechanical ventilation • More flexible

Drawbacks	• Expensive in installation and maintenance • Particularly negative pressure ventilation	• Climate impact • Design complexity • Reduces comfort levels in hot, humid, or cold conditions • Inability to create negative pressure in isolated areas.	• May be more costly or complex to design

Natural Ventilation – windows

The advantage of natural ventilation is that it is cost-effective, and patients can easily control their environment by opening/closing windows.

Simple natural ventilation can be optimized by maximizing the window size, opening fixed window panes, and placing windows on opposite walls.

Ventilation can also be optimized by using «mixed-flow fans». Types of mixed-flow fans include ceiling fans, pedestal/table fans, or window/exhaust fans.

The disadvantages of natural ventilation include: lack of temperature control; magnitude and direction of ventilation; Increasingly, buildings are constructed with interior spaces, and fire safety measures also hinder ventilation.

Mechanical ventilation

Mechanical ventilation uses fans to direct airflow through a building.

- Mechanical ventilation can be fully controlled and integrated with heating, ventilation, and air conditioning (HVAC) systems, as is commonly done in some office buildings.
- Mechanical ventilation includes "mixed ventilation," in which exhaust and/or supply fans are used in conjunction with natural ventilation to achieve adequate dilution when sufficient ventilation speed cannot be achieved through natural ventilation alone.

Mechanical ventilation with or without climate control may be appropriate where natural ventilation cannot be effectively implemented or when such systems are inadequate considering local conditions (e.g., building construction, climate, regulations, culture, cost, and outdoor air quality).

A poor ventilation system in infectious hospitals, including tuberculosis dispensaries, can negate all the efforts of medical professionals and pose a serious risk to both the medical staff and the surrounding individuals.

In infectious wards, exhaust ventilation with mechanical drive through separate channels in each cubicle and semi-cubicle is installed, and these areas should be equipped with air disinfection devices.

In the absence of mechanical ventilation with mechanical stimulation in infectious wards, natural ventilation should be equipped with mandatory air disinfection devices of the recirculation type in each cubicle and semi-cubicle, ensuring an efficiency of inactivating microorganisms and viruses of not less than 95%.

Features of ventilation in infectious wards:

- Equipped with supply and exhaust ventilation with mechanical stimulation and air supply to the corridor.
- Air is removed through separate channels for each cubicle.
- 75% of infectious diseases are transmitted through airborne droplets, making proper ventilation in hospital rooms very important.

Health care-associated infection (HAI) often occur due to poor ventilation, specifically because of an imbalance between air supply and exhaust or due to the integrity of the ventilation system being compromised.

5.11 ORGANIZATION OF HUMAN FLOW IN ACTIVITY ZONES

Patient Placement

Proper patient placement is crucial for preventing the transmission of infections in a hospital setting.

Cleaning should be performed before admitting a patient to the room. There should be a policy for room cleaning both (a) after a patient is discharged (final cleaning) and (b) before a patient is admitted.

- All patient care items used by the previous patient should be removed and replaced with clean items, such as bed linen, waterproof covers, oxygen humidifiers, face masks, etc., following the cleaning policy.
- Equipment and patient care items should be cleaned, disinfected, or sterilized in accordance with the disinfection policy.

An important goal of infection prevention is to minimize microbial contamination in patient care areas and in areas where instruments are handled.

These objects include:

- **Procedural rooms**, where patient examinations and procedures are performed (such as vascular catheterization), wound treatment (dressing changes), blood collection, diagnostic rooms with invasive procedures (gynecological examinations, proctological examinations, dental procedures, etc.), vaccination, normal childbirth, and others Intensive care units (ICUs), including the intensive care unit.
- **Surgical departments**, where both major and minor surgeries are performed. The surgical department includes pre-surgical and postoperative rooms, as well as several auxiliary spaces,
- **Workplaces where,** tools are processed. These include dirty and clean rooms, where contaminated instruments, equipment, and other items are first cleaned (washed), then sterilized after drying and packaging (if endoscopes undergo chemical sterilization, i.e., high-level disinfection), and stored.
- Place signs in each zone to clearly indicate proper environmental control and dress code.

In these areas, it is important to direct activities and human traffic to separate contaminated zones from areas where procedures are conducted.

Procedure rooms (intensive care units, diagnostic rooms with invasive procedures, maternity wards, gynecologist's offices, dentist's offices, proctologist's offices, etc.)

- Continuous flow of people should be restricted, allowing access only to authorized medical personnel, patients, and their relatives.
- Access to the procedural room is allowed only for patients and medical personnel conducting the procedure and providing assistance. It is necessary to limit the number of family members during procedures. One family member, chosen by the patient and familiar with the rules of conduct in this room, is allowed.
- Patients may wear their own clean clothing.
- Visitation is allowed for therapeutic and surgical patients, pregnant women, those in labor, maternity patients, and newborns by close relatives (husband, wife, father, mother) with the patient's consent.
- If conditions permit (separate delivery rooms), the presence of a partner (companion) is allowed.

The distance between beds

- In open-plan wards, there should be enough space between beds to reduce the risk of cross-contamination or infection through direct or indirect contact or airborne transmission. The distance between beds should be at least 1-2 meters.
- Single Rooms.
- Separate rooms reduce the risk of infection transmission from an infected patient to others by minimizing direct or indirect contact with the infection. Single rooms should have a sink for handwashing, a toilet, and a bathroom.

Surgical Department

Free Access Area

- This area, isolated from the rest of the surgical department, serves as the entrance from the main corridor. Through this area, medical personnel, patients, and materials enter the surgical department.
- In this area, a limited number of relatives (companions) are allowed in appropriate attire when no procedures or manipulations are taking place.

Transitional (transit) zone

- This zone primarily consists of changing rooms and lockers. Here, medical personnel put on surgical attire and change their shoes, allowing them to move from the unrestricted area of the surgical department to the semi-restricted or restricted area. Access to this zone is allowed only for authorized medical personnel.

Semi-restricted area

This text appears to be describing the peripheral support zone of a surgical department, including pre-surgical and postoperative rooms, a storage area for sterile and highly disinfected items, and corridors leading to a restricted zone.

- Restrict continuous access to non-authorized medical personnel and patients.

- The staff working in this zone must wear special surgical gowns and caps.
- Personnel must wear clean closed-toe footwear to protect their feet from liquids and falling objects.
- It is not permissible to wear flip-flops or sandals as they do not provide protection against sharp object falls.

Restricted area

- This zone consists of the operating room(s) and the hand surgical scrub area.
- During reconstruction or the construction of a new building, it is essential to consider a separate entrance for personnel, patients, and equipment in the operating room.
- Restrict continuous access to non-authorized medical personnel and patients.
- Doors should always be closed, except for when medical personnel, patients, equipment, and supplies are being moved.
- Never store instruments or other items in the operating room.
- Medical personnel WHOhave undergone surgical hand scrubbing must wear a complete set of surgical attire, covering their head and the hair-bearing part of their face with a surgical cap and mask.
- Patients admitted to the surgical department should be dressed in a clean gown or covered with a clean sheet, with their hair covered.
- Patients do not need to wear masks during transportation, except in cases where airborne precautions are required for respiratory infections.

Working zone

Depending on the size and type of healthcare facility, the working area for instrument processing (e.g., CSSD) can be either part of the surgical department, located in a space adjacent to the surgical department, or situated in a separate room. This room should be nearby the surgical department, with a 'dirty area' equipped for cleaning previously used instruments.

Procedural rooms includes intensive care units, resuscitation ward, diagnostic rooms with invasive procedures, delivery rooms, gynecologist's examination rooms, dentist's offices, proctologist's offices, etc.

It is necessary to restrict the continuous human flow, allowing access only for authorized medical personnel, patients, and their relatives.

Access to the procedural room should be allowed only for patients and medical personnel conducting the procedure and providing assistance. It is necessary to limit the number of family members present during procedures. One family member, chosen by the patient and familiar with the rules of conduct in this room, is allowed.

Patients are allowed to wear their own clean clothing.

Visitation is allowed for therapeutic, surgical patients, pregnant women, those in labor, maternity patients, and newborns by close relatives (husband, wife, father, mother) with the patient's consent.

If conditions permit (individual delivery rooms), the presence of a partner (companion) is allowed.

5.12 TRANSMISSION-BASED PRECAUTIONS

Precautions based on the mode of infection **transmission are used in addition to standard** precautions for patients with known or suspected presence of microorganisms for which additional precautions are necessary to prevent transmission. Patients are prescribed **precautions based on transmission,** when they are infected or colonized by specific pathogens.

Precautions based on infection transmission are initiated based on clinical observations when there is suspicion of the presence of specific pathogens, and then they are either continued if the infectious cause is confirmed or discontinued if the infectious cause is ruled out.

There are three types of infection transmission-based precautions - **contact, droplet, and airborne**; the type is used depending on the mode of transmission of a specific disease. Some infections require more than one type of infection transmission-based precautions (e.g., atypical pneumonia, tuberculosis, which require airborne and contact precautions, as well as eye protection during any client interaction).[22]

Patients can be hospitalized or transferred to a hospital without a specific diagnosis. In cases of any doubts regarding the presence of an infectious process in the patient's body in the absence of a diagnosis. Precautions regarding the mode of transmission should be applied based on the patient's signs and symptoms (**empirically)** until a final diagnosis is established. Sometimes, it may be necessary to implement isolation measures that belong to multiple categories.

5.12.1 Infection prevention measures transmitted by contact

Contact transmission of infection is the most common mode of transmission and typically involves transmission through touch or contact with blood, bodily fluids, or secretions. Contact can be either direct or indirect.

- Direct (immediate) transmission occurs when infectious agents are transferred from one person to another, such as when a healthcare worker's unprotected cut on the skin comes into contact with a patient's blood.
- Indirect transmission involves the transfer of infectious agents through a contaminated intermediate object or person. For example, a healthcare worker's hands can transfer infectious agents after touching an infected part of one patient's body without hand hygiene before touching another patient.

These precautionary measures reduce the risk of transmission of microorganisms from an infected or colonized (healthy carrier) patient through direct or indirect contact. They are intended for patients infected or colonized (healthy carriers) with pathogenic microorganisms such as hepatitis A or ECHO viruses, herpes simplex viruses, hemorrhagic fever viruses, and bacteria resistant to multiple drugs (antibiotics). It's interesting to note that chickenpox can be transmitted through both airborne and contact routes at different stages of the disease. There are several viruses transmitted through direct contact that can cause illnesses in infants. Furthermore, contact precautions should be applied to patients with a wet or draining infection that can be contagious (e.g., drained abscess, herpes zoster, impetigo, conjunctivitis, scabies, lice, and wound infections).

[22] Transmission-based precautions for the prevention and control of infections: aide-memoire/ WHO2022

Table 24. Precautions for contact transmission

These precautions are used in addition to Standard Precautions for patients with known or suspected infection or colonization (healthy carriers) with organisms transmitted through direct patient contact or indirect contact with environmental surfaces or patient care items.	
Patient placement	
	• A separate room; the door can be left open. • If there is no separate room, the patient is placed in a room with another patient WHOhas the same active infection, transmitted by the same microorganisms, but without any other infection (cohorting).
Gloves	
	• Wear clean, non-sterile examination gloves or rubber gloves when entering the room. • Change gloves after contact with infectious material (e.g., feces or wound secretions), any contact with the patient, and objects in the patient's environment. • Remove gloves before leaving the room.
Handwashing	
	• Wash your hands with an antimicrobial (antiseptic) solution or use an alcohol-based hand sanitizer after removing gloves. • Do not touch potentially contaminated surfaces or items before leaving the room. • Do not touch your face or eyes.
Gown and personal protective equipment	
	• Wear a clean, non-sterile gown (apron) when entering the patient's room if contact with the patient is expected. • Remove the gown and apron before leaving the room. Do not touch potentially contaminated surfaces or items with your clothing before leaving the room.
Patient transportation	
	• Limit patient transportation to essential purposes only. • Take precautions during transport to minimize the risk of microorganism transmission.
Equipment for patient care	
	• If possible, designate non-critical patient care equipment for individual patients. • Wash and disinfect all equipment that has been used.

5.12.2 Infection prevention measures transmitted by droplets

Droplet precautions are designed to prevent the transmission of specific pathogens that spread through close contact with respiratory secretions, specifically respiratory droplets. Since in a medical facility, some pathogenic microorganisms do not remain contagious over long distances, special air treatment and ventilation are not required to prevent airborne transmission.

These precautionary measures reduce the risk of nosocomial transmission of pathogens that are entirely or partially transmitted by droplets larger than 5 μm in size (for example, H. influenzae and N. meningitides; M. pneumoniae, influenza viruses, epidemic mumps, and rubella). Other conditions include diphtheria, pertussis (whooping cough), pulmonary anthrax, and streptococcal pharyngitis (scarlet fever in infants and young children).

Droplet transmission can occur through particles containing infectious agents that remain contagious over time and at a distance. Fine aerosols are formed during breathing, singing, talking, coughing, or sneezing, and can also result from the evaporation of larger droplets in low humidity conditions. Some procedures, particularly those that induce coughing, can contribute to the airborne transmission of infection. These include diagnostic sputum induction, bronchoscopy of the airways, and endotracheal intubation.

Most aerosol particles generated during coughing can be detected in the air at a distance of approximately 1 meter. Within a few seconds, large particles (> 5 μm) rapidly fall to the ground due to gravity, but some larger droplets can dry out and become smaller in the air due to the loss of moisture contained in saliva. Direct transmission in this manner can be prevented by wearing face protection (surgical mask and/or face shield) within 2 meters of the patient or when entering the patient's room.

When preventing infections transmitted by droplets, there is no need for special ventilation, and the door to the room can be left open.

Table 25. Precautions for droplet transmission

Apply in addition to Standard Precautions for patients with identified or suspected infection with microorganisms transmitted by large droplets (greater than 5 μm).	
Patient Placement	
	• Single room; the door can be kept closed. • If there is no separate room, place the patient in the same room as a patient with the same active infectious disease but without any other infection (cohorting). • If neither option is possible, ensure a distance of at least 1 meter (about 3 feet) between patients.
Respiratory Protection	
	• Wear a mask if you are within 1 meter about 3 feet of the patient.

Patient Transportation	
	• Limit patient transport to essential purposes only. • During transport, the patient should wear a surgical mask. • Notify the receiving department in advance.

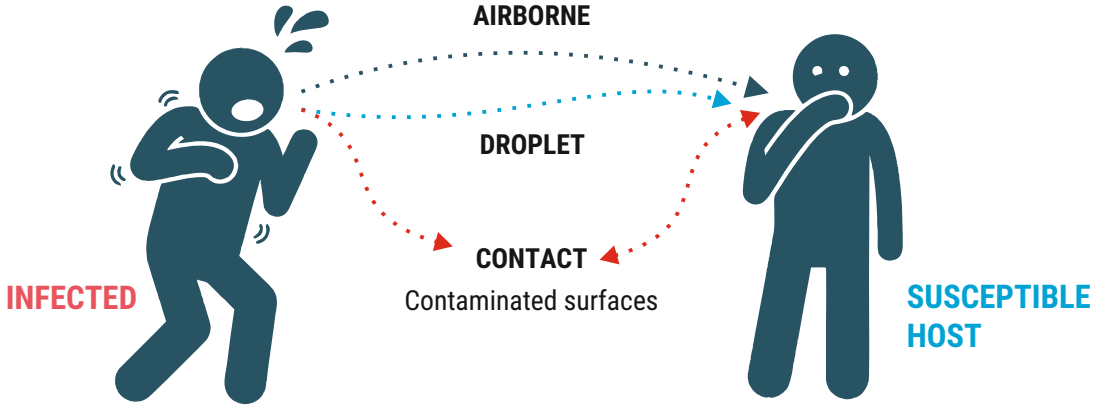


Figure 30. Spread of infection

5.12.3 Measures for the prevention of airborne-transmitted infections

Precautions for droplet infections are simpler than airborne infections because the particles remain in the air for a short period and spread only within a distance of about one and a half meters, so close contact with the source is required for the susceptible recipient to become infected (Table 25).

Small particles (≤ 5 micrometers in size) carrying microbes can remain in the air. They can be transmitted through the air current at a distance of more than 2 meters from the source. Examples include: chickenpox, measles, and pulmonary tuberculosis.

These precautions aim to reduce intrahospital transmission of particles sized 5 μm or smaller, which can remain in the air for several hours and spread widely. Microorganisms that are fully or partially transmitted by airborne means include tuberculosis (TB) mycobacteria, the chickenpox virus, and the rubella virus. Precautionary measures to prevent airborne transmission of infection are recommended for patients in whom the causative agents of these infections have been identified or are suspected. For example, precautionary measures to prevent airborne transmission should be applied to an individual with HIV WHOhas symptoms such as cough, night sweats, or fever, along with clinical or radiological findings in the lungs, until tuberculosis is ruled out.

Adhering to the WHO's «5 Moments for Hand Hygiene», recommendations, especially before and after patient contact and after removing personal protective equipment (PPE), is mandatory.

Table 25. Precautionary measures for airborne transmission

Use in addition to standard precautions for patients infected or suspected of being infected with small droplets (less than 5 μm).	
	**STRICTLY OBSERVE THE FOLLOWING PRECAUTIONS!** Use alcohol-based hand sanitizer or wash your hands before entering the patient's room.
	• Separate room; the door is always closed. • If there is no separate room, the patient is placed in a room with a patient with the same active infectious disease but without any other infection (cohorting). • If both options are not possible, ensure a distance of at least 1.5 meters between patients.
Respiratory protection	
	• Wear a surgical (medical) mask if you are within 1 (1.5 meters of social distancing) meter of the patient • When performing procedures, use non-sterile gloves and a gown.
	• Disinfect equipment, when removing it. • Dispose of gloves, gown, and masks in a Class B container. • Wash your hands before leaving the room.
Patient transportation	
	• Limit patient transportation to essential purposes only. • The patient should wear a surgical (medical) mask during transportation. • Notify the receiving department.

All patients with respiratory diseases should be in a separate room or at a distance of at least 1.5 meters from other patients while awaiting admission to the room.

Medical staff should adhere to the above-mentioned infection prevention measures, i.e., wear a surgical or procedural mask for close contact in addition to standard precautions when examining a patient with symptoms of respiratory infection, especially fever. These measures should be followed until it is determined that the causative agent requiring airborne and droplet precautions is not the cause of the symptoms.

Additional precautions for patients with tuberculosis

- Inform patients placed in the tuberculosis isolation unit about the mechanism of tuberculosis transmission and the reasons for their stay in isolation.
- Teach patients to cover their mouth and nose with a tissue when coughing and sneezing, even when isolated, to trap moisture droplets before they enter the air.

- Assist the patient in adhering to isolation measures (e.g., staying in an isolation room with the door closed).
- Antimicrobial ultraviolet lamps, located on the ceiling, can be used in addition to central ventilation in the isolation room. These lamps should be wiped clean of dust daily to maintain their effectiveness.
- Precautions can be discontinued when there is no suspicion of TB or when the patient is on effective treatment, when the patient's condition is clinically improving, and when three consecutive sputum samples collected on different days do not contain TB bacilli.

Additional precautions for patients with COVID-19

Epidemic control measures for the new coronavirus infection are implemented concerning the source of infection (the patient and asymptomatic carrier), transmission of the pathogen, as well as the susceptible population (protecting individuals WHOhave been in contact with or are currently in contact with an infected person).

The measures aimed at preventing and limiting the spread of infection include:

- Patient triage, early diagnosis, and source control.
- Standard precautions (hand hygiene, risk assessment, personal protective equipment, respiratory hygiene, needlestick injury prevention, environmental cleaning, bed linen, waste disposal, patient care equipment).
- Additional practical precautions (precautions for contact, airborne, and when necessary, airborne-droplet transmission) among individuals WHOmay be infected with COVID-19.
- Administrative control; training of medical staff, procedures, policies, etc.
- Environmental control and engineering control; room ventilation, cleaning.

Measures for the prevention and control of Legionella include

- Temperature control to combat Legionella colonization in the building's water supply system.
- The design of the water supply system, operation and maintenance plan, and its implementation.
- Assessment and control of Legionnaires' disease risk.
- Regular inspection/cleaning of showers, faucets, monitoring of humidifiers, and other water sources in the facility.
- Development and implementation of a Legionella monitoring plan/procedure.

5.12.4 Precautions against transmissible infections

Transmissible diseases pose a serious threat to public health worldwide. They are caused by parasites, viruses, and bacteria transmitted to humans by mosquitoes, triatomine bugs, flies, gnats, ticks, tsetse flies, microscopic mites, and lice. Major global transmissible diseases in humans include malaria, dengue fever, lymphatic filariasis, chikungunya, onchocerciasis, Chagas disease, leishmaniasis, Zika virus disease, yellow fever, and Japanese encephalitis. Other transmissible diseases have localized significance and are prevalent in specific regions or population groups.

It is necessary to conduct surveillance for transmissible diseases, implement preventive measures, and adhere to general precautions in the fight against mosquitoes, insects, and rodents.

It is necessary to conduct regular educational and awareness-raising activities and take measures for individual and collective protection against mosquitoes, ticks, bugs, flies, and other disease vectors in all institutions providing medical and cosmetic services.

CHAPTER VI. PREVENTION OF INFECTIONS IN SPECIAL UNITS AND SITUATIONS

6.1 PREVENTION OF INFECTIONS IN SURGICAL DEPARTMENTS

INFECTIONS IN THE FIELD OF SURGICAL INTERVENTION: HARSH FACTS

- Surgical Site Infections (SSI), including Health care-associated infection (HAI), threaten the lives of hundreds of millions of patients every year.
- They contribute to the spread of antibiotic resistance (AMR).
- The incidence rate of Health care-associated infection (HAI) ranges from 0.6 to 9.5 per 100 surgical procedures and remains the second most frequent type of infections causing increased antibiotic susceptibility in Europe and the USA.
- In low-income countries, infection is the most common complication in surgery, and Health care-associated infection (HAI) are the most frequent source of Healthcare-Associated Infections with an average of 5.9 per 100 surgical procedures and 11.2 per 100 surgical patients (WHO. Updated systematic review - unpublished data, 2017).

Process

Preventing cases of incorrect site selection for surgery, incorrect procedures, and the wrong patient requires the consistent and effective implementation of the following three complementary components.

1. Pre-surgical verification

Objective: Reduce the risk of incorrect patient and procedure identification by ensuring that all relevant documents and diagnostic tests are available before the procedure starts; that they are correctly identified, marked, and matched with patient identifiers; that they are reviewed and align with the patient's expectations and the team's understanding of the intended patient, procedure, site, and, if applicable, any implants. Missing information or discrepancies must be resolved before the start of the procedure.

Process: A continuous process of gathering and verifying information, starting from the decision to perform the surgery, continuing in all conditions and activities related to pre-surgical patient preparation, up to the "last timeout" just before the procedure begins.

2. Marking the Surgical Site

Objective: Unambiguously identify the intended incision or insertion site.

Process: During procedures involving the disruption of integrity or the presence of multiple structures, areas, or stages, the intended site should be marked in a way that it remains visible after the patient is examined.

3. "Final time check" right before the procedure

Goal: Perform a final check to ensure the accuracy of patient selection, procedure, location, and, if necessary, the patient's position, implants, and required special equipment.

Process: Active communication among all members of the surgical team, sequentially initiated by the designated team member, conducted in a "fault-tolerant" mode, meaning the procedure does not commence until all questions or issues have been resolved.

Detailed characteristics of the components of the pre-surgical preparation process

The consecutive execution of the three main components of this protocol (pre-surgical verification, site marking, "waiting time") requires adherence to the following specifications.

The process of pre-surgicalpre-surgical verification.

Verification of the correctness of patient selection, the surgical procedure, and the surgical site:

- At the time of surgical planning.
- During pre-admission testing and assessment.
- During admission or upon entry into the institution.
- At any time when the responsibility for patient care is transferred to another healthcare provider, as an official part of the handover process.
- If possible, with the involvement of the patient, while they are awake and conscious.
- Before the patient leaves the pre-surgical area or enters the operating room.

The pre-surgical verification checklist is used to ensure the presence and verification of the following documents before the procedure begins:

- Relevant documentation (such as medical history, physical examination, consent, pre-anesthesia assessment).
- Results of diagnostic tests, including biopsy reports.
- Relevant images, correctly labeled and presented.
- Specific type and size of required implants and detailed requirements for special equipment.

Pre-surgical preparation is a complex process that involves multiple professional disciplines in various healthcare settings, starting from primary diagnosis and extending to the commencement of surgical intervention. Considering this context, the effective and efficient implementation of the pre-surgical process to ensure the correct site, procedure, and surgeon will require the integration of its stages into existing patient assessment, diagnostic, pre-surgical preparation, and patient flow processes, rather than just adding new tasks. Therefore, it is important to identify other aspects of patient care that this aspect of pre-surgical preparation should interact with, including the following.

Pre-admission assessment (in the physician's office or clinic):

- Informed consent process.
- Diagnostic investigations (laboratory, imaging, biopsy, etc.).
- Surgical procedure planning.

- Pre-anesthesia patient assessment and pre-surgical care.
- Patient admission into the surgical facility.
- Surgical site preparation.
- Medications and instruments before anesthesia.
- Surgical room preparation.
- Documentation of care.
- Information transfer between physicians.

Surgical asepsis

The principle of surgical asepsis is to prevent SSI (Surgical Site Infection), which is used in all surgical procedures.

This is achieved by using sterile instruments, suture materials, dressings, and other materials, as well as by the surgical team wearing sterile gowns and gloves, and performing the surgery in a adequately ventilated operating room to reduce the microbial bioburden of microorganisms generated in the operating suite.

Non-sterile individuals should only touch non-sterile items. All sterile packages should be opened using a no-touch technique to prevent contamination of sterile instruments.

Preparation

1. Effective clinical practice involves allowing patients to take a bath or shower before surgery. For this purpose, either regular or antimicrobial soap can be used.
2. Patients undergoing cardiothoracic and orthopedic surgery with known nasal colonization of Staphylococcus aureus (S. aureus) should receive perioperative intranasal applications of 2% mupirocin ointment with or without chlorhexidine gluconate (CHG) combination. Consideration should also be given to the treatment of patients with known nasal colonization of S. Aureus undergoing other types of surgical procedures, using perioperative intranasal application of 2% mupirocin ointment with or without body washing with CHG.
3. For patients undergoing any surgical procedure, hair should not be removed, or if absolutely necessary, it should only be removed using scissors. Shaving is strongly discouraged at any time, whether before surgery or in the operating room.
4. Surgical antibiotic prophylaxis (SAP) should be administered before the surgical incision when indicated (depending on the type of surgery) within 30 - 120 minutes before the incision, taking into account the antibiotic's half-life.
5. Surgical hand preparation should be done by washing with either an appropriate antimicrobial soap and water or using an appropriate alcohol-based hand rub (ABHR) before donning sterile gloves.
6. Mechanical bowel preparation (MBP) (without the use of oral antibiotics) should not be used to reduce the incidence of surgical site infections (SSI) in adult patients undergoing elective colorectal surgery.
7. Pre-surgical oral antibiotics in combination with mechanical bowel preparation (MBP) should be used to reduce the risk of surgical site infections (SSI) in adult patients undergoing elective colorectal surgery.

8. Consider the possibility of introducing oral or enteral nutritional formulas with increased nutrient content for the purpose of preventing surgical site infections (SSI) in patients with insufficient body mass WHOare undergoing major surgical procedures.
9. Do not discontinue immunosuppressive therapy before surgery with the aim of preventing surgical site infections (SSI).
10. Cleaning and preparation of the operating room for each surgical procedure; cleaning and sterilization/disinfection of surgical instruments and other equipment; ensuring and maintaining asepsis in the operating room.
11. Ventilation systems with laminar airflow should not be used to reduce the risk of surgical site infections (SSI) in patients undergoing total joint arthroplasty surgeries.
12. Either sterile, disposable non-woven, or sterile reusable fabric sheets, drapes, and surgical gowns can be used during surgical procedures for the prevention of surgical site infections (SSI). Do not use plastic adhesive incise drapes with or without antimicrobial properties to prevent surgical site infections (SSI).
13. Antiseptic solutions based on alcohol should be used for the preparation of the surgical site skin in patients undergoing surgical procedures.
14. Antimicrobial-impregnated dressings should not be used after preparing the surgical site skin to reduce the incidence of surgical site infections (SSI).
15. Adult patients undergoing general anesthesia with tracheal intubation for surgical procedures should receive 80% FiO2 intraoperatively and, if possible, in the immediate postoperative period for 2-6 hours to reduce the risk of surgical site infections (SSI).
16. Consider the use of warming devices in the operating room (OR) and during surgical procedures to maintain the patient's body temperature and reduce the risk of surgical site infections (SSI).
17. Consider the use of protocols for careful blood glucose control during the perioperative period for diabetic and non-diabetic adult patients undergoing surgical procedures to reduce the risk of surgical site infections (SSI).
18. Strictly monitor and administer intraoperative fluid therapy according to the indications to reduce the risk of surgical site infections (SSI).
19. If necessary, use irrigation of the surgical wound with a water-based povidone-iodine (PVP-I) solution before wound closure to prevent surgical site infections (SSI), especially in clean and clean-contaminated wounds. Antibiotic irrigation of the surgical wound before closure should not be used to prevent surgical site infections (SSI).
20. Use aseptic dressings for infected wounds to reduce the frequency of surgical site infections (SSI).
21. Consider the use of negative pressure wound therapy in adult patients with predominantly closed surgical incisions in high-risk wounds to prevent surgical site infections (SSI), taking into account available resources.
22. Consider the possibility of using triclosan-coated suture material to reduce the risk of surgical site infections (SSI) regardless of the type of surgical procedure.
23. Do not extend surgical antibiotic therapy as prophylaxis after the surgery.

