

Core components for infection prevention and control programmes

Report of the Second Meeting
Informal Network on Infection Prevention
and Control in Health Care

Geneva, Switzerland
26–27 June 2008



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Core components for infection prevention and control programmes

Infection Prevention and Control in Health Care Informal Network Report of the Second Meeting, 26–27 June 2008, Geneva, Switzerland

Executive summary

The Second Meeting of the Infection Prevention and Control Informal Network took place on 26–27 June 2008, at the headquarters of the World Health Organization (WHO) in Geneva, Switzerland. There were 28 participants, including six external experts, eight members of staff from WHO units at headquarters and representatives from four WHO regional offices.¹

The objectives of the meeting were to identify infection prevention and control (IPC) core components for national programmes and for the programmes of local health-care facilities, in order to contribute to the strengthening of capacity for the prevention of health care-associated infections (HAI) and to prepare an efficient response to emergencies involving communicable diseases, such as epidemics.

This meeting report summarizes the conclusions of the participants during discussions on the scope of IPC programmes and the considerations necessary for the description of core components of IPC programmes. These discussions covered prevention of HAI in patients, health-care workers and visitors; preparation of health-care systems for the early detection and management of epidemics and effective response to these; coordinating the community response to infectious diseases; prevention of the emergence of antimicrobial resistance and/or dissemination of resistant strains; and minimization of the impact of HAI infections on the environment. The core components identified by the meeting participants are summarized in Table 1.

Some priorities for research were identified:

- Skills and curriculum for the training of infection-control professionals;
- The optimum ratio of infection-control professional staff to workload;
- Strategies for implementation of new IPC programmes; and
- The applicability of the core components to the different types of health systems, health-care facilities and other conditions of health-care settings.

This report constitutes an expert opinion on the basic components that are necessary to an IPC programme at a national level and in health-care facilities. The meeting contributed to the setting of priorities for the development of such programmes, particularly at the national level, and also yielded strategic elements for the revision of existing guidelines on these matters, setting a road map for further development.

¹ The list of participants is given in Annex 1.

Table 1. Summary of core components of infection prevention and control programmes

Category	Components
Organization of IPC programmes	A structure responsible for policies, goals, strategies, legal, technical framework and monitoring. Existence of qualified dedicated technical staff with defined responsibilities, scope and functions. A budget adequate to meet programmed activities
Technical guidelines	Development, dissemination and implementation of technical evidence-based guidelines for prevention of the relevant risks and/or infections, adapted to local conditions.
Human resources	Training for all health-care personnel in IPC and specialized training of infection-control professionals. Adequate staff responsible for IPC activities. Address biological risks and implement preventive measures.
Surveillance of infections and assessment of compliance with IPC practices	Established priorities for surveillance of infections and pathogens, standardized case definitions and active methods of surveillance. Systematic assessment of compliance with IPC practices. Detection of outbreaks and prompt response. Documentation of the situation of HAI and IPC practices.
Microbiology laboratory	Standardization of microbiology laboratory techniques. Promotion of the interaction between IPC activities and the microbiology laboratory. Use microbiology data for surveillance and IPC activities. Establish laboratory biosafety standards.
Environment	Minimum requirements for IPC: clean water, ventilation, hand-washing facilities, patient placement and isolation facilities, storage of sterile supply, conditions for building and/or renovation.
Monitor and evaluation of programmes	Regular monitoring, evaluation and reporting of IPC outcomes, processes and strategies at national level and in health-care facilities. Promotion of evaluation in a non-punitive culture.
Links with public health or other services	Links between public health services and the facilities for events of mandatory reporting. Permanent coordination with activities related to waste management and sanitation, biosafety, antimicrobial pharmacy, occupational health, patients and consumers and quality of health care.

HAI, health care-associated infections; IPC, infection prevention and control.

Acronyms

BDP	Biorisk Reduction for Dangerous Pathogens (WHO unit)
EPR	Epidemic and Pandemic Alert and Response (WHO department)
HAI	health-care associated infections
HIV	human immunodeficiency virus
ICU	intensive-care unit
IHR	International Health Regulations
IPC	infection prevention and control
SARS	severe acute respiratory syndrome
TB	tuberculosis
WHA	World Health Assembly
WHO	World Health Organization

Core components for infection prevention and control programmes

Infection Prevention and Control in Health Care Informal Network Report of the Second Meeting, 26–27 June 2008, Geneva, Switzerland

1. Introduction

Health care-associated infections (HAI) are an important public health problem because they occur frequently, cause morbidity and mortality and represent a significant burden among patients, health-care workers and health systems. HAI occur worldwide and affect all countries, irrespective of their degree of development.

The most common types of HAI include infections of surgical wounds, the blood stream, the urinary tract and the lower respiratory tract. In some settings, puerperal endometritis and gastrointestinal infections are also common. Infection rates are higher among patients with increased susceptibility because of their age (the very young and the elderly), severity of the underlying disease, use of invasive devices and procedures, or conditions that impair the immune system (such as chemotherapy and transplants).

