



Infection Prevention and Control Program in Healthcare Facilities: Minimum Requirements

Sağlık Tesislerinde Enfeksiyon Önleme ve Kontrol Programı: Asgari Gereklilikler

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Abstract

Healthcare-associated infections (HAIs) represent a significant public health challenge that adversely affects morbidity and mortality rates. The majority of these infections are preventable through the implementation of effective infection control measures. The prevention of HAIs is crucial not only for enhancing the quality of care and ensuring patient safety, but also for mitigating the development of antimicrobial resistance. In regions where Infection Prevention and Control (IPC) programs are either non-existent or inadequate, minimum standards must be established and adhered to at both the institutional and national levels. These minimum standards are informed by the basic components of IPC programs, as delineated by the World Health Organization. They encompass the essential IPC protocols that must be implemented to safeguard the health and safety of patients, healthcare workers, and visitors. This review aims to delineate the key minimum standards that are necessary for the effective prevention and control of HAIs.

Keywords: Healthcare-associated infections; Minimum requirements; Prevention and control

Healthcare-associated infections (HAIs) constitute a significant public health issue, contributing negatively to both morbidity and mortality. Epidemiological data indicate that HAIs affect approximately 10% of patients in developing countries and 7% in developed ones.^[1] Beyond their health implications, HAIs impose substantial economic burdens on the society. The majority of these infections are preventable through the implementation of effective infection control measures. Preventing HAIs is essential for

maintaining the quality of patient care, ensuring patient safety, and protecting healthcare personnel. Furthermore, their prevention is critical in combating the development of antimicrobial resistance.^[2]

Providing clean and safe care is a fundamental patient right. The core components of Infection Prevention and Control (IPC) programs are encapsulated in the evidence-based guidelines developed by the World Health Organization (WHO) and other national- and hospital-level protocols.^[2]

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However, establishing effective programs for reducing HAIs and antimicrobial resistance may require a phased approach, particularly in countries where IPC programs are either non-existent or underdeveloped. In such contexts, promptly meeting at least the minimum standards at both healthcare institution and national levels and then building upon these standards incrementally are crucial.

Studies show that infection control committees fulfill only the minimum infection prevention and control requirements mainly due to the lack of financial support. Therefore, it is thought that strategic plans should be made for improvement.^[3] Minimum standards are based on the essential components of IPC, as determined by the WHO. These standards are defined as the IPC protocols necessary for ensuring the fundamental protection and safety of patients, healthcare workers, and visitors at both the national and institutional levels. The primary audience for these standards includes IPC leaders, policymakers, senior national executives, institutional administrators, and other professionals with the authority or interest in developing and strengthening IPC programs. It is important to highlight that the IPC program implementation is the collective responsibility of all healthcare professionals, not merely the IPC committee or managers.

Therefore, all healthcare professionals must be adequately informed about these minimum standards. Efforts should be made to ensure the active dissemination of information about the IPC minimum standards to healthcare professionals across various domains and functions, including through annual in-service training, pre-service education, and other relevant updates.^[2,4]

A five-phase implementation cycle is recommended for facilitating the successful execution of the IPC improvement intervention program (Fig. 1). The steps in this cycle are as follows:

- preparation;
- current situation determination;
- preparation and implementation of an action plan;
- evaluation of effectiveness; and
- ensuring program sustainability.

This review aims to determine the minimum standards required for the effective prevention and control of healthcare-associated infections.

We reviewed the current literature to determine the minimum standards required for the effective prevention and control of HAIs. Moreover, we searched for relevant studies in the Centers for Disease Control and Prevention

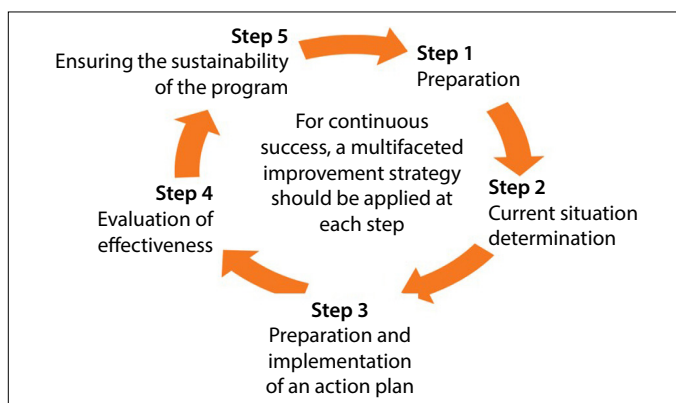


Figure 1. Five-step cycle in infection prevention and control recommended by the World Health Organization (adapted from source 3).