24. Perioperative antibiotic prophylaxis should not be continued in the presence of a drain for the purpose of preventing surgical site infections (SSI). Drains should be removed promptly when there are clinical indications for their removal.
25. Do not use dressings of any type with enhanced capabilities over a standard dressing on primarily closed surgical wounds to prevent surgical site infections (SSI).

SURGICAL HAND PREPARATION



Figure 32. Surgical hand preparation

The antiseptic hand preparation before a surgical procedure reduces the number of microorganisms and inhibits the growth of microorganisms on the hands beneath the gloves. The soap containing chlorhexidine or povidone-iodine is the most commonly used product for surgical hand preparation. The antimicrobial effectiveness of alcohol-based preparations surpasses the effectiveness of all other currently available methods for surgical hand preparation.

Surgical hand preparation is carried out with the aim of removing/destroying transient microflora and reducing the number of resident microflora. Hand hygiene is performed by personnel involved in surgical procedures, childbirth, catheterization of major blood vessels, etc.

The WHOapproach to surgical hand preparation requires six basic hand steps, as for hand hygiene, but it involves additional steps for rubbing the forearms (Figure30). The time required for surgical hand antisepsis depends on the product used, although for most products, a recommended exposure time of 2 minutes or more is advised.

There are specific rules in the technique of surgical hand antisepsis, with an emphasis on thorough treatment of the nail bed, interdigital spaces, a strict sequence of processing stages with a specified time frame for each stage.

It is necessary to take into consideration the following characteristics for the sink in the pre-surgical room:

- The front part of the sink should be oval in shape.
- Sinks should be designed to reduce the risk of splashing.
- The sink should be made of ceramic or stainless steel material.
- Mechanism for opening and closing the tap using the elbow of the hand or a pedal.

In order to prevent hand injuries, medical workers WHOdirectly perform surgical procedures should not be involved in household tasks.

Other key aspects of surgical hand preparation include:

- Nails should be short, and attention should be paid to them when washing hands - most of the microbes on hands originate from under the nails.
- One should not wear artificial nails or apply nail polish.
- Before entering the operating room, all jewelry (rings, watches, bracelets) should be removed.
- Change into clean surgical attire and footwear.
- Put on a gown, mask, and goggles.
- The absence of micro-injuries (cuts, abrasions, micro-cracks, scratches, punctures).
- Hands should be washed up to the elbows with soap before entering the operating room.
- After entering the operating room, hands should be dried with a sterile disposable towel.
- Perform aseptic hand antisepsis before donning sterile gown and gloves.

After hand disinfection using any of the highly active antiseptic agents, it is mandatory to wear gloves when performing a surgical procedure. Disposable gloves sterilized with gamma rays or ethylene oxide in factory conditions are used. Sterile gloves should be put on after the complete evaporation of the antiseptic solution.

Surgical clothing

Surgical clothing includes gloves, gowns, caps, masks, eye protection, impermeable aprons, and closed footwear. It protects the patient from the risk of infection through the hair, skin, clothing, and respiratory secretions of the surgical team. Surgical clothing also protects the surgical team from the risk of contact with the patient's blood and tissues during the operation.

Surgical sheet and towels

Surgical sheet and towels are typically made from stitched fabric squares of various sizes. They are used *to cover* the surgical field around the incision, wrap instruments and other items for sterilization, cover tables in the operating room, and are also placed over patients to keep them warm during surgical procedures.

The use of surgical towels for surgical procedures

The use of sterile towels to create a working field around the incision limits the area of skin that needs to be treated and prepared with an antiseptic solution before applying the towels. They are typically made from stitched fabric squares of various sizes to cover the surgical field around the incision, wrap instruments and other items for sterilization, and cover tables in the operating room. They are also used to cover patients in order to keep them warm during surgical procedures.

The use of sterile towels for surgical procedures

This is necessary to create a working field around the incision and limit the area of exposed skin. The surgical field should be treated with an antiseptic solution before applying the towels. Although this area is often referred to as the «sterile field», it remains sterile for only a short period of time. Sterile surgical towels allow moisture to penetrate and can contribute to the spread of microorganisms from the skin, even after surgical preparation with an antiseptic solution, into the wound. Therefore, neither hands in sterile gloves nor sterile instruments and other objects should touch the towels once they have been placed on the surgical field. Since fabric towels cannot serve as an effective barrier, clean, dry towels can be used if sterile towels are not available.

***Remember**: Once a sterile towel touches the patient's skin, it ceases to be sterile.*

***Remember**: Do not lean on or touch areas covered by surgical drapes, as bacteria can easily penetrate through dry material due to the physical pressure caused by leaning on surgical drapes.*

***Remember**: Sterile drapes do not substitute for good aseptic technique.*

PRE-SURGICAL SKIN PREPARATION

While it's impossible to sterilize the skin completely, treating it with an antiseptic solution minimizes the number of microorganisms around the surgical wound that could infect the wound and cause an infection.

Do not shave hair in the surgical field. Shaving increases the risk of infections by 5-10 times, as tiny skin abrasions create ideal conditions for the growth and proliferation of microorganisms. If necessary, **trim** the hair close to the skin immediately before the surgery.

Ask the patient about any **allergic reactions** (e.g., to iodine) before selecting an antiseptic solution.

In case of visible contamination, thoroughly wash the skin or the external genital area with soap and clean water, and dry it before applying an antiseptic agent.

Choose one of the recommended antiseptic solutions below:

- Alcohol-based solutions: 3% iodine tincture or 0.5% chlorhexidine.

- Alcohols (70 - 90% ethyl, isopropyl).
- Solution of chlorhexidine gluconate (2-4%) (e.g., Hibitane, Hibiscrub, Hibiclens®).
- Chlorhexidine gluconate and cetrimide, various concentrations, at least 2% (e.g., Savlon).
- Iodophors (aqueous solution) (7.5-10%), various other concentrations (e.g., Betadine).
- Chloroxylenol (Para-chloro-meta-xylenol or PCMX) (0.5-3.75%) and various other concentrations (e.g., Dettol).

Thoroughly wipe the skin with a cotton or gauze swab soaked in antiseptic, keeping the swab dry and using a sterile forceps. Move from the center to the periphery of the surgical field by several centimeters. Circular motions from the center help prevent secondary contamination of the surgical field by local skin bacteria.

Before starting the procedure, wait for some time to allow the antiseptic to take effect effectively. When using iodophors, you should wait for two minutes or until the skin has dried before starting the procedure because the active ingredient (free iodine) is released slowly.

***Note**: Do not allow the antiseptic to run under the patient's body, as this can cause skin irritation.*

Aseptic non-contact technique («no-touch»)

It is important to always use the "no-touch" technique for transferring sharp objects (scalpels, needles, or sharp scissors) by establishing a safe or neutral zone within the surgical field:

- Sharp objects are defined as any items sharp enough to puncture a glove (scissors, needles, scalpels, blades, etc.).
- It is necessary to use a sterile kidney-shaped basin or another appropriate small container to create a safe or neutral zone.
- The container should be placed on a sterile field between the surgeon and the assistant.
- The assistant places tools one by one in the container as needed.
- The surgeon or physician takes instruments from the container and returns them to the container after use with audible feedback.

Algorithm of the aseptic non-contact dressing technique

1. Wash your hands well.
2. Prepare a clean disposable bag, pouch, or container for class B contaminated waste
3. Wash the table surfaces in accordance with sanitary standards.
4. Gather dressing equipment (sterile towels and balls, forceps, clamps, scissors, sterile tray, antiseptic, etc.) in one container or a large tray or on a table surface covered with a sterile drape and sheet. When gathering the necessary dressing equipment, if they are located in different places, it can lead to hand contamination, so it's important to keep everything in one place.
5. Open the bottle.
6. Sanitize your hands with an antiseptic.
7. Put on clean non-sterile gloves.
8. Place a disposable diaper or sheet on the couch, and lay the patient down.

9. Remove the dressing, open the wound, and dispose of the soiled dressing in the container for contaminated waste.
10. Remove the non-sterile gloves.
11. Sanitize your hands with an antiseptic.
12. Put on sterile gloves (if the wound is not clean and there is drainage from the wound)
13. Administer medication or treat the wound without touching it.
14. Dress the wound without touching it.
15. Take off and dispose gloves in a bag, pouch, or container for class B contaminated waste.
16. Prepare instruments and sharp objects for pre-sterilization cleaning.
17. Wash the table surfaces in accordance with sanitary standards.
18. Remove the gloves and place them in a container for class B contaminated waste.
19. Thoroughly wash your hands.

Instructions for handling mucous membranes

The use of alcohol or alcohol-containing solutions is prohibited. Alcohols can cause burning, dryness, and irritation of mucous membranes, which, in turn, promotes the growth of microorganisms.

You **should ask the patient** about **any allergic reactions** (e.g., to iodine) before choosing an antiseptic solution.

In case of visible contamination, you should thoroughly wash the mucous membrane with clean water and dry it before applying an antiseptic agent.

If iodophor is used, it is necessary to wait for 2 minutes before starting the procedure.

The infrastructure of the Operating Block (OB)

The Operating Block is a complex of specialized rooms in the surgical department designed for performing surgical procedures and facilitating the necessary activities for them. The primary requirement for its design is maximum isolation from other departments of the healthcare facility.

To ensure a clean and uncontaminated environment, the[23] Operating Block (OB) should be located away from patient care areas and patient traffic. For this reason, the Operating Block (OB) is typically situated at a higher level, preferably on the top floor.

The microclimate in operating rooms is maintained using special filters, air conditioning with negative pressure, supply and exhaust ventilation systems with vertical airflow, and a predominance of inflow over exhaust.

Components of the operating block (OB)

The Operating Block (OB) is a multifunctional space. In this zone, patients are received and prepared for surgery, the surgical team is prepared for the operation, and the surgical procedures themselves take place. In many hospitals in developing **countries that do not have a Central Sterile Service Department (CSSD), the Operating Block (OB)** may also include **zones**

[23] OB – Operating Block

for the cleaning, processing, and sterilization of equipment. Furthermore, there are areas for processing and storing cleaning equipment, as well as for the handling **and disposal of waste.**

The rooms in the OB are distributed into zones depending on the required level of sterility and cleanliness.

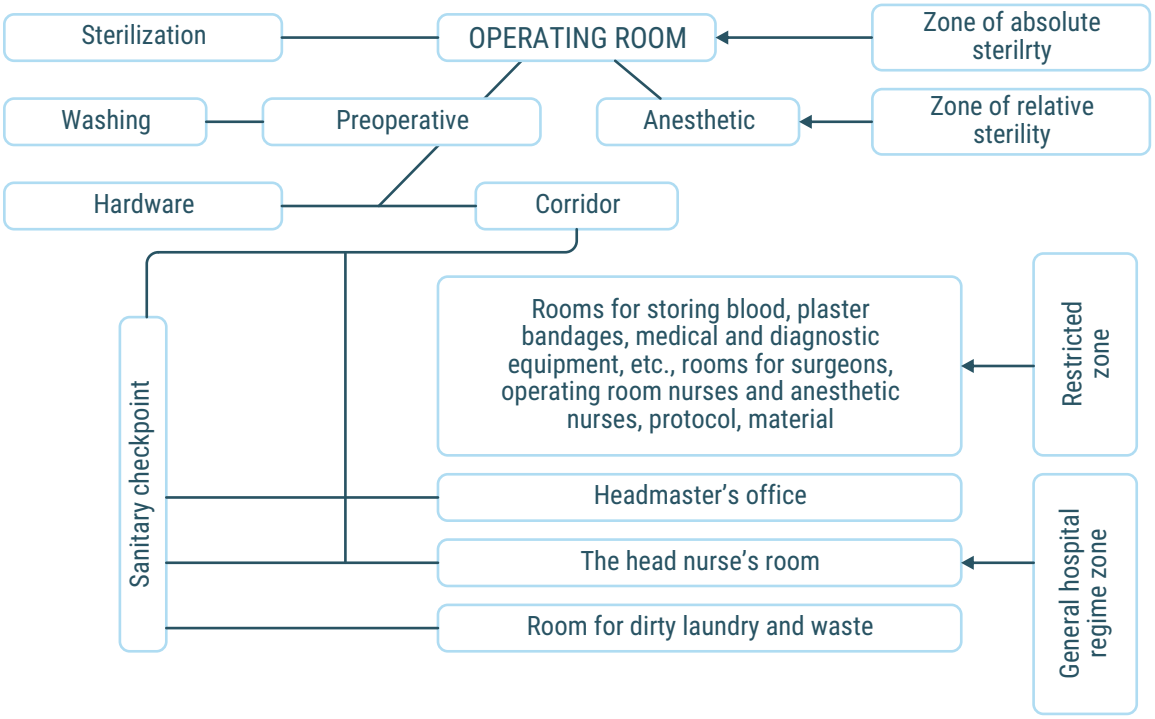


Figure 33. Rough plan of the OB

OB zoning concept

Features of different zones in order of their cleanliness

The first zone is sterile, and it includes the operating room and the instrument sterilization area (if there is no Central Sterile Service Department - CSSD). The operating team personnel can access this zone through a sanitary passageway and a pre-surgical area, while the patient enters from the pre-surgical preparation room. The boundary of the sterile zone is marked by a red line on the floor, and it can only be crossed by individuals wearing surgical attire, shoe covers, and masks.

The second zone is the restricted area. This zone includes the pre-surgical area, the washing area, and the anesthesia room, all of which are directly connected to the operating room.

The third zone is the restricted access area. This zone includes the blood storage room, equipment room, instrument and material room, medical staff area, express laboratory, the clean half of the sanitary passageway, and others.

The fourth zone is the general hospital area. This zone includes rooms whose entrance is not connected to passing through the previous zones (head of department's office, senior operating nurse's office, room for processing used laundry and storing cleaning equipment, etc.).

Surgical Antimicrobial Prophylaxis (SAP)

Surgical Antimicrobial Prophylaxis (SAP) should be administered before the surgical incision as indicated (depending on the type of surgery). This should be based on the hospital's policy regarding antibiotics.

The initial dose of the prophylactic antimicrobial agent should be administered intravenously, and the timing should be such that the bactericidal concentration of the drug is established in the serum and tissues at the time of the incision.

The administration of pre-surgical antibiotic prophylaxis (PSAP) should be within 30 to 120 minutes before the incision, taking into account the antibiotic's half-life. In the case of a cesarean section - see the section of “Obstetrical care”.

Clinicians should consider the half-life and protein binding as the most important pharmacokinetic parameters for any specific Surgical Antimicrobial Prophylaxis (SAP) agent to ensure adequate concentration in the serum and tissue during the incision and throughout the surgical procedure.

Surgical Antimicrobial Prophylaxis (SAP) should not be extended beyond the completion of the surgery, and it is not recommended for the prevention of surgical site infections (SSI) when wound drainage is present.

To reduce the length of hospital stay, patients are discharged before the incision fully heals.

The patient should be informed about how to care for the incision site, personal hygiene, the signs and symptoms of infection, and whom to contact in case of infection development.

Schedules and cleaning procedures for operating room (see the chapter on environmental cleaning)

At the beginning of each day, all surfaces (tables, chairs, etc.) should be wiped with a clean, damp, lint-free cloth to remove any dust that may have accumulated overnight.

The final cleaning after each surgical procedure **is not mandatory**.

The final or ultimate cleaning (floor mopping and wiping all surfaces from top to bottom) of the operating room should be conducted at the **end** of each day (every 24 hours).

***Remember**: do not wipe or sweep the operating room dry. This raises dust, dirt, and microorganisms into the air, contaminating clean surfaces.*

***Remember**: All areas of the surgical suite, sinks, hand-washing stations or support areas, corridors, and equipment must undergo a full cleaning, regardless of whether they were used during the 24-hour period of surgical procedures or not.*

***Note**: During the construction or reconstruction of operating rooms, it is essential to provide ventilation and air conditioning with negative pressure*

***Remember**: Since all patients are considered potentially susceptible to infection and carriers of infection, standard precautions are followed. Additional measures are not required, even if it is known that the patient is infected.*

6.2 RISK OF HAI IN THE ICU

In Intensive Care Units (ICUs), patients WHOare particularly vulnerable and at a significantly higher risk of Health care-associated infection (HAI) are accommodated. Since protection is compromised due to various invasive devices such as peripheral and central catheters, urinary catheters, and mechanical ventilators, they are particularly susceptible to infections associated with various medical devices.

Internal factors such as immunosuppression and concurrent illnesses exacerbate their vulnerability. Patients in the Intensive Care Unit (ICU) are also exposed to broad-spectrum antibiotics and are susceptible to multidrug-resistant microorganisms such as Acinetobacter spp. and Pseudomonas spp.

The risk factors for the development of Health care-associated infection (HAI) related to the patient, therapy, and the environment include:

- Age >70 years.
- Shock, severe trauma, acute kidney failure, and coma.
- Previous antibiotics.
- Mechanical ventilation.
- Permanent catheters.
- Patients with weakened immune systems, taking steroids, or undergoing chemotherapy.
- Prolonged stay in the Intensive Care Unit (> 3 days).

6.3 COMBINED APPROACH TO PREVENTING AND COMBATING HEALTH CARE-ASSOCIATED INFECTION (HAI)

Since device-associated infections represent a significant burden of Health care-associated infection (HAI), a comprehensive approach to treatment has been proven to achieve a high level of treatment compliance and better outcomes.

A combined package of services includes a set of evidence-based measures, the joint implementation of which has demonstrated a significant improvement in patient care. Collectively, they have a greater impact on the outcome than their isolated implementation individually. Adherence to such an approach ensures the consistency and reliability of patient care. The combined set of measures has demonstrated a significant impact on the prevention of HAIs (Healthcare-Associated Infections) in the provision of medical care, such as the prevention of central line-associated bloodstream infections (CLABSI), catheter-associated urinary tract infections (CAUTI), ventilator-associated pneumonia (VAP), and surgical site infections (SSI).

Combined sets of interventions and instructions should be simple, clear, and precise to make them easy to perform correctly. The measures included in the package should also be adapted to the local conditions of patient care.

6.3.1. Ventilator-associated pneumonia (VAP)

Pneumonia is the second most common Healthcare-Associated Infection (HAI) recorded worldwide and is associated with significant morbidity and mortality. Most patients with Healthcare-Associated Pneumonia (HAP) are elderly individuals with severe underlying medical conditions, immunosuppressive states, sensory and cardiovascular-pulmonary diseases, as

well as those WHOhave undergone thoracoabdominal surgeries. Most bacterial pneumonias associated with healthcare occur as a result of the aspiration of bacteria colonizing the patient's oropharynx or upper gastrointestinal tract. Intubation and mechanical ventilation significantly increase the risk of bacterial pneumonia because they alter the patient's first-line defense. Pneumonia that occurs in a patient on mechanical ventilation, caused by infectious factors, is referred to as Ventilator-Associated Pneumonia (VAP).

Prevention of VAP

Preventive measures for VAP include reducing patient aspiration, preventing cross-contamination or colonization through healthcare worker's hands, proper use and appropriate disinfection or sterilization of respiratory therapy devices, and staff training.

VAP prevention strategies

Technical maintenance of the respiratory therapy equipment in use

- Liquids sprayed through a nebulizer or used in a humidifier should be sterile and distributed under aseptic conditions.
- Liquid reservoirs should be filled immediately before use. Refilling partially filled reservoirs is not allowed. The remaining liquid should be drained, and the reservoir should be filled with fresh liquid.
- Water condensed in the tubing should be drained, and it should not be allowed to flow back into the reservoir.
- Disposable supplies such as nasal cannulas, tubing, masks, ventilators, and breathing circuits are intended for single-patient use only.
- When respiratory therapy equipment, including mechanical ventilators, is used for the treatment of multiple patients, the breathing circuit should be changed between patients.
- Ventilation circuits should be maintained in working condition.

Processing reusable equipment

- All equipment subject to sterilization or disinfection should first be thoroughly cleaned of organic materials such as blood, secretions, or other residues/dirt.
- Respiratory therapy equipment that comes into contact with mucous membranes or is a reusable part of the breathing circuit should undergo high-level disinfection or sterilization.
- Coolant chambers for ultrasonic nebulizers are difficult to disinfect properly, and they should undergo high-level disinfection or gas sterilization (ethylene oxide). There is no need for this if a disposable chamber is used.
- Manual resuscitation bags that have been used for a patient should undergo high-level disinfection or sterilization (except for single-use ones).

Suctioning mucus from the airways

- Frequent suctioning can lead to excessive trauma and the risk of cross-contamination.
- Suctioning should be performed only when necessary to reduce excessive secretions.
- Suctioning should be performed while wearing gloves on both hands, protective goggles, and a mask.

- A sterile catheter should be used for each suctioning session (defined as a single suctioning event, with suctioning performed only with short breaks and catheter rinsing).
- Connecting tubes for suctioning and patient suction canisters should be changed daily. Except for single-use cases, suction canisters should be thoroughly cleaned of organic materials and then subjected to high-level disinfection or sterilization.

Combined bundle of services for the prevention of Ventilator-Associated Pneumonia (VAP)

- Lifting the head of the bed from 30 to 45 degrees.
- Prevention of peptic ulcer disease.
- Prevention of Deep Vein Thrombosis (DVT) if there are no contraindications.
- Daily oral care with chlorhexidine.

6.3.2. Catheter-associated bloodstream infection

Intravascular catheters are an integral part of modern healthcare, but their use exposes patients to the risk of local and systemic infections, including local infection, bloodstream infection (BSI), septic thrombophlebitis, endocarditis, and other metastatic infections.

Central bloodstream infection can be caused by skin microorganisms that contaminate the catheter during insertion or migrate along the catheter, or by microorganisms from the hands of healthcare workers during procedures. The most commonly implicated microorganisms are coagulase-negative staphylococci, especially *Staphylococcus epidermidis*. Other microorganisms include *Staphylococcus aureus, Candida species*., enterococci and gram-negative microorganisms. It is crucial to use advanced evidence-based methods for the prevention of catheter-related infections or associated bloodstream infections (BSIs).

Possible ways of contamination of catheters

There are four commonly recognized ways of catheter contamination:

- Migration of skin microorganisms at the site of insertion of a skin catheter into the tract and along the catheter's surface with colonization of the catheter tip (the most common route of catheter infection for short-term insertion).
- Direct contamination of the catheter or catheter hub through contact with hands or contaminated fluids or devices.
- Infection spreading through the bloodstream from another source of infection.
- Contaminated infusion solution.

Catheter Type Selection

Central venous catheters can be single-lumen or multi-lumen and are made from various materials, sometimes with medical coatings, such as antimicrobial, antiseptic, or heparin coatings.

- Catheters made of polytetrafluoroethylene or polyurethane are associated with fewer infectious complications compared to catheters made of polyvinyl chloride or polyethylene. However, there is no compelling evidence that the frequency of catheter-related bloodstream infections (CRBSI) differs significantly for different materials.
- Usually, polyurethane is considered suitable for short-term use, while silicone is often chosen for long-term use.

Prevention of catheter-associated infections

Training of healthcare workers:

- Training healthcare workers on the indications for the use of intravascular catheters, proper procedures for insertion and care of intravascular catheters, as well as appropriate infection control measures to prevent catheter-related infections.
- Periodic assessment of knowledge and adherence to recommendations for all personnel involved in the placement and maintenance of intravascular catheters.
- Assigning only trained personnel WHOdemonstrate competence in the placement and maintenance of peripheral and central intravascular catheters.
- Ensuring the appropriate level of knowledge and skills for nursing staff in intensive care units.
- Selecting the optimal insertion site: peripheral catheters and central catheters.
- Using the upper extremity instead of the lower extremity for catheter insertion.
- Urgent replacement of a catheter inserted in the lower extremity with a catheter inserted in the upper extremity.
- In children, catheters can be inserted in the upper or lower extremities or the veins of the head (in newborns or young children) as the insertion site.

Aseptic technique during catheter placement (CVC/umbilical)

- Aseptic technique during CVC placement significantly reduces the risk of infection.
- It is necessary to practice strict adherence to hand hygiene and aseptic technique.
- It is necessary to use maximum precautions regarding the sterile barrier, regardless of whether it occurs in the operating theater or in the ward. His should include the use of a sterile gown, gloves, cap, mask, and a sterile drape for the entire body during the insertion of a CVC or peripheral venous catheter.
- A sterile sleeve should be used to protect pulmonary catheters during insertion.

Skin preparation

- Before the insertion of a peripheral venous catheter, clean skin should be treated with an antiseptic agent (70% alcohol, iodine tincture, iodophor, or chlorhexidine gluconate).
- The clean skin should be treated with a 0.5% chlorhexidine alcohol solution before inserting a central venous catheter or a peripheral arterial catheter and during dressing changes. If there is a contraindication to chlorhexidine, iodine tincture, iodophor, or 70% alcohol can be used.
- Antiseptics should be allowed to dry.

Prophylaxis with antibiotics

- Antimicrobial agents should not be routinely administered before or during the use of a central venous catheter to prevent catheter colonization or CRBSI (catheter-related bloodstream infection).

6.3.3. Phlebotomy (blood collection)

Blood collection is one of the procedures with the highest risk of injury and accidental blood contact. When collecting a blood sample, it is necessary to observe the following rules:

- Gather the equipment and assemble the needle and syringe or vacuum tube system depending on what will be used.
- Wash your hands with soap under running water and dry them with a disposable towel or use hand sanitizer.
- Explain and clarify the procedure to the patient or caregiver as needed.
- Select a site for blood collection, preferably in the antecubital fossa. Hanging the arms down or warming the area can facilitate the search for a vein. Palpate the area to locate anatomical landmarks, but do not touch it after applying an antiseptic solution.
- Apply a tourniquet four or five fingers above the chosen site for venipuncture.
- Ask the patient to make a fist to make the veins more prominent.
- Put on appropriate clean examination gloves.
- Disinfect the area with a 70% alcohol solution and allow it to completely dry. Use a spiral movement from inside to outside to avoid re-contamination of the injection sites.
- Secure the vein by holding the patient's hand and placing the thumb below the venipuncture site.
- Quickly insert the needle into the vein at a 30-degree angle.
- When enough blood has been collected, remove the tourniquet before removing the needle.
- Remove the needle and apply a sterile swab to the site with gentle pressure.
- Discard the used syringe and needle or other blood collection device in the safety box. Place items that may drip blood or biological fluids into a Class B hazardous waste container.
- Label the blood sample. Check the label and form for accuracy.
- Remove gloves and dispose of them in a Class B container.
- Practice hand hygiene. If using soap and water, dry your hands with a disposable towel.

6.3.4. Catheter-Associated Urinary Tract Infection (CAUTI)

Catheter-associated urinary tract infection (CAUTI) is typically defined as a urinary tract infection (UTI) (significant bacteriuria plus symptoms and/or signs related to the urinary tract, in the absence of another identifiable source) in a patient with an indwelling urinary catheter or WHOhas been catheterized within the last 48 hours.

In the recommendations of the Infectious Diseases Society of America (IDSA), CAUTI is defined as 'in patients with either an indwelling urethral or suprapubic catheter, the presence of symptoms and/or signs compatible with UTI, without another identified source of infection, and a urine culture with a count of ≥10,^{3} colony-forming units (CFU) per milliliter (ml) of a single uropathogen in a catheter urine specimen or ≥10,131 CFU/ml of a single uropathogen in a midstream specimen of urine in a patient whose urethral or suprapubic catheter was removed within the prior 48 hours.

Strategies for Preventing CAUTI:

- Urinary catheters should only be inserted when necessary and left in place for as long as necessary. They should not be used solely for the convenience of medical personnel.
- Avoid using urinary catheters for the treatment of urinary incontinence.
- Use urinary catheters in operated patients only when necessary, not on a routine basis.
- In operated patients for whom a permanent catheter is indicated, remove the catheter as soon as possible after the operation, preferably within 24 hours, if there are no specific indications for further use.

Table 26. Risk factors for symptomatic urinary tract infection (UTI) and asymptomatic bacteriuria

Symptomatic UTI	Bacteriuria
• Long-term catheterization • Female • Old age • Immune system disorder	• Disconnection of the drainage system • Low professional qualifications • Placement of the catheter outside the surgical field • Continence • Diabetes • Local infection • Renal dysfunction • Orthopedic / neurological services

Catheter insertion

- Read SOP before the insertion of catheters.
- Thoroughly wash your hands, use Personal Protective Equipment (PPE) before catheter insertion.
- Catheters should be inserted following aseptic rules and using sterile gloves and equipment.
- For insertion, sterile gloves, wipes, sponges, an appropriate antiseptic solution for periurethral cleansing, and a disposable packet with lubricating gel should be used.

The medical worker inserting the catheter should use sterile personal protective equipment. Permanent catheters should be securely anchored after insertion to prevent movement and tension in the urethra.

Maintenance of a urinary catheter

- Maintain a closed drainage system.
- In case of aseptic technique breach, disconnection, or leakage, the catheter and collection system must be replaced using aseptic technique.
- Ensure that the catheter and collection tube are not bent or kinked.
- The collection bag should always be positioned below the level of the bladder.

- The collection bag should be regularly emptied using a separate clean container for each patient.
- Never place the drainage bag in a location that can soil it, such as on the floor.
- Permanent catheters or drainage bags should not be changed at routine/fixed intervals.
- If there are no clinical conditions (for example, in patients with bacteriuria after catheter removal following urological surgery), systemic antimicrobial agents should not be prescribed for the prevention of CAUTI (Catheter-Associated Urinary Tract Infection).
- To prevent irritation, treat the periurethral area with antiseptic agents that do not contain alcohol.
- Routine hygiene is appropriate (for example, cleaning the area's surface during daily bathing or showering).
- Irrigation should be avoided unless obstruction is expected (for example, as it may occur in bleeding after prostate or bladder surgery); closed continuous irrigation may be used to prevent obstruction.
- If the catheter is blocked, it should be replaced if there is a likelihood that the catheter contributes to obstruction (e.g., formation of stones).