Outbreaks of HAI may have severe consequences in hospitals and transmission from former patients, visitors and staff may also lead to outbreaks in the community. The emergence of infections such as severe acute respiratory syndrome (SARS), viral haemorrhagic fevers, avian influenza, and the threat of pandemic influenza highlight the need for efficient infection-control practices in health-care settings. Among many lessons learnt from the SARS epidemics is the fact that health-care facilities can act as amplifiers of the outbreaks, increasing the number of cases occurring. Adequate preparation and an ongoing institutional culture of safe health-care practices to prevent and control the dissemination of pathogens are relevant in the control of many outbreaks of communicable disease that may affect the community.

The emergence and spread of antimicrobial resistance among many microorganisms, such as multidrug-resistant/extensively drug-resistant strains of *Mycobacterium tuberculosis* and Gram-negative bacilli, has rendered many formerly easily treatable infections more difficult to manage. While resistance to antimicrobial agents is a problem in the community as well as in health-care facilities, it is particularly important in hospitals, where the highly susceptible population may act as a permanent reservoir of resistance or source of amplification of the transmission of resistant bacteria, in the absence of effective infection-control programmes.

A considerable proportion of the burden of disease attributable to HAI is preventable and many interventions that have been proven to be effective are of low cost. Infection prevention and control (IPC) activities and programmes have been successful in controlling HAI in various settings in a sustainable way and with a favourable cost–benefit ratio. Many of these programmes developed as a result of an outbreak or crisis and included a response characterized by strong political support and leadership (local and/or national).

While many organizations (e.g. scientific societies, professional groups, governmental bodies, nongovernmental organizations) have produced policy documents and standards for IPC in individual health-care facilities, few have addressed components for national programmes and none have done this in such a way as to integrate the components of national and local programmes.

The evaluation of plans for preparing health-care facilities for epidemics and pandemics during the workshop *Health care facility emergency preparedness and response to epidemics and pandemics* organized by the World Health Organization (WHO) in Thailand in 2006 (with the participation of four countries), and the frequency of requests for guidance from WHO regional offices make it clear that among the main obstacles to the elaboration of plans and the actual response to emergencies involving communicable diseases are the lack of established IPC capacities in the health-care facilities and the weakness of many national IPC programmes. The assumption is that regions, countries and health-care institutions that have existing IPC programmes will be better able to respond to these needs in a more pertinent, timely and efficient way than those that do not. Such IPC programmes will also contribute to the prevention of endemic infections associated with health care and to the better management of outbreaks of these infections that cause a high morbidity, mortality and economic burden to patients and institutions.

The goal of the WHO IPC in Health Care initiative is to assist Member States to promote high-quality health care with a low risk of HAI for patients, health-care workers and all people associated with the health-care setting and its environment, and to accomplish these goals in a cost-effective manner. The lack or outdated nature of recommendations on the essential components that should form the basis for national and local IPC programmes motivated a meeting of the experts that constitute the Informal Network of IPC in Health Care, which has provided technical support to this WHO programme since 2007. The experts were asked to identify such components and develop a prioritized road map for development of IPC programmes. The identification of core components necessary to all IPC programmes will help in the development of IPC programmes at different levels of the health-care system, from the ministry of health to the individual health-care facility.

1.1 Aims of the meeting

The aims of the meeting were:

- To identify essential or “core” components of IPC programmes in national and local health-care settings (i.e. health-care facilities) in order to contribute to:
 - the strengthening of the capacity of health systems by establishing permanent activities to prevent HAI;
 - the preparation and management of the response to emergencies related to communicable diseases, e.g. epidemics and pandemics.
- To identify elements necessary for the strengthening of an IPC network in order to contribute to the coordination and dissemination of knowledge, strategies and research priorities.

The present meeting took place in the context of WHO Strategic Objectives 1, 5, 10 and 11, which are:

- To reduce the health, social and economic burden of communicable diseases;

- To reduce the health consequences of emergencies, disasters, crises and conflicts, and minimize their social and economic impact;
- To improve health services through better governance, financing, staffing and management, informed by reliable and accessible evidence and research; and
- To ensure improved access to, quality and use of medical products and technologies.

The present meeting directly contributed to the implementation of the following World Health Assembly (WHA) resolutions that are linked to the area of IPC:

- WHA48.13 on prevention and control of communicable diseases;
- WHA51.17 and WHA58.27 on improving containment of antimicrobial resistance and effective monitoring and control of HAI;
- WHA54.14 on global health security;
- WHA55.18, in which Member States are urged to pay the closest possible attention to the problem of patient safety and to establish and strengthen science-based systems necessary for improving patient safety and the quality of health care;
- WHA56.19 and WHA58.5, in which Member States are urged to develop and implement national plans for preparedness and response to pandemic influenza. Guidance on infection-control measures is crucial for such plans, and resolution WHA58.5 requests the Director-General of WHO to evaluate the potential benefit of protection measures, especially in health-care settings;
- WHA60.26, to devise national policies and plans for implementation of the global plan of action on workers' health and to establish appropriate mechanisms and legal frameworks for their implementation, monitoring and evaluation.

1.2 Proceedings of the meeting

The agenda of the meeting is presented in Annex 3.

The participants nominated Shirley Paton as Chairperson and Cathryn Murphy and Fernando Otaíza as Rapporteurs.

