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Infection prevention and control in health care: time for collaborative action

Infections acquired during health care delivery, more appropriately called health care-associated infections (HAIs), are a significant public health problem around the world. It is estimated that 5%–10% of patients admitted to acute care hospitals in developed countries, acquire one or more infections. In developing countries the risk of infection is 2–20 times higher and the proportion of patients infected can exceed 25%. The objective of this paper is to draw attention to the hitherto unrecognized public health problem emerging from health care-associated infections in the Region and provide evidence that a considerable proportion of the burden of disease attributable to health care-associated infections can be prevented with low-cost interventions. A set of actions are proposed that can be implemented easily and readily across countries without major resource implications.

A draft resolution is attached for consideration by the Regional Committee.

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Executive summary

Infections acquired during health care delivery, more appropriately called health care-associated infections (HAIs), are by far the most frequent adverse events in health care. Health care-associated infections occur worldwide and affect both developed and resource-limited countries. About 5%–10% of patients admitted to acute care hospitals in developed countries acquire health care-associated infections at any given time but the risk of acquiring infection is 2–20 times higher in developing countries. The Eastern Mediterranean Region has one of the highest frequencies (11.8%) of health care-associated infections in the world confirming that this is a growing challenge to quality of health care in the Region. The economic cost of health care-associated infections as well as the opportunity cost to health services is enormous. According to some estimates, preventing a case of health care-associated infections saves on an average more than US\$ 10 000 and reduces the patient's risk of death from 7% to 1.6%.

The pandemic (H1N1) 2009 virus infection, the growing emergence of antimicrobial-resistant microorganisms and the evolving public health threats from known and unknown disease pathogens, such as severe acute respiratory syndrome and viral haemorrhagic fevers, have underscored the urgency of the need for organization and implementation of infection prevention and control programmes in health care in coherence with other public health services and interventions. Despite a number of World Health Assembly and Regional Committee resolutions urging Member States to recognize safe health care practices as fundamental to quality of care in health systems, none of these resolutions have addressed the multi-directional and cross-cutting scope of infection prevention and control programmes in health care. There remain considerable gaps in terms of a harmonized and systematic approach to prevent and tackle health care-associated infections across the continuum of patient care. The current global evidence clearly demonstrates that a considerable proportion of the burden of disease attributable to health care-associated infections can be prevented with low-cost interventions. However, translation of evidence into reliable and sustainable practice in health care remains a major challenge despite increasing clinical awareness of ways and means to reduce and prevent infections acquired during health care. The implementation of evidence-based infection control measures needs more public health actions and organizational control for universal application of evidence-based prevention and control practices, compliance with those practices, behavioural change, risk management, standardized surveillance methods, sterility assurance and generation of more reliable estimates of the burden of HAI through clinical audit. All these interventions need to be embedded and sustained in a comprehensive strategy for infection prevention and control.

Despite the availability of low-cost interventions for infection prevention and control, the compliance with standard infection control practices remains very low, particularly in low-income and middle-income countries. The current opportunities to improve patient safety and quality of care and to significantly reduce health care costs with low-cost, high yielding interventions should not be wasted. This is the time for collaborative action. Breaches in infection control measures in health care facilities can undermine every health gain and investment made in the health sector. This paper proposes a set of actions that can be implemented easily and readily across countries without major resource implications.

1. Introduction

Infections acquired during health-care delivery, more appropriately called health care-associated infections, are a significant public health problem around the world. Although estimates of the global burden of health-care associated infections are hampered by the limited availability of reliable data, it is estimated that in developed countries, between 5% and 10% of patients admitted to acute care hospitals and acquire one or more infections. In developing countries, on the other hand, the risk of infection is 2-20 times higher and the proportion of patients infected can exceed 25% (1). Health care-associated infections appear to be a hidden, cross-cutting problem and, importantly, no health-care setting, no hospital and no country in the world can claim to have solved this problem yet.

Health care-associated infections can be acquired anywhere along the continuum of health care settings, including long-term care, home care and ambulatory care. They affect a large number of patients and health care workers every year and frequently result in amplification of epidemics. According to the available evidence, the impact of health care-associated infections includes prolonged hospital stay, long-term disability, increased resistance of microorganisms to antimicrobials, massive additional financial burden for health systems, high cost for patients and their family and unnecessary deaths. Rates of health care-associated infections are also considered an important indicator of quality of patient care.