6.4 PREVENTION OF INFECTIONS IN THE MATERNITY WARD AND NEONATOLOGY DEPARTMENT

The main task of the staff in obstetric institutions when managing normal childbirth is to ensure the safety of the woman and the child with minimal medical interventions in the physiological process of childbirth.

Neonatal sepsis and postpartum endometritis are primarily caused by microorganisms present in the vaginal flora of mothers. The risk of these infections can be significantly reduced through simple infection control measures in obstetrics.

For a long time, it was believed that infection control for women and newborns could be ensured by creating «closed» maternity homes with restricted access for visitors. However, it has been found that such a system not only does not prevent hospital-acquired infections but also contributes to the development of hospital strains of pathogens, increases the level of patient stress, and reduces the quality of medical care.

The common clinical manifestations of HAIs in women after childbirth and in newborns, their causative agents, and medical risk factors are presented in Table 27.

Table 27. Clinical forms of ISMP in the postpartum period in mothers and newborns

Clinical signs	Medical risk factors	Most common pathogens
Sepsis in women and in newborns	Catheterization of blood vessels Vessels	*Escherichia coli, Klebsiella spp., Staphylococcus aureus, Campylobacter fetus*
Pneumonia in women and newborns	Endotracheal intubation	*Staphylococcus aureus, Acinetobacter species, Klebsiella spp.*
Surgical wound infection in women	Episiotomy, cesarean section, prolonged hospitalization, absence of antibiotic prophylaxis during cesarean section surgery	*Staphylococcus spp., Streptococcus spp., Pseudomonas aeruginosa*
Skin and soft tissue infections in women and newborns	Mastitis in women - incorrect breastfeeding the newborn. In newborns - trauma when performing medical procedures, disturbances in the management of the umbilical residue	*Staphylococcus aureus*

Maternal «postpartum infection» includes:

- Intranatal (intra-amniotic infection that occurred before birth) and
- Postpartum bacterial infections related to childbirth

Clinical manifestations of maternal infections include:

Endometritis: an infection of the endometrium (the uterine lining) and can spread to the myometrium (the smooth muscle layer of the uterus). It manifests as fever, pain in the **abdomen**, uterine tenderness, foul-smelling vaginal discharge, and signs of peritonitis in women WHOhave undergone a cesarean section. Cesarean section is the most important factor contributing to postpartum endometritis.

SSI: Surgical Site Infection after Cesarean Section. It can be superficial or deep. Postpartum SSI (Surgical Site Infection), wound infection, and endometritis are the main reasons for prolonged hospitalization and place a heavy burden on the healthcare system.

Sepsis pelvic thrombophlebitis: thrombosis of deep pelvic veins due to inflammation and clot formation. This can occur after prolonged labor, premature rupture of the fetal membranes, and difficult childbirth.

Infected episiotomy/perineotomy: this is an infection in the surgical incision made in the perineum to facilitate childbirth.

Healthcare-associated urinary tract infections (HAUTIs): typically occur after a cesarean section.

Intraamniotic infection syndrome, also known as amnionitis or chorioamnionitis. It is an acute infection of the uterus and its contents (fetus, placenta, and amniotic fluid) during pregnancy. This occurs after prolonged rupture of the fetal membranes and due to microorganisms present in the cervix and vagina. It rarely occurs (<5%) in term deliveries but increases to 25% in preterm deliveries (less than 37 weeks of pregnancy).

Prevention of maternal and neonatal infections during childbirth through natural birth pathways - vaginal delivery

Vaginal childbirth does not require sterile conditions, but cleanliness is of paramount importance. Special attention should be paid to the cleanliness of hands, the clean perineal area, and the umbilicus. Clean to clean, sterile to sterile.

Factors that increase the risk of infection during vaginal childbirth

- Prolonged rupture of the fetal membranes (>24 hours) Pre-labor rupture of the fetal membranes.
- Birth canal injury.
- Placental retention requiring manual removal of the placenta or placental fragments.
- Episiotomy. Minor obstetric procedures.
- Obstructive labor, Protracted labor.
- C-Section.
- Use of forceps.
- Multiple vaginal examinations (especially by medical students and nurses).

Infection prevention

- The most important microorganisms causing neonatal sepsis are Group B Streptococcus (GBS) and Escherichia coli (E. coli).
- Neonatal sepsis due to GBS can be prevented by intravenous administration of antibiotics to the mother during labor. The decision to carry out such prophylaxis is based on the presence of risk factors for neonatal GBS sepsis or the colonization of GBS in the vagina.
- Cesarean section is the most important risk factor for maternal infection in the postpartum period and is associated with an increased risk of infection by 5-20 times compared to vaginal deliveries.
- A single dose of antibiotic prophylaxis reduces the risk of infections after a cesarean section (surgical site infection, endometritis, and urinary tract infection) in all patients, both in emergency and planned procedures.
- Outbreaks of classical puerperal fever caused by beta-hemolytic streptococcus group A, still occur, although they are irregular. They require immediate investigation of the source of infection, including the search for carriers among healthcare workers.

During childbirth, there is frequent and often uncontrollable contact with blood and other bodily fluids. The transmission frequency of bloodborne pathogens is high when preventive measures are neglected.

Digital vaginal examination with a four-hour interval is recommended for the routine assessment of the active first stage of labor in low-risk women.

For each examination, a pair of clean examination gloves should be used. Sterile gloves are not necessary.

The tip of the diagnostic finger should not penetrate the cervical os of the uterus unless a decision has been made to induce labor.

RECOMMENDED PRACTICE

- Standard infection control measures in obstetrics should be taken before, during, and after childbirth. During childbirth, it is advisable to constantly wear gloves and preferably to put on a gown, mask, and eye protection during all procedures.
- Patients at high risk should receive antibiotic prophylaxis during vaginal deliveries at 4-hour intervals (see below), to prevent GBS sepsis in newborns.
- In the case of a cesarean section, all patients should receive a single dose of antibiotic prophylaxis intravenously according to the Cesarean Section standard, preferably 30 - 60 minutes before the incision (depending on the medication, the substance concentration should be at its maximum at the time of skin incision).
- In resource-limited settings, cleaning the birth canal with a disinfectant during vaginal examinations and other (instrumental) procedures can be used to reduce the risk of both neonatal sepsis and maternal infections.
- Vaginal examinations should be minimized to limit the risk of infection.
- Tetanus prophylaxis should be administered in the case of out-of-hospital births and unsafe abortions.

Neonatal sepsis

- The most important pathogens causing neonatal sepsis are Group B Streptococcus (GBS) *and Escherichia coli (E. coli)*. The newborn becomes colonized with these microorganisms during passage through the birth canal.
- Prophylaxis against GBS infections can be achieved by intravenously administering high doses of antibiotics every 4 hours before delivery to women with GBS colonization and/or women with risk factors for neonatal GBS sepsis (delivery before <37 weeks of pregnancy, rupture of fetal membranes for more than > 18 hours, postpartum temperature > 100.4 F (38.0 C)).
- The feasibility and economic efficiency of screening for Group B Streptococcus colonization during pregnancy depend on the conditions.
- Women WHOhave previously had bacteriuria during pregnancy with Group B Streptococcus (GBS) and those WHOhave had a child with GBS sepsis should always be given GBS prophylaxis. High doses of intravenous penicillin or ampicillin are the first-choice medications. Patients with a penicillin allergy are administered clindamycin.

Postpartum endometritis

- Postpartum endometritis is a serious complication of childbirth. Infections are often polymicrobial, caused by the mother's endogenous flora, and outbreaks are rare.
- The frequency of endometritis is significantly higher after a cesarean section than after vaginal deliveries.

- When it comes to the prevention of any surgical infection, the general principles for preventing endometritis include proper surgical technique, skin antiseptics, and timely antimicrobial prophylaxis.
- Although emergency cesarean sections are associated with a higher level of infection compared to elective procedures, antibiotic prophylaxis is effective for both high-risk patients (delivering after rupture of fetal membranes) and low-risk patients (intact fetal membranes, not in labor). Prophylaxis with single doses (such as cefazolin) should be administered after operative vaginal deliveries, manual removal of the placenta, uterine curettage, or in cases of third-degree tears.
- Despite adequate antimicrobial prophylaxis, the incidence of endometritis after cesarean section remains high (10-20%), and further prevention largely depends on mitigating risk factors, such as reducing the number of vaginal examinations during labor.
- Manual removal of the placenta is associated with a higher frequency of endometritis compared to spontaneous placental delivery, which is preferred whenever possible.

Pathogenic microorganisms transmitted through blood during childbirth

- Pathogenic microorganisms transmitted through blood pose a threat to both the mother, the child, and healthcare workers during childbirth.
- Scalpel electrodes are contraindicated if the mother is infected with hepatitis B, C, or HIV.
- For mothers with hepatitis B, the newborn should be immunized after birth.
- For mothers infected with HIV, antiretroviral therapy during pregnancy and for the newborn can reduce the risk of vertical transmission.
- During childbirth, there is often exposure to blood. Gloves are often punctured or torn during childbirth. Needlestick injuries and splashes often occur. Therefore, it is advisable to always wear gloves. During cesarean sections, two pairs of gloves should be worn, and during prolonged surgeries, lasting more than 40-50 minutes, in cases of bleeding, or peritonitis, it is mandatory to change gloves. Additionally, it is advisable to wear gowns, masks, and eye protection.

Herpes simplex virus (HSV)

Mothers with active genital HSV infections should be handled with the observance of barrier precautions. Medical personnel and the mother should wear gloves when handling an infected area or materials (such as gauze, etc.).

SUMMARY

The importance of infection control in obstetrics was established when Ignaz Semmelweis made his historic observations in the second half of the nineteenth century. Standard hygiene precautions for healthcare workers are the best way to prevent the spread of healthcare-associated pathogens. Furthermore, simple measures can significantly prevent infections caused by microorganisms from the mother's endogenous flora. Most infectious complications of childbirth are relatively rare nowadays, but in resource-limited countries, the burden of neonatal and maternal postpartum morbidity and mortality due to bacterial infections remains high.

Infection prevention before childbirth

- Use clean examination gloves, wash the perineal area (vulva, perineum, and anal area) with clean water and soap. The anal area should be cleaned last, and the washcloth used for perineal cleaning should be disposed of in a Class B container.
- Remove the gloves and dispose of them in a Class B container, then wash your hands.
- Hair in the genital/perineal area should not be shaved; if necessary, use clippers to trim the hair. Routine shaving is not recommended by the World Health Organization (WHO) as it increases the risk of infection after childbirth.
- When the amniotic fluid has been draining for 18 hours or more, it is necessary to initiate prophylactic administration of antibiotics (such as ampicillin) as per the standards of obstetric care.
- If the amniotic fluid has been discharged at a preterm gestational age, prophylactic antibiotic therapy (such as erythromycin) should also be initiated according to the standards of obstetric care.

Infection prevention during childbirth

- Hand hygiene (see SOP Surgical Site Infection) or washing hands with antiseptic soap and water thoroughly up to the elbows, following proper hand hygiene techniques.
- Use personal protective equipment (PPE) if there is a high risk of contact with blood and biological fluids or the risk of splashes from blood and blood-stained amniotic fluids.
- Gloves:
    - Sterile surgical gloves.
    - To ensure protection up to the elbows, regular-length gloves can be extended with sterile surgical sleeves up to the elbows, i.e., creating extended sleeves (these sleeves can be made by cutting the fingers off sterile gloves with sterile scissors). A sterile sleeve can be worn on each forearm before putting on a sterile surgical glove. Clean examination gloves are necessary for washing the perineal area.
- Sterile, moisture-proof gown, rubber/plastic apron.
- Mask with a protective face shield for the eyes.
- The instruments used during childbirth (scissors, umbilical cord clamp, needle holder, forceps, tissue forceps, urinary catheter, suture material, etc.) should be sterile.
- The healthcare worker receiving the baby should wash their hands, following hand hygiene requirements, and wear sterile gloves. The baby should be wrapped in a clean blanket or swaddle.
- If neonatal resuscitation is required, it should be performed using mechanical aspiration.
- If manual removal of the placenta is required, a new pair of sterile gloves, supplemented with sterile sleeves up to the elbow, should be worn to prevent contamination of the forearm with blood.
- If the amniotic fluid has been discharged prematurely during a preterm pregnancy, prophylactic antibiotic treatment (ampicillin) should be initiated as per obstetric standards at the onset of labor.

Infection prevention after childbirth

- Before removing gloves, the placenta should be placed in a clean container, and all blood-stained discharges should be placed in the appropriate Class B container with a lid.
- After use, suture needles should be placed in a Sharps Container (KBVU in Russian abbreviation) for safe disposal.

Prevention of infection during a cesarean section

A cesarean section should be performed with the observance of all standard precautions and asepsis. To prevent surgical complications, the World Health Organization (WHO) surgical safety checklist should be used.

Procedures for preventing infection in patients WHOhave undergone a cesarean section include:

- The abdomen should not be shaved before the surgery. If necessary, clippers can be used for hair trimming. Before a planned cesarean section, if possible, a woman should take a shower. In case of an emergency situation or the absence of conditions for taking a shower, the abdomen should be washed with soap and warm water.
- The surgeon and assistant should wear a face shield or mask and protective goggles, as well as a plastic or rubber apron over their working attire, as there is an expected risk of blood splatter and amniotic fluid mixed with blood.
- If there has been rupture of membranes for more than 18 hours, antibiotic prophylaxis should be initiated according to the standard for premature rupture of membranes. If a cesarean section is either emergency or planned, perioperative antibiotic prophylaxis should be administered according to the cesarean section standard (a single injection of a first-generation cephalosporin or penicillin) 15-60 minutes before the incision, not after clamping the umbilical cord.
- The healthcare worker receiving the newborn should wash their hands according to hand hygiene procedures and wear clean gloves before touching the baby.
- The baby should be placed on clean bed linen.
- Before manually removing the placenta, sterile surgical gloves should be changed/worn up to the elbow or a sterile sleeve with a regular sterile surgical glove can be used.

Postnatal care for the mother

- When working with perineal pads, vaginal discharges, or perineal sutures, clean gloves should be worn.
- It is necessary to ensure that the mother can urinate without any difficulties.
- The mother should be taught to cleanse the perineal area with boiled water and soap after changing the pad or defecation.
- If the mother is breastfeeding, she should be taught how to care for her breasts and nipples to prevent mastitis.
- If the delivery was done through a cesarean section, it's important to take precautions to avoid lung problems during the postoperative period.
- Patients should be encouraged to make frequent movements in bed and to walk.

- If a permanent urinary catheter is in place, precautions should be taken to prevent urinary tract infections. The catheter should be removed as soon as possible.

Postnatal care for a newborn

- When handling a newborn, clean gloves and a plastic/rubber apron should be worn until any blood, meconium, or amniotic fluid is removed from the baby's skin.
- The removal of blood and biological fluids from the newborn's skin should be done carefully using cotton balls/soft cotton, soaked in boiled warm water, followed by drying the skin to prevent infection.
- Hand hygiene (handwashing or using an alcohol-based antiseptic solution).
- The newborn should be kept clean by washing them with a soft cloth or cotton balls soaked in warm water after each diaper change. Use fresh cotton balls and a separate container for each instance of washing. Perform hand hygiene before and after performing hygienic procedures and changing the baby's clothes.
- Administer prophylactic tetracycline eye ointment for gonorrhea to the newborn at the end of 1 hour after breastfeeding.

Umbilical cord care:

- Perform hand hygiene before and after caring for the umbilical cord.
- Keep the umbilical cord stump clean and dry.
- Do not cover the umbilical cord stump with a bandage or dressing.
- Teach the mother to inspect the umbilical cord stump for redness or the presence of pus/blood and to report it to the clinic as soon as possible if it occurs.

Instructions for cervical or vaginal cleansing

For **cervical** and **vaginal** cleansing before inserting a uterine elevator for procedures, choose an aqueous antiseptic solution such as povidone-iodine (iodophor) or 2-4% chlorhexidine gluconate (e.g., Hibiclens or Savlon, provided they are prepared correctly). **Do not use alcohols or alcohol-containing solutions**, such as Dettol. Alcohols can cause burning, dryness, and irritation of mucous membranes, which, in turn, promotes the growth of microorganisms. In addition, hexachlorophene (pHisoHex®) is neurotoxic (Larson 1988) and should not be used on mucous membranes, such as the vaginal mucosa, because it is easily absorbed (Larson 1995).

Instructions

STEP 1: Ask the patient about any **allergies reactions** (e.g., to iodine) before selecting an antiseptic solution.

STEP 2: In case of visible contamination, thoroughly wash the external genital area with soap and clean water, and dry it before applying the antiseptic.

STEP 3: After inserting the speculum, apply a generous amount of antiseptic to the cervix and vagina (twice). If the external genitalia appear clean, there is no need to treat them.

Step 4: If iodine is being used, wait for (2 minutes) before starting the procedure.

6.5 PREVENTION OF INFECTIONS IN THE DIALYSIS UNIT

Infection is the most common cause of hospitalization and the second leading cause of death among patients undergoing hemodialysis (HD), following cardiovascular diseases. Patients undergoing hemodialysis (HD) are susceptible to various types of infections, including bloodstream infections and localized vascular access infections, bloodborne infections (such as HBV, HCV, and/or HIV), and airborne infections (for example, tuberculosis).

Outbreaks of viral hepatitis C (HCV) in dialysis centers, which occur frequently, have been linked to poor infection control practices. Sources of infections can include contaminated water, equipment, and surrounding surfaces in the treatment area, as well as patients with infections that pose a risk to other nearby patients.

Methods for maintaining infection control measures in a dialysis unit

Patients undergoing hemodialysis are at an increased risk of healthcare-associated infections. Therefore, an infection control program is of utmost importance in a hemodialysis unit. Responsibilities for conducting the Infection Control Program (PIIK) should be assigned to a physician or senior nurse working in the unit. The role of this liaison person includes:

- Monitoring the practice of adhering to infection control measures (IPC).
- Training new staff and providing regular training for the entire team.
- Conducting periodic risk assessments.
- Using a combination of infection prevention measures.

Measures to reduce the risk of infection for patients in the hemodialysis unit

In the context of hemodialysis, contact transmission plays a crucial role in the transmission of bloodborne pathogens. Transmission occurs through the hands of healthcare workers, directly or indirectly contaminated with infected blood from contaminated surfaces and equipment.

- Standard precautions should be consistently applied to all patients and include the use of gloves, disposable plastic aprons or gowns, masks (when necessary) to prevent healthcare workers from coming into contact with blood, bodily fluids, excretions, or contaminated items.
- Respiratory etiquette should be observed.
- A patient diagnosed with an airborne-transmitted disease should be immediately provided with a mask and isolated from other patients in a separate room, preferably with negative pressure.
- Patients and healthcare personnel should be vaccinated according to the recommendations of the national immunization program.
- Both the patient and the nurse should wear masks when a catheter (not a fistula or graft) is connected or disconnected from the bloodlines during dialysis.

Dialysis water

During each dialysis session, a patient is exposed to more than 100 liters of water. Therefore, it is essential to purify and filter the water. Contaminants must be removed through deionization and reverse osmosis.

It is necessary to conduct bacterial culture and endotoxin analysis in the dialysate and reverse osmosis water no less than once a month and during outbreaks using standard quantitative

methods in accordance with available recommendations. The dialysate must be tested at the end of the treatment day.

Reprocessing and reuse of dialyzers

To combat bacterial and viral contamination between treatment procedures, it is usually recommended to perform «hot» disinfection of the dialysis equipment. If the «artificial kidney» does not have the function of "hot" disinfection, then it is recommended to perform chemical disinfection between dialysis sessions, for example, using a solution of sodium hypochlorite. The microbiological effectiveness of both chemical and "hot" disinfection should be confirmed through regular cultures.

Reprocessing is conducted outside the dialysis area in a specially designated room. This is the process of cleaning, inspecting, and filling the dialyzer with a disinfectant solution.

Reuse is performed in the treatment area. This pertains to the inspection, disinfection, rinsing, and testing to ensure complete removal of all disinfectants and the "reuse" of the reprocessed dialyzer for the same assigned patient.

Reuse and reprocessing must comply with all applicable standards.

6.6 PREVENTION OF INFECTIONS IN CLINICAL LABORATORIES

The laboratory (clinical or bacteriological) is a workspace where numerous potential pathogens are encountered daily. The laboratory (clinical or bacteriological) is a workspace where numerous potential pathogens are encountered daily. Laboratory workers can minimize the risks when working with these infectious agents by applying appropriate principles and methods of biological safety.

While safe work practices are primarily intended to prevent illness from infections among laboratory workers, laboratory-associated infections can impact public health, leading to secondary cases among the population. For example, household transmission of pathogens (such as Influenza A) is well-known. Thus, the prevention of laboratory-associated infections has an impact on both individual health and public health.

Common laboratory safety rules

Structural features for biological safety:

- A specially designated area for blood and other clinical sample collection should be provided, physically separated from the patient waiting room and the sample processing area.
- In each laboratory room, sinks for handwashing should be provided, preferably with running water, ideally located near the exit door.
- Adequate space should be provided for the safe conduct of laboratory work, as well as for cleaning and technical maintenance.
- The walls, ceilings, and floors should be curved and non-slip to facilitate easy cleaning, be impermeable to liquids, and resistant to chemicals and disinfectants commonly used in the laboratory.
- The floors should be non-slip.

- The countertops should be waterproof and resistant to disinfectants, acids, alkalis, organic solvents, and moderate heat.
- The lighting should be sufficient for all types of activities. Unwanted reflections and glare should be avoided.
- Laboratory furniture should provide open spaces between and under the tables. Laboratory furniture should provide open spaces between and under the tables.
- Storage space should be of sufficient size to store consumables for immediate use, thus preventing clutter on countertops and in walkways. Additional space for long-term storage should also be provided, conveniently located outside the laboratory's work areas.
- Facilities and means for the safe handling and storage of solvents, radioactive materials, compressed and liquefied gases should be provided.
- Storage areas for outerwear and personal belongings should be organized outside the laboratory's work area.
- Areas for eating and drinking, as well as for rest, should be organized outside the laboratory's work area.
- Doors should have viewing panels, meet fire safety specifications, and preferably be self-closing.
- At Biosafety Level 2, an autoclave or other means of decontamination should be located near the laboratory.
- Safety systems should include fire and emergency electrical systems, emergency showers, and eye-washing facilities.
- Appropriately equipped and easily accessible first aid rooms should be available.

Requirements for the work clothing of laboratory personnel

- Laboratory coats should be fully fastened, and all laboratory personnel must wear them at all times in the laboratory. These coats should be left in the laboratory during lunch or breaks, as well as when leaving the laboratory.
- Laboratory coats should be regularly disinfected and laundered (never taken home for washing).
- One should wear comfortable, water-resistant, closed-toe shoes with non-slip soles that cover the entire foot.
- Wearing long, dangling jewelry is prohibited in the laboratory.
- Long hair should be tied back, and facial hair should be covered to prevent contamination and interference with laboratory work.
- In case of a spill or emergency, a spare clean laboratory coat should be available.

Risk assessment

Risk assessment of all activities performed in the laboratory is mandatory to ensure the ability to manage and reduce risks for those working in the laboratory. Risk should be assessed considering the adequacy of any existing control measures and the acceptability of the risk.





Risk assessment includes a systematic review of the work to determine:

- The presence of biological agents.
- Hazardous characteristics of known infectious or potentially infectious agents or materials (see classification of infectious microorganisms by risk groups).
- Contact with infectious agents associated with laboratory work.
- The probability of causing a laboratory-associated infection as a result of such exposure and the potential consequences of such an infection.

Risk assessment helps in selecting appropriate levels of biological safety and the necessary microbiological methods and equipment to ensure safety (primary barriers) and institutional safety measures (secondary barriers) that can prevent laboratory-associated infections.

The risk assessment process should be integrated into the overall management of laboratory services. Risk assessment can be simplified into the following steps.

The approach to risk assessment

- It is necessary to identify the threats and those WHOmay be affected (the risk group of the agent, procedure, object, personnel, animals).
- Risk assessment (agent and procedure) should be conducted, considering existing control measures and the level of residual risks.
- The risk should be reduced.
- A reassessment of risk is conducted (any incidents/deviations).
- Gloves should be removed before handling phones, tools, or computers.
- When there is a risk of splashing or spilling samples, protective goggles and masks or face shields should be worn.
- Never store food or beverages in refrigerators or freezers containing microorganisms or clinical samples.

Proper workplace practices

- Workspaces should not have clutter, dirty glassware, or contaminated items such as towels or lint-free wipes.
- Equipment and work surfaces should be disinfected upon entering the laboratory and before leaving the work area, using freshly prepared chlorine solution (hypochlorite).

- Spilled liquids should be promptly and properly cleaned up in accordance with the laboratory's policy.
- Sending contaminated worksheets is prohibited; results and data should be transferred to new worksheets before sending.
- Hand hygiene should be strictly followed, especially before putting on gloves, after removing gloves and other protective clothing, before leaving the laboratory, before eating or drinking, after using the restroom, and when hands are visibly soiled.

Good Laboratory Practice (GLP)

- Use appropriate personal protective equipment (PPE).
- Do not work with new or unfamiliar equipment until you have received proper training and permission.
- Doors of rooms where work with microorganisms of risk group 2 and above is carried out should have the international symbol and warning sign for biological hazard.
- All individuals entering the laboratory must have permission from the laboratory supervisor.
- Minimize the use of sharp objects. Sharp objects should be disposed of in containers for biologically hazardous sharps, which are secured against unauthorized access, punctures, and leaks, and have appropriate labeling and color-coding.
- After work is completed, stocks and other cultures should be stored in an airtight container. For transporting stocks and cultures from one room to another, use an airtight container labeled with the biological hazard symbol (Figure 33).



Figure 33. The international symbol for biological hazard

- Cultures should be disinfected/inactivated before disposal using chemical disinfection or autoclaving.
- Broken glass should be picked up using forceps.
- Broken glass should be disposed of in a biohazard-labeled sharps container of the appropriate color.
- Personnel should be aware of the location of eye wash stations and showers and receive training in biological safety, including spill management.

Procedures for blood sampling

All blood should be considered potentially infectious. When taking samples, the following precautions should be observed:

- Blood samples from all patients should be collected in a separate room;
- Blood should not be taken in rooms typically used as laboratories or offices; as well as
- Protective clothing, including a clean lab coat or gown and gloves, should be worn.

Handling of samples sent to the laboratory

All samples must be received in a closed container with the appropriate patient information along with a properly filled-out sample request form.

For transporting samples in the laboratory, it is necessary to use racks or trays for test tubes.

The assessment should be reviewed, revised, and modified, especially in the event of a change in the nature of the work or if events suggest that it is no longer valid.

When assessing risks, it is necessary to take into account the following key points:

- The list of risk groups for involved microbiological agents.
- The pathogenicity of the agent and the infectious dose.
- The potential outcome of exposure.
- Natural route of infection.
- Other routes of infection that arise as a result of laboratory manipulations (parenteral, airborne droplets, oral).
- The stability of the agent in the environment.
- The concentration of the agent and the volume of concentrated material that needs to be manipulated.
- The prevalence of specific infections in the local community.
- Information obtained from animal studies and reports of laboratory infections or clinical reports.
- Planned laboratory procedures (ultrasonication, air ionization, centrifugation, etc.).
- The likelihood of infection (including during regular work and in case of accidents).
- Risks for laboratory personnel and other individuals such as visitors, sanitation workers, support staff, contractors.

The level of risk should be assessed in all places where diagnostic testing is conducted, including hospital wards, clinics, medical centers, and surgical suites. If assessments indicate that risks cannot be adequately controlled, appropriate measures should be taken or samples may need to be sent to another location for processing. The laboratory should have Standard Operating Procedures (SOPs) in place for any expected accidents or contamination. The laboratory should also maintain records of all accidents in the laboratory, staff exposures, actions taken, and procedures implemented to prevent similar incidents in the future.

The procedure for cleaning spills (in case of accidents)

The laboratory should develop standard procedures for spill cleanup and should have the necessary equipment and materials on hand. The basic spill kit should include concentrated disinfectant (chlorine bleach or iodophor), a pack of paper towels, sponges, sturdy work gloves, forceps for collecting broken glass, and a container that can be autoclaved. Blood and sputum should be treated with either sodium hypochlorite or sodium dichloroisocyanurate (NaDCC).

- Small spills can be wiped up with a paper towel dampened in a 0.5% sodium hypochlorite solution.
- For large spills, sodium dichloroisocyanurate (NaDCC) granules should be spread over them for at least two minutes before wiping them up with paper towels. As an alternative, you can cover the stain with paper towels, then carefully pour a 0.5% hypochlorite solution and leave it for at least two minutes before cleaning.

When spraying on the body, it is necessary to:

- Change contaminated clothing.

- Thoroughly rinse the affected area with running water and soap for one minute.
- Seek medical attention if the spill comes into contact with mucous membranes or intact skin.
- Report the incident to the laboratory supervisor.

In such a case, it is necessary to fill out an accident, incident, and spill report form. Like all medical information, this report should be confidential. Information is disclosed only with the signed consent of the healthcare worker.

The levels of biological safety in a laboratory

Laboratory facilities are classified into biosafety levels 1 through 4 based on a combination of structural features, design, protective measures, equipment, methods, and operational procedures required for working with agents of varying risk groups.The main hazardous characteristics of an agent include its ability to infect and cause disease in a susceptible human or animal host, its virulence as measured by the severity of the disease, and the availability of preventive measures and effective methods of disease treatment.