Two presentations were made on IPC-related activities at WHO headquarters and at WHO regional offices. In order to set the focus of subsequent discussions, three presentations were made on national or regional experiences in establishing core components for IPC programmes.

There was a general discussion session on the scope of IPC programmes in health care and the considerations that should be taken in account in the description of the core components of such programmes. This is presented in section 2.

After a discussion session on the general categories of core components for IPC programmes that should be explored, the participants were separated into two groups, one facilitated by Susan

Wilburn and including all participants from WHO programmes and regional offices, and the other facilitated by Shirley Paton and including all the external experts. The two subgroups each compiled a list of core components for each of the general categories, and the two lists were subsequently combined. For each general category, the framework of the discussion is summarized, and is followed by a table listing the proposed core components of the category for national-level authorities and the local health-care facilities. This is presented in section 3. These discussions generated a list of needs for research that are presented in section 4.

This report provides an expert opinion on the essential components of an IPC programme at a national level and in local health-care facilities. It contributes to the setting of priorities for the development of these programmes. The report contains the collective views of an international group of experts and staff from WHO HQ and regional offices, and does not necessarily represent the decisions or the stated policy of the World Health Organization.

1.3 Declaration of interests

The external experts had completed the required WHO declaration of interests and no conflicts of interest with the subject matter of this meeting or with WHO were identified.

1.4 Documents consulted by the participants

Before and during the meeting, the participants had access to documents related to the issues discussed, from WHO and other sources. A list of the documents provided is given in Annex 2.

2. The scope of IPC programmes in health care, and general considerations: summary of discussions

2.1 The scope of IPC programmes

The purposes of IPC in health care are:

- To prevent the occurrence of HAI in patients, health-care workers, visitors and other persons associated with health-care facilities.
 - These infections may be:
 - endemic, associated or not with the use of devices or procedures during health care;
 - epidemic, originating within the population of the health-care facility;
 - a consequence of the transmission of community-acquired infections to patients in the health-care facilities that provide care, generating the amplification of epidemics of community-acquired infections.
- To prepare health-care facilities for the early detection and management of epidemics and to organize a prompt and effective response;
- To contribute to a coordinated response to control community-acquired infectious diseases, endemic or epidemic, that may be “amplified” via health care;
- To contribute to preventing the emergence of antimicrobial resistance and/or dissemination of resistant strains of microorganisms; and
- To minimize the environmental impact of these infections or their management.

The proposed components identified as essential or “core” elements of IPC programmes are limited to those considered by the participants to be of the utmost importance, being basic, indispensable and necessary for any IPC programme to meet its objectives.

2.2 Considerations and assumptions for the discussion

2.2.1 Epidemiology of infections

- The main sources of the infectious agents that cause HAI are:
 - patients, either the patient’s own microbiological flora or that of other patients;
 - health care workers carrying the microbiological agents; and
 - the inanimate environment.
- The modes of transmission of communicable diseases are similar in health-care settings and in the community; however, the clinical practices employed during care

in health-care settings (e.g. invasive procedures, manipulation by the health-care worker) may themselves facilitate the spread of pathogens and infections.

- Most HAI are endemic and are associated with the individual risk factors of the patients and with clinical procedures. A smaller proportion of HAI is associated with epidemics. Such epidemics can originate from patients with communicable diseases admitted to the facilities, from the contamination of a common source within the facility, or as a result of systematic failure to use aseptic technique for a given procedure that can generate series of cross-infections by the same agent.
- The risk factors for HAI are of a broad variety and are specific for each type of infection. Generally, host factors (such as age and severity of the underlying disease) are the main determinant factors for most types of HAI. Some health-care practices such as use and manipulation of invasive devices are strongly associated with infection. Risk factors that are associated with the inanimate environment, such as the contamination of air, water or surfaces, play a minor role in most HAI.

2.2.2 There is a lack of recommendations on essential components

- Very few publications provide sound epidemiological data that can be used to determine which components are essential for IPC programmes in terms of effectiveness in reducing the risk of infections at the national level or at the local level of the health-care facility, and none of the relevant studies available are recent.
- Some publications from groups of experts, scientific societies or other interest groups provide suggested lists of components based on expertise or other rationale. Most of these refer to the components that health-care facilities must adopt according to the standards of accreditation agencies or other requirements and very few documents provide recommendations for national programmes.

2.2.3 Distinguishing the respective roles of national and local programmes in order to determine essential programme components:

- The national-level health authority should, directly or by delegation, regulate, provide guidance, promote and supervise compliance with regulations.
- At the local-level (health-care facility), care must be provided in a safe and efficient manner for patients, health-care workers and others.

2.2.4 The IPC components of national-level and local-level programmes should be aligned and consistent.

2.2.5 The IPC components may differ according to the type of care provided (i.e. critical care, primary care).

- The list of core components produced at the present meeting is general, and the components must be adapted to the type of care.

2.2.6 The characteristics of the components needed during routine non-epidemic periods may be different from those necessary during outbreaks.