The growing emergence of antimicrobial resistance is proving that, without appropriate infection control practices, health care facilities may act as permanent reservoirs of resistance or amplify transmission of resistant bacteria within facilities and in the community. The experience from epidemics of emerging infectious diseases, such as severe acute respiratory syndrome (SARS), various viral haemorrhagic fevers, and the recent pandemic (H1N1) 2009, demonstrates how easily health care facilities can act as amplifiers of new pathogens and diseases in the community if there is no effective infection prevention and control programme in place. Inadequate infection prevention and control practices also have an impact on the environment, for example through improper health care waste management and overuse of chemical disinfectants and detergents.

World Health Assembly resolution WHA55.18 urged Member States to pay the closest possible attention to the problem of patient safety and to establish and strengthen science-based systems, necessary for improving patients' safety and the quality of health care. Resolutions WHA51.17 and WHA58.27 also called for improved containment of antimicrobial resistance and effective monitoring and control of health care-associated infections. The Regional Committee for the Eastern Mediterranean, in resolution EM/RC52/R.4, recognized the need to ensure safety of medical and health practice as a main component of health care and its quality assurance/improvement and accordingly urged Member States to develop national standards for patient safety. An essential element for implementation of the International Health Regulations (IHR) 2005 is early detection and containment of events that may constitute a public health emergency of international concern. Infection prevention and control are among the core capacities required for implementation of the regulations by Member States.

The objective of this paper is to draw the attention of the Regional Committee to the hitherto unrecognized public health problem emerging from health care-associated infections in the Region and provide evidence that a considerable proportion of the burden of disease attributable to health care-associated infections can be prevented with low-cost interventions. This paper describes the magnitude of such infections at the global and regional level, highlights the multi-dimensional and cross-cutting nature of infection prevention and control and indicates the cost-savings that can be gained by the health sector through prevention. The paper proposes a set of actions that can be implemented easily and readily across countries in the Region without major resource implications.

2. Situation analysis

2.1 Patients: vulnerable populations

Health care-associated infections are a global health problem with over 1.4 million patients developing serious infections during care for an unrelated condition at any given time (2). While the average rate for acquiring health care-associated infection may vary by country, the average mortality rate attributable to health care-associated infections among patients affected by them is presumed to be as high as 10% (3). The burden of health care-associated infections outside the hospital setting (for example, associated with long-term care, home care or ambulatory care) remains virtually unknown.

According to a literature review of national or multicentre studies published from 1995 to 2008, the overall prevalence of health care-associated infections in developed countries varies between 5.1% and 11.6% and approximately the same proportion of hospitalized patients acquire at least one health care-associated infection (4). The European Centre for Disease Prevention and Control reported an average prevalence of 7.1% in European countries. (5). The estimated incidence rate in the United States of America was 4.5% in 2002, corresponding to 9.3 infections per 1000 patient-days and 1.7 million affected patients (6). Multi-centre studies conducted in health care settings in developing countries (Albania, Brazil, Mexico, Tanzania and Thailand) report hospital-wide rates of health care-associated infections markedly higher (higher than 15% with a range from 6% to 27%) than those in developed countries (7). The burden of disease is also reflected in significant annual financial losses. In the USA, approximately 99 000 deaths were attributed to health care-associated infections in 2002 and the annual impact was approximately US\$ 6.5 billion in 2004 (6). In England, 100 000 cases of health care-associated infections are estimated to cost the national health systems a minimum of GBP 1 billion per year, with more than 5000 attributable deaths, every year [8].

An international survey on the prevalence of health care-associated infections carried out in 55 hospitals of 14 countries representing four WHO regions in the mid 1980s showed the highest prevalence (11.8%) in hospitals in the Eastern Mediterranean Region, with a prevalence of 7.7%, 9.0%, and 10.0%, respectively, in the European, Western Pacific and South-East Asia regions (9). In some countries of the Eastern Mediterranean Region (Morocco, Jordan and Tunisia), prevalence studies on the rates of health care-associated infections conducted between 2004 and 2008 have found them to be between 12% and 18% (10).