Guideline, PubMed, UpToDate, Web of Science, and Google Scholar databases between January 1, 2008 and September 1, 2024. The search terms were "IPC" and "minimum standards in infection control."

Minimum Standards for HAI Prevention and Control Program

IPC Program Establishment

Establishing active, independent IPC programs with clearly defined objectives and activities aimed at ensuring patient safety, implementing effective infection control measures, and preventing antimicrobial resistance is essential in preventing HAIs at the national level. These programs should be integrated with other relevant national initiatives. Additionally, healthcare institutions must implement IPC programs supported by dedicated, trained teams specifically focused on combating antimicrobial resistance through IPC practices.^[5,6]

The following components are essential in ensuring compliance with the minimum IPC requirements at the national level: an established focal point for the IPC program, such as the appointment of trained, full-time physician and nurse dedicated to IPC, and the allocation of a specific budget for implementing IPC strategies and plans.

Additionally, it is also crucial to have a high-level official within the Ministry of Health, such as the Minister of Health or the Director-General of Health Services, who will be responsible for overseeing the IPC efforts. The Ministry of Finance plays a vital role in ensuring budget allocation. Leaders for the hand hygiene and antimicrobial resistance prevention programs must be appointed to foster synergistic actions across initiatives.

The IPC focal point, in collaboration with institutions and external partners, is responsible for developing objectives, action plans, and integration with other national programs. Healthcare institutions must have part-time trained staff dedicated to IPC in primary healthcare settings and a health officer who oversees regional connections at the administrative level.

In facilities with more than 10 healthcare workers, the IPC officer is responsible for various activities, including consultation of equipment procurement and maintenance, supervision of IPC activities, registration of diseases in the national network system, and reporting of unusual situations. In facilities with fewer than 10 healthcare workers, the IPC officer may still handle some of these responsibilities, but a regional officer support is generally required for an effective monitoring.

The following key elements are necessary for implementing a functional IPC program in secondary and tertiary healthcare institutions: an allocated budget; the presence of full-time nurse and doctor trained in IPC for every 250 beds; an IPC program that aligns with the national program; a multidisciplinary team; and an easily accessible microbiology laboratory. A microbiology laboratory with an external quality control system is particularly critical for a successful IPC program.^[4,5]

Infection Prevention and Control Guidelines

The IPC guidelines should be grounded in evidence, drawing upon scientific literature and existing guidelines, and should reference international standards, where available. These evidence-based, nationally validated guidelines must reflect the most current research and should be regularly updated (i.e., at least every 5 years) to ensure that healthcare practices remain up-to-date and effective. Accordingly, strategies for the training and dissemination of IPC guidelines should be developed and implemented as part of the minimum requirements.

Moreover, specialized procedures should also be established to prevent common HAIs. The standard guidelines adapted to the national context and based on evidence should include the following topics at a minimum:^[6,7]

- hand hygiene;
- triage;
- patient care;
- environment hygiene;
- medical waste management;
- safe injection;

- post-exposure prophylaxis and vaccinations; and
- decontamination of medical devices and aseptic techniques.

In addition to all the primary-level requirements in secondary and tertiary healthcare institutions, the following topics should be included in the guidelines, as well:

- standard isolation precautions;
- aseptic technique for invasive procedures;
- basic epidemiology; and
- occupational health and safety.

Infection Prevention and Control Trainings

To ensure the successful implementation of the IPC guidelines, healthcare professionals must be thoroughly trained on the guide's recommendations, and their adherence to these guidelines must be consistently monitored. Accordingly, healthcare personnel should receive IPC training as part of their in-service training both at the beginning of their employment and periodically throughout the year.