- Both situations were considered, and it was agreed that the vast majority of HAI are endemic, that these cause the highest burden of disease overall, that outbreaks can be prevented and that they are more likely to happen in health-care facilities with a high rate of endemic HAI. Thus, the description of the components focuses on the:
 - prevention of endemic infections associated or otherwise with devices and procedures;
 - prevention and management of outbreaks in the health-care facilities and/or of the amplification of outbreaks of community-acquired infections; and
 - preparedness of health-care facilities to face larger-scale epidemics.

2.2.7 The core components considered for IPC programmes by the present meeting are presented in the following categories:

1. Organization of IPC programmes
2. Technical guidelines
3. Human resources, including
 - Training
 - Programme staffing
 - Occupational health issues for health-care workers.
4. Surveillance of disease and assessment of compliance with IPC practices
5. Microbiology laboratory support
6. Environment
7. Evaluation of IPC programmes
8. Links with public health and other services/societal bodies.

2.2.8 The components are of diverse nature and are expressed in terms of structures or processes:

- Structures, e.g. trained infection-control professionals, existence of technical guidelines;
- Processes, e.g. provision of training, monitoring of compliance with preventive practice.

3. Core components of IPC programmes: description

During discussion, the meeting participants identified core components of IPC programmes within the eight categories defined previously (section 2.1.7). The core components are described in this section.

3.1 Organization of IPC programmes

Framework of the discussion

The organization of IPC programmes must be established at national and local levels, with appointed persons, clear objectives, functions and a defined scope of responsibilities. The core components identified within this category are summarized in Table 2.

3.1.1 The objectives of the activities should be established and define the scope of the activities

- The objectives should include at least:
 - Goals to be achieved for endemic and epidemic infections; and
 - Desired compliance of processes and practices that are known to be effective in preventing HAI.
- The IPC activities are related to infections in:
 - Patients
 - Health-care workers
 - Visitors.
 - The functions for IPC include:
 - Surveillance of HAI;
 - Maintaining efficient aseptic technique for health-care practices including:
 - standard precautions
 - appropriate selection and use of antiseptics
 - technique for clinical procedures.
 - Development of guidelines and standardization of effective preventive practices:
 - Sterilization and disinfection of clinical materials
 - Isolation precautions
 - Outbreak management
 - Training of health-care workers
 - Assessment of compliance with the IPC practices
 - Assurance of procurement of adequate supplies.

- The relationship between IPC activities and other important activities should be specified. Some of these are:
 - Prevention and containment of antimicrobial resistance
 - Tuberculosis, HIV and other relevant public health programmes
 - Laboratory biosafety
 - Occupational health
 - Quality of care
 - Patient safety
 - Waste management and other environmental issues
 - Patients' rights.

3.1.2 The organization of the programme should include at least but not be limited to:

- Appointed technical team of trained professionals in charge of infection control at both national level and local level, that should include:
 - Medical professionals
 - Nursing professionals.
- The technical teams should have:
 - Formal training in infection control
 - Time assigned according to the tasks
 - Authority to perform the needed infection prevention and control tasks.
- A budget balanced with other health priorities and according to the programmed IPC activities.

3.1.3 The programme may use local experiences and knowledge obtained from successful interventions as a base for the development of strategies

A system for documentation and dissemination of successful local or national initiatives may be established to set examples of how solutions with good results can be implemented with existing resources, culture and setting.

3.1.4 Coordination with other groups that are important stakeholders involved in the development of policies, their implementation and/or their evaluation

An official group, committee or an equivalent structure that periodically interacts with the technical team responsible of the programme may be needed. This group provides an instance for multidisciplinary technical input and cooperation, support and information sharing. Other tasks that the group may perform are to review the contents of the programme, promote improved

practice, ensure appropriate training, reviews risks associated with new technologies and periodically evaluate the programme.

- At a national level this group may include other national programmes, scientific professional organizations (i.e. medical, nursing), national referral laboratories, environmental authority, patient's associations and/or training centres.
- At a local level, this group may include leaders of the main clinical departments, nursing services, support services (e.g. central supply, microbiology laboratory), administration, housekeeping, sanitation and environmental services.
- The coordination at both levels may include strategic programmes such as those related to tuberculosis, HIV and others.

Table 2. Organization of IPC programmes: core components:

Level of organization	
National-level authority	Health-care facility
<p>Authority of the programme established by the pertinent national health authority with:</p> <ul style="list-style-type: none"> • Qualified dedicated staff; • Defined IPC scope and functions; • Budget sufficient to meet programmed activities and objectives. 	<p>Designated qualified IPC leadership in the health-care facility authority with:</p> <ul style="list-style-type: none"> • Authority delegated from the administration or equivalent; • Qualified dedicated staff. <ul style="list-style-type: none"> — Trained infection control professional; — Access to trained medical support. • IPC functions and scope are defined; • Budget sufficient to meet programmed tasks.
Responsible for policies, goals, strategies, legal and technical framework and monitoring for IPC	Responsible for organizing, implementing and monitoring practices throughout the facility for the prevention and control of endemic and epidemic HAI
Represents IPC in relationships with other national programmes and key stakeholders	Represents IPC in relationships with other programmes and key stakeholders within the health-care facility
Responsible for the IPC elements of the preparedness plans and coordination of the response to public-health emergencies due to communicable diseases (e.g. pandemics)	Responsible for the IPC elements of the preparedness plans and response to public-health emergencies due to communicable diseases (e.g. pandemics)

HAI, health care-associated infections; IPC, infection prevention and control.