Table 29. The levels of biological safety in a laboratory

Level	Description of microorganisms	Examples of microorganisms	Security Practices	Necessary equipment (primary barrier)	Additional equipment (secondary barrier)
1	Do not cause infections in healthy adults	*Bacillus subtilis, Naegleria gruberi, Infectious canine*	standard laboratory safety rules	not required	Sink
2	Related to human diseases. Danger of transmission: skin damage, ingestion, mucous membranes	*Measles virus, Salmonellae, Toxoplasma spp*	Level 1 and: • Access restriction • Biological threat icons • Strict precautions • Waste disposal and medical supervision	Biological safety cabinets Class 1 and 2. Personal protection: gown, gloves, masks (as needed)	Level 1 and the presence of an autoclave
3	Dangerous microorganisms, typically transmitted through the airborne route, can lead to fatal diseases	*M. Tuberculosis, St. Louis encephalitis virus, Coxiella Burnetii.*	Level 2 and: • Access restriction • Decontamination of waste and laboratory clothing • Medical monitoring of personnel	Biological safety cabinets Class 1 and 2, and physical barriers for all open manipulations. Personal protection: gown, gloves, masks (as needed)	Level 2 and: • laboratory separation from common areas, • self-closing double door system, • absence of recirculation of outgoing air, • creating reduced pressure within the laboratory

4	Microorganisms that cause life-threatening or untreatable infections primarily transmitted through the airborne route (e.g., hemorrhagic fever viruses).	*Ebola Zaire, Sin Nombre virus, Rift Valley Fever*	Level 3 and: • changing clothes before entering the laboratory • showering after exiting the laboratory • complete decontamination of clothing after exiting the laboratory	Class 3 biological safety cabinets or Class 1 or 2 biological safety cabinets in combination with special suits for personnel (fully enclosed, supplied air, increased pressure)	Level 3 and: • the laboratory is located in a separate building (or strictly isolated). separate supply/exhaust systems for vacuum and decontamination • adherence to additional requirements for microbiological and biomedical laboratories

CHAPTER VII. SAFE WATER AND FOOD

7.1 SAFE WATER

A medical facility should have a sufficient and constant supply of safe water. Safe water should be available for drinking, handwashing, food preparation, personal hygiene, medical procedures, cleaning, and laundry.

The water requirement for hospitals with fewer than 100 beds is 340 liters per bed per day, while for hospitals with more than 100 beds, the requirement is 400 liters per bed per day.

The quality of water should meet hygienic standards before entering the distribution network, as well as at points of water intake for both external and internal plumbing systems.

Centralized drinking water supply in medical facilities should comply with the requirements «Hygienic Requirements for the Quality of Water in Centralized Drinking Water Supply Systems».

The criteria for drinking water may not be suitable for the use of water in medical purposes. Water for medical use may require additional treatment. Some requirements for the use of water in medical facilities include purified water for injection preparation, which should be sterile, and water needed for hemodialysis, which should be purified and free from contaminants, with its own standards.

These standards allow for a zero level of microorganisms such as bacteria (*E. coli*), parasites (*e.g., Giardia lamblia*), and viruses (e.g., hepatitis A or E); low turbidity (opacity due to solid particles and other contaminants); minimal levels of disinfectants, disinfectant by-products, inorganic and organic chemicals, and radioactive substances. At the very least, clean water should not contain microorganisms and should have a low level of turbidity (clear, not cloudy).

Water supply system

- The quality of water for domestic and drinking purposes should comply with sanitary regulations.
- All newly constructed, reconstructed, and existing medical facilities, including day care centers, must be equipped with continuous water supply from one or more sources of safe water (tap water, wells/boreholes, protected dug wells, protected springs, stored water), sewage systems, and centralized hot water supply.
- The system should be designed and maintained at the proper temperature and appropriate pressure.

- The hospital's water supply system should not be connected to any other piping systems or structures that could lead to contamination without the use of appropriate air gaps or approved backflow prevention devices or vacuum breakers.
- In patient rooms (including pediatric and neonatal rooms), all procedure rooms and wards, medical offices, staff rooms, restrooms, sluices of boxes and half-boxes, maternity rooms in pediatric departments, procedure rooms, dressing rooms, and auxiliary rooms, sinks with elbow-operated faucets with hot and cold water supply, as well as dispensers (elbow-operated) with liquid (antiseptic) soap and antiseptic solutions, should be installed.
- Sinks should be located at a sufficient distance from beds and patients to avoid contamination of wastewater through back splashes/airborne droplets.
- Stagnation and backflow should be minimized, and dead-end pipes should be avoided.
- The growth *of Pseudomonas* spp., Legionella, and other bacteria can be prevented if the water supply system maintains the correct water temperature, with cold water below 20 C, stored hot water above 60 C, and circulating hot water with a minimum return temperature of 51 C.
- Pipes carrying clean water should not run adjacent to sewage pipes, as this can lead to the suction of sewage into clean water pipes through non-sealed cracks and connections.
- When the water supply system cannot provide water that meets the recommended drinking standards, measures such as boiling, chlorination, and filtration, or reverse osmosis, are recommended at the point of use.
- The water requirement for hospitals with fewer than 100 beds is 340 liters per bed per day, while for hospitals with more than 100 beds, it is 400 liters per bed per day.

Water storage tanks

Due to the lack of a continuous water supply, many hospitals have to rely on backup water sources. These storage reservoirs can be large rooftop tanks or smaller tanks at the department level. Rooftop storage tanks should have the capacity to store a 48-hour water supply. The water storage capacity should be safe, non-toxic, and easy to maintain.

Water storage tanks should be easily accessible for cleaning. Cleaning of department-level drinking water storage tanks should be done daily, and the tank should be equipped with a tap or shut-off valve.

A medical facility should establish a procedure and schedule for cleaning water storage tanks.

Disinfection of water sources

Tanks can be disinfected by adding chlorine in the form of calcium hypochlorite, strong calcium hypochlorite, or liquid bleach. The amount of chemicals needed to disinfect drinking water can be calculated using the chlorine solution preparation formula.

Testing water sources for the presence of free chlorine is conducted to determine the suitability of the water for drinking. The free chlorine content should be 0.2 ppm, indicating that a sufficient amount of chlorine has been added to deactivate contaminating bacteria and viruses, and that the water will not be contaminated during storage.

CLEAN WATER TREATMENT

Clean water

Drinking (clean) water should be safe in terms of epidemic and radiation concerns, free from chemical and toxicological hazards, and have favorable sensory properties. It should be safe for consumption and for household purposes (e.g., for handwashing and medical instruments), as it meets specific healthcare standards.

Access to safe (clean) drinking water is crucial for health, is a fundamental human right, and is an integral part of effective health policy.

The quality of water should meet hygienic standards before entering the distribution network, as well as at points of water intake for both external and internal plumbing systems.

Boiling is a preferred method for preparing clean water that is safe for drinking, making oral rehydration solutions (ORS)[24] or preparing infant formula. As an alternative, if tap or well water is clear (i.e., contains a low amount of organic matter), chlorination with just 1 ppm (0.0001%) of chlorine is sufficient for water disinfection while maintaining some residual activity. In emergency situations or where water is turbid and filtration is not possible (e.g., when producing a large amount of disinfected water), the chlorine concentration should be increased to 10 ppm (0.001%) to ensure it is sufficient for water disinfection and still detectable if stored overnight before consumption.

Water that has been boiled for 20 minutes is considered safe for drinking and for use in preparing ORS and infant formula. Additionally, tap water can be disinfected by adding small amounts of chlorine-containing compounds such as sodium hypochlorite. For example, just 10 ml (2 teaspoons) of 0.5% chlorine solution is sufficient to treat 20 liters of water to make it safe for drinking (CDC 2000). If tap or well water is turbid (cloudy), it should be filtered or allowed to settle so that solid particles (sediment) settle, and then carefully decant the clear water before boiling or treatment.

Remember: *chlorination of turbid (cloudy) water is not effective because organic matter combines with free chlorine, reducing the concentration in the treated water.*

Preparing clean water containing up to 10 ppm (0.001%) sodium hypochlorite solution is a cost-effective procedure, easy to prepare, and often necessary in emergency situations (such as during floods or other natural disasters that can lead to significant contamination of the water supply system). Furthermore, the ability to prepare clean water daily in medical facilities is of great importance, as some small medical clinics are located in rural or remote areas. Often, they do not have access to a reliable source of water that could be used for handwashing and the processing of instruments, surgical gloves, and other medical items before final treatment through deep disinfection or sterilization.

[24] ODS – Oral Dehydration Solution

Table 29. Preparation of clean (disinfected) water

Purpose	Pretreatment (Filter)	Preferred	Alternative	Concentration (ppm) (%)
Drinking water, oral rehydration solution (ORS), and infant formula	+	Boiled	Chlorinated	1 (0,0001)
Emergency use	±	Chlorinated	Boiled	10 (0,001)
Medical use (handwashing and instrument cleaning)	±	Chlorinated	-	10 (0,001)

7.2 WASTEWATER TREATMENT AND SEWAGE

The wastewater from medical facilities can potentially contaminate the municipal water supply system, community surface water, or groundwater, and therefore should undergo proper treatment before discharge.

The treatment and disinfection of wastewater from medical facilities should be carried out at city-wide or other sewage treatment plants that guarantee effective wastewater treatment and disinfection. In the absence of city-wide or other sewage treatment plants, wastewater from medical facilities should undergo complete biological treatment and disinfection at local facilities.

Wastewater from infectious disease treatment facilities (departments) should be disinfected before discharge into the external sewage system.

In rooms for plaster preparation, it is advisable to install a gypsum trap beneath the sink.

Wastewater from mud treatment rooms, mud kitchens, and other mud therapy rooms should be discharged through special traps into a common mud trap.

For the treatment of industrial wastewater from the food block building in hospitals with 1000 beds or more, the installation of grease traps (outside the building) should be considered.

7.3 FOOD SAFETY AND KITCHEN HYGIENE

The food block of a medical facility is a complex of special rooms where food products are received, stored, undergo primary (cold) and thermal culinary processing, and ready meals are served. The food block in hospitals, dispensaries, and maternity hospitals consists of a food preparation service and buffets/distribution areas with dining rooms in the inpatient departments. In medical and social institutions in the country, a centralized system of meal organization is practiced.

The food preparation service is a complex of storage, production, service, and utility (for staff) rooms.

Hospital food blocks can be centralized or decentralized. A centralized food block (central kitchen) is located: a) inside a common building - in single-building hospitals (with up to 300 beds); b) in a separate building - in large multi-building hospitals. In a centralized system, there

is a central food block in the hospital. In this central food block, ready meals are prepared, and then they are delivered to the departments in containers, where they are heated and served to the patients. One positive aspect is the preparation of food in one place under the supervision of a dietitian. Negative aspects include the need to transfer food to thermoses, its transportation (often outdoors), which leads to cooling of the food that requires reheating, which reduces its nutritional value and affects its taste properties.

Central procurement for a decentralized food unit consists of the following rooms: a) production - separate workshops for vegetable preparation, meat and poultry, fish, confectionery, dishwashing kitchen, dispatch of the main and infectious buildings, dishwashing for containers; b) storage - refrigerated chambers for separate storage of meat, fish, dairy products, fruits, and greens, waste (with a separate external exit); separate storerooms for vegetables, bread, dry products, pickles, as well as for linen and inventory; container; loading; in) service and domestic - the rooms of the head of production and personnel, storekeeper's room, personnel's personal hygiene room, staff restrooms, dressing room with a shower.

In hospitals with 50 - 200 beds, some rooms are combined, such as meat, poultry, and fish preparation workshops, dispatch of the main and infectious buildings, refrigerated chambers for storing meat, fish, dairy products, fruits, and greens, storerooms for dry products and bread, storerooms for linen and inventory.

Quality and quantity of food are key factors in a patient's recovery. Ensuring the safety of food products is an important service in the healthcare sector. The responsible managers of healthcare institutions must daily ensure that the food prepared and served to patients, visitors, and staff is handled, stored, prepared, and served in a way that prevents contamination. The heads of the food department are responsible for the quantity and quality of the prepared food.

Access to a sufficient amount of safe and nutritious food is extremely important for improving health. Unsafe food containing harmful bacteria, viruses, parasites, or chemicals can cause over 200 diseases, ranging from diarrhea to cancer.

The food preparation area should be clearly divided into dry and wet zones. All contact surfaces should be pre-disinfected. Boards for raw vegetables and meat and fish should be disinfected with chlorine at a concentration of 50 parts per million, and with a chlorine concentration of 100 parts per million. The minimum contact period is 2-3 hours.

The food department in the institution should maintain the following accounting journals in which the results of production control are recorded.

- The journal of rejects of food products and food raw materials;
- The journal of rejects of finished products;
- The journal of results of medical examinations of workshop employees.

Warehousing

- In the food block, it is necessary to organize appropriate storage facilities for all items, including food ingredients, equipment, and non-food materials such as dishes, linens, disposable and reusable items, packaging, and chemicals. During storage, food products should be protected from contamination such as water leakage, pest infestation, as well as from any other unsanitary conditions. Appropriate shelves and racks should be used for storing products. Storing food products on the floor is not allowed.

- The storage area should be clean and dry to prevent spoilage. Such a storage area should be protected from pests and located away from dressing rooms, toilets, sewage systems, and chemical/pesticide storage areas.
- Storage facilities should be designed and constructed in a way that avoids cross-contamination.
- For products requiring refrigeration, and for frozen products, there should be refrigerated storage at temperatures ranging from 4 C to 8 C and a freezer at -18 C. Separate refrigeration and freezer units should be provided for vegetables/fruits and meat and fish products.
- There should be separate sections for storing raw, processed, packaged, rejected, returned, or recalled food products. Allergenic materials or products, such as peanuts, should be clearly labeled.
- Cleaning supplies should have visible labels and be stored separately.

Risk factors in hospital kitchens

This is mainly related to food contamination, stale food, improper storage at room temperature or inadequate cooling, unhygienic preparation of enteral or infant nutrition, which can be transmitted by food industry workers.

The reception of products and the verification of accompanying documents are carried out by the storekeeper (warehouse manager) with the participation of the production manager (head chef) and the dietetic nurse.

Products should be stored according to the accepted classification by types of products:

- Dry products (flour, sugar, grains, pasta, etc.);
- bread;
- Meat and fish;
- Dairy and fatty;
- Gourmet;
- fruit toothpick.

Raw materials and finished products should be stored in separate refrigeration chambers.

When storing food products, it is necessary to strictly adhere to the rules of product placement, storage standards, expiration dates, and storage conditions. It is not allowed to store raw products or semi-finished products together with finished products; store spoiled or suspicious-quality products together with good-quality ones; store packaging, carts, household materials, and non-food items in the same areas as food products. Strong-smelling products (such as herring, spices, etc.) should be stored separately from other products. Products with a specific odor (spices, herring, etc.) should be stored separately from products that can absorb foreign odors (butter, cheese, eggs, tea, salt, sugar, etc.).

Contamination of food products can be prevented by following the following rules:

- reliable and high-quality consumables;
- appropriate storage facilities;
- hygiene precautions;

- personal hygiene, hand hygiene;
- the use of uniforms, including hair coverings and gloves;
- screening food block workers for infectious diseases (gastrointestinal, respiratory, or skin infections) in accordance with the country's requirements.

The five most important principles of safe food consumption, according to the World Health Organization's recommendations on "adequate heat treatment of food," involve ensuring that the temperature inside the food reaches at least 70 C. It is also important to thoroughly wash fruits and vegetables, especially if they are consumed raw. Whenever possible, vegetables and fruits should be peeled. Vulnerable populations such as children and elderly individuals should avoid consuming raw or inadequately cooked meat products, raw milk, and products made from raw milk.

Regular handwashing is strongly recommended, especially before preparing food, eating, and after using the toilet, particularly for people caring for young children, the elderly, and individuals with weakened immune systems, as bacteria can be transmitted not only through food, water, and direct contact with animals but also from person to person.

Kitchen Staff Hygiene

Food service workers should be trained in the importance of adhering to hygiene rules during food preparation. All food service staff should undergo medical examinations within the specified timeframes, including the required bacteriological tests, as well as screening for infectious diseases (gastrointestinal, respiratory, or skin infections).

Food service workers must maintain a high level of personal hygiene. Hair, nails, and mustaches/beards should be properly trimmed, hair should be tied back, and gloves should always be worn.

Employees in the food service department of medical institutions WHOare involved in food preparation and processing must inform their employers of the following:

- Diarrhea and/or vomiting.
- Skin rash/skin lesions (such as boils, cuts, etc.).
- Respiratory infections and sore throat.
- Purulent discharge from the eyes, ears, nose, or mouth/gums.
- Jaundice.
- Fever.

Overalls (uniform)

Uniforms should be changed daily, and a daily supply of clean uniforms should be provided.

Special clothing includes:

- Dirty aprons for dirty tasks and clean ones for distribution.
- Hair coverings or caps.
- Household gloves.
- Footwear: Closed shoes should be used in the kitchen.

Hands hygiene

Kitchens should be equipped with a functional sink with water and soap.

Hands should be washed after working with non-food chemicals and incompatible food products (e.g., raw or cooked food) or contaminated materials.

Handwashing should be mandatory and repeated after using the toilet, eating or drinking, hair arrangement or combing, touching the face, nose, or eyes, contact with dirty equipment and work surfaces, as well as after handling raw food. The provision of liquid soap and disposable towels in restrooms is mandatory.

Personal habits

The staff shall:

- Trimming nails and not wearing bracelets, rings, and nail polish while performing job duties.
- Ensuring that clothing does not have visible traces of dirt and spilled food.
- Using hairnets (hair restraining devices) while performing job duties.
- Using serving utensils/dishware for handling food whenever possible.
- Not consuming food or beverages in food preparation or serving areas.
- Not using tobacco products in any form during food preparation or service.

Water

The kitchen should be equipped with a continuous supply of drinking water and hot water.

Cleaning schedule

- All surfaces should be cleaned with detergent and hot water, followed by mandatory drying.
- Cutting boards should be washed and disinfected after use.
- The kitchen should be dry. There should be a separate area for washing.
- Dishes and utensils should be washed in the sink.
- Cleaning actions should be recorded.
- Cleaning of areas where special dishes are prepared should be done using separate and specialized cleaning equipment.

Servicing refrigerators and freezers

Regular temperature checks and cleaning of refrigerators should be carried out according to a schedule, which should be recorded in a special journal.

Taking out the trash from the kitchen

Food returned to the kitchen should be discarded. These and other food waste should be stored in trash cans lined with black plastic bags outside the diet department, which are cleaned regularly.

Raw kitchen material after slicing vegetables, fruits, etc. can be composted, provided there is sufficient space.

Waste storage and garbage bins must be maintained in proper cleanliness, free from pests, and in a closed state, and they should be disposed of in accordance with local rules and regulations, including for plastic and other non-ecofriendly materials.

Conditions under which workers in the food service industry should not be allowed to work

Hepatitis A

- Any employee associated with the food department WHOis infected with Hepatitis A (HAV) must be suspended from working with food products for seven days after the onset of jaundice and/or symptoms.
- Food department workers WHOhave been in contact with a Hepatitis A patient should not be excluded, provided that proper hygiene rules are followed.
- If an employee working with food products is in close contact at home with a confirmed case of Hepatitis A (HAV), they should consider preventive measures (HNIG or HAV vaccine).
- Colleagues at work of a person working with food products WHOhas contracted Hepatitis A should be considered close contacts.

Typhoid / paratyphoid

- **Case**: Exclude until obtaining 6 consecutive negative stool samples, taken at 2-week intervals, starting 2 weeks after completing antibiotic treatment.
- **Carrier**: Exclude until obtaining 6 consecutive negative stool samples, taken at 2-week intervals.
- **Suspected Case** (history suggests typhoid fever): consider the necessity of obtaining 6 consecutive negative stool samples with two-week intervals.
- **Contact with a case/outbreak**: Exclude until obtaining 3 consecutive negative stool samples, taken at weekly intervals, starting 3 weeks after the last contact with the untreated patient.
- **Household contact with a carrier**: consider the possibility of exclusion until 3 consecutive negative stool samples are obtained at weekly intervals, starting from the date of identifying the carrier.

Staphylococcus Aureus

Nasal carriers of S. *aureus* (golden staph) should not be excluded from handling food products, but it is necessary to avoid unhygienic actions.

Skin lesions

Exclude employees working with food products WHOhave infectious skin lesions on exposed parts of the body that cannot be properly covered (with a waterproof dressing) until they have healed.

Group A streptococci

- Treatment for nasal carriage is usually not indicated; it may be considered if a food-handling worker is involved in an outbreak of group A streptococcal (ß-hemolytic) infections.

- Exclude food handlers with streptococcal sore throat until symptoms clear.
- Exclude workers handling food WHOhave infected skin lesions on exposed body parts that cannot be adequately covered (with a waterproof dressing) until healed.

Vibrio cholerae

- Food handlers infected with V. *cholerae* 01 or 0139 should be excluded for 48 hours after the first normal stool. When microbiological cleaning is indicated (e.g. sanitary facilities / suspected personal hygiene), two consecutive negative stool tests at least 24 hours apart are required.
- Prolonged carriage is rare. If carriage treatment is considered, sensitivity should determine the choice of antimicrobial agent used, taking into account the possibility of emergence of resistant strains.

CHAPTER VIII. SURVEILLANCE OF HEALTH CARE-ASSOCIATED INFECTIONS

8.1 PURPOSE OF EPIDEMIOLOGICAL SURVEILLANCE

The purpose of epidemiological surveillance is to collect, describe and interpret data on the basis of which it is possible to identify the causes of the development of HAI, and further develop measures for their prevention. Only through regular epidemiological surveillance can effective measures be developed to reduce the frequency of infections in healthcare facilities.

Epidemiological surveillance of HAI in health care facilities provides for:

- Ensuring the active identification, recording and registration of HAI in patients on the basis of clinical, laboratory, epidemiological and pathological-anatomical data.
- Operational and retrospective analysis of morbidity, mortality, including analysis by clinical forms, age structure, departments, causes of HAI, factors of the treatment process (operations, childbirth, catheterization, ventilation, etc.), nature of infection (endogenous and exogenous).
- Identification of causes, groups and factors contributing to the occurrence and spread of HAIs in certain categories of patients in various types of health care facilities.
- Epidemiological analysis of the incidence of HAI of medical personnel with the identification of the leading causes and factors contributing to the occurrence and spread of HAI.
- Assessment of the epidemiological safety of the therapeutic and diagnostic process (data on surgical and other invasive manipulations, childbirth).
- Evaluation of the strategy and control of the use of antibiotics in different departments and types of health care organizations.
- Microbiological monitoring of HAI pathogens with specific identification (typing) of HAI pathogens isolated from patients, personnel, environmental objects, determination of the spectrum of resistance of isolated strains to antibiotics, antiseptics, disinfectants and others) in order to develop a rational strategy and tactics for their use.
- Assessment of the effectiveness of preventive and anti-epidemic measures.
- Forecasting the epidemic situation.

Routine surveillance of HAI at a health care facility should be conducted by a health care facility infection control specialist or SEMS through the systematic collection of patient data, prospective, prioritized data that allow risk-adjusted morbidity rates to be obtained.

Types of surveillance appropriate for HAI

- **Active monitoring**. This includes systematic data collection by the hospital's designated trained infection control specialist / nurse. Information is collected from various data sources inside and outside the branches. Active methods of HAI detection involve constant study of direct sources of information in order to identify cases of infection. This approach is most preferable.

- **Passive monitoring** consists of reporting any suspected HAI to the department's physicians or nurses, and is not an effective method of tracking HAI. Passive epidemiologic surveillance methods can detect only 14 -34% of infections.
- **Clinical observation of patients**. This includes HAI counting, risk factor assessment, monitoring of patient care procedures and practices for adherence to IPC principles. It also requires going around the wards and talking to caregivers.
- **Laboratory observation**. This type of supervision is based solely on the results of laboratory studies of clinical samples. The Microbiology Laboratory also conducts AMR model studies on common isolates and new or emerging pathogens, as well as resistance models.
- **Priority and comprehensive monitoring**. Priority monitoring, also referred to as Targeted, Focused or Targeted Surveillance, focuses on specific events, processes, organisms and /or patient populations. On the other hand, comprehensive monitoring requires significant resources to continuously monitor all patients for all HAI events and / or processes.
- **Environmental monitoring**: monitoring and surveillance of water and sanitation and hygiene systems.

8.2 REQUIREMENTS FOR EFFECTIVE EPIDEMIOLOGICAL MONITORING

At the beginning of conducting an environmental assessment (EA), it is necessary to have a well-developed plan with defined objectives and tasks, a list of collected data, methods of analyzing results, and a way to communicate results to interested parties.

During the observation process, it is important to ensure strict adherence to the same principles of organization, including a consistent frequency of data collection, the use of consistent definitions of adverse events, the same denominators, and consistently high-quality laboratory data, with well-trained medical personnel.

The success of epidemiological surveillance depends on:

- The presence of a standard definition of a healthcare-associated infection case.
- The correct choice of a method for detecting cases of Health care-associated infection (HAI).
- Correct calculation of Hai frequency indicators.
- Effective microbiological monitoring of microorganisms circulating in the hospital.
- Effective supervision of wash, environmental cleaning and waste management.

HAI are subject to accounting and registration in accordance with ICD-10[25], according to the list provided for in the form of monthly state statistical observation No.1 "Information on infectious and parasitic diseases".

The specialist WHOidentifies a case of healthcare-associated infection (HAI) formulates the diagnosis according to ICD-10, registers it in the infectious disease record journal, and conveys the information to the deputy head of the healthcare institution responsible for epidemiological (epidemiologist and/or assistant epidemiologist) or medical work for the purpose of timely organization and implementation of epidemiological or preventive measures.

[25] ICD International Classification of Diseases, 10th Revision

Information about each case of healthcare-associated infection (HAI) is transmitted to the authorities authorized to carry out state sanitary and epidemiological surveillance in accordance with the established procedure.

In the event of an outbreak of group diseases, the healthcare facility reports to the authorities authorized to conduct state sanitary and epidemiological surveillance in accordance with the established procedure for submitting extraordinary reports on emergency situations of sanitary and epidemiological nature.

Cases based on primary and final diagnoses in healthcare facility (HF) and State System of Epidemiological Surveillance and Control are subject to registration and recording. More detailed information on healthcare-associated infections (BBID) is provided in Appendix 7.

Not subject to registration as healthcare-associated infections (BBID):

- all cases of acute or chronic infections that occurred prior to medical care;
- all diseases caused by opportunistic microorganisms for which there is no evidence of nosocomial origin;
- neonatal infections acquired transplacental (intrauterine);
- cases of infections after surgical interventions for acute purulent-septic diseases of internal organs complicated by perforation and / or peritonitis;
- infections resulting from surgical interventions for disintegrating malignant tumors, soft tissues or internal organs;
- cases of phlebitis, thrombophlebitis with intravenous administration, cystitis — with intravesical administration of cytostatic drugs, cases of cellulitis, tissue necrosis — with extravasation with cytostatics.

8.3 REQUIREMENTS FOR MICROBIOLOGICAL SUPPORT OF EPIDEMIOLOGICAL SURVEILLANCE

Laboratory studies of environmental objects in healthcare facilities are conducted in accordance with sanitary rules for the organization and implementation of production control to ensure compliance with sanitary regulations and the implementation of sanitary and epidemiological (preventive) measures.

Bacteriological studies are conducted in accordance with the production control plan for each department, approved by the head of the organization, but no less than once every 6 months. The scope of sanitary-bacteriological research is determined by epidemiological necessity.

Microbiological monitoring is conducted by microbiological laboratories within the hospital, and in their absence, through contracts with accredited organizations.

Bacterial contamination of the air environment is examined in various rooms of the healthcare institution, taking into account their functional purpose for sanitary-microbiological indicators, such as CFU (Colony-Forming Units) and golden staphylococcus.

The objects of research during bacteriological control are:

- Air environment.
- Objects inside the hospital environment.
- Medical devices (medical instruments, dressings and sutures, etc.) for sterility.

- Examination of pharmaceutical forms (for injections, treatment), control of sterility of medical devices, including consumables for ventilators, excluding pharmaceutical forms and sterile products of industrial production.
- Equipment for anesthesia, extracorporeal circulation devices, incubators for neonatal care.
- Breast milk, infant formula, solutions for newborns' consumption, oils for the daily hygiene of newborns.
- Hands of hospital staff, skin of the surgical field, skin and mucous membranes of newborns.
- Sterilization equipment.
- Disinfection chambers.
- Chemical agents for disinfection.
- Bed linen.
- Food block (buffet rooms).

To detect hospital strains, testing of isolated strains from patients and the external environment is conducted for sensitivity/resistance to antimicrobial drugs, antibiotics, antiseptics, disinfectants, and other antimicrobial agents. This includes determining the active substances in the working solutions of disinfectants.

8.4 REQUIREMENTS FOR CONDUCTING MEASURES WHEN DETECTING AN INFECTIOUS DISEASE OR HEALTHCARE-ASSOCIATED INFECTION (HAI)

In the territorial body and institution responsible for state sanitary supervision at the location where a case of infectious disease is detected, information from the emergency notification is transferred to Form No. 091.

In bodies and institutions overseeing public health supervision, HAIs are subject to individual registration based on the results of epidemiological investigations when establishing a cause-and-effect relationship between an HAI case and the provision of medical care to the patient.

General information on the detection of infectious diseases, including cases of HAI, is reported monthly within the prescribed deadlines and is entered into the form of state statistical reporting "Report on specific infectious and parasitic diseases and their carriers," approved by the Agency for Statistics under the President of the Republic of Tajikistan No. 374 dated November 1, 2007, "On the approval of the form of state statistical reporting on 6 infections" for submission from the territorial level (city, district, regional) to the republican level.