A national policy and a curriculum for the IPC in-service training should be established for all healthcare professionals, and reviews must be conducted at least every 5 years. These guidelines should be published as evidence-based documents and approved by the health ministry. Additionally, a national system for monitoring and evaluating the effectiveness of the IPC training should also be implemented, and its assessments must be conducted at least annually.

The national IPC program must be developed in collaboration with local and academic institutions to create pre-undergraduate and graduate in-service curricula. These curricula should be disseminated across all health science faculties and should cover essential topics, such as hand hygiene, environmental cleaning, waste management, healthcare worker safety, including post-exposure prophylaxis and vaccination, medical device decontamination, and protective equipment usage. To prevent HAIs and antimicrobial resistance and reduce the associated risks, the IPC training must also include task-based strategies for participants. In healthcare institutions, both clinical and cleaning staff at the primary and secondary levels must receive training on the institution's IPC guidelines upon commencing employment. This training must be extended to all clinical and cleaning staff in tertiary healthcare institutions not only after they start work, but also on an annual basis to reinforce and update their knowledge.

In secondary and tertiary healthcare institutions, all personnel involved in IPC must undergo specialized IPC training or attend relevant courses to ensure that they are equipped with the latest knowledge and skills necessary for effective IPC within their respective institutions.^[7,8]

HAI Surveillance

A multidisciplinary national strategic plan must be developed for HAI surveillance and IPC monitoring. The surveillance method must be tailored to align with the institution's and/or country's priorities. National IPC programs and networks must be established alongside strategic plans incorporating feedback mechanisms for national-level surveillance. These programs should also allow for a comparative analysis across institutions.

Surveillance should encompass comprehensive HAI data, including incidence, prevalence, etiology, disease severity, and attributable burden of disease. It should also identify antimicrobial susceptibility patterns, monitor exposures among high-risk patients, ensure early cluster and outbreak detection, and evaluate the effectiveness of interventions.

While surveillance in primary and secondary healthcare institutions is not mandated as a minimum requirement, these institutions should adhere to national plans, particularly in cases where outbreaks are detected and reported. By contrast, in tertiary healthcare institutions, active surveillance is mandatory. To support this, the necessary infrastructure and resources, such as reliable laboratories, comprehensive medical records, and trained personnel, must be in place.

Point prevalence studies should be regularly conducted to provide a quick overview of the current HAI situation. Surveillance in healthcare facilities should be systematically planned to detect epidemics, guide the control measures, and prevent antimicrobial resistance. This should include the regular and on-time reporting of results to healthcare workers through national networks.^[7,8]

Multimodal Strategies

Under the leadership of the national IPC focal point, multimodal strategies can be developed and implemented to align interventions with national guidelines and standard operating protocols. These versatile strategies comprise three or more interconnected components designed to drive behavioral changes and achieve targeted outcomes. They typically include checklists and prevention bundles created by multidisciplinary teams and aim to foster

quality improvement, enhance patient safety, and promote effective multimodal interventions.

Collaborative efforts are essential for developing and advancing these strategies. Accordingly, healthcare facilities are encouraged to adopt multimodal strategies to prevent infections and mitigate antimicrobial resistance. In primary healthcare settings, these strategies should be implemented at a minimum to enhance interventions, such as hand hygiene, safe injection practices, decontamination of medical instruments and devices, and environmental cleaning.

Meanwhile, in secondary healthcare facilities, multimodal strategies should be employed to enforce standard precautions and ensure effective triage. In tertiary care settings, multimodal strategies must focus on reducing specific infections, particularly in high-risk areas. These strategies should target interventions, such as standard and contamination-based precautions, triage, prevention of catheter-related infections, and reduction of surgical site infections.^[4,9,10]

Monitoring, Audit, and Feedback

At the national level, a comprehensive monitoring and evaluation program must be established to assess whether activities align with their intended aims and objectives. Hand hygiene monitoring is recognized as a key indicator within this framework and should be emphasized at the national level. Regular audits of healthcare practices related to IPC should be conducted in health institutions, and timely feedback must be provided in accordance with established standards.