3.2 Technical guidelines

Framework of the discussion

The IPC measures should be consistent with the available evidence of their impact. The field of IPC has accumulated considerable knowledge on the effectiveness of preventive interventions, many of them simple and cost effective. The existence of national technical guidelines provides a framework to implement evidence-based practices.

Early participation of stakeholders (i.e. health authorities, health care facilities, scientific societies, patients' organizations) in the production of the national guidelines may contribute to the consensus and be relevant during the implementation phases.

The core components identified within this category are summarized in Table 3.

3.2.1 The "basic set of IPC guidelines" includes:

- Standard precautions:
 - Hand hygiene
 - Sterilization and disinfection of medical materials
 - Prevention and management of injuries from sharp instruments.
- Early detection of disease and isolation precautions:
 - Patient placement
 - Use of personal protective equipment.
- Aseptic technique and device management for clinical procedures, according to the scope of care

Since the scope of practices may be very different in health-care facilities according to the type of care offered, the guidelines should be prioritized on the most frequent and/or risky practices (e.g. injection safety, use of indwelling catheters and other invasive procedures).

- Waste management.

3.2.2 The basic issues related to health care workers' health include:

- Pre- and post-employment screening to identify conditions that may put workers at risk
- Vaccinations.

Table 3. Technical guidelines: core component:

National-level authority	Health-care facility
Development and dissemination of national technical guidelines using the best evidence available for IPC for the basic set of guidelines (section 3.2.1)	Adaptation and implementation of national technical guidelines to the local level
	Development of local guidelines as needed, such as the ones in the basic set of IPC guidelines (section 3.2.1)

IPC, infection prevention and control.

3.3 Human resources

Framework of the discussion

Since health-care activities are mostly performed directly by individuals, personal variation of practice is a challenge and the performance of health-care workers is crucial for the outcomes. Clinical procedures that are necessary for diagnosis or treatment may be associated with a risk of HAI for the patient and/or personnel. Some clinical procedures that are associated with a risk of HAI, especially in settings where there is low awareness of IPC, may be widespread; modifying accepted practice in order to reduce the risk of HAI may require cultural and behavioural changes of considerable magnitude and require intermediate to long-term strategies.

The core components identified within this category are summarized in Table 4.

3.3.1 Training

Guidelines provide a technical framework and description of how a standard, clinical procedure should be performed in order to reduce the risk of HAI, but the existence of guidelines alone is not sufficient to ensure that common clinical practice achieves the requirements.

Many factors affect whether standard practice is consistent and appropriate and well-trained health-care workers are more likely to comply with standard procedures if they have the means to do so (e.g. resources, organizational structure, facilities).

Training offered to health-care workers must be pertinent and relevant to the tasks that each worker is required to perform. Three categories of human resources may be identified for the purpose of training in IPC.

- **Infection-control professionals:** these are the physicians, nurses and other professionals that are members of the technical teams that are responsible for the IPC activities at any level. The knowledge and skills of this group of professionals include the contents and general principles of infection prevention and control, surveillance of infections, outbreak management and monitoring of clinical practice.
- **All health-care workers involved in direct care of patients:** these are the clinical staff (i.e. physicians, nurses, dentists, medical assistants, etc.), laboratory and other health-care workers (i.e. housekeeping) that provide patient care at any level and must perform clinical procedures in such a way as to minimize the risk of infection.
- **Other personnel that support the above:** these are administrative and managerial personnel (i.e. local authorities, administrators) responsible for the implementation of support and for monitoring national and local policies.

3.3.2 Staffing

While an in-depth discussion of this topic was beyond the scope of the meeting, the ratio of health-care workers to workload (as represented by the number of beds in the facility, admissions or other proxy) is known to be associated with several health-care outcomes such as infection rates. The level of staffing of infection-control professionals has been associated with the results of IPC programmes, where higher ratios are associated with better results; although the optimum ratio of IPC professionals to workload, in terms of tasks to be performed, in order to have a positive impact on the health indicator, has not yet been established.

3.3.3 Biological risks

The biological risks to which health-care workers are exposed are important to IPC for several reasons.

- Health-care workers are exposed to many microbiological agents that are present in the patients. In some outbreaks, health-care workers have been severely affected, representing a large number of the cases reported.
 - Some exposures may be prevented via simple measures, such as standard precautions. Others may be prevented by early detection and isolation of the source patients.
 - Some infections resulting from accidental exposures may be prevented if they are adequately managed with the use of immunoglobulins or other measures, as is the case for hepatitis B.
 - Some infections may be prevented with vaccines.
- Infected health-care workers may infect patients.
- Health-care workers may asymptotically carry infectious agents and transmit them to patients (i.e. infectious agents that are resistant to antimicrobials).

- Health-care workers manipulate substances indicated for IPC purposes, such as certain disinfectants, that may be harmful if used incorrectly.

IPC programmes are closely related to many activities of occupational health programmes and must work in coordination.