Four types of infection account for more than 80% of all health care-associated infections: urinary tract infection (usually catheter-associated), surgical-site infection, bloodstream infection (usually associated with the use of intravascular device) and pneumonia (usually ventilator-associated) (Table 1). In developed countries, catheter-associated urinary tract infections are the most frequent (accounting for about 35% of such infections) but carry the lowest mortality and cost. Surgical site infections are second in frequency and third in estimated cost. Bloodstream infections and pneumonia are less common but are associated with much higher mortality (up to 50%). In developing countries, much higher rates of surgical-site infections are reported, ranging from 12% to 39% (3). Similarly for some device-associated infections (e.g. bloodstream infection and ventilator-associated pneumonia), the incidence rate can be up to 19 times higher than in developed countries (3,11)

Table 1. Device-associated infection rates and frequency in developed countries

Type of infection	Frequency (%)	Attributable mortality (%)	Increased length of stay (days)
Urinary tract infections	35	–	–
Surgical site infection	20	4.3	6.5
Primary blood stream infection	15	20.0	8.5
Ventilator-associated pneumonia	15	27.0	5.0

Some patient sub-populations are particularly vulnerable, for example, elderly patients, patients with severe underlying conditions and patients exposed to aggressive medical and surgical interventions, including invasive devices, organ transplantations, xenotransplantation etc. One of the most vulnerable categories of patient is neonates. The rates of neonatal infections in developing countries are reported to be 3–20 times higher than those reported for hospital-born babies in developed countries with an average of 4384 children dying every day of neonatal infections in the developing countries (12). Hospital-born babies in developing countries are particularly at increased risk of neonatal infections, probably associated with poor quality of perinatal care and infection prevention and control practices. In some countries of the Region, the reported rate of neonatal sepsis has been found to be between 6.5 and 38 per 1000 live hospital-born babies (13).

2.2 Health care workers

Health-care workers are exposed to many microbiological agents that are present in patients. In some outbreak situations, health care workers have also been severely affected, representing a large number of the cases reported. During the SARS epidemics, 37%–63% of cases in some of the highly affected countries were among health care workers (14). In the Eastern Mediterranean Region, during the three Ebola haemorrhagic fever outbreaks in Sudan, 76 health care workers in 1976, 2 in 1979, and 3 in 2004 were reported to be infected while providing care to the patients in the health care facilities (15).

Of particular concern is the increased risk in developing countries of acquiring bloodborne pathogens through occupational exposure, due to a combination of higher prevalence of infections and fewer safety precautions. Health care workers incur an estimated 2 million needlestick injuries each year that result in approximately 16 000 hepatitis C (HCV) and 66 000 hepatitis B virus (HBV) infections (16). WHO estimates the global burden of disease due to occupational exposure to HBV and HCV infections to be about 40%, and 4.4% of HIV infections among health care workers to be attributable to percutaneous injuries at work (17). A number of published studies have reported high frequency of needlestick injuries and other percutaneous exposures to blood among health care workers in the Region. According to research conducted by WHO, NAMRU-3 and the Ministry of Health of Egypt, one half of all health workers surveyed in Egypt were found to suffer needlestick injury every year with a mean of 4 such injuries per year (18). Another study in Egypt showed the mean rate of needlestick injury to be 4.9 per worker per year (19). Similar observations have been made in Pakistan and Yemen. WHO estimates that occupational exposures cause approximately 10 000 HBV infections and 3500 HCV infections per year among health care workers in the Region (20).

2.3 Amplification of epidemics

Transmission of health care-associated infections from former patients, visitors and staff may also lead to outbreaks in the community. The emergence of life-threatening infections, such as SARS in 2003, viral haemorrhagic fevers such as the Ebola and Marburg viral infections, and the recent pandemic (H1N1) 2009, have shown that health care facilities become disease amplifiers in the absence of effective infection control measures. Additional protection measures need to be taken for a novel pathogen when no information on the mode of transmission is available or predictable. 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.

2.4 Antimicrobial resistance

Antimicrobial resistance is a global concern for effective health care delivery. Studies from some countries (Egypt, Jordan, Lebanon, Morocco and Tunisia) in the Region show that the antimicrobial resistance pattern is particularly acute, with methicillin resistance rates in *Staphylococcus aureus* exceeding 50% in several countries and resistance to third generation cephalosporins in *Escherichia coli* exceeding 70% in some countries (21). Reports on penicillin resistance in *Streptococcus*

pneumoniae from other Mediterranean countries are scarce. Two study reports from Lebanon describe a 56%–61% penicillin resistance rate against *S. pneumoniae*, while in Morocco and Tunisia the penicillin resistance rate was found to be 5% and 10%, respectively (22).