The IPC structural and process indicators must be closely monitored in primary healthcare institutions. Meanwhile, in secondary and tertiary healthcare institutions, priorities should be clearly defined, and the individuals responsible for the periodic or continuous monitoring of these indicators should be identified.

The successful implementation of these monitoring and evaluation activities requires support at both the national and local levels. Policies offering positive or negative incentives based on the indicator performance should be developed to ensure active participation from hospital administrators. These policies will help drive adherence to the IPC standards and improve the overall healthcare quality.^[11,12]

Some studies have also emphasized the need to include training, monitoring, and feedback components in IPC interventions to increase behavioral changes in healthcare workers.^[13]

Bed Occupancy Rate at Workload, Personnel, and Health Institution Levels

A critical minimum standard for reducing hospital infections and antimicrobial resistance pertains to the management of workload, staff numbers, and bed occupancy rates. Healthcare institution-level recommendations emphasize that bed occupancy should not exceed the institution's established capacity, and the number of healthcare personnel should be proportional to the patient workload. As advised, a triage system within primary healthcare institutions must be implemented to mitigate overcrowding and enhance patient flow, in addition to creating a distinct system for consultation management. Adherence to WHO guidelines and utilization of national tools, such as patient-to-staff ratio norms, are also essential for optimizing the staffing levels.

For secondary and tertiary care institutions, recommendations include the establishment of a management-approved system to standardize bed occupancy and effectively manage space utilization within the facility. Beds must be positioned at least 1 m apart, and the overall occupancy must not exceed the institution's designed bed capacity.

Decisions concerning staffing, bed occupancy, and workload are primarily the responsibility of senior management rather than the infection control team or program. Additionally, a national strategic plan for facilitating the successful implementation of these recommendations and for supporting human resource development should be developed.^[4,14]

Appropriate Environment and Equipment for IPC at Healthcare Institutions

An essential component of the minimum IPC measures involves the environment in which precautions are implemented and the materials and equipment utilized. Patient care must occur in a hygienic setting that supports effective IPC practices, ensuring the availability of appropriate equipment. In primary healthcare institutions, clean water must be consistently available to facilitate fundamental IPC measures, including hand hygiene, waste management, and cleaning and decontamination of medical equipment. Each healthcare facility should provide at least two functional and improved sanitation areas—one designated for patients and another for staff. Equipment ensuring proper hand hygiene must also be accessible at every point of care. Given the established advantages of alcohol-based hand sanitizers over traditional soap and water,

these sanitizers must be readily available at all care points, alongside water, soap, and disposable towels in clinical services. These maintenance points should be strategically located within 5 m of toilets. The facility should also include a sufficient number of single-patient isolation rooms. In cases where this number is inadequate, patients with similar pathogens should be cohorted. Adequately labeled waste bins must be available to facilitate the segregation of infected waste, which should be disposed of safely using appropriate methods like autoclaving, incineration, and burial. Institutional architecture should support adequate ventilation and decontamination of reusable materials. The IPC guidelines dictate the implementation of effective disinfectant solutions for environmental cleaning and medical equipment sterilization. The regular monitoring of the chlorine concentration and other disinfectant solutions is necessary, and dosage adjustments must be made as needed to ensure compliance with established targets. Ventilation is critical for maintaining a hygienic environment within the institution. Natural ventilation should be optimized through functional windows and doors facilitating a minimum of six to eight air changes per hour. A designated area for patient assessment or triage is essential for identifying the causes of disease and directing patients to appropriate areas based on their conditions. The responsibility of fulfilling these minimum requirements belongs to trained IPC personnel, healthcare institution managers, and healthcare staff. At least two functional and improved wastewater treatment systems should also be implemented for outpatient units. One system should be available for every 20 beds in inpatient clinics. The use of safe water for water-related IPC interventions must adhere to the WHO drinking water quality standards, specifically ensuring that *Escherichia coli* is undetectable in 100 mL of water, and that there is a minimum free chlorine residue of 0.5 mg/L. This practice minimizes both direct and indirect health risks by preventing exposure to enteric and environmentally borne pathogens, such as *Pseudomonas* spp. and *Legionella* spp. Sufficient water tanks must be installed to provide service for a minimum of 48 h to mitigate the risk of water shortages. Adequately labeled waste bins should be placed throughout the facility to promote the segregation of healthcare wastes, including needles and sharps. The institution must be designed to facilitate adequate ventilation—either natural or mechanical—to prevent the transmission of infectious pathogens. Moreover, sufficient and appropriate materials and equipment must also be available to execute all IPC practices in accordance with the minimum standards and precautions outlined in institutional protocols. In high-risk areas, such as operating