Table 4. Human resources: core components

National-level authority	Health-care facility
Establish the required contents and elements for: <ul style="list-style-type: none"> • Basic training in IPC for all health-care personnel • Specialized training of infection-control professionals(technical teams) 	Provision of initial and periodical training in IPC to all health-care personnel
Define the standards for adequate staffing of IPC technical teams	Provision of access of infection-control professionals to specialized training
Address biological risks, define preventive measures and establish the links with other occupational health activities and programmes	Provision of the proper staffing of the IPC technical teams in terms of number, skills and training Adaptation and implementation of the measures to prevent biological risks of staff during the health-care processes

IPC, infection prevention and control.

3.4 Surveillance for HAI and assessment of compliance with IPC practices

Framework of the discussion

3.4.1 Surveillance for HAI

IPC activities should respond to actual needs. In order to fulfil the objectives of IPC programmes, surveillance systems for HAI and for assessment of compliance with IPC practices should be in place. These will also contribute to the assessment of the impact of IPC interventions. Surveillance activities are time-consuming and need to be balanced with the time needed for prevention and control activities. More advanced surveillance systems also require good quality microbiological laboratory procedures and data for the identification of etiological agents and patterns of resistance to antimicrobials.

The core components identified within this category are summarized in Table 5.

Surveillance should have clear objectives. At the very least, surveillance should provide information for:

- Describing the status of infections associated with health care (i.e. incidence and/or prevalence, type, etiology, severity, attributable burden of disease)
- Identification of high-risk populations, procedures and exposures
- Early detection of outbreaks
- Assessment of the impact of interventions.

There are several models of surveillance for HAI in different settings, mostly in acute care facilities (i.e. hospitals) and in long-term hospitalized care. All include:

- The objectives of surveillance
- A standardized set of case definitions
- A method for detecting infections (numerators)
- A method for detecting the exposed population (denominators)
- The process for the analysis of data and reports, including numerator and denominator data and calculation of rates.
- Some models include a method for evaluating the quality of the data.

Most systems select some relevant infections for surveillance and currently the surveillance of all infections (“total surveillance”) is rarely done. There should be a process for deciding surveillance priorities; frequently the HAI selected for surveillance purposes include those that are preventable, especially:

- Infections that may become epidemic in the health-care facility;
- Infections in vulnerable populations, such as neonates, burn patients, patients in intensive care units and immunocompromised hosts;

- Infections that may cause severe outcomes, such as high case fatality, and infections caused by multi-drug resistant pathogens;
- Infections associated with selected invasive devices or specific procedures, such as use of intravascular devices, indwelling urinary catheters, and surgery, among others.
- Infections that may affect health-care workers in clinical, laboratory and other settings.

Methods for detecting infections should be active. Passive surveillance should be discouraged because it has low sensitivity. Different surveillance strategies have been proposed and described, such as

- Prevalence studies;
- Incidence studies, with models such as site-oriented surveillance, department-oriented surveillance or priority-oriented surveillance.

3.4.2 Assessment of compliance with IPC practices

IPC interventions may require the consistent practice of preventive procedures such as hand hygiene, respiratory protection, use of surgical antimicrobial prophylaxis and aseptic manipulation of invasive devices. The ways in which these procedures are performed depend on decisions made by individual health-care workers and the availability of appropriate resources. In order to identify deviations from requirements and to improve performance and compliance, the frequent assessment of working practices is necessary, using direct observation of procedures or other methods.

Table 5. Surveillance of HAI and assessment of compliance with IPC practices: core components

National-level authority	Health-care facility
Coordinates, gathers and documents the available data on HAI at the country level	Documents the situation of HAI and IPC processes in the health-care facility
Defines the national objectives of surveillance	Defines the local objectives of surveillance aligned with the national objectives
Establishes the priorities for surveillance of infections, pathogens and others	Establishes the priorities for surveillance according to the scope of care in the facility
Establishes what data should be provided to the health authority and how	Establishes the minimum registers necessary for medical records used for surveillance purposes and monitors compliance
Reports to interested parties on the national situation of HAI and special events	Conducts surveillance applying national standardized case definitions and methods of surveillance of infections
Standardizes: <ul style="list-style-type: none"> <li data-bbox="240 1055 450 1084">• case definitions <li data-bbox="240 1106 552 1135">• methods of surveillance. 	Detects outbreaks and coordinates the response
Promotes the assessment of IPC practices and other relevant processes in a blame-free institutional culture	Reports HAI and events to the local interested parties and the Public Health authorities as required by regulations
	Conducts the assessment of IPC practices and other relevant processes in a blame-free institutional culture

HAI, health-care associated infection; IPC, infection prevention and control

3.5 Microbiology laboratory support

Framework of the discussion

Microbiology laboratory support has several implications for patients and for IPC programmes. Identification and characterization of the etiological agent responsible for an infection is important so that clinicians can decide on treatment options to improve the patient outcome and also decrease the period of infectivity of many agents. For IPC programmes, such information is especially useful for the early detection of some outbreaks in which cases are described by the identification of the pathogen concerned or a distinct pattern of antimicrobial resistance. It also provides data on the local epidemiology of HAI. Microbiology laboratory support also provides information relevant for policies on the use of antimicrobials.