In case of cancellation, modification, or clarification of the diagnosis for an infectious disease, a new urgent notification is drawn up and sent no later than 12 hours after the cancellation, modification, or clarification of the diagnosis to the territorial authority and institution responsible for state sanitary supervision at the location of identifying the case of infectious disease.

When HAI or group infectious diseases occur, the deputy head of the healthcare institution (or the epidemiologist and/or assistant epidemiologist) with the participation of specialists from relevant departments conducts a comprehensive epidemiological investigation aimed at determining the causes of the current situation and developing measures to eliminate them.

The investigation of the causes of group diseases and the implementation of measures to eliminate them are carried out in collaboration with the authorities of the State System of Epidemiological Surveillance and Control.

In case of postoperative complications, the patient is transferred to the department of purulent surgery. In the absence of a purulent surgery department, the patient should be isolated in a separate room.

Patients with infection of any localization, regardless of the time of its onset, caused by methicillin (oxacillin)-resistant Staphylococcus aureus (MRSA) or vancomycin-resistant Enterococcus (VRE), should be isolated in boxed rooms.

When working with this category of patients, the staff must follow the following rules:

- When entering the patient's room, the staff should wear a mask, special clothing, and gloves, and remove them when exiting.
- Items used for patient care, as well as a stethoscope, thermometer, and others, should only be used for that specific patient.
- Dressing changes for the patient should be carried out in the patient's room.
- Upon entering and exiting the patient's room, the staff should disinfect their hands with an alcohol-based skin antiseptic solution.
- After a patient is discharged, a final disinfection is conducted, including chamber disinfection of bed linen and air disinfection.
- After disinfection, a laboratory examination of the environmental objects (in the patient's room) is conducted. Filling the room is done after receiving satisfactory results from microbiological testing.

In maternity hospitals, in the event of group diseases occurring, the admission of pregnant women and women in labor is suspended, and the issue of investigating and identifying the causes is addressed. An alternative space is urgently set up to accommodate pregnant women and expectant mothers. A hospital is determined for the hospitalization of sick newborns with the maximum conditions for their isolation, the organization of round-the-clock resuscitation and intensive care.

If an infectious disease is suspected or detected in a patient undergoing inpatient treatment, he/she shall be isolated until the issue of his/her transfer to the infectious diseases department (infectious diseases hospital) is resolved.

In case of group diseases in somatic hospitals, children's hospitals, patients with infectious diseases should be transferred to the infectious department (infectious hospital).

Based on the results of the epidemiological investigation, a conclusion is made about the causes of the group disease, the type of epidemic process, the sources of infection, the leading pathways and factors of transmission of infectious agents that led to the occurrence of diseases.

Taking into account this conclusion, a set of preventive and anti-epidemic measures is being developed and implemented to localize and eliminate group nosocomial diseases, including the appointment of specific and nonspecific prophylaxis.

8.5 CALCULATION OF HAI INDICATORS

Data sources

Division / ward

- Patients to whom devices have been inserted and WHOhave undergone procedures associated with the risk of infection, such as indwelling vascular or urinary catheters, surgical operations.
- Record fever and other clinical signs suggestive of infection.
- Antimicrobial therapy.
- Laboratory tests such as microbiological cultures.
- Reviews of case histories.

Laboratory reports

Daily review of laboratory reports can help in identifying healthcare-associated infections (BBID).

- Review of patients WHOhave identified microorganisms potentially associated with infection.
- AMR models can help identify issues related to emerging resilience.
- Laboratory reports alone cannot be relied upon for the following reasons:
    - Samples may be inappropriate.
    - Some pathogens are difficult to isolate.
    - Isolation of the organism may be colonization rather than infection.
- Laboratory reports are necessary for the diagnosis of UTIs, IC, and epidemiological surveillance of resistant microorganisms.

Data to be collected

- Patient number, date of admission to the hospital.
- Demographics and risk factors: age, gender, severity of underlying disease, diabetes and any primary diagnosis, permanent devices, surgical procedure, other treatments such as chemotherapy.
- Date, type of HAI event, organisms isolated and antimicrobial susceptibility.
- Infections should meet the basic definition of HAI, i.e. should be detected 48 hours (> 2 calendar days) after hospitalization.

Exact infection rates can only be calculated using both numerator (specific infection frequency) and denominator (all patients at risk for a specific healthcare-associated infection) data and should reflect the 'risk of impact,' i.e., the number of days of device use, surgical procedures, and the number of patient-days in the unit/hospital. For surveillance purposes, analyzing numerator data alone does not make sense unless process control charts are used. Indicators of healthcare-associated infections (BBID) can be calculated as follows:

The general formula for calculating healthcare-associated infection (BBID) indicators is:

$$\mathbf{P} = \frac{I}{N} \times \mathbf{1000}, \quad \textit{where:}$$

P – is the incidence rate,
I – is the absolute number of cases,
N – number of treated
(births, live births, surgical interventions)

Surgical intervention infection *= Number of surgical intervention infections/ number of all surgical procedures *100*

Device-associated infection *= Number of device-associated infections / Number of device-days * 1000*

Table 30. Approximate scheme for comparing numerators and denominators of a fraction when calculating healthcare-associated infection (BBID) rate

Nosological forms	The denominator of the fraction when calculating the incidence rate
Purulent-septic infections of newborns	Number of newborns born alive
Perinatal infection	Number of newborns born alive
Purulent-septic infections of puerpera	Number of Deliveries
Surgical Site Infections	Number of surgical interventions
Infections related to infusion, transfusion and therapeutic injection, immunization	Number of inpatients + number of visits to HF doctors, including prophylactic
Urinary tract infections	Number of patients treated in the hospital
Lower respiratory tract infections (LRTIs) and pneumonia	Number of patients treated in the hospital
Acute intestinal infections, acute viral hepatitis A, E	Number of patients treated in the hospital
Droplet infection	Number of patients treated in the hospital
HAI related to the performance of official duties in the personnel of medical organizations	Number of employees of medical institutions (medical personnel and other personnel)
Total HAI	Number of inpatients + number of outpatients

CHAPTER IX. MANAGEMENT OF HAI OUTBREAKS IN HOSPITALS

9.1 CALLS DURING EPIDEMICS:

Intensification of the epidemic. If the health care facility does not take appropriate measures to prevent and control the infection, it can exacerbate the epidemic by spreading the infection among patients, staff and visitors. By discharging from the hospital, these infected individuals can amplify the transmission of the virus in society.

Huge demand for medical resources. Human and material resources, including hospital facilities and medicines, may not be sufficient to meet demand, especially in the case of an epidemic that can last weeks or months.

The health care facility must change its priorities and adapt its operating procedures to ensure a coordinated systemic response to a rapidly evolving, potentially complex situation.

Limited time to establish connections or strengthen partnerships. Managing an epidemic or another emergency situation represents a challenge for the relationships between the hospital and local health authorities, service providers, and other stakeholders in the healthcare sector and the community. Therefore, well in advance of an actual emergency situation, it is advisable to analyze existing partnerships and, if necessary, establish new partnerships.

The occurrence of **two or more infections similar in location and time** is defined as **a cluster or outbreak** and requires investigation to identify transmission routes and possible sources of infection to take action to prevent further spread. If the number of cases is steadily increasing and they are separated by an interval approximately equal to the incubation period, the spread of the disease is likely due to person-to-person transmission.

On the other hand, if a large number of cases occur after a joint exposure, i.e. surgery, it is called an outbreak from a common source, implying a common source of the disease

An outbreak is defined as the occurrence of a disease at a rate greater than expected in a defined geographical area over a defined period of time[26]. In the context of Hai, the geographic area may be a hospital, department, intensive care unit (ICU), or operating rooms. When there are more cases of infection with the same organism than can normally be expected in a single unit or period, this can be declared as an outbreak of the disease. Investigating an outbreak of Health care-associated infection (HAI) should be done as quickly as possible, as the availability and quality of microbiological evidence and epidemiological data deteriorate rapidly over time between the onset of illness and the investigation.

9.2 «OUTBREAKS» vs. «CLUSTERS»

Sometimes small outbreaks are referred to as clusters (e.g., virus hepatitis A and virus hepatitis C). A cluster is a collection of cases, grouped by person, place, and time, the number of which is assumed to be greater than expected. Functionally, there is little difference, as both

[26] S. Beck Sug, W.R. Jarvis, W.J. Marton, Outbreak Investigation, Hospital Infection Control Epidemiology. 1997

outbreaks and clusters need to be investigated to identify the responsible factor(s) and identify infection prevention and control measures.

The main objective of the outbreak investigation is to:

- Determine the extent of the outbreak in terms of time, location and person.
- Determination of the cause of the outbreak and the mode of transmission.
- Management of the outbreak.
- Preventing similar outbreaks in the future.
- Evaluation of existing infection prevention and control strategies.

The investigation of a healthcare-associated infection (HAI) outbreak may vary depending on the type of institution, the focus of the infection/disease, the type of pathogen involved, and so on. For example, an outbreak of respiratory infection in a hospital's intensive care unit may require a better understanding of the patient's location in the facility, a history of lung ventilation, and the receipt of respiratory support. On the contrary, an outbreak of an infection associated with an inpatient facility may require a better understanding of the type of invasive treatments or details of procedures / infusions performed in that facility, etc.[27]

9.3 STAGES OF INVESTIGATING A HEALTHCARE-ASSOCIATED INFECTION OUTBREAK

During the investigation of an outbreak, expert epidemiological consultation on procedures may be required. The formulation of the hypothesis about the source and distribution is done before microbiological studies are carried out in order to collect the most suitable samples.

Steps to be taken to investigate the HAI outbreak

Step 1. Outbreak Assumption

- Formation of an interdisciplinary commission, including a leader, epidemiologists, obstetricians-gynecologists, neonatologists, microbiologists, and others.
- Classification of presumed cases according to the standard definition and their tally.
- In the absence of an officially approved standard case definition for infection, it is necessary to formulate such a definition based on ICD-10 (International Classification of Diseases, 10th edition) in accordance with clinical and laboratory data.
- Establishing the baseline disease frequency, the increase in the number of cases, and the characteristics of its course.
- Studying other epidemiological data.
- Examination of changes that could have affected the infection frequency (for example, new personnel or a reduction in the staff-to-patient ratio, new procedures, etc.).
- Compilation of a work plan.
- Notifying the sanitary-epidemiological services and healthcare authorities.

[27] https://www.outbreak-database.com

- Notifying healthcare workers and other personnel about the presumed outbreak.
- Increasing compliance with standard infection prevention and control measures.

Step 2. Confirmation of the outbreak

- Confirmation of the number of cases meeting the outbreak definition.
- Analysis of microbiological data. If necessary, requesting additional laboratory tests, such as molecular typing of microorganisms.
- After collecting initial information, infection cases can be classified as 'confirmed' (usually through laboratory verification), 'probable' (usually having typical clinical manifestations), and 'suspected' (usually having atypical manifestations).
- Conducting a literature review on the identified issue.
- Requesting support from specialists.

Step 3. Case definition and identification of other cases

- Confirmation of diagnoses in accordance with the standard case definition of healthcare-associated infections, identification of patient groups, locations of occurrence, associated circumstances, and the inclusion of clinical microbiological research data.
- Confirmation of connections between cases using typing methods, (possibly with the involvement of a reference laboratory).
- Collection and analysis of data from patient and healthcare worker surveys, as well as data obtained from medical records.
- Screening patients for active Hai detection.

Step 4. Description of each case

- Patient: gender, age, inpatient department (for women – profession, place of residence).
- Time of symptom onset: day and time.
- Associated Circumstances.
- Carrying out a graphical analysis of the epidemic curve to create a hypothesis: the number of cases of infection along the Y axis, the time of onset of symptoms along the X axis.

Step 5. Creating a hypothesis about the occurrence of an outbreak

- Hypothesis is a scientific assumption put forward to explain any phenomena and requiring confirmation or refutation.
- The HAI outbreak hypothesis is created using a number of reasonable data on the potential causative agent, source, and route of transmission based on:
    - information collected from staff and patient interviews, analysis of medical records;
    - microbiological examination, including flushing from environmental objects, if necessary.

- Hypothesis testing with the help of facts and an epidemiological case-control study. This is a retrospective study that compares the characteristics of patients from two groups: experimental (patients with a disease) and control (patients without a disease).

Step 6. Combating the spread of infection

- Temporary suspension of patient admissions.
- Consideration of the need to transfer infected patients for treatment to other inpatient units or other healthcare facilities.
- Strengthening control over compliance with standard prevention measures and the use of PPE by analyzing the clinical situation, interviewing staff and patients, monitoring HAI prevention practices and based on epidemiological and environmental investigations.
- Change of PPE after contact with an infected patient.
- Increasing the frequency and efficiency of cleaning rooms with the use of disinfectants.
- Deciding on the need for prophylactic treatment or immunization.
- Ensuring that infected or colonized areas of the patient's body are covered with a dressing (for example, in streptoderma).
- Restriction of movement of patients, staff and visitors within the medical facility.
- Analysis of the effectiveness of the efforts made.

Step 7. Communication

- Official documentation of actions taken.
- Informing all staff at a general meeting.
- Regularly alert staff via email.
- Labeling of the history of persons in contact with sick patients.
- Announcement of restriction of access to the ward or department.
- Development and dissemination of information for patients and visitors.

Step 8. Conclusions and recommendations for the prevention of HAI outbreaks

- Preparation of a report on the results of the investigation, measures taken and their effectiveness with short-term and long-term recommendations for the prevention of outbreaks.
- Adoption of infection prevention and control measures to prevent similar outbreaks in the future.
- Presentation of information to all employees of the health care facility.

9.4 PREPARATION OF HEALTHCARE FACILITIES FOR THE EPIDEMIC [28]

- Define the roles and objectives of the hospital in the national and local response. Some hospitals may be designated to accept only suspected or only confirmed cases of epidemic disease.

[28] WHOPreparedness of hospital facilities for epidemics. Geneva: who, 2014. http://apps.who.int/iris/bitstream/handle/10665/151281/9789241548939_eng.pdf

- Implementation of IPC measures. Appropriate measures should be taken to prevent the spread of infection among hospital staff, patients and visitors. Hospital management should review and, if necessary, revise hospital IPC protocols. Additional prevention and control measures may be required to cope with the specific nature of the epidemic.

An effective infection control program and the ability of health care facilities to apply appropriate IPC measures in normal, routine conditions will strengthen the ability of health care facilities to apply them in practice during an epidemic situation.

TRAINING OF HOSPITAL STAFF

All employees, regardless of their individual daily responsibilities, need training in the procedures and protocols described in the MPTF's emergency response plan. They should also participate in regular exercises necessary to maintain a state of readiness to perform their role in an emergency.

- Development of a plan for the response of healthcare facilities to emergencies.
- Establishment of a coordination center / commission of the health care facilities for emergency situations to hold meetings and manage emergency response measures (including information and communication).
- Development of SOPs for emergencies.
- Development of patient triage protocols (including triage area designation) and patient flows in and around the hospital.
- Determination of measures to ensure the safety of hospital staff.
- Maintain continuity of basic services and planned procedures.
- Strengthening the capacity necessary to work with information and communications, personnel issues and logistics.
- Establishment of an epidemic response team and development of an action plan.
- Development of an anti-epidemic action plan adapted to the specifics of the epidemic.
- Taking measures to ensure the ability of healthcare facilities to meet a sudden increase ("surge") in demand for certain services, equipment or supplies caused by an emergency / epidemic.
- Define roles and responsibilities of key departments and individuals involved in emergency response.
- Determination of routes for referral of patients to the hospital:
    - Admission department;
    - Triage;
    - Mechanism of redirection to other health care facilities;
    - Mechanism for communication with and reporting to public health authorities.

Implementation of IPC measures

- Installation of a screening / surveillance system for the early detection and investigation of cases.
- Definition and description of the role and tasks of all employees in the field of IPC during an epidemic situation.
- Training: All staff should receive IPC training to enhance their ability to perform their roles in the implementation of hospital emergency response measures.
- Definition of infection control measures for triage, referral and placement of patients, early enrollment and treatment, specimen collection and transport.
- Define requirements for minimum consumables and infrastructure to implement IPC measures.

CHAPTER X. RATIONAL USE AND MANAGEMENT OF ANTIMICROBIAL DRUGS

The WHOhas named AMR as one of the 10 global public health threats facing humanity. The main factor in the emergence of drug-resistant pathogens is the incorrect and excessive use of antimicrobials.

About 700 thousand people around the world die every year as a result of improper use of antibacterial drugs. This is comparable to the number of coronavirus victims. According to who, in the absence of regulation of antibiotic use, about 10 million people will die each year in 2050 due to the development of antimicrobial resistance (Drug-resistant infections: A threat to our economic future. 2017).

Back in 2016, former WHO Director-General Margaret Chan said " … antimicrobial resistance is a slow-motion tsunami…".

Proper use and management of antimicrobials is an integral part of the IPC programme. An antimicrobial stewardship program (AMP) should be developed in each health care facility to promote the effective and prudent use of antibiotics and to prevent the development and transmission of multidrug-resistant microorganisms (MDRs). A multidrug-resistant organism (MDR) is a multi-antibiotic resistant microorganism. Antibiotic resistance means that some treatments will fail or be less effective.

Unreasonable use of antibiotics in a self-healing or non-infectious disease, as well as the wrong choice of antibiotic, dose or duration of therapy, lead to the development of bacterial resistance, disrupt the normal bacterial flora and increase the risk of colonization of resistant microorganisms. There is a window period between the development of multi-resistance and its actual detection. During this period, the infection can spread among patients if the risk factors for infection are not taken into account. Clinicians may be under pressure to prescribe broad-spectrum drugs where multi-resistant pathogens are widespread, further exacerbating the development of resistant organisms.

10.1 WHO ANTIBIOTIC CLASSIFICATION BOOK (AWARE: ACCESS, WATCH, RESERVE)

In 2017, the WHO Expert Committee on the Selection and Use of Essential Medicines as a Tool to Support the Rational Use of Antibiotics at the Local, National and Global Levels developed the AWaRe Classification of Antibiotics. This classification divides antimicrobials into three groups: access, surveillance, and reserve, taking into account the impact of different antibiotics and classes of antibiotics on antimicrobial resistance to emphasize the importance of their proper use. The 2021 AWaRe classification update includes an additional 78 antibiotics not previously classified, bringing the total to 258.

10.2 ANTIBIOTICS OF THE ACCESS GROUP

This group includes antibiotics that have activity against a wide range of commonly encountered sensitive pathogens, as well as showing lower resistance potential than antibiotics from other groups. Selected antibiotics in the Access group are recommended as primary options for empirical treatment of first or second-line infectious syndromes reviewed by the Expert Committee on the EML, and are listed as individual drugs in the WHO Essential Medicines List (AWaRe 2022 classification).

10.3 ANTIBIOTICS OF THE WATCH GROUP

This group includes classes of antibiotics with higher resistance potential and includes most of the top-priority agents among critically important antimicrobials for human medicine and/or antibiotics that have a relatively high risk of selecting for bacterial resistance. These drugs should be prioritized as the primary objectives of management and monitoring programs. Individual antibiotics of the observation group are recommended as the main first or second choice empiric treatment options for a limited number of specific infectious syndromes and are listed as single medicinal products in the WHOModel Lists of Essential Medicines.

10.4 ANTIBIOTICS OF THE RESERVE GROUP

This group includes antibiotics and classes of antibiotics that should be reserved for the treatment of confirmed or suspected infections caused by multidrug-resistant microorganisms. Reserve group antibiotics should be considered as a “last resort” option.

Antibiotics from the selected reserve group are listed as stand-alone drugs in the WHO Model Lists of Essential Medicines if they have a favorable risk-benefit profile and proven activity against “critically priority” or “high priority” pathogens listed in the WHO Priority Pathogen List, especially carbapenem-resistant enterobacteriaceae. These antibiotics should be available, but their use should be tailored to specific patients and conditions where all alternatives have proven ineffective or inappropriate.

These medicines could be protected and prioritized as key objectives of national and international management programmes, including monitoring and reporting on use to maintain their effectiveness.

Tajikistan updates the Essential Medicines List (EML) based on WHO recommendations every two years. The latest version of the Standard Operating Procedures for Laboratory Services (SOLS) was adapted in 2022, along with the updated Law on Medicines and Medical Devices in the Republic of Tajikistan. To implement the AWaRe classification, the MoHSP will develop by-laws to regulate the correct use of antimicrobials.

Proper use of antimicrobials at the level of health care facilities can be achieved by:

- Developing and approving standard treatment guidelines and protocols or hospital policies for antibiotics with a multidisciplinary approach using a local antibiotic profile.
- Ensuring continuous training of healthcare professionals on the rational use of antibiotics, and ensuring the implementation of antibiotic policies.
- Restrictions on the use of antibiotics according to the WHO AWaRe Classification.

- Antibiotic susceptibility testing before starting treatment or STRICT SELECTION of antibiotics based on the clinical spectrum of the disease, the nature of the sensitivity, the patient's tolerance and their cost.
- The widespread use of antibiotics of the access group is at least 60% of all uses per year with minimal parenteral and maximum oral applications in the appropriate dosage, frequency, time of administration and duration of antimicrobial therapy.
- Discontinuation of antimicrobial therapy based on predetermined criteria.
- Establishment of close contact between clinicians, practitioners, dentists, pharmacists and specialists of laboratories and surveillance system.
- Monitoring AMR surveillance and antimicrobial use.
- Monitoring the dispensing and sale of over-the-counter antimicrobials (especially focusing on reserve and surveillance group drugs).
- Periodic inspections of antibiotic prescriptions and analysis of their consumption and sensitivity.

Proper use of antimicrobials at the level of health care facilities can be achieved by:

- Developing and approving standard treatment guidelines and protocols or hospital policies for antibiotics with a multidisciplinary approach using a local antibiotic profile.
- Ensuring continuous training of healthcare professionals on the rational use of antibiotics, and ensuring the implementation of antibiotic policies.
- Restrictions on the use of certain antibiotics.
- Antibiotic susceptibility testing before starting treatment or STRICT SELECTION of antibiotics based on the clinical spectrum of the disease, the nature of the sensitivity, the patient's tolerance and their cost.
- Widespread use of antibiotics with a narrower spectrum of action with appropriate dosage, frequency, time of administration and duration of antimicrobial therapy.
- Discontinuation of antimicrobial therapy based on predetermined criteria.
- Establishing close cooperation between clinicians, practicing physicians, dentists, pharmacists, laboratory specialists, and the epidemiological surveillance system.
- Monitoring AMR surveillance and antimicrobial use.
- Monitoring the dispensing and sale of antimicrobial drugs without prescriptions (with a particular focus on reserve and watch drug groups).
- Conducting periodic reviews of antibiotic prescriptions and analyzing their consumption and sensitivity.

WHO recommends at least 10 key interventions to rationalize the use of antibacterial drugs, six before or during prescription and four after prescription. (*Antimicrobial stewardship interventions: a practical guide. 2021)*

Table 31. A compilation containing a list of 10 interventions

Interventions before or during the appointment	Post-appointment interventions
• Raising awareness of clinicians • Patient and public education • Facility Specific Guidelines for the Management of Common Infections • Cumulative antibioticograms • Prior authorization for the use of restricted antimicrobials • Cancellation of erroneous labeling of antibiotic allergy	• Prospective audit and feedback • Self-assessment by physicians of antibiotic prescriptions (antibiotic timeout) • Antibiotic Dose Optimization • Determination of the duration of antibiotic therapy

CHAPTER XI. PROTECTION OF HEALTHCARE PROFESSIONALS

11.1 PREVENTION OF INFECTIONS AMONG HEALTH CARE WORKERS

Healthcare professionals perform a wide range of activities in a variety of settings that pose a threat to their health and well-being. The administration of the health care facility is responsible for the safety and health of its employees. At the same time, healthcare professionals are also responsible for implementing safe working practices and taking the necessary precautions to reduce risk in the course of their work.

The following are the main types of health threats:

- **Physical hazards**: for example, injuries when lifting and moving patients.
- **Chemical hazards**: e.g. exposure to toxic chemicals such as disinfectants.
- **Biological** threats: for example, infections transmitted in health care facilities.
- **Radiation hazards**: for example, exposure to X-ray and radiotherapy facilities.
- **Psychological threats**: for example, stress due to lack of staff, night shifts.
- **Ergonomics**: e.g. back or neck pain or eye strain due to poorly designed seats, workstations, bed arrangement and / or treatment room.
- **Accidents / falls** due to lack of patient safety measures.

Personnel protection is an integral part of health and safety. It is the responsibility of all health facilities to ensure that all their staff are adequately trained and equipped with the skills necessary to operate safely. All health care workers should receive appropriate education and *practical* training on all issues related to infection prevention and control as part of their familiarization with the tasks and responsibilities and this process should become mandatory for the institution.

11.2 OCCUPATIONAL HEALTH PROGRAM/HEALTH FACILITY RESPONSIBILITY

An occupational health programme is essential for the effective implementation of an IPC programme and has an impact on patient safety. All health care workers should have access to an employee health care program with the following responsibilities:

- Conduct a pre-employment health assessment and health check-up of all personnel through regular mandatory medical check-ups.
- Maintaining accurate and up-to-date records of all employees.
- Immunization of all personnel at the required time interval in accordance with national requirements.
- Organization of training for personnel at all levels of personal hygiene and handling of sharp and prickly objects and contact with blood and body fluids.

- Conduct an assessment of personnel returning to work after absences due to diarrhea or other infectious diseases to ensure that the infection has cleared and provide recommendations regarding individuals who are chronic carriers.
- Keeping records of all injuries with sharp and stabbing objects / vaccinations and, if necessary, organizing post-exposure prophylaxis and staff counseling.
- Periodic assessment of potential infectious / microbiological and chemical (e.g. chemical disinfectants) threats to personnel at the HF level.
- Conducting regular training among all health care workers on safety regulations and IPC.

It is also necessary to establish the immune status of the employee, i.e. whether the healthcare worker is vaccinated against tuberculosis, rubella, measles, mumps, chickenpox and hepatitis B virus. In addition, it is possible to clarify and identify the presence of skin diseases such as eczema and infectious disease, or the presence of an immunosuppressive disorder in the history. All health information and medical records of each employee must be *kept confidential.*

11.3 RESPONSIBILITY OF HEALTHCARE PROFESSIONALS

Each employee has a responsibility to play their role in IPC, and to implement best practices in their day-to-day work to protect their own health and safety as well as the health and safety of others. It is important to note that certain health conditions (such as pregnancy, immune status, and certain skin conditions) increase the susceptibility of health care workers to infection.

Staff should be suspended from work if they suffer from acute or chronic diarrhea or respiratory illness. Institution staff should inform management immediately in the presence of any infections that may threaten others.

Healthcare professionals are responsible for immediately seeking professional advice and complying with recommendations as to whether they should change their professional practices or current responsibilities if they have any reason to believe they have been exposed to a serious vector-borne infection. It is imperative that healthcare professionals do not rely on their own risk assessment.

The responsibilities of the health care provider for the prevention of Hai include:

- Timely informing the administration of the healthcare facility about any epidemiologically significant contact.
- Timely informing the administration of the health care facility about the presence of an infection that poses a threat to others.
- Immediate appeal for appropriate medical care to a specialist doctor in case of illness.
- Resolving the issue of temporary suspension from work due to the presence of an infectious disease or transfer to another job.
- Resolving the issue of temporary suspension or transfer to another job in the presence of a condition or disease in which contact with infections is especially undesirable (pregnancy, taking immunosuppressants, etc.).

In table 32, recommendations are provided for the temporary isolation of employees with acute infectious diseases from work.

Table 32. Recommendations for admission to work after acute infectious diseases

Infection	Permit To Work
Conjunctivitis	After the disappearance of symptoms
Gastroenteritis (giardiasis, dysentery, salmonellosis)	24 hours after the disappearance of symptoms. If gastroenteritis is caused by norovirus — within 48 hours after symptoms disappear
Herpes (in the presence of open rashes)	After the disappearance of symptoms
Influenza	6 days after symptom resolution
Pertussis	5 days after completion of antibiotic therapy or 21 days after onset of symptoms without antibiotics
Pediculus (negative)	After the end of the first course of treatment
Staphylococcal infection (if it is impossible to close the focus of inflammation with a bandage)	After completion of antibacterial therapy and disappearance of symptoms
Streptococcal infection (if it is impossible to close the focus of inflammation with a bandage)	4 hours after the start of antibacterial therapy. Employees with pharyngitis / tonsillitis should avoid contact with patients for at least 24 hours after starting antibiotic therapy
Tuberculosis	If there is a risk of infection with tuberculosis, the employee must undergo an appropriate examination and is suspended from work until permission is obtained from the TB doctor
Measles and rubella	4 days after the rash disappears. In case of suspicion — after receiving negative results of serological tests
Mumps	9 days after the onset of symptoms. In case of suspicion — after receiving negative results of serological tests
Chicken Pox	After the disappearance of symptoms
Respiratory viral infections	After the disappearance of symptoms
Infectious mononucleosis	Employees are not suspended from work as long as they feel well enough

11.4 MANAGEMENT OF SHARP AND NEEDLESTICK INJURIES AND CONTACT WITH BLOOD AND BODY FLUIDS

Infections transmitted through contact with blood and body fluids remain a serious problem, and the risk of infection depends on the prevalence of the serotype in the general population. Overall, more than 30 different pathogens have been reported to cause infection after contact with blood or body fluids by healthcare professionals and laboratory personnel.

HIV, hepatitis B and C, and syphilis are a spectrum of major infections that can be transmitted through blood and other body fluids.

It is estimated that the risk of HIV transmission is 0.03% (~1:3000) by skin contact and 0.1% (~1:1000) by contact with the blood of an HIV-infected person.

The risk of contracting the hepatitis C virus as a result of an accidental needle shot can be estimated from 0 to 3% and can reach a maximum of 10% only if the patient has hepatitis C RNA.