theaters and intensive care units, reliable lighting must be maintained to ensure continuous and safe patient care. A 24-h power supply or a backup power source is essential for high-risk services because the sterilization unit operation is contingent upon a dependable power supply. A designated area must also be provided for decontaminating reusable medical devices. The number of isolation rooms must be adequate enough to allow for the cohorting of patients with similar pathogens. Given the heightened risk of HAIs and antimicrobial resistance in secondary and tertiary healthcare institutions, at least one isolation room should be allocated for every 20 beds in secondary healthcare facilities and a minimum ratio of one isolation room per 10 beds in tertiary healthcare institutions. The individuals accountable for ensuring compliance with these minimum requirements in secondary and tertiary healthcare institutions include the national IPC leader within the Ministry of Health, trained IPC personnel, environmental health officers, engineers, administrative financial managers, and national purchasing managers from the finance ministry, alongside institution managers or department heads and health personnel.^[4,5,11–14]

Tomczyk et al.^[15] evaluated the IPC practices in qualitative analyses conducted in low-income countries and tried to summarize the main lessons as follows: development of IPC programs; development of guidelines; training; follow-up of HAIs; development of multimodal strategies; monitoring, audit, and feedback; improvement of staff and bed occupancy rates; and ensuring that the infection control team is included in the construction and repair works. To effectively enhance IPC across all healthcare institutions, the following summarized actions are recommended:

1. Development of national IPC programs: All countries should establish national IPC programs. This includes the creation of standards and national action plans to ensure the availability of essential IPC materials and equipment.
2. Responsibility for hygiene: The institution's authorities must be accountable for maintaining an adequate hygiene environment.
3. Basic components required in health institutions:
 - Access to clean water: Ensure a continuous supply of clean and sufficient water from an improved source for handwashing, personal hygiene, medical activities, kitchen use, and cleaning.
 - Functional sanitation facilities: Establish sanitation facilities that allow for the safe off-site disposal or removal of sewage, fecal waste, and medical waste.
 - Proper drainage: Implement effective drainage systems for wash water to prevent the development and spread of vectors.
4. Key practices to improve hand hygiene:
 - Hand hygiene accessibility: Maintain continued access to hand hygiene areas equipped with alcohol-based hand antiseptics and, where appropriate, water, soap, and disposable towels.
 - Sharps waste management: Provide adequate sharps waste bins to segregate healthcare-associated waste, ensuring safe handling and disposal through methods like autoclaving, incineration, and off-site treatment.
 - Regular cleaning: Ensure sufficient materials and personnel for the regular cleaning of examination rooms, waiting areas, and toilets.
 - Personal protective equipment (PPE): Supply adequate amounts of appropriate PPE for healthcare providers involved in patient care and removal of healthcare-related wastes.
 - Adequate ventilation: Design spaces to ensure adequate ventilation, thereby reducing the risk of infections caused by respiratory pathogens.
 - IPC committee involvement: Include the IPC committee in the planning of all systems and in the design and construction of healthcare facilities.
 - Reliable energy supply: Ensure adequate energy supply to support the sterilization processes and the continuous operation of medical devices.
 - Well-lit areas: Provide well-lit environments to facilitate uninterrupted health practices both during the day and at night.
5. These measures collectively contribute to the establishment of a robust IPC framework that promotes patient safety and reduces the risk of HAIs.

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