The core components identified within this category are summarized in Table 6.

For IPC programmes, there are many important issues associated with the interpretation of data from clinical microbiology laboratories and which can cause important biases. These include:

- The quality of the microbiological laboratory techniques must be assured in order to obtain valid data for clinical decisions and epidemiological use.
- Clinical departments and services must provide adequate procedures for the collection and transport of samples to the microbiology laboratory.
- Information from clinical microbiology laboratories requires analysis in order to differentiate HAI from those acquired in the community, cases of infection from colonization and to avoid double-counting of cases from which more than one culture has been processed.
- The analysis of data from such laboratories, usually collected for decisions and purposes pertaining to individual patient care, may produce information on the etiology and/or patterns of antimicrobial resistance of the most severe infections and not necessarily of all infections or the predominant ones.

Laboratory procedures may carry a risk of infection for persons involved in the chain of obtaining, handling and/or processing samples. In order to minimize the risk of infection in laboratory environments, appropriate biosafety standards should be in place and be monitored.

Table 6. Microbiology laboratory support: core components

National-level authority	Health-care facility
Standardize microbiology laboratory techniques	Provide good-quality microbiological laboratory services
Promote the interaction between IPC activities and the microbiology laboratory	Liaise IPC activities with those of the microbiology laboratory
Establish laboratory biosafety standards	Use microbiological data for surveillance and IPC activities
	Implement laboratory biosafety standards

IPC, infection prevention and control

3.6 Environment

Framework of the discussion

Several environmental issues are of concern for IPC. The most relevant are those that deal with some features of the building and conditions in the health-care facility.

The core components identified within this category are summarized in Table 7.

3.6.1 Patient care activities should be undertaken in a hygienic environment that facilitates preventive practices and that does not obstruct them

The health-care facility should provide at least the following:

- Clean water for consumption;
- Access to hand-hygiene facilities with running water and soap in areas designated for patient care or where other health-care procedures are performed;
- Clean, hygienic conditions in the facility;
- Well-ventilated areas;
- Well-illuminated areas where the health-care procedures are performed.

Other aspects that require attention because of relevant environmental factors associated with the risk of infections:

- Storage of sterile supplies should be dry and free of dust;
- Building and renovation works in progress in health-care facilities should incorporate proper containment of dust and particles, especially if they affect:
 - Operating rooms;
 - Intensive care or burn units;
 - Areas housing severely immunocompromized patients.
- Some IPC activities (e.g. isolation precautions) may require that patients with infections be separated from other patients.
 - In some instances, patients with HAI may share a room with others that have the same infection, e.g. adenovirus infection.
 - For some diseases, such as tuberculosis, some specific environmental conditions must be provided, such as ventilation.
 - In some instances, the provision of single patient room with defined ventilation conditions may be necessary to prevent transmission, e.g. infections with multidrug-resistant/extensively drug-resistant strains of *M. tuberculosis*.

Table 7. Environment: core components

National-level authority	Health-care facility
Define the physical requirements for IPC in health care settings:	Identifies infectious risks in the environment and proposes interventions on issues related to:
<ul style="list-style-type: none"> • Provision of clean water • Ventilation • Hand-washing facilities • Patient placement • Medical waste management 	<ul style="list-style-type: none"> • Provision of clean water • Ventilation • Hand-washing facilities • Patient placement and isolation facilities • Storage of sterile supplies • Building and/or renovation • Medical waste management

IPC, infection prevention and control.

3.7 Monitoring and evaluation of IPC programmes

Framework of the discussion

IPC programmes should be periodically evaluated to assess the extent to which the objectives are met, the goals accomplished, whether the activities are being performed according to requirements and to identify aspects that may need improvement. Evaluation also allows documentation of the impact of the programmes in terms of defined outcomes.

Important information that may be used for this purpose include the epidemiological indicators obtained by the surveillance system, the results of the assessments of compliance with IPC practices, other process indicators such as training activities and resource allocation obtained through audits and other means.

IPC policies should encourage improvement and promote learning from experience in a non punitive institutional culture, therefore contributing to better patient care and quality outcomes.

The core components identified within this category are summarized in Table 8.

Table 8. Monitoring and evaluation: core components

National-level authority	Health-care facility
Mechanism in place that provides regular reports on the state of the national goals (outcomes and processes) and strategies	Regularly reports on the state of the local goals (outcomes and processes) and strategies and the impact of the IPC activities
Mechanism in place that regularly monitors and evaluates the IPC activities and structure of the health-care facilities through audits or other officially recognized means	Regularly monitors and evaluates compliance with regulations, activities and programmed interventions
Promote the evaluation of the performance of local IPC programmes in a non punitive institutional culture	Regularly monitors and evaluates compliance with clinical practices
	Promote the evaluation of performance of the activities of the IPC programme in a non punitive institutional culture

IPC, infection prevention and control.

3.8 Links with public health and other services

Framework of the discussion

Most health-care facilities are involved in formal and/or informal networks of services with other organizations, institutions and facilities (e.g. hospitals, laboratories, teaching centres). The communication between these is relevant for the planning of coordinated responses to emergencies and the transfer of instructions, information and/or knowledge.