HBV has the highest concentration in serum, the lowest – in semen and saliva. The virus is resistant, lives in the environment for more than 7 days. Among a vulnerable group of healthcare professionals, the risk of HBV infection following a needle-stick injury ranges from 6 to 30%, depending on the absence or presence of the HBV e-antigen. If the HCW is fully vaccinated, there is probably no risk.

It is important that all healthcare professionals apply a safe work system when using or disposing of sharp objects. Healthcare professionals should follow standard IPC precautions, including hand hygiene and appropriate use of PPE, when performing any task or activity involving potential contact with blood, body fluids or tissues.

A sharp object injury can be defined as a puncture of the skin by an instrument or object contaminated with human blood, *body fluids* or high-risk tissues. For practical purposes, personnel who have eye, mouth, skin contamination, cuts or abrasions, splashes or spills will be managed in accordance with the sharps handling policy.

Biological fluids of increased risk include blood, amniotic fluid, semen, vaginal secretions, human breast milk, cerebrospinal fluid, peritoneal fluid, pleural fluid, pericardial fluid, synovial fluid, saliva associated with dental procedures (likely to be contaminated with blood, even if not visibly so), exudate, or other tissue fluids from burns or skin lesions, as well as unfixed tissues and organs. *Low-risk body fluids* (unless they have visible spots) include urine, vomit, saliva (unrelated to dentistry), and feces.

11.5 RISK ASSESSMENT

Risk assessment is an integral part of management and requires the collection of the following information for assessment:

- Type of fluids: blood, body fluids and other potentially infectious tissues.
- Inoculum Size: Evaluate the inoculum size.
- Type of injury, extent and depth, i.e. superficial or deep.
- The size and type of the contaminated needle, i.e. was the instrument / needle hollow or hard, and was there visible blood contamination?
- The degree and duration of contamination, i.e. massive or minor, and the duration of contact of blood and body fluids with the skin or mucous membrane.

- If the injury was caused by a needle, was it used to administer drugs or draw blood and was it attached to a syringe of blood?

11.6 EVALUATION OF ORIGINAL PATIENT AND HEALTHCARE PROVIDER

- After obtaining informed consent, request and obtain an initial sample for urgent testing for HBV, HCV, and HIV. In this case, the possibility of using rapid testing should be considered.
- Conducting an infection risk assessment for unknown sources.
- Discarded needles or syringes should not be tested for blood-borne viruses.
- Conducting an assessment of exposed health care workers. This assessment is based on a risk analysis.
- Administer appropriate PEP if the risk of HIV or HBV and HCV infection is significant. If the source is unknown, as much information as possible should be collected to assess the risks.

First Aid

If blood or other body fluids come into contact with the skin:

- Washing with soap and water;
- 70% alcohol treatment.

In case of damage (injections, cuts, etc.):

- Removing the glove or exposing the wound area;
- Hand washing with soap under running water;
- Lubrication of the wound with antiseptic solution;
- Sealing the wound with a bactericidal patch.

If blood and other body fluids of the patient come into contact with the mucous membranes of the eyes, nose and mouth:

- Flushing the oral area with plenty of water;
- Rinsing the mucous membrane of the eyes and nose with water (do not rub).

If blood and other body fluids of the patient get on the robe, clothing:

- Removing work clothing and placing it in a container for soiled laundry, then sending it to the laundry for washing;
- Other actions: Immediate notification of the head of the department about the incident;
- Filling out the incident form and liaising with the union in accordance with local regulations;
- Assessment of the risk of injury and the adoption of appropriate measures by the trade union.

It is critical that HCWs do not rely on their own risk assessment.

11.7 PREVENTIVE MEASURES AFTER EXPOSURE

When considering post-exposure prophylaxis (PEP), the survivor should undergo a risk assessment and receive counseling. After consultation and advice, the affected employee may, in the absence of any contraindications, decide to start implementing PEP (post-exposure prophylaxis) measures as follows:

Hepatitis B: as recommended , this should be discussed with the responsible person of the institution who will assess the immune status of the HBV infection and take appropriate action. Based on the evaluation, hepatitis B vaccine ± hepatitis B immunoglobulin can be administered.

Hepatitis C virus: There is currently no effective vaccine to prevent HCV transmission. However, treatment of acute hepatitis C is known to be highly effective. Please contact your local expert for evaluation, testing and treatment in accordance with the rules established by the Ministry of Health and Social Protection of the Republic of Tajikistan.

Human Immunodeficiency Virus (HIV): Urgent action is needed. If indicated, CVP measures should be initiated as soon as possible, ideally within one hour of injury or within 72 hours of exposure. Typically, healthcare facilities should store starter kits in a pharmacy, and they consist of a starter package of antiretroviral therapy for 3–5 days. If PEP is initiated, risk assessment, counseling, analysis of test results, and treatment monitoring are important in local infectious disease. HIV PEP interventions consist of a 28-day course of antiretroviral therapy.

11.8 RISK BASED VACCINATION REQUIREMENTS

Depending on their work activity and the risk of contact with blood and biological substances, health workers can be assigned to risk categories A, B and C, and, accordingly, requirements for vaccination before employment are developed:

- **Category A** - High risk (direct contact with blood or biological substances): doctors, nurses, medical students and nurses, dentists, laboratory staff, medical equipment maintenance engineers, CSO staff, nurses, employees responsible for biomedical waste management.
- **Category B** - Low risk (indirect contact with blood and body substances): there is a risk of airborne contamination, but rarely have direct contact with blood or body substances (e.g. food service personnel and support staff).
- **Category C** - Minimal risk (minimal patient contact): the same risk of contact with blood and body fluids as the general population, i.e. office clerks, gardeners and kitchen staff. Immunization requirements can be considered based on their actual job requirements.

Based on this classification, immunization requirements are considered as follows.

Hepatitis B

HBV vaccine for risk categories A, B and C

- Mandatory immune test for HBV antigens.
- HBV antigens >10 at any post-vaccination stage indicate lifelong immunity to hepatitis.

Influenza

Provide seasonal influenza vaccine annually to individuals in Risk Categories A and B.

Tetanus toxoid:

It can be administered to persons of risk categories A and B if they have not been vaccinated within the last 6 months.

Rabies

Consideration should be given to assigning PEP to HCWs working with rabies cases, Risk Category A.

CHAPTER XII. PREVENTION OF INFECTIONS AT HOME

12.1 GENERAL PRINCIPLES

Many patients with acute and chronic illnesses are usually treated at home. This situation poses a risk of transmission to family members caring for patients and the surrounding population. Healthcare professionals who work with such families and caregivers should consider it their responsibility to teach the following infection prevention techniques that can reduce the risk of infection:

- Hands hygiene
  - Regular and thorough hand washing before and after contact with the patient, his blood or body fluids, using soap and clean running water (for example, from a tap or watering from a jug), or
  - The use of an alcohol-based hand treatment solution (see the formula for mixing the solution).
- Patients should be in a well-lit room with access to fresh air.
- Patients should be dressed in clean clothes and their bed should be kept clean and dry at all times.
- The person caring for the patient should wear clean clothes, clothes, sheets should be washed with soap or detergent and dried in the sun, and clothes should be ironed with a hot iron.
- Disinfecting surfaces that are subject to frequent touching. Scheduling of daily and weekly cleaning and disinfection activities based on location and level of contamination. You should clean more often when there are patients in the family.
- Preventing the patient from lying in one position for a long time, assisting them in regularly turning over or changing positions to prevent the appearance of pressure sores.
- All family members must observe respiratory etiquette. When coughing and sneezing, cover the inside of the hand, not the palms, and cover the mouth when coughing with a handkerchief (preferably) or cloth. Always dispose of used wipes in dumpsters and wash your hands after coughing and sneezing each time.
- If the patient has diarrhea, they should use a toilet or vessel, and wash their hands thoroughly with soap under clean, running water after each stool, and before eating and contacting or preparing food or beverages.
- Cover the mattress with a plastic sheet that can be easily disinfected and washed.
- Check that the patient takes all medications prescribed by the doctor.
- If direct contact with tissues, blood, body fluids, secretions or excrement is possible, the person caring for the patient should wear gloves that are properly removed after the

procedure. Even if the gloves have been worn, the hands should be washed before putting the gloves on and after removing them. If gloves are not available, even simple plastic bags (clean and dry) will provide some protection against infection.

- If you need to remove the hair, do not shave it with a razor – if necessary, cut the hair close to the surface of the skin with scissors, but do not break the integrity of the skin.
- Any tissue, plastic coating or clothing that has come into contact with blood, body fluids, secretions or excrement should be removed. If there is a need to reuse them, they should be decontaminated in 0.5% chlorine solution for 10 minutes, washed with soap or detergent solution, and dried in the sun (clothes should then be ironed).
- Wipe hard surfaces (mattresses, tables) that may be in contact with blood, body fluids, secretions or excrement, a cloth soaked in 0.5% chlorine solution.
- If any instruments to be reused (e.g. knife) are used, they must be decontaminated in 0.5% chlorine solution for 10 minutes, washed with soap or cleaning solution to remove blood and tissues, and boiled for 20 minutes.
- Dispose of all materials that have been in contact with blood, body fluids, secretions or excrement properly, so that they do not pose a threat to the family and the surrounding population.
- The best method is to burn and bury all materials that have been in contact with blood, body fluids, secretions or excrement (napkins, cloth or plastic sheets, gloves, blades, etc.).
- Waste should be buried in a deep pit and completely covered with earth so that children or other people cannot reach it. They can also be thrown into a deep waste pit.
- When cleaning the premises or during waste disposal, gloves should be worn.

APPENDIX

APPENDIX 1. TERMS AND DEFINITIONS

Administrative monitoring	A way to reduce patient or employee exposure by implementing policies and procedures, changing the allocation of responsibilities, training in specific work practices, and taking other administrative measures to reduce exposure.
Algorithm	technology of therapeutic and diagnostic manipulations and preventive measures, taking into account the exclusion of risk factors.
Antibiotics	Substances of natural or semisynthetic origin that inhibit the growth of living cells, most often prokaryotic or protozoa.
Antiseptic treatment procedure	A complex of therapeutic and preventive measures aimed at the destruction of microbes on the skin, in the wound, pathological formation or the body as a whole.
ANTISEPTIC	A chemical agent that, when applied to living tissue, destroys or inhibits the reproduction of microorganisms.
Asepsis	A set of measures aimed at preventing the ingress of a microorganism into the (wound) of the patient's body, and includes the destruction of microbes and their spores by disinfection and sterilization.
Aseptic technique	The technique where medical instruments and gloved hands of healthcare workers must not touch surrounding objects during surgical operations or invasive procedures.
Safety	No unacceptable risk associated with the possibility of damage
Safe injection	An injection that does not harm the patient, does not expose the healthcare professional to any risk, and does not create waste that poses a risk to society.
Biological Safety	A set of measures to prevent the occurrence of the disease in patients and medical personnel, the state of carriage, intoxication, sensitization of the body, injuries caused by microorganisms and their waste products, as well as cell and tissue cultures.
Hospital-Acquired Infection	This refers to any clinically manifested diseases of microbial origin that affect a person as a result of their hospitalization or visit to a medical, preventive, social, or cosmetic institution, for the purpose of treatment or prevention, or after discharge from the hospital (e.g., wound infection). It also includes personnel in these institutions due to their professional activities, regardless of whether symptoms of the disease manifest during the presence of these individuals in the aforementioned institutions

	(according to the incubation period).
Epidemic outbreak (group incidence)	A short-term increase in the incidence of an infectious disease in a limited group of the population (collective, locality), the incidence of which is associated with a common source of the infectious agent and / or with a common factor of transmission.
Susceptibility	The ability of the human body, animals, plants to disease in contact with pathogenic agents of biological nature (viruses, microbes, protozoa, etc.).
Thorough cleaning	This is a complex of sanitary and hygienic and disinfection measures aimed at creating an aseptic regime of premises where certain medical manipulations are carried out.
Hand Hygiene	A set of methodological techniques, including the use of a detergent or antiseptic, to remove contaminants and transient microflora from the skin of the hands of medical personnel.
Disinfection (decontamination)	A set of measures aimed at partial, complete or selective destruction of potentially pathogenic microorganisms for humans at environmental facilities in order to break the path of transmission of infectious agents from the source of infection to susceptible people.
DISINFECTANTS	Disinfectants, sterilizers, disinsection and deratization agents used for the prevention and control of infectious, parasitic diseases of humans, ensuring the killing of the causative agents of the above diseases, their carriers and preservation reservoirs.
Disinfectant	A physical or chemical agent comprising a disinfectant or active substance.
Disinfectant solution	An alcohol-containing formulation (liquid, alcohol-based hand gel) intended for hand hygiene to prevent the spread of microorganisms.
Decontamination	The use of physical or chemical means to remove, decontaminate or destroy pathogens from a surface or object to the extent that they are no longer capable of transmitting infectious particles and the surface or object is rendered safe for handling, use or disposal. This term is used to refer to cleaning, disinfection and sterilization.
Isolation	A set of measures aimed at preventing the transmission of infectious agents from patients with potentially contagious diseases, conditions to other patients, medical workers and visitors to a health care facility.
Invasive medical intervention	The use of devices and devices that overcome the natural barriers of the body, with which the infectious agent can penetrate directly into the bloodstream, organs, cavities and tissues of the patient's body.
Health care-associated infection (HAI)	This refers to any clinically manifested diseases of microbial origin that affect a person during their hospitalization or visit to

	a medical, preventive, social, or cosmetic institution for the purpose of treatment or prevention, or after discharge from the hospital (e.g., wound infection). It also includes personnel in these institutions due to their professional activities, regardless of whether symptoms of the disease manifest during the presence of these individuals in the aforementioned institutions (according to the incubation period). It also includes cases of infection in healthcare workers as a result of their professional activities.
Engineering controls	Engineering control is necessary to reduce the concentration of infectious bacilli in the air in places where air contamination is most likely. Engineering control includes: ventilation; ultraviolet radiation and air filtration.
Used bed linen	Refers to any bed linen that has been used to care for patients without severe contaminants.
Quality of care	A system of criteria that allows to determine the quality of medical care as in a certain medical institution, at a certain doctor, in a certain territory.
Catheter-associated bloodstream infections (CCAIC)	A group of infectious diseases that develop in a person as a result of the use of a vascular catheter for the administration of drugs, blood sampling or other procedures in the provision of medical care.
Cosmetic service	It is a facial and body care service by physically and chemically treating the skin of the face and body, the eyebrows and eyelashes of the client in order to rejuvenate them, as well as to give the face an individual expressiveness using decorative cosmetics to meet the aesthetic needs of the client in accordance with fashion.
Skin antiseptic	An antiseptic intended to be applied to intact healthy skin to prevent the transmission of transient or resident skin bacteria from person to person or from the surgical site to the underlying tissues. Skin disinfectants include antiseptics, antiseptic soaps and handwashes, and hand rubs.
Infection Control	A system of effective organizational, preventive and anti-epidemic measures aimed at preventing the occurrence and spread of hospital infections, based on the results of epidemiological diagnostics.
Surgical site infection	This is any clinically recognized infection affecting organs and tissues of the human body affected during surgery, and occurs precisely in connection with surgery within 30 days (without an implant) or 1 year (with an implant) after surgery.
Urinary tract infection	This is a term that combines a number of genitourinary diseases in which there is microbial colonization in the urine above 104-105 CFU/ml and microbial invasion with the development of an infectious process in any part of the genitourinary tract from the external opening of the urethra to the cortical substance of the

	kidneys. Depending on the level of damage to the urinary system, pyelonephritis, cystitis, prostatitis, urethritis, etc. differ. The category of urinary tract infections includes clinically pronounced urinary tract infections, asymptomatic bacteriuria and other urinary tract infections.
Lower respiratory tract infection (nosocomial pneumonia)	These are cases of inflammatory lung damage that developed no earlier than 48 hours after the patient was admitted to a medical institution.
Information and communication technologies	A set of methodological, technical software or other means for the effective processing, transmission and use of information.
Health facility	All types of organizations, regardless of the legal form and form of ownership, the main activity of which is outpatient and / or inpatient medical care.
Health Care	A set of measures aimed at meeting the needs of the population in maintaining and restoring health.
Medical service	An event or a set of measures aimed at the prevention of diseases, their diagnosis and treatment, as well as medical rehabilitation, having an independent completed value and a certain cost and provided by employees with higher or secondary medical education.
Medical waste	Means any waste consisting wholly or partly of human or animal tissue, blood or other body fluids, excrement, drugs or other pharmaceutical products, bandages or clothing or medical care and dental practices or syringes, needles or other sharp objects which have been in contact with blood or excrement and, if not rendered harmless, may be hazardous to any person coming into contact with them. Medical waste also includes waste produced in small quantities during medical procedures, including at home (for example, during injections, etc.).
Medical Technology	The set and procedure of medical measures, including methods of diagnosis, treatment, rehabilitation and prevention, necessary for the provision of medical care to the patient.
Microbiological monitoring	Comprehensive and dynamic monitoring of pathogenic and opportunistic microorganisms isolated from patients, staff and facilities of the hospital environment of a medical institution, their properties and circulation features.
Handwashing	Wash hands with soap and water followed by drying with disposable towels.
Infection carrier	A person (host) who is a carrier of a microorganism (pathogen) but does not necessarily exhibit clinical signs / symptoms of the disease. Depending on the type of pathogen, the carrier may periodically or continuously release microorganisms into the environment and therefore act as a potential reservoir or source of infection.

Sharp objects	Any objects capable of inflicting penetrating wounds, including needles, scalpel blades, wires, trochors, autolancets, wire cutters, etc.
Occupational health and safety	Preventive and curative health services in the workplace provided by trained occupational health professionals, i.e. nurses, hygienists, doctors.
Cleaning of HF	This is a set of measures to reduce the risks from hazardous medical waste, providing for mandatory disinfection and / or detoxification, as well as a possible reduction in volumes and / or making them unrecognizable.
Waste management	All activities related to the separation, collection, storage, use, disposal, transportation and disposal of waste.
Waste decontamination	Waste decontamination: Treatment (including incineration) at specialized waste treatment facilities, reducing the hazardous effect of the waste on the environment and on people.
Hazardous Waste	These are wastes (except radioactive) containing substances that have hazardous properties (toxicity, infectivity, explosiveness, flammability, high reactivity) and are present in such quantities and in such a form that they pose an immediate or potential threat to human health or the environment, both independently and when in contact with other substances.
Patient	A person whouses medical services, regardless of whether they have a disease, or who has applied for medical services.
Personnel	Employees, contract workers, and health care workers who provide services in a health care facility.
Post Exposure HIV Prophylaxis	Preventive measures proposed to prevent specific aspects of HIV exposure and to prevent HIV infection in people exposed. These services include counselling, risk assessment, HIV test (subject to informed consent), first aid and, if necessary, a short (28 days) course of antiretroviral treatment with follow-up and support.
Post-exposure prophylaxis (PEP)	Therapy carried out to prevent the transmission of bloodborne pathogens after potential exposure. PEP is effective for HIV and hepatitis B.
Pre-sterilization Cleaning	Removal from products to be sterilized of any medical products, organic (protein, fat, etc.) and inorganic contaminants, including drug residues.
Prevention	A system of comprehensive state, social, hygienic and medical measures aimed at preventing diseases and / or eliminating risk factors.
Standard definition	A set of standard criteria for resolving the case of the presence or absence of a particular disease / condition in a given individual.
Sanitation	A system of measures ensuring the protection of health and

	prevention of various diseases, as well as a set of measures for the practical application of standards, sanitary rules and technologies developed by hygienic science, ensuring the optimization of living conditions, work, rest, nutrition, by wastewater treatment and at the stages of localization, emptying, transportation, final disposal.
Sanitary and epidemic measures	Organizational, administrative, engineering, health, veterinary and other measures aimed at eliminating or reducing the harmful effects of environmental factors on humans, preventing the occurrence and spread of infectious diseases and mass non-communicable diseases (poisoning) and their elimination.
Sanitary system	Sanitary system: is a specific series of sanitary technologies (and services) for the management of faecal sludge and/or wastewater at the stages of containment, emptying, transportation, treatment and end use/disposal.
Waste segregation	Activities for the collection and temporary storage of waste in accordance with the established classes of threat, physical properties and aggregate state.
Standard measures	Daily procedures aimed at reducing the risk of spreading diseases among patients and employees of the treatment and prevention organization.
Special measures	Measures implemented in cases where the implementation of standard precautions is not sufficient.
Personal Protective Equipment (PPE)	Products designed to protect clothing, skin and mucous membranes from the effects of infectious materials. These include: gloves, lab coats, aprons, shoe covers, goggles, sunglasses, masks, respirators, and resuscitation bags.
Sterilization	A method that ensures the death of vegetative and spore forms of pathogenic and non-pathogenic microorganisms in the sterilized material.
Health facilities	An institution of any organizational and legal form that carries out medical activities and provides medical services.
Environmental cleaning	Cleaning and disinfection (if necessary, depending on the level of risk) of environmental surfaces (e.g. bed rails, mattresses, call buttons, chairs) and surfaces of non-critical patient care equipment (e.g. IV racks, stethoscopes).
Epidemiological diagnostics	Recognition of the manifestations of morbidity and epidemiological status based on epidemiological research methods and scientific data on the cause, conditions and mechanism of occurrence and spread of diseases.
Epidemiological surveillance	One of the main components of infection control involves the systematic collection of information under a special program on the occurrence of hospital-acquired infections and the factors affecting it, the analysis and comparison of the data obtained, and the provision of information to medical personnel to

	address issues on measures to improve the quality of medical care.
Epidemic process	The process of interaction between the pathogen – parasite and the human body at the population level, manifested under certain social and natural conditions by single and / or multiple diseases, as well as asymptomatic forms of infection.
Epidemiological control	Continuous epidemiological and management activities aimed at reducing losses (due to morbidity, mortality, disability) and improving public health.
Epidemic	The progressive spread of an infectious disease among people, which significantly exceeds the incidence rate usually recorded in this territory and can cause emergencies.
Exogenous infection	An infection caused by a pathogen that has entered the body from the environment.
Endogenous infection	infection caused by the activation of an obligate-pathogenic microbe already in the body (for example, mycobacterium tuberculosis) or microbes - normal inhabitants of the human body. It usually occurs as a result of a decrease in natural and (and) acquired immunity, as well as a result of passive introduction of a large dose of the microbe into sterile areas of the human body.
Sodium hypochlorite (NaOCl) **Calcium Carbonate**	is a solution obtained by reacting chlorine with a solution of sodium hydroxide. These two reagents are the main byproducts of most chlor-alkaline cells. Sodium hypochlorite, commonly referred to as bleach, has many uses and is an excellent disinfectant/antimicrobial agent is a white solid containing 65% free chlorine and readily soluble in water. Calcium hypochlorite is very stable and can be stored for a long time. Corrosive material with strong odor.
Surgical hand preparation	A set of methodological techniques, including hygienic washing of hands (hands, wrists and forearms), followed by their treatment with a skin antiseptic, to destroy the transient, as well as reduce the amount of resident (natural) microflora.
Exogenous infection	An infection caused by a pathogen that has entered the body from the environment.
Infection transmission	Infectious diseases acquired before admission to the hospital and manifested or detected in the hospital.
Waste transportation	Transfer of waste between objects of its generation, sorting, storage, processing, neutralization, disposal and destruction.
Waste management	The purposeful disposal, disposal, destruction, removal, disposal or discharge of any waste into the air, on land and in the water. In the context of this document, disposal means the storage and subsequent destruction of injection equipment and blood collection devices in order to prevent their reuse and prevent injury.

APPENDIX 2. THE ALGORITHM OF ACTIONS FOR PREPARING A 0.5% SOLUTION OF CHLORINE IS AS FOLLOWS

Determination of the activity (percentage content) of chlorine in a laboratory of the Sanitary and Epidemiological Service (SES). The correct preparation of a chlorine solution depends on the chlorine's activity or concentration	
Wearing an additional medical gown, apron, respirator, rubber gloves on yourself	
Dilution of the required amount of chlorine depending on the activity and needs of your institution	
The process begins with dissolving calcium hypochlorite by adding a small amount of water and stirring with a wooden spatula until it forms a uniform paste. Then, the remaining amount of water is added to reach the desired volume	
Settling the mixture in a container for 30 minutes	
Labeling of the container with the disinfecting solution indicating the concentration and name of the solution, date, time of preparation of the solution, full name of the person who prepared this solution. This information should also be logged	
The potency (activity) of a chlorine solution remains effective for up to 8 hours	
Storage in a hermetically sealed container in a cool, well-ventilated area inaccessible to unauthorized persons	

APPENDIX 3. THE FORMULA FOR PREPARING A DILUTED SOLUTION OF CHLORINE FROM DRY CHLORINE POWDER IS AS FOLLOWS

When preparing a calcium hypochlorite solution, it is important to take into account the percentage of active chlorine content (activity) in the dry chlorine powder.

$$\frac{desired\ chlorine\ concentration\ (0{,}5\%)}{available\ concentration\ (65\%)} \times 1000$$

Example: If you want to prepare a 0.5% solution from 65% chlorine powder, it should look like this:

$$\frac{0{,}5}{65} \times 1000 = 7{,}7\ gr. = per\ 1\ lit\ of\ water$$

Therefore:

$$50\ lit = 7{,}7 \times 50 = 385\ grm$$

Since it was easier to calculate, 1 tablespoon equals = 15 grams:

$$\frac{385\ gr.}{15\ gr.} = 26\ spoons$$

That is, to obtain 50 liters of a solution with a concentration of 0.5% for disinfection, 26 spoons of chlorine with a concentration of 65% will be required.

Formula for preparing a diluted chlorine solution from any concentrated chlorine solution i.e. concentrate.

Check the concentration (% concentrate) of the chlorine product you are using.

Determine the required number of parts of water using the following formula.

Total number of parts (ppm) of water = $\left[\frac{actual\ \%}{desired\ \%}\right] - 1$

Mix 1 part of concentrated chlorine solution with a total number of parts of water.

Example: Prepare a solution (0.5%) from a 5% concentrated solution

STEP 1: Calculate the O.N. of water: $\left[\frac{5.0\%}{0.5\%}\right]$ −1 = 10 − 1 = 9

STEP 2: Take 1 part of the concentrated solution and add 9 parts.

The approximate amount (in grams) required to prepare 0.1% and 0.5% chlorine-containing solutions from several commercially available chlorine-containing tabletted and powdered products is given in Table 33.

Table 33. Preparation of diluted chlorine solutions from dry powders

Available chlorine (%)[29]	0,5%	0,1%
Calcium hypochlorite (70% active chlorine)	7,1 g/L [30]	1,4 g/L
Calcium hypochlorite (35% active chlorine)	14,2 g/L	2,8 g/L

[29] Use boiled water to prepare a 0.1% chlorine solution for deep disinfection, as tap water contains microscopic organic substances that deactivate chlorine.

[30] For dry powders, read: X grams per liter (for example: calcium hypochlorite – 7.1 grams mixed with 1 liter of water).

APPENDIX 4. CHECK LISTS/CONTROL LIST FOR IPC

CHECKLIST FOR THE FIRST CONTROL OF MEDICAL WASTE COLLECTION, STORAGE, AND DISPOSAL

Name of the medical organization _____

Organizational unit _____

Responsible individual _____

Date of the audit «_____»_____ 202__ .

What to check	YES	NO	Note
Disposable containers (bags, containers) with waste of Class A and B are labeled with the code of the healthcare institution's subdivision, the name of the institution, the date, and the last name of the person responsible for waste collection	☐	☐	
- «Medical waste. Class A»	☐	☐	
- «Hazardous Waste. Test Class B»	☐	☐	
Medical waste of Class A is collected in a foot-operated container lined with a disposable bag of any color, except yellow and red	☐	☐	
Piercing and cutting waste is collected in puncture-resistant disposable containers of yellow color	☐	☐	
Other Class B waste is collected in the pedal-operated container installed in the room, lined with a disposable bag of yellow color	☐	☐	
Disposable bags are filled to a volume of no more than ¾	☐	☐	
When sealing disposable bags, use zip ties or other devices to prevent the spillage of Class B waste	☐	☐	
The collection and storage deadlines at the medical waste collection point have been observed	☐	☐	
There is a stand-cart with a bag attached to it for transporting Class B medical waste	☐	☐	
At the end of the shift, reusable equipment is disinfected by wiping it with a cloth soaked in a disinfectant solution approved for this purpose	☐	☐	
Personal protective equipment is available	☐	☐	
Documentation:	☐	☐	
- Algorithms / Standard Operating Procedures (SOP) for collection, storage, and disposal	☐	☐	
- Journal for recording medical waste of the structural subdivision	☐	☐	

CHECKLIST FOR THE CHIEF NURSE FOR IPC

Name of the medical organization _____

Organizational unit _____

Responsible individual _____

Date of audit/monitoring «_____»_____ 202__ .

What to check	Yes	No
The rooms in the department are visually clean	☐	☐
Regular cleaning in all department rooms is conducted at least twice a day	☐	☐
The cleaning equipment is labeled, used for its intended purpose, stored in specially designated areas outside of working offices	☐	☐
All reusable medical devices undergo disinfection after each use	☐	☐
All reusable medical devices are disposed of as medical waste after use	☐	☐
Critical medical devices undergo three stages of processing: disinfection, pre-sterilization cleaning, and sterilization	☐	☐
Surfaces in procedure rooms that come into contact with patients (couches, dressing tables, procedure tables) are disinfected after each procedure	☐	☐
The department is equipped with all the necessary disinfectants in full	☐	☐
Disinfectants are used in accordance with the instructions for use	☐	☐
The containers with working solutions of disinfectants are labeled	☐	☐
For the collection of sharp medical waste of Class B, puncture-resistant and moisture-resistant containers with tightly fitting lids are used	☐	☐
Class B medical waste is promptly disinfected	☐	☐
The department's staff is provided with special clothing, footwear, and personal protective equipment	☐	☐
The rules for using medical gloves and personal protective equipment are followed by the department staff	☐	☐
Changing special clothing is done regularly	☐	☐
Personal belongings and special clothing are stored separately	☐	☐
The staff of the department follows the rules of hand hygiene for medical workers	☐	☐
The staff is provided with the necessary skin antiseptics and hand care products in full	☐	☐

CLEANING QUALITY CHECKLIST

Structural unit _____

Date of inspection: «_____»_____ 202__ .