In 2008, an estimated 390 000–510 000 cases of multi-drug resistant tuberculosis infection emerged globally (23). Multi-drug resistant and extensively drug-resistant tuberculosis are an emerging concern worldwide. In the countries of the Region, approximately 24 000 new cases of multi-drug resistant tuberculosis occur each year, with the best estimate between 11 000 and 81 000, and a recent survey indicates that 3% of all new cases in the Region could be multi-drug resistant (24). Prevention and control of tuberculosis requires sound infection prevention and control practices in health care.

2.5 Transmission of blood-borne pathogens in health care settings

The 2004 global burden of disease study revealed that as many as 5%–10% of new HIV infections, 30%–32% of new HBV infections, and around 40% of new HCV infections in low and middle-income countries may be attributable to exposure in health care settings, including unsafe injections, unsafe blood and occupational exposures (25). Worldwide, of the 16 billion injections that are administered each year in developing and transitional countries, up to 39% of injections are given with syringes and needles that are re-used without sterilization, and in some countries this proportion is as high as 70% (26). A significant proportion of blood supply is either not screened at all for HIV, HBV and HCV, or not screened properly. It is estimated that unsafe blood transfusion causes approximately 16 million hepatitis B infections, 5 million hepatitis C infections, and 160 000 cases of HIV globally every year (27).

In the Eastern Mediterranean Region, WHO estimates over 2.1 billion injections are provided in health care settings each year, with the majority of these injections (around 95%) occurring in the curative sector. Many injections are unnecessary and unsafe and a high proportion of injections is administered by informal private providers. Of particular concern is the reuse of injection equipment in the absence of sterilization. It is estimated that around 2.5 million HBV infections, 600 000 HCV infections, and 2200 HIV infections occur each year in the Region due to unsafe injections, accounting for 58% of all HBV infections, 82% of HCV infections and 7% of HIV infections (28).

2.6 Environment

Effective functioning of health care settings depends on a number of environmental requirements, including safe and sufficient water, basic sanitation, adequate management of health care waste, appropriate knowledge and application of hygiene, and adequate ventilation. Moreover, generation of infectious and biohazardous medical waste, use (and often misuse) of chemicals for decontamination, and burning of medical waste may make health care facilities themselves an important source of environmental pollution.

Unsafe waste management remains a potential source of infection transmission in the Region. Experiences show that, often, health care waste management does not follow any standard and appropriate infection control procedures. In 2002, the result of a WHO assessment conducted in 22 developing countries showed that the proportion of health care facilities that do not use proper waste disposal methods ranged from 18% to 64% (29).

2.7 Health care-associated infection and economic cost

Health care-associated infection is a global health phenomenon that results in substantial economic cost. The primary cost is that patients with hospital-acquired infections have their stay prolonged, during which time they occupy scarce bed-days and require additional diagnostic and therapeutic interventions. The economic burden of health care-associated infection is substantial, although it varies from country to country. Some studies have shown that an estimated average cost of US \$558 to US\$ 593 for each urinary tract infection, US\$ 2734 for each surgical-site infection, US\$ 3061 to

US\$ 40 000 for each bloodstream infection, and US\$ 4947 for each case of pneumonia could be saved if these infections could be prevented (30). Estimates of the cost of health care-associated infections, in 2002 prices, suggest that the annual economic costs are US\$ 6.7 billion per year in the United States (31) and GBP 1.06 billion (approximately US\$ 1.7 billion) in the United Kingdom (32). According to some estimates, preventing a case of health care-associated infection saves on average more than US\$ 10 000 and reduces the patient's risk of death from almost 7% to 1.6% (33)

Major economic impact may follow amplification of epidemics. The SARS pandemic is estimated to have cost around US\$ 60 billion, being largely associated with amplification due to unsafe health care.

The economic rationale for preventing health care-associated infections can be summarized as follows. Such infections take up scarce health sector resources by prolonging hospital stays and adding costs, by affecting the health workforce, and by amplifying epidemics. Effective infection-control strategies release these resources for alternative uses. If these resources have a value in an alternative use, then the infection control programmes should be credited with generating cost savings.

3. Current strategy, response and challenges

3.1 WHO strategy

The need for sound infection prevention and control practices has been recognized as a key element for strategies to address relevant public health issues in several resolutions of the World Health Assembly and the Regional Committee for the Eastern Mediterranean.