The core components identified within this category are summarized in Table 9.

- Frequently there are national regulations on the reporting of certain communicable diseases or other events of relevance for public health to the appropriate local, regional or national authorities.
- Authorities and other public health services need efficient means of communication with health-care facilities and other health providers in order to disseminate knowledge, regulations, public health strategies/programmes or other information. These links are particularly important:
 - During community outbreaks that may have an impact on health-care facilities, because the latter may need to care for unexpectedly large numbers of patients or

because they may act as amplifiers of the outbreaks through increased risk of infection for other patients and/or health-care workers; and

- For the reporting of unusual relevant events to, from and/or between facilities, such as outbreaks or the emergence of a new pathogen or of an important pattern of resistance to antimicrobials.

Hospital-based infection-surveillance systems should be linked to the public health infection-surveillance system; information regarding diseases of potential concern should be reported immediately to the public health authorities. This is in agreement with the requirements of the International Health Regulations (IHR) for 2005, which have been in force since June 2007. The IHR require Member States to notify WHO of events that may constitute a public health emergency of international concern. Likewise, infection-control practices in health-care must be in place for the purposes of containment following these events.

Table 9. Links with public health or other services: core components

National-level authority	Health-care facility (local level)
Defined procedures for the links between public health services and health-care facilities for events of mandatory reporting (i.e. cases of infections, rates of infections, outbreaks) and other communications	Established communication links with the relevant public health or other services for the purpose of reporting events and receiving information
	Represents IPC in relationships with services related to:
	<ul style="list-style-type: none"> • Waste management and sanitation • Biosafety • Antimicrobial pharmacy • Occupational health • Patients and consumers • Quality of health care

IPC, infection prevention and control

4. Core components of IPC programmes: research agenda

During the discussions, several areas were identified by the participants as being key issues that required further research in order for recommendations to be developed. The four main ones are described below.

4.1 Skills and curriculum for training of infection-control professionals

There is evidence and rationale to support the notion that the participation of trained infection-control professionals in health-care facility IPC programmes is associated with better results. However, the specific contents and skills that are needed are not clear. Several organizations (mostly professional groups associated with medicine and nursing in countries where IPC programmes have existed for long time) have a proposed basic training and curriculum for technical IPC teams. Training content and strategies and skills necessary for professionals participating in IPC programmes that are just beginning or that have limited resources need to be described and evaluated.

4.2 Ratio of infection-control professionals to workload

The ratio of infection-control professionals, particularly nurses, to the number of beds (or admissions or any other indicator of workload) of a health-care facility has been associated with success in IPC programmes. The optimum ratios of infection-control professionals to workload for IPC programmes that are just beginning or that have limited resources need to be studied.

4.3 Strategies for implementation

There are numerous studies that demonstrate successful interventions for the prevention and control of endemic HAI and outbreaks, such as provision of basic organizational structure and building infrastructure, promoting a culture of safety, implementation of evidence-based interventions guided by surveillance findings, reinforcement of leadership and performance feedback. The best strategies for establishing IPC programmes locally or nationally, particularly in low-resource settings, have not yet been described.

4.4 Applicability of the core components

The core components described in section 3 were identified during consultation with experts, and staff from WHO regional offices and WHO programmes and initiatives that deal with IPC issues using their experience and the available documentation (Annex 2). The applicability and implementation of these components should be monitored in order to determine their influence on the results of IPC programmes and so that they can be adapted where necessary. Further research is needed in order to identify which are the components that are associated with success that may be used to set the priorities for an IPC programme and/or in checklists for the assessment of programmes.

Annex 1: List of participants

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Annex 2

Documents consulted by the participants

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Annex 3

Agenda of the Second Meeting of the Infection Prevention and Control in Health Care Informal Network

26 June

08:30 *Welcome*

Mike Ryan, Director of EPR

Cathy Roth, Coordinator of BDP

Introduction of participants, goals, procedures and expected results of the meeting

Designation of Chairperson and Rapporteur

09:00–09:30 *Presentation: IPC in WHO today (Carmem Pessoa)*

09:30–10:30 *Framework of discussions*

Presentations on experiences setting essential IPC components at country/regional level (Shirley Patton, Ziad Memish, Michael Bell)

10:30–10:45 *Coffee break*

10:45–12:00 *Discussion in order to define what is a “core component”*

What are “core components” for IPC?

Other considerations: levels of the elements (basic and state-of-the-art) that help design a stepwise strategy for the development of components and the need for alignment of national & local level components.

12:00–13:00 *Lunch*

13:30–17:30 *Discussion on IPC core components*

Identification of IPC core components for hospital/local and national level

Description of components and listing of the key elements for each component

Description of (1) the basic level and (2) state-of-the-art of key elements

27 June

- 08:30 *Summary of core components for IPC at national level and recommendations for prioritizing*
- 10:00 *Coffee break*
- 10:30 *Summary of core components for IPC and recommendations for prioritizing*
- 11:45 *Wrap-up, recommendations and research needed*
- 12:30–13:30 *Lunch*
- 13:30 *IPC network: terms of reference and operation*
- 15:30 *Meeting with IPC network closes*