Inspection Time: _____

Who checked_____

	Results	
	YES	YES
1. Condition of chambers/offices:		
Horizontal surfaces are clean and, streak-free	☐	☐
Walls are clean, no visible dirt	☐	☐
The floor surface and baseboards are clean and streak-free	☐	☐
Glass and mirror surfaces are clean and streak-free	☐	☐
The surface of office equipment is cleaned	☐	☐
2. Condition of toilets:		
Sinks and faucets are clean, without any deposits or stains	☐	☐
Shower cabins/bathtubs are clean, without any deposits or stains	☐	☐
Walls are clean, no visible dirt	☐	☐
Toilet and urinal cleaned	☐	☐
The floor surface and baseboards are clean and streak-free	☐	☐
Toilet brushes washed	☐	☐
Garbage bags replaced	☐	☐
3. Condition of the corridor:		
Horizontal surfaces are clean and, streak-free	☐	☐
Walls and wall panels are clean, without visible dirt or stains	☐	☐
The floor surface and baseboards are clean and streak-free	☐	☐
4. Condition of ladders:		
Handrails are clean, without visible dirt or stains	☐	☐
Walls and wall panels are clean, without visible dirt or stains	☐	☐
The floor surface and baseboards are clean and streak-free	☐	☐

ANNEX 5. FEATURES OF VARIOUS DISINFECTION TECHNOLOGIES

Types of disinfection	Decontamination levels	Decontaminants and regimens
Sterilization	Destruction of all vegetative microorganisms and spores.	• High temperature (steam or dry heat). • Gaseous or vaporous sterilizing agents (ethylene oxide , etc.). • Hydrogen peroxide plasma. Radiation method (Gamma or beta radiation). • Liquid sporicidal sterilization agents with prolonged exposure (6-12 hours): - aldehydes - hydrogen peroxide (6%) - peracetic acid (Dezoxone-1)
High-level disinfection	Destruction of all vegetative microorganisms and spores. It is possible to save part of the dispute	• Liquid sporicidal disinfectants at short-term exposure (10-60 min): - aldehydes - ortho-phthalaldehyde - hydrogen peroxide (6%) - Peracetic acid
Intermediate (medium) level disinfection	Destruction of Mycobacterium tuberculosis and all other vegetative bacteria; all fungi and most viruses	• Tuberculocidal agents: - Phenols - Iodophors - chlorine-active substances - alcohols
Low-level disinfection	Destruction of most vegetative bacteria, some viruses (hepatitis B, C, HIV, herpes, influenza, etc.) and some fungi (except for mycobacterium tuberculosis).	Quaternary ammonium compounds

ANNEX 6. HAND HYGIENE SELF-ASSESSMENT FORM

What is the purpose of this material?

The purpose of this material is to assess the implementation of hand hygiene at all levels of health care facilities. This material is used as a diagnostic tool in order to identify deficiencies that require additional measures and their timely elimination.

The results of the self-assessment can be used in the development of an action plan to further improve hand hygiene by health care workers.

How do I use this tool?

The hand hygiene assessment tool includes five elements, that is, five points of the WHO Multimodal Strategy for Improving Hand Hygiene (*WHO Multimodal Strategy for Improving Hand Hygiene, 2012)*

Based on the final assessment, the facility is assigned one of the following four levels of hand hygiene implementation:

1. **Insufficient**: Existing hand hygiene measures are insufficient and require significant improvement.
2. **Basic:** Some aspects of hand hygiene are implemented, but they do not work at the proper level. Further improvement is required.
3. **Medium:** Most aspects of hand hygiene are implemented at a sufficient level. Attention should be paid to the scale and quality of activities, and the development of appropriate plans to maintain.
4. **Perfect:** Hand hygiene support and hand hygiene practices are implemented in full compliance with WHO recommendations.

This self-assessment tool is developed in accordance with the WHO *Hand Hygiene Self-Assessment Systems* guidelines of 2010.

1. Hand Hygiene Self-Assessment Tool: Changing the System

Question	Answer	Grade
1.1. To what extent are alcohol-containing solutions available in your health care facility? (Choose one answer)	Not available	0
	Only in some offices or remotely	5
	Available in all institution with permanent security, and paragraph storage in the majority of departments	20
	Available throughout the facility with permanent provision, and storage facilities in all departments	30
1.2. The presence of handwashing sinks:		
Available at each point of care (wards, emergency room, surgical ward, locker room, etc.)	No	0
	Yes	5
Available at the department / institution during the audit	No	0
	Yes	5
The institution (department) has access to an improved source of water supply	No	0
	Yes	10

1.3. Water supply system		
Round-the-clock	No	0
	Yes	10
At least 5 per week	No	0
	Yes	10
		/ 10
1.4. Is there liquid soap near each hand wash basin?	No	0
	Yes	15
		/15
1.5. Is each sink provided with disposable towels?	No	0
	Yes	15
		/15
General points		
Answer this question only if you received less than 100 points for items from 1.1 to 1.5.		
Does your health care facility have a current infrastructure improvement plan?	No	0
	Yes	10
2. Hand Hygiene Assessment Tool: Training		
2.1. In connection with the training of healthcare professionals at your facility:		
2.1.a Is hand hygiene training provided to employees in your facility? (Select only one answer)	Never	0
	At least once	10
	Continuous Training medical workers; nurses or all occupational categories	15
	Mandatory Training all categories of medical employees when they are hired for work and continuous training workplace health and safety.	20
2.1.b Is there a system for training all healthcare workers?	No	0
	Yes	20
2.1.c Is there a specialist in the facility with sufficient skills to teach hand hygiene and assess competency?	No	0
	Partially – in some departments have specialists and / or are just learning some medical employees	10
	Yes, in all or almost all departments have specialists and all or almost all categories employees are trained	20
Total		**/60**
2.2. Are the following training resources (or local printed materials) available to all HCWs?		
2.2.a The WHO Hand Hygiene Guidelines for Health: Conclusion	No	0
	Yes	5
2.2.b Hand Hygiene Information Sheet	No	0

	Yes	5
2.2.c Glove Information Sheet	No	0
	Yes	5
	Points	/ 20
2.3. Is there a specialized program that includes hand hygiene training?	No	0
	Yes	20
		/ 20
Total points		**/ 100**
3. Hand Hygiene Assessment Tool: Evaluation and Conclusions		
3.1. Is the facility's infrastructure regularly inspected for hand hygiene products	No	0
	Yes	10
		/10
3.2. Is there a continuous assessment of health care professionals' knowledge of hand hygiene indications and practices?	No	0
	Yes	10
		/10
		/15
3.3. Indirect monitoring of hand hygiene compliance		
3.3.a. Is the use of alcohol-containing liquids monitored quarterly?	No	0
	Yes	2,5
3.3.b. Is soap consumption checked quarterly?	No	0
	Yes	2,5
		/5
3.3. Overall		/ 5
3.4. Direct hand hygiene monitoring		
3.4.a. What is the overall level of hand hygiene compliance based on observing / monitoring hand washing? Please select one answer	≤30%	0
	31 – 40%	5
	41 – 50%	10
	51 – 60%	15
	61 – 70%	20
	71 – 80%	25
	≥ 80%	30
		/ 30
3.5.a. Provision of urgent conclusions after monitoring		
Are opinions and recommendations provided to health professionals after a compliance audit?	No	0
	Yes	10
3.5.b. Provision of systematic recommendations and conclusions after systematic monitoring		
Do HCWs receive regular information about the hand hygiene program, including information about product use and completion of the training package?	No	0
	Yes	10
3.5.c. Provision of systematic recommendations after systematic monitoring		
Does the facility management (executive	No	0

management) receive regular information about the hand hygiene program, including information on the use of products and replenishment of the training package?	Yes	10
***3.5.* Total**		/30
Total points		**/ 100**
4. Hand Hygiene Assessment Tool: Workplace Reminders		
4.1. Are the following posters displayed?		
4.1.a. Hand hygiene poster (select only one answer)	Not demonstrated	0
	Are demonstrated in some offices	5
	Demonstrated in most departments / points of care	10
	Demonstrated in all branches / points of care	20
4.1.b. Poster on the proper conduct of hand disinfection using alcohol solutions (select only one answer)	No	0
	Demonstrated in some offices	5
	Demonstrated in most departments / points of care	10
	Demonstrated in all branches / points of care	20
4.1.c. A poster describing the correct hand washing technique (select only one answer)	No	0
	Demonstrated in some offices	5
	Demonstrated in most departments / points of care	10
	Demonstrated in all branches / points of care	20
4.1 Outputs		**/60**
4.2. Is hand hygiene carried out by demonstrating and regularly updating or replacing damaged posters?	No	0
	Yes	10
4.2. Total		/ 10
4.3. Are there hand hygiene leaflets visible in the offices?	No	0
	Yes	10
4.3. Total		/ 10
4.4. Does the facility have other memos? For example, hand hygiene posters, protective screens, signs, stickers, etc.	No	0
	Partially – in some places	10
	Yes – throughout the building	20
4.4. Total		**/ 20**
Other elements: All memos in the workplace		**/ 100**
5. Hand Hygiene Self-Assessment Tool: Institutional Safety Climate for Hand Hygiene		
5.1. About the hand hygiene group that promotes and implements hand hygiene based on good hand hygiene practices:		
5.1.a. Is such a group organized?	No	0

	Yes	10
5.1.b. Does this group meet regularly (at least once a month)?	Yes	5
	No	10
5.1.c. Is time allocated for the organization of hand hygiene activities and training in hand hygiene principles?	No	0
	Yes	2
5.1 Subtotal		**/20**
5.2 Have the following facility management representatives made meaningful commitments to promote proactive hand hygiene in the past 12 months by participating in working groups, discussions, etc.?		
5.2.a Chief Physician of the Hospital	No	0
	Yes	10
5.2.b Deputy Chief Physicians of the Hospital	No	0
	Yes	10
5.2.c Heads of clinical departments and bacteriological laboratory	No	0
	Yes	10
5.2 Subtotal		**/ 30**
5.3 In connection with the involvement of patients in the promotion of hand hygiene:		
5.3.a Do patients have information about the importance of hand hygiene? For example, posters or leaflets	No	0
	Yes	10
5.3.b Has a formal patient engagement program been implemented?	No	0
	Yes	10
5.3 Subtotal		**/ 20**
5.4 Does your facility have local initiatives to support continuous improvement? For example:		
5.4.a E-learning on hand hygiene	No	0
	Yes	5
5.4.b Establish an annual facility level hand hygiene goal	No	0
	Yes	5
5.4.c Messages that constantly remind of hand hygiene, for example, a bulletin of the institution, morning meetings, practical examples, etc.	No	0
	Yes	5
5.4.d Responsibility system for health care workers	No	0
	Yes	5
5.4 Total		**/ 20**
5.5 Detailed plan to promote hand hygiene throughout the facility, including on 5 May (World Hand Hygiene Day)	No	0
	Yes	10
5.5 Total		**/ 10**
Institutional security environment		**/100**
STEP 2: Summing up the scores for all 5 items		
Elements of a multimodal strategy	**Average Scores**	
1. System Change		
2. Training		

3. Evaluation, monitoring and discussion		
4. Workplace Reminders		
5. INSTITUTIONAL ENVIRONMENT		
Total points		
STEP 3: Determine the level of hand hygiene for your facility		
Sum of points (range)		
Definition of Hand Hygiene Assessment		
0 – 125		
126 – 250		
251 – 375		
376 – 500		

APPENDIX 7. STANDARD DEFINITION OF HAI CASES AND REPORTING FORMS

STANDARD DEFINITIONS FOR HEALTHCARE-ASSOCIATED INFECTIONS (HAI)

Principles underlying the definitions of Health care-associated infection (HAI).

Principle 1 The data on the basis of which Hai is identified and then classified are various combinations of clinical signs, as well as the results of laboratory and other types of diagnostic tests.

Clinical data are the result of direct observation of the patient's condition, as well as a study of the medical record or other documentation, such as temperature sheets.

Laboratory data include positive results from cultures, antigen or antibody tests, and microscopic examinations.

Additional data are provided by other diagnostic methods, including radiographic, ultrasound (US), computed tomography (CT), nuclear magnetic resonance (NMR), radioisotope scanning, endoscopy, biopsy, and needle biopsy.

Additional specific criteria are included for the diagnosis of infections that have different clinical symptoms in neonates and young children.

Principle 2 A fully acceptable criterion for the truth of infection is the diagnosis by a physician based on direct observation during surgery, endoscopic examination or other diagnostic procedure, or based on clinical manifestations, unless there is convincing evidence refuting such a diagnosis (for example, if the record is mistakenly recorded in the card of another patient or the diagnosis is presumed and is not confirmed by subsequent studies).

However, in some cases of specific localization of infections in accordance with the established criteria, the appointment of appropriate antimicrobial therapy is required only on the basis of the clinical diagnosis of the doctor, even in the absence of supporting data.

Principle 3 In order for the infection to be classified as nosocomial, there must be no evidence that it was noted explicitly or in the incubation period at the time of hospitalization.

At the same time, infection is classified as nosocomial in the following cases:

- The patient is infected in the hospital, and clinically the infection manifests itself after discharge;
- Neonatal infections when infection is associated with passage through the birth canal.

Principle 4. The Hai category does not include cases where infection occurs in the following conditions:

- infection is a complication or continuation of an infection or infections that were already noted at the time of hospitalization of the patient, except when the detection of a new pathogen or a change in the nature of clinical symptoms makes it highly likely to suspect infection with a new infection,
- infection develops in the newborn and manifests itself clinically early after birth, while it is known or proven that the infection occurred transplacental (this applies to diseases such as *herpes simplex*, toxoplasmosis, rubella, cytomegalovirus infection and syphilis).

Principle 5. Neither during the hospital stay nor after discharge, the periods when the infection should be classified as in-hospital or out-of-hospital are not specifically designated, except for a few special cases specifically specified in the list of IUDs. Thus, in each case, the origin of the infection should be determined only on the basis of data that could confirm the fact of infection in a hospital.

Information on suspected case of health care-associated infection (communicable disease)

1. N (medical card of an inpatient; medical card of a patient receiving medical care in an outpatient setting; medical card of a pregnant woman, a woman in labor and a woman in labor receiving medical care in an inpatient setting) and other medical document.
2. Surname, name _____
3. Patient date of birth _____
4. Structural unit — for the record _____
5. Primary diagnosis — ICD code _____
6. Preliminary diagnosis if infection is suspected (intestinal infection, respiratory tract infection, surgical site infection, bloodstream infection, urinary tract infection, other) (underline or enter) — ICD code _____
7. The presence of the patient (underline or enter) clinical signs of infectious diseases, other: _____

   clinical signs of purulent-inflammatory infections:

   in the postoperative wound, at the insertion site of the vascular catheter, other:

   _____

   prescribing antimicrobial therapy (specify the date of prescription and the medicinal product) _____

   change in antimicrobial therapy (specify the date of prescription and the medicinal product) _____

   appointment of a microbiological examination from the alleged source of infection _____

   microbiological result (indicate the dates of the event and the receipt of the result and the result) _____
8. Date of completion — Time _____
9. Surname, name, patronymic (if any) of the health worker — signature _____

List of infectious diseases related to the provision of medical care to be identified and registered in a medical organization

I.	Clinical (nosological) groups of infectious diseases associated with the provision of medical care	ICD-10 codes
	Surgical Site Infections	A48.0; T79.3; T81.4; T82.6; T82.7; T83.5; T83.6; T84.5 - T84.7; T85.7; T87.4; T88.8; G04.2; G04.8; G04.9 Other ICD-1034 codes of nosological forms according to the field of surgical intervention (J85; J86; K65; N98.0; O04.0; O04.5; O07.0; O08.0 and others)
	Respiratory infections	J15.0 - J15.6; J15.8; J15.9; J16; J18; J20 - J22; T88.0
	Infections related to infusion, transfusion and therapeutic injection, immunization, including catheter-associated bloodstream infections	A40; A41; I80; T80.2; T.82.6; T.82.7; T88.0; R65.0; R65.1; Y71.2
	Urinary tract infections	N30.0; N34.0; N39.0; T83.5; T83.6; T81.4
	Purulent-septic infections of newborns	G00; I80.8; J15.0 - J15.6; J15.8; J15.9; J16; J18; J20 - J22; L00; L01; L02; L03; L08.0; L08.8; L08.9; M86.0 - M86.2; M86.8; M86.9; P36; P38; P39; T80.2; T83.5
	Purulent-septic infections of puerpera	O85; O86; O90.0 - O91.1; O99.5; O75.3
II.	Nosological forms of infectious diseases caused by pathogenic microorganisms and parasitic diseases	Codes according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10)
	Acute intestinal infections, acute viral hepatitis A, E	A01; A03; A04; A05; A08; A09; B15; B17.2
	Other Salmonella Infections	A02
	Droplet infection	A36; A37; A39; B01; B05; B06; B26; J06; J09 - J11; J22
	Including	B05
	Tuberculosis newly diagnosed, active forms	A15 - A19
	HIV-related disease	B20 - B24
	Hepatitis virosa B	B16
	Viral hepatitis C	B17.1
	COVID-19	U07.1; U07.2
	Pneumonia (viral, bacterial, caused by other pathogens, unspecified)	J12 - J18
	Other infectious diseases, carriage of infectious agents	Codes according to International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10)

Surgical site infection

Surgical infection of the superficial incision must meet the following criteria:

- The infection occurs within 30 days after the surgical procedure and involves only the skin and subcutaneous tissue at the incision site and the patient has at least ONE of the following criteria:
- Purulent discharge from the surface incision.
- Isolation of a culture of a microorganism from aseptically taken fluid or tissue of a surface incision.
- The presence of one of the following signs or symptoms of infection: pain or tenderness on palpation, local swelling, redness or fever, and the fact that the surgeon intentionally opened a superficial incision, although no microbial culture was isolated from the incision site.
- The diagnosis of surgical superficial incision infection is made by the surgeon or other attending physician.

Not reported as a surgical superficial incision infection:

- suture abscess (slight inflammation and discharge limited to dotted areas near the threads);
- infection of the external genitalia after circumcision of the foreskin (this procedure, in accordance with the NNIS Program, is not considered an operative intervention);
- infected birth trauma;
- surgical incision infection that involves the fascial and muscular layers (see Definition of deep incision surgical infection).

Surgical infection of a deep incision must meet the following criteria: The infection occurs within 30 days after the surgical procedure (in the absence of an implant) OR within 1 year (in the presence of an implant) and involves deep soft tissues (for example, the fascial and muscular layers) in the incision area and the patient has at least ONE of the following criteria:

- Purulent discharge from the depth of the incision, but not from an organ / cavity that has undergone surgery.

Spontaneous opening of a deep incision or intentional opening by the surgeon when the patient has at least one of the following signs or symptoms of infection: fever (> 38°C), local pain or tenderness, although no microbial culture is isolated from the incision site.

The presence of an abscess or other manifestations of infection, covering a deep incision site and identified by direct examination, during reoperation, histopathological or radiological (radiological) examination.

The diagnosis of surgical superficial incision infection is made by the surgeon or other attending physician.

Surgical Organ / Cavity Infections

The organs and cavities where the infection occurred include a different anatomical part (than during the incision), for example, an organ or cavity that opens or is manipulated during surgical procedures.

Surgical infection of the organ / cavity must meet the following criteria:

Infection occurs within 30 days after the surgical procedure in the absence of an implant OR within 1 year in the presence of an implant at the surgical site and lesion of another (than incisional) anatomical part, for example, an organ or cavity that opens or is manipulated during surgical procedures, as well as one of the other four criteria:

- Purulent discharge from drainage that has been established by puncturing an organ / cavity (if the area around the wound puncture has become infected, it should not be considered a surgical infection, but an infection of the skin or soft tissues, depending on the depth).
- Isolation of microorganisms from a fluid or tissue obtained aseptically from an organ / cavity.
- An abscess or other signs of infection involving an organ / cavity were detected on direct examination, during reoperation, histopathological or radiological (radiological) examination.
- The diagnosis of surgical infection of the organ / cavity is made by the surgeon or other attending physician.
- Surgical infection involving more than two specific sites.
- An infection that encompasses both superficial and deep incision sites is classified as a surgical deep incision infection.
- Infection that sometimes enters the organ / cavity through an incision. Thus, infection usually does not entail re-operation and is considered a complication of the incision. Thus, it is classified as a deep incision surgical infection.

Urinary tract infections

Urinary tract infections include manifest urinary tract infection, asymptomatic bacteriuria, and other urinary tract infections.

Manifest urinary tract infection should be determined based on one of four criteria:

- The presence of one of such signs as fever (>38°C), involuntary frequent urination, dysuria or suprapubic tenderness, as well as excretion of uroculture[31] (in the amount of ≥105 colonies / ml of urine) of no more than 2 types of microorganisms.
- Presence of two of the following: fever (>38°C), frequent urination, dysuria or suprapubic tenderness, and any of the following:
    a. pyuria (10 leukocytes in 1 ml of urine or 3 leukocytes with a strong increase in the microscope in the field of view of a smear of non-centrifuged urine);
    b. detection of microorganisms in Gram-stained smears of non-centrifuged urine;
    c. two repeated urocultures of the same uropathogenic microorganism (in the amount of ≥10² colonies / ml of urine) from samples taken aseptically;
    d. single isolated uroculture of a microorganism (in an amount of≥105 colonies / ml of urine) in a patient receiving appropriate antimicrobial therapy;
    e. doctor's diagnosis;
    f. prescribing appropriate antimicrobial therapy by a physician.

[31] Urine samples, the study of which is of great importance for establishing the presence of nosocomial infection, should be taken aseptically using appropriate methods (bladder catheterization, suprapubic aspiration, etc.)

- The patient at the age of ≤12 months has one of such signs as fever (>38°C), hypothermia (<37°C), apnea, bradycardia, dysuria, vomiting, as well as excretion of uroculture (in the amount of ≥105 colonies / ml of urine) of no more than two types of microorganisms.
- Absence of an indwelling catheter 7 days before the first two cultures (≥105 colonies / ml urine) of the same microorganisms, but not more than two types, in the absence of fever (>38°C), involuntary frequent urination, dysuria or pain in the suprapubic region:

Other urinary tract infections (kidneys, ureters, bladder, urethra, or tissues surrounding the retroperitoneal or peri-renal space) should be determined based on one of four criteria:

- Isolation of a culture of a microorganism from fluid (but not from urine) or from
- Tissue of the affected area.
- Abscess or other manifestations of infection directly detectable
- During examination, during surgical operation or during pathohistological examinations.
- The presence of two of the following: fever (>38°C), localized pain or tenderness on palpation in the affected area, and any of the following:
    a. purulent discharge from the affected area:
    b. isolation of the blood culture of the microorganism;
    c. radiographic confirmation of infection;
    d. doctor's diagnosis;
    e. prescribing appropriate antimicrobial therapy by a physician.
- A patient ≤12 months of age has one of the following: fever (>38°C), hypothermia (<37°C), apnea, bradycardia, dysuria, vomiting, and one of the following:
    a. purulent discharge from the affected area:
    b. isolation of the blood culture of the microorganism;
    c. radiographic confirmation of infection;
    d. doctor's diagnosis;
    e. prescribing appropriate antimicrobial therapy by a physician.

***Note**: Radiographic confirmation of infection includes abnormal results from ultrasound, computed tomography, magnetic resonance imaging, or radioisotope scanning.*

Upper respiratory infections

Upper respiratory tract infections (pharyngitis, laryngitis, epiglotitis) must meet one of the following criteria:

- The presence of two of the following signs: fever (more than 38˚C), erythema on the back wall, sore throat, cough, hoarseness, purulent discharge from the throat, as well as the presence of one of the following circumstances:
    a. Isolation of the microorganism in cultures of samples taken from the affected area;
    b. Isolation of a microorganism in blood culture;

c. Diagnostically significant Ig M antibody titer or four-fold increase in anti-pathogen IgG antibody level in paired serum samples;

d. Diagnosis made by a physician.

- Abscess visible on direct visual inspection, during surgery, or supported by histopathological findings.
- In a patient over 12 months of age, the presence of two of the following signs: fever over 38˚C, hypothermia over 37˚C, apnea, bradycardia, nasal discharge, purulent discharge from the throat, as well as the presence of one of the following circumstances:

  a. Isolation of a pathogen in the culture of a sample taken from an infected area;

  b. Isolation of a microorganism in blood culture;

  c. Diagnostically significant Ig M antibody titer or four-fold increase in anti-pathogen IgG antibody level in paired serum samples;

  d. Diagnosis made by a physician.

Lower respiratory tract infections (excluding pneumonia)

Lower respiratory tract infections include infections such as bronchitis, tracheobronchitis, bronchiolitis, tracheitis, pulmonary abscess, and pulmonary empyema.

Bronchitis, tracheobronchitis, bronchiolitis, tracheitis without pneumonia should be determined on the basis of one of two criteria.

- The patient has no clinical or radiographic evidence of pneumonia, but has two of the following: fever (>38°C), cough, new or increased sputum production, wheezing, noisy (wheezing) breathing, and any of the following:

  a. isolating the culture of the microorganism from a sample obtained by deep tracheal, aspirate or bronchoscopy;

  b. positive antigen test result in respiratory secretion.

- There are no clinical or radiographic signs of pneumonia in a patient ≤12 months of age, but there are two of such signs (in the absence of another established cause) as fever (>38°C), cough, primary or increased sputum secretion, wheezing, noisy (wheezing) breathing, respiratory failure, apnea or bradycardia, as well as any of the following:

  a. isolating the culture of the microorganism from the material of deep tracheal aspirate or obtained during bronchoscopy;

  b. diagnostic single antibody titer (IgM) or quadruple anti-microbial antibody titer (IgG) in paired serum samples.

Other lower respiratory tract infections should be determined based on one of three criteria:

- Detection of microorganisms in a smear or isolation of culture from lung tissue or fluid, including pleural fluid.
- Presence of lung abscess or empyema detected during surgery or pathohistological examination.
- The presence of an abscess cavity revealed by radiographic examination of the lungs.

Pneumonia

The definition of pneumonia is presented separately from the definition of other lower respiratory tract infections.

Criteria for pneumonia include various combinations of clinical, radiological, and laboratory data.

In general, cultures of microorganisms isolated from sputum are not used to diagnose pneumonia, but they help to establish etiology and provide useful information on antibiotic sensitivity.

Serial chest radiographs may be more useful than a single X-ray.

Pneumonia should be defined based on one of four criteria.

1. Wheezing or blunting of percussion sound on physical examination of the chest and any of the following:
    a. primary discharge of purulent sputum or change in the nature of sputum;
    b. isolation of the blood culture of the microorganism;
    c. isolating the microorganism from a trans-tracheal aspirate sample, bronchial lavage, or biopsy specimen.
2. X-ray examination shows new or progressive infiltrates, induration, cavities, pleural effusion, and any of the following:
    a. primary discharge of purulent sputum or change in the nature of sputum;
    b. isolation of the blood culture of the microorganism;
    c. isolation of a microorganism from a sample of trans-tracheal aspirate, bronchial lavage or biopsy specimen;
    d. isolating the virus or detecting the viral antigen in the respiratory secretion;
    e. diagnostic single antibody titer (IgM) or quadruple anti-microbial antibody titer (IgG) in paired serum samples;
    f. pathohistological signs of pneumonia.
3. A patient <12 months of age has two of the following symptoms: apnea, tachypnea, bradycardia, heavy breathing, wheezing or coughing, and any of the following:
    a. increased respiratory secretion;
    b. primary discharge of purulent sputum or change in the nature of sputum;
    c. isolation of the blood culture of the microorganism;
    d. isolation of a microorganism from a sample of trans-tracheal aspirate, bronchial lavage or biopsy specimen;
    e. isolating the virus or detecting the viral antigen in the respiratory secretion;
    f. diagnostic single antibody titer (IgM) or quadruple anti-microbial antibody titer (IgG) in paired serum samples;
    g. pathohistological signs of pneumonia.
4. In a patient <12 months of age, a chest X-ray shows new or progressive infiltrates, cavities, induration, or pleural effusion, and any of the following:

a. increased respiratory secretion;
b. primary discharge of purulent sputum or change in the nature of sputum;
c. isolation of the blood culture of the microorganism;
d. isolation of a microorganism from a sample of trans-tracheal aspirate, bronchial lavage or biopsy specimen;
e. isolating the virus or detecting the viral antigen in the respiratory secretion;
f. diagnostic single antibody titer (IgM) or quadruple anti-microbial antibody titer (IgG) in paired serum samples;
g. pathohistological signs of pneumonia.

Infections of bones and joints

Bone and joint infections include osteomyelitis, infection of the joint or joint bag, and infection of the intervertebral discs.

Osteomyelitis should be determined on the basis of one of the following criteria:

1. Isolation of a culture of a microorganism from bones.
2. Presence of osteomyelitis detected during surgery or pathohistological studies.
3. The presence of two of these signs (in the absence of another established cause), such as fever, localized edema, tenderness on palpation, fever, and any of the following:
   a. isolation of the blood culture of the microorganism;
   b. radiographic confirmation of infection.

Infection of the joint or joint bag should be determined on the basis of one of three criteria:

1. Isolation of the culture of the microorganism from the joint fluid or synovial biopsy specimen.
2. The presence of an infection of the joint or joint bag identified during surgery or pathohistological examination.
3. The presence of two of these signs (in the absence of another established cause), such as joint pain, swelling, tenderness on palpation, fever, the presence of effusion or limited mobility and any of the following:
   a. detection of microorganisms and leukocytes in a Gram-stained swab of joint fluid;
   b. radiographic confirmation of infection.

Intervertebral disc infection should be determined based on one of the following criteria:

1. Isolation of a culture of the microorganism from the affected tissue taken during surgery or needle aspiration.
2. The presence of infection in the area identified during surgery or pathohistological examination.
3. Fever (>38°C) in the absence of another established cause or pain in the affected area, as well as radiographic confirmation of infection.

Genital infections

The group of infections observed in obstetric and gynecological practice, as well as in the treatment of urological disorders in men, is defined as genital infections.

This category includes endometritis, infections resulting from episiotomy, inflammation of the external genital organs and other types of infections of the genital organs of men and women.

Endometritis

Endometritis must meet at least ONE of the following criteria:

- Isolation of microorganisms from endometrial fluid or tissue obtained during surgery by puncture or scraping.
- Purulent discharge from the uterus, as well as the presence of two of the following signs or symptoms without another established cause: fever (> 38° C), abdominal pain, tenderness on palpation of the uterus.
- An infection that develops after an episiotomy must meet one of the following criteria:
- Purulence from the episiotomy area.
- Abscess in the episiotomy area.

External genital infection must meet one of the following criteria:

- Purulent discharge from the external genital organs.
- Presence of external genital abscess.

Vaginal infection should be determined based on one of three criteria:

- Purulent discharge from the vagina.
- The presence of a vaginal abscess.
- Isolating the culture of the microorganism from a fluid or tissue derived from the vagina.

Other infections of the male or female reproductive organs (epididymis, testis, prostate, vagina, ovary, uterus or other deep pelvic tissues, with the exception of endometritis and infections of the external genital organs) must meet one of the following criteria: the presence of two of the following symptoms: fever (>38˚C), nausea, vomiting, pain, soreness, dysuria, as well as the presence of one of the following circumstances:

a. Isolation of the blood culture of the microorganism;
b. Diagnosis made by a physician.

Ocular and oral infections

- Eye infections include conjunctivitis and other eye infections.
- Ear infections include inflammations (otitis media) of the outer, middle, and inner ear.
- Infections of the nose, pharynx, and mouth include infections of the mouth, upper respiratory tract, and sinusitis.

Conjunctivitis

Endometritis must meet at least ONE of the following criteria:

- Isolation of the microorganism in exudate cultures obtained from the conjunctiva of the eye or adjacent tissues (eyelid, cornea, meibomian glands or lacrimal glands).
- Soreness or redness of the conjunctiva or tissues surrounding the eyeball and at least ONE of the following circumstances:
    a. the presence of leukocytes and microorganisms in gram-stained exudate smears;
    b. purulent exudate.
- Confirmation of the viral etiology of conjunctivitis.
- Eye infections (other than conjunctivitis) should be determined based on one of two criteria.
- Isolation of the culture of the microorganism from the anterior or posterior chamber of the eye, or from the vitreous fluid.
- The presence of two of these signs (in the absence of another established cause), such as eye pain, visual impairment or suppuration in the anterior chamber of the eye, as well as any of the following:
    a. doctor's diagnosis;
    b. isolation of the blood culture of the microorganism.

Oral infection (mouth, tongue, gums) should be determined based on one of three criteria.

- Isolation of microorganism culture from oral tissue material.
- Abscess or other manifestations of oral infection, identified by direct examination, during surgery or by pathohistological examination.
- Abscess, ulceration, or white plaque on the inflamed mucosa or plaque on the oral mucosa, and any of the following:
    a. detection of microorganisms in a Gram stained smear;
    b. a positive result of treatment of the smear with potassium hydroxide (KOH) on fungi;
    c. diagnostic single antibody titer (IgM) or quadruple anti-microbial antibody titer (IgG) in paired serum samples;
    d. physician's diagnosis and treatment (topical or oral antifungal).

Digestive system infections

Necrotic enterocolitis in children must meet the following criteria: the presence of two of the following signs that are not explained by any other known causes:

- Vomiting, bloating or food retention.
- Abundant visual detection.
- Persistent microscopic examination of blood in the stool, as well as the presence of one of the following events, confirmed by radiological data:
    a. the presence of gas in the abdominal cavity;
    b. bowels on Bloat;
    c. presence of unchangeable "rigid" loops of the small intestine.

Infections of the gastrointestinal tract (esophagus, stomach, small intestine, large intestine, rectum), with the exception of gastroenteritis and appendicitis, must meet one of the following criteria:

- Abscess or other manifestations of infection observed during surgery or confirmed by histopathological data.
- The presence of two of the following signs that are not explained by any other known reasons and confirm the presence of infection in the area of the affected organ or tissue: fever over 38˚C, nausea, vomiting, abdominal pain, sensitivity, as well as the presence of one of the following circumstances:
    a. Isolation of a microorganism in the culture of a detachable or tissue sample taken during surgery or endoscopy or through a drainage introduced by a surgical method;
    b. Detection of a microorganism in a Gram stained smear;
    c. Isolation of a microorganism in blood culture;
    d. Radiographic data confirming the presence of infection;
    e. Pathological changes observed during endoscopic examination (e.g. esophagitis or proctitis caused by *Candida*).

Skin and soft tissue infections

Skin and soft tissue infections include skin infection (other than incisional wound infection), soft tissue infection, pressure ulcer infection, burn infection, breast abscess or mastitis, omphalitis, infant pustular rash, and neonatal circumcision infection.

Skin infection should be determined based on one of two criteria.

- Purulent discharge, pustules, vesicles or boils.
- The presence of two of these signs at the affected site, such as Local pain or tenderness on palpation, swelling, redness or fever, as well as any of the following:
    a. isolation of a culture of a microorganism from aspirate or excreted from the affected area, if the isolated microorganism belongs to the normal microflora of the skin, then there should be a pure culture of this microorganism;
    b. isolation of the blood culture of the microorganism;
    c. diagnostic single antibody titer (IgM) or quadruple anti-microbial antibody titer (IgG) in paired serum samples.

Soft tissue infection (necrotic fascia, infectious gangrene, necrotic cellulitis, infectious myositis, lymphadenitis or lymphangitis) should be determined based on one of four criteria.

- Isolation of a culture of a microorganism from tissue or discharge from an affected area.
- Purulent discharge from the affected area.
- Presence of abscess or other manifestations of infection detected during surgery or pathohistological examination.
- The presence of two of these signs at the affected site, such as Local pain or tenderness on palpation, swelling, redness or fever, as well as any of the following:
    a. isolation of the blood culture of the microorganism;

b. Diagnostic single antibody titer (IgM) or quadruple anti-microbial antibody titer (IgG) in paired serum samples.

Pressure ulcer infection includes both superficial and deep infection. The criteria for determining it should be, first of all, the presence of two of such signs as redness, tenderness on palpation or swelling of the edges of the wound, as well as one of the other two criteria.

- Isolation of the culture of the microorganism from the fluid obtained by aspiration with a needle or biopsy of tissue taken from the edge of the ulcer.
- Isolation of the blood culture of the microorganism.

Omphaliti

Neonatal omphalitis (<30 days of age) must meet at least one of the following criteria:

- Erythema and / or separation of the clove from the umbilical fossa and at least ONE of the following circumstances:
  a. Isolation of a microorganism in the inoculation of aspirate or discharge;
  b. Isolation of a microorganism in blood culture.
- Erythema and suppuration from the umbilical fossa.

Primary bloodstream infection

Primary bloodstream infection includes laboratory-confirmed circulating blood infections and clinical sepsis.

The definition of clinical sepsis was originally intended for infants and neonates.

A laboratory-confirmed bloodstream infection should be determined based on one of three criteria:

- Isolation of blood culture of a microorganism recognized as etiologically significant, which is not related to an infection of another location.
- Presence of one of fever (>38°C), chills or hypotension and any of the following:
  a. isolation from two blood samples (taken at different times) of a common skin contaminant[32] that is not related to an infection of another location;
  b. isolating a common skin contaminant from the blood of a patient with a vascular catheter and prescribing appropriate antimicrobial therapy by a physician;
  c. a positive blood test result for a microorganism antigen[33], which is not related to an infection of another location.
- A patient aged ≤12 months4 has one of the following: fever (>38°C), fever (<37°C), apnea or bradycardia, and any of the following:
  a. isolation from two blood samples (taken at different times) of a common skin contaminant that is not related to an infection of another location;

[32] A microorganism that belongs to the normal skin flora (e.g., diphtheroids, different species of Bacillus, different species of Propionbacterium, coagullase-negative staphylococci, or micrococci)

[33] Detection of antigens of bacteria, fungi or viruses (for example, various species of Candida, Herpes simplex, varicella zoster, Haemorhilus influenzae, Streptococcus pneumonia, Neisseria meningitides, Group B streptococci) is carried out using accelerated laboratory methods (coagglutination reactions, counter immunoelectrophoresis or latex agglutination)

b. isolating a common skin contaminant from the blood of a patient with a vascular catheter and prescribing appropriate antimicrobial therapy by a physician;

c. a positive blood test result for a microorganism antigen, which is not related to an infection of another location.

***Note**: If the microorganism isolated from the blood is similar (in etiology) to the causative agent of nosocomial infection of other localization, then the bloodstream infection is classified as secondary. The exception is bloodstream infections associated with the use of intravascular catheters, which are classified as primary, even if there are some signs of infection at the entrance gate.*

These criteria are typical for infants ≤12 months, they can be found in older children

Clinical sepsis should be defined based on one of two criteria:

1. The presence of one of the clinical symptoms or signs (in the absence of other established causes), such as fever (>38°C), hypotension (systolic blood pressure <90 mmHg), or oliguria (>20 ml/hour), and all of the following:
   a. no blood culture test was performed or no microorganism or antigen was detected in the blood;
   b. absence of infection of other localization;
   c. prescribing appropriate antimicrobial therapy by a physician.
2. A patient <12 months of age has one of the following clinical signs or symptoms (unless another known cause is present): fever (>38°C), hypothermia (<37°C), apnea or bradycardia, and all of the following:
   a. no blood culture test was performed or no microorganism or antigen was detected in the blood;
   b. absence of infection of other localization;
   c. prescribing appropriate antimicrobial therapy by a physician.

Scheme for identifying, recording and recording cases of diseases suspected of Hai

***Note**: In cases of epidemic complications within a healthcare organization, information about them must be reported in accordance with the procedures established by the order of the Ministry of Health and Social Protection of the Population of the Republic of Tajikistan "On the approval of the procedure for the registration and special surveillance of infectious, parasitic, and occupational diseases, injuries, poisonings, including the list of diseases and emergencies for which an unscheduled report must be submitted" from 28.02.2019, No. 133. This includes the preparation of unscheduled reports for deaths from infectious diseases, including all cases of death from congenital infectious diseases. Transfer of information about the final diagnosis to the territorial GSESN with a note in the "Journal of Infectious Diseases."*

- Discussion of the results of the epidemiological investigation at the commission for the prevention of Hai with the establishment of an epidemiological diagnosis.
- Final clinical diagnosis.

- Identification of a case of illness (death) suspected of hospital (nosocomial or skidding) infection.
- Initial diagnosis of hospital-acquired infection.
- Registration of a case in the "Journal of Infectious Diseases" form No.060/y.
- Transfer of the initial "Emergency Notification of an Infectious Disease" to the State Service of Emergency Situations at the place of Hai detection with the indication of the disease code according to ICD-10.
- Conducting an epidemiological investigation.

The nomenclature of infectious diseases related to the provision of medical care that are subject to identification and registration in medical, social, and cosmetic facilities

I. Clinical (nosological) groups of infectious diseases related to the provision of medical care caused by conditionally-pathogenic microorganisms.	**Codes for International statistical classification diseases and issues related to health, 10-st revision (ICD-10)**
Surgical Site Infections	T.81.4; T82.6–T82.7;T83.5–T83.6; T84.5–T84.7; T85.7; T87.4; T79.3; Other ICD-10 codes of nosological forms in accordance with the field surgical intervention (J85; J86; K65; O04.0; O04.5; O07.0, and others)
Respiratory infections	J15.0–J15.6; J15.8–J15.9; J16; J18; J20–J22; T88.0
Bloodstream infections (infections related to infusion, transfusion, and therapeutic injection)	A40-A41; I80; T80.2; T.82.6-T.82.7; R65.0; R65.1; Y71.2
Urinary tract infections	N30.0; N34.0; N39.0; T83.5–T83.6; T81.4
Purulent-septic infections of newborns	G00; I80.8; J15.0–J15.6; J15.8–J15.9; J16; J18; J20–J22; L00; L01; L02; L03; L08.0; L08.8–L08.9; M86.0–M86.2; M86.8–M86.9; P36; P38; P39; T80.2; T83.5
Maternity infections	O85; O86; O90.0–O91.1; O99.5
II. Nosological forms of infectious diseases caused by pathogenic microorganisms, and parasitic diseases	**Codes for International statistical classification diseases and issues related to health 10-st review (ICD-10**
Acute intestinal infections, acute viral hepatitis A, E	A01; A03; A04; A05; A08; A09; B15; B17.2
Other Salmonella Infections	A02
Droplet infection	A36; A37; A39; B01; B05; B06; B26; J06 J09–J11; J22 including measles B05

Tuberculosis newly diagnosed, active forms	A15–A19
HIV-related disease	B20–B24
Hepatitis virosa B	B16
Viral hepatitis C	B17.1
COVID-19, total	J12–J18; U07.1; U07.2
from it pneumonia	J12–J18; U07.1; U07.2
Among them, pneumonias caused by the COVID-19 virus, the virus has been identified	U07.1; J12–J18
Other infectious diseases and carrier states of infectious agents are designated by codes according to ICD-10, corresponding to the nosological form	

APPENDIX 8. HAND HYGIENE MONITORING FORM (WHO)

HAND HYGIENE MONITORING FORM

Medical facilities:		**Period Number * :**		**Session No. ***	
Services:		**Date: (DD/MM/YY)**	/ /	**Observer: (initials)**	
Ward:		**Start/End: (hh:mm)**	: / :	**Page Number:**	
Department:		**Duration: (mm)**		**Gor/district**	

Category of field		**Category of field**		**Category of field**		**Category of field**	
Code		**Code**		**Code**		**Code**	
№		**№**		**№**		**№**	

Exh .	**Reading**	**Effect of MR**	**Exh .**	**Reading**	**Effect of MR**	**Exh .**	**Reading**	**Effect of MR**	**Exh .**	**Reading**	**Effect of MR**
1	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**1**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**1**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**1**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove

2	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**2**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**2**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**2**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove
3	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**3**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**3**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**3**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove
4	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**4**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**4**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**4**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove
5	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**5**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**5**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**5**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove
6	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**6**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**6**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**6**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove

7	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**7**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**7**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**7**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove

8	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**8**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**8**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove	**8**	☐ do-osm. ☐ pre-pr. ☐ psl-c.s.v. ☐ pos-osm. ☐ in.prc.envir-ent	☐ MP ☐ OP ○ omission ○ glove

* It is filled out by the data administrator.
** **Optional**; to be filled out if deemed appropriate, in accordance with local needs and rules.

year of birth = hand hygiene;
do-osm = before contact with the patientr;
before - ex = before the aseptic procedure;
after b.c. = after a situation involving the risk of contact with body fluids;
s.r.l. = after patient contact;
after prk.kr. = after contact with the patient's environment;
O.R. = hygienic hand sanitizer;
M.R. = hand washing with soap and water;
omission = no hand hygiene was performed.

FORM FOR RECORDING OBSERVATION RESULTS - CALCULATION OF THE INITIAL COMPLIANCE LEVEL

	Institution:						Period:			Place in the institution/department:					
	Prof. Cat.			Prof. Cat.			Prof. Cat.			Prof. Cat.			Total for the session		
Session №	Ref. (n)	M.P. (n)	A.P. (n)	Ref. (n)	M.P. (n)	A.P. (n)	Ref. (n)	M.P. (n)	A.P. (n)	Ref. (n)	M.P. (n)	A.P. (n)	Ref. (n)	M.P. (n)	A.P. (n)
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															
Total															
Calculation	Measures (n) = Case (n) =			Measures (n) = Case (n) =			Measures (n) = Case (n) =			Measures (n) = Case (n) =			Measures (n) = Case (n) =		
Adherence to															

$$\text{Compliance (\%)} = \frac{\text{Outcome}}{\text{Cases}} \times 100$$

User Guidelines:

1. Determine the location within the institution/department where data is collected for analysis, and report on data related to the selected place within the institution/department.
2. Check the data included in the form for recording observation results. Measures for hand hygiene that are not related to identified indications should not be considered, and vice versa.
3. You should mention the session number of work and the corresponding observation data in the same line. The reference to the session number of work confirms that the provided data were taken into account when calculating the hand hygiene compliance rate.
4. Results by professional category and by session of work (vertically):
   - 4.1 Sum up the instances of taking measures for hand hygiene recorded in the registration card by professional category: write the total in the corresponding cell in the calculation form.
   - 4.2 Sum up the positive actions related to hand hygiene, associated with the total number of mentioned cases above, specifying the difference between hand washing (H.W.) and hand sanitization (H.S.) cases: record the total in the corresponding cell in the calculation form.
   - 4.3 Continue similar operations for each session (data recording form).
   - 4.4 Add up all the sums for each professional category and perform the calculation to determine the compliance rate (expressed in percentage).
5. Summing up the results recorded in each row allows you to calculate the overall compliance, indicated at the end of the last right column.

THE FORM FOR RECORDING OBSERVATION RESULTS IS AN ARBITRARY CALCULATION FORM

(related to the identified indications of hand hygiene compliance)

	Institution: _____ Period: _____ Location in the institution: _____														
	Before touching the patient			Before a procedure that requires cleanliness/aseptic procedure			After the risk of contact with bodily fluids			After touching the patient			After touching objects around the patient		
Work session No.	So far--nations (n)	M.P. (n)	A.P. (n)	So far--nations (n)	M.P. (n)	A.P. (n)	So far--nations (n)	M.P. (n)	A.P. (n)	So far--nations (n)	M.P. (n)	A.P. (n)	So far--nations (n)	M.P. (n)	A.P. (n)
1															
2															
3															
4															
5															
6															
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11															
12															
13															
14															
15															
16															
17															
18															
19															
20															
Total															

Calculation	**Measures (n) =** **Indications (n) =**	**Measures (n) =** **Indications (n) =**	**Measures (n) =** **Indications (n) =**	**Measures (n) =** **Indications (n) =**	**Measures (n) =** **Indications (n) =**
Ratio: measures/ indications*					

***Note**: This calculation does not provide an exact assessment of compliance frequency, as the denominator in the calculation is an indication, not an instance. The measure is artificially inflated in accordance with each indication. However, the result provides a general idea of the healthcare worker's behavior regarding each type of indication.

User Guidelines:

1. Determine the location within the institution/department where data is collected for analysis, and report on data related to the selected place within the institution/department.
2. Check the data included in the form for recording observation results. Measures for hand hygiene that are not related to indications should not be taken into account, and vice versa.
3. If multiple indications arise within a single case, each of them should be considered separately, just like the corresponding measure for hand hygiene compliance.
4. You should mention the session number of work and the corresponding observation data in the same line. The reference to the session number of work confirms that the provided data were taken into account when calculating the hand hygiene compliance rate.
5. Results for indications and work sessions (vertical):
   - 5.1 Sum up the indications one by one in the form for recording observation results: record the total in the corresponding cell in the calculation form.
   - 5.2 Sum up the positive actions related to hand hygiene, associated with the total number of mentioned indications above, specifying the difference between hand washing (H.W.) and hand sanitization (H.S.) cases: record the total in the corresponding cell in the calculation form.
   - 5.3 Continue similar actions for each work session (form for recording observation results).
   - 5.4 Add up all the sums for each indication and perform the calculation to determine the ratio (expressed in percentage).

ANNEX 9. MINIMUM CRITERIA FOR IPC AT THE PRIMARY, SECONDARY AND TERTIARY LEVELS OF CARE

National level	PHC	Secondary level	Tertiary level
CC 1: Infection Prevention and Control Program			
Current IPC programme, including: • At least one in-house coordinator trained by IPC. • Special budget for implementation of IPC strategy / plans.	• Trained IPC officer who works full-time (part-time) in each PHC facility. • One trained health care professional responsible for IPC at the next administrative level (e.g. district) to oversee and coordinate IPC responsible activities at PHC facility level	• The programme in action • Trained IPC Coordinator (one trained IPC specialist – nurse or physician for 250 beds) • Interdisciplinary committee / team whose job responsibilities include implementation of IPC activities • Allocated budget for implementation of IPC measures • Access to the microbiological laboratory	• The programme in action • One trained full-time IPC specialist for 250 beds (nurse or doctor). • The IPC programme has a dedicated budget. • Interdisciplinary committee / team whose job responsibilities include implementation of IPC activities • Access to the microbiological laboratory
CC 2 of the Guidelines for Infection Prevention and Control (IPC)			
It is recommended that evidence-based **guidance** be developed and implemented to reduce the incidence of HAI and AMR. In order to successfully implement the recommendations of the Manual, **education and training** of relevant health care workers should be provided for all elements presented in it, and **monitoring** of the implementation of the recommendations of the Manual should be organized.	• **Standard Operating Procedures (SOPs)**adapted to the facility and monitoring compliance • SOPs based on evidence and adapted to the conditions of a particular health care facility, as well as based on the national guidance on PCI As a minimum, the facility should have SOPs on the following aspects: • hand hygiene • decontamination of medical devices and devices, as well as equipment used for patient care	All requirements, as for primary care institutions, with additional **SOPs**: • standard and route-specific precautions (detailed); • adherence to the principles of asepsis during invasive procedures, including surgical interventions; • individual SOPs for the prevention of the most common HAIs, taking into account the local context / epidemiology • occupational health and safety (detailed)	All requirements, as for primary care institutions, with additional **SOPs**: • standard and route-specific precautions (detailed); • adherence to the principles of asepsis during invasive procedures, including surgical interventions; • individual SOPs for the prevention of the most common HAIs, taking into account the local context / epidemiology • occupational health and safety (detailed)

	• premises cleaning • disposal and disposal of medical waste • Injection Safety • Protection of healthcare workers (for example, at least post-exposure prophylaxis, vaccination) • adherence to the principles of asepsis during manipulations • medical triage of patients • basic principles of observance of standard precautions, taking into account specific modes of transmission • Continuous monitoring of the implementation of at least some IPC / SOP recommendations		
3. Infection prevention and control (IPC) education and training			
It is recommended to organize **training for all health care workers**, using teamwork and problem-solving strategies that ensure the active participation of all, as well as to include **practical** exercises at the patient's bedside and simulation exercises aimed at reducing the risk of Hai and AMR.	• IPC training for all clinical frontline staff and hiring cleaning staff • National Policy Mandating IPC Training for All Healthcare Workers • Approved national IPC curriculum agreed with national IPC guidance and supported by the relevant governing body • National monitoring and evaluation system and schedule to verify the effectiveness of CIP training and hands-on training (at least once a year) • All clinical staff directly assisting patients, as well as cleaning staff,	• IPC training for all clinical frontline staff and hiring cleaning staff • All clinical staff directly assisting patients, as well as cleaning staff, should receive training and hands-on training on facility guidelines/IPC SOPs when hiring • All responsible IPC programme staff should receive specific IPC training	• IPC training for all clinical frontline staff and hiring cleaning staff • All clinical staff directly assisting patients, as well as cleaning staff, should receive training and hands-on training on facility guidelines/IPC SOPs when hiring • All responsible IPC programme staff should receive specific IPC training

	should receive training and hands-on training on facility guidelines/IPC SOPs when hiring • All those responsible for IPC at the health care facility level and IPC programme staff at the district level should receive specific IPC training		
CC 4: Healthcare-associated infection surveillance (HAI)			
Surveillance of Hai at the health care facility level is recommended to guide IPC actions and detect outbreaks, including AMR surveillance with timely transmission of results to health workers and stakeholders, and through national networks.	Surveillance of HAI is not required at the level of the primary care system, but such health care facilities should be involved in the implementation of national or subnational plans, if they are developed	• Supervision of HAI should be carried out in accordance with national or subnational plans	• Active surveillance of HAI should be carried out, which includes the collection of information on AMR • The necessary structures and auxiliary resources (e.g. reliably operating laboratories, medical records, trained staff) should be ensured, taking into account the type and method of supervision carried out • The method of supervision is determined by the priorities / plans of the health care facilities and / or the country • Timely and regular feedback should be provided to key stakeholders, in particular hospital management, to ensure that the necessary measures are implemented
CC-5 multimodal strategies			
It is recommended to use multimodal strategies in the implementation of IPC activities, which will improve the practice and reduce the levels of Hai and AMR.	Multimodal strategies for priority IPC actions Use multimodal strategies – at a minimum, to implement measures to improve hand hygiene, safe injection practices, decontamination of	Multimodal strategies for priority IPC actions The use of multimodal strategies – at a minimum, to implement measures aimed at improving compliance with standard precautions and	Multimodal strategies for priority IPC actions Use multimodal strategies to implement measures aimed at improving compliance with standard and precautionary measures, taking

	medical instruments and devices, and to prevent environmental contamination	precautions, taking into account specific transmission routes of infections, as well as the principles of medical triage	into account specific transmission routes, triage principles, as well as measures aimed at reducing levels of specific infections in high-risk areas / groups, taking into account local priorities
6: Monitoring/audit and feedback			
Carry out **regular monitoring / audit** and timely feedback on the results of checking medical care practices for their compliance with IPC standards, the purpose of which is to prevent and control HAI and AMR at the level of health care facilities. Feedback should be provided to all persons who have undergone inspections and authorized employees.	Organize monitoring of **structural indicators** and indicators of the IPC **process** , which is based on IPC priorities identified in the implementation of other components. This will require decision-making at the national level and support for their implementation at the subnational level	A person responsible for conducting periodic or continuous monitoring of the selected process and structure indicators, which are determined by the priorities of the health care facility or the country, should be identified Hand hygiene is one of the most important indicators for monitoring Timely and regular feedback should be provided to key stakeholders, in particular hospital management, to ensure that the necessary measures are implemented	
7. WORKLOAD, STAFF AND BED LINEN			
Ensure strict adherence to the following elements in order to reduce the risk of HAI and spread of AMR: • the load of the bed capacity should not exceed the standard capacity of the institution; • the availability of health workers should strictly correspond to the workload of the institution and the workload when working with patients.	**In order to prevent overcrowding:** • A patient flow management system, a triage system (including referral to higher level facilities) and a consultation management system should be established in accordance with current guidelines **To optimize staffing levels:** • Assessment of appropriate levels of staffing by patient category using WHO/ national tools (national standards for the ratio of patients to health workers) and development of an appropriate plan	**To standardize bed occupancy:** • create a system for monitoring the use of space in the institution and establish a standard indicator of bed capacity in the health care facility • control over compliance with the established rules by the hospital administration • no more than one patient per bed • the distance between the beds is at least 1 meter • the total number of patients should not exceed the capacity of the hospital bed capacity • In order to prevent overcrowding and optimize	

		staffing levels: The same minimum requirements as for primary care facilities
8. SUPPORTIVE ENVIRONMENT, MATERIALS AND EQUIPMENT FOR THE IMPLEMENTATION OF IPC MEASURES		
Care and patient care activities should be carried out in clean and hygienic conditions, which contributes to the implementation of practices related to the prevention and control of HAI and AMR. This includes all elements of water, sanitation and hygiene (WASH) infrastructure and services and the availability of appropriate IPC materials and equipment. The Expert Group recommends that all materials and equipment for proper hand hygiene be made available at the point of care.	Water is always available on-site to comply with basic IPC measures, including hand hygiene, cleaning, laundry, decontamination of medical devices, and medical waste management Working technical means for hand hygiene are always available at the points of care and in the toilets On the territory / in the building of the institution there are at least 2 working toilets of improved type, one for patients, the other for employees The layout of the facility should provide sufficient natural air ventilation, there should be rooms for decontamination of reusable medical devices, for medical triage, as well as places for temporary group accommodation / isolation of patients, if necessary The facility has adequate IPC facilities and equipment in sufficient quantities (e.g., mops, detergents, disinfectants, PPE, and sterilization equipment) and power supply to implement all basic IPC measures in accordance with the guidelines / SOPs, including, if applicable, all standard precautions Availability of a sufficient number of properly labeled tanks for separate waste collection; treatment and safe disposal of waste Sufficient volumes of clean water are available to implement all necessary IPC measures and special medical procedures, and permanent water supply within the facility is ensured	Working technical **means for hand hygiene** are always available in places of care, in toilets and office premises (for example, in disinfection rooms) There are at least 2 working toilets of an improved type that ensure the safety of waste, one for outpatients and 1 toilet for every 20 beds in inpatient departments The layout of the facility should provide **adequate air ventilation** (natural or mechanical, if necessary) to prevent the spread of infectious agents The facility should be allocated a place / space for decontamination **and treatment** of medical devices (i.e. decontamination department) in accordance with the guidelines / SOPs The facility should have adequate wards for isolation of patients or at least one room for group accommodation of patients with the same pathogens, if the number of individual wards for isolation of patients is not enough Availability of sufficient number of properly **labeled** tanks for separate waste collection, and safe treatment and disposal of this waste is ensured There are sufficient quantities of appropriate supplies and equipment, as well as reliable power supply, to implement all IPC measures, including standard precautions and precautions specific to the routes of infection transmission in accordance with guidelines/SOPs.


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