World Health Assembly resolution WHA51.17 and WHA58.27 drew attention to the need for improved containment of antimicrobial resistance and effective monitoring and control of health care-associated infections. Resolution WHA55.18 urged Member States to pay the closest possible attention to the problem of patient safety and to establish and strengthen science-based systems, necessary for improving patients' safety and the quality of health care, while WHA56.19 and WHA58.5, in particular, urged Member States to develop and implement national plans for pandemic influenza preparedness and response. Guidance on infection control measures has been regarded as crucial for such plans, and resolution WHA58.5 requested the Director-General of WHO to evaluate the potential benefit of protection measures, especially in health care settings.

WHA60.26 urged Member States 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. WHA62.15 on prevention and control of multidrug-resistant tuberculosis and extensively drug-resistant tuberculosis, stated, in particular, that national airborne infection control policies should be developed and implemented as part of general infection prevention and control programmes. Most recently, WHA63.18 urged Member States to promote total injection safety at all levels of the national health system.

The Regional Committee, in resolution EM/RC52/R.4, recognized the need to ensure safety of medical and health practice as a main component of health care and its quality assurance/improvement and accordingly urged Member States to develop national standards for patient safety. It also called for rational use of antimicrobials to prevent antimicrobial resistance in health care (resolution EM/RC/48/R.8). However, none of these resolutions have addressed the scope of infection prevention and control and the necessary strategic framework. There are still considerable gaps in terms of a harmonized, comprehensive and consistent approach in order to:

- prevent the occurrence of health care-associated infections in patients, health-care workers, visitors and other persons in health-care settings;
- prepare health care facilities for the early detection and management of epidemics and organization of a prompt and effective response;

- contribute to a coordinated response to control community-acquired infectious diseases, endemic or epidemic, that may be “amplified” via health care;
- contribute to preventing the emergence of antimicrobial resistance and/or dissemination of resistant strains of microorganisms; and
- minimize the environmental impact of health care-associated infections or their management.

A number of countries have made progress in controlling the problem of health care-associated infections but in most countries, including the countries of the Eastern Mediterranean Region, the current strategies for infection prevention and control are fragmented and are not harmonized between different programme areas.

3.2 Current response

Infection control is not a well recognized discipline within the health systems in the countries of the Region and there is significant variation in the development of infection control programmes and initiatives among them. The existing infection control programmes are often unidirectional, focusing only on one or a few interventions, such as surveillance or antibiotic usage. Local studies and local expertise have not been utilized in developing infection control programmes.

At the same time, WHO has produced policies and guidelines, addressing specific infection prevention and control issues, and has been supporting Member States through vertical programmes and related initiatives, such as patient safety, safe injections, Stop Tuberculosis, HIV, epidemic and pandemic preparedness and response, water and sanitation and occupational health. A number of infection prevention and control or related activities, such as infection prevention and control preparedness and response, safer care, safe surgery, occupational health, injection and immunization safety, hospital waste management, blood safety and laboratory biosafety, have been carried out in many health care facilities, but have been implemented vertically, in a fragmented manner. For example, since the formulation of the regional plan of action and strategy for injection safety in the Expanded Programme on Immunization in 2004, there has been considerable progress in ensuring safe immunization injections but unsafe injection practices in general have not been tackled as a problem in curative health care. Health care facilities often do not have plans to prevent needlestick and sharps exposures among health care workers, and there is a lack of information and research in this field, particularly in health care facilities.

Another example of the lack of efficiency arising from strategies that are not harmonized relates to blood safety. Regional efforts are being made to improve safety of blood and blood products and to rationalize the use of blood transfusion, with a particular focus on life-saving transfusions in countries emerging from disaster situations. However, the Region is far from achieving WHO’s key recommended interventions, such as 100% screening of blood for HBV, HCV and HIV, use of voluntary nonremunerated donors, and use of standardized tests and reagents for the screening of blood. Thus, despite considerable efforts made by individual initiatives, a cohesive framework is lacking, leading to inefficient and weak infection prevention and control practices.

3.3 Challenges

Standard precautions are the foundation for prevention and control of health care-associated infections, reducing both known and unknown biological risks associated with health care. Lack of adherence to standard precautions in health care facilities remains a formidable obstacle. In hospitals and other health care facilities, the compliance of health care workers with one of the key elements of the standard precautions, hand hygiene, remains low due to lack of educational efforts and awareness building. Other areas of concern include poor awareness or knowledge about communicable disease transmission among health care workers and lack of commitment among senior policy planners. This is particularly significant in developing countries where nurses, doctors and patients are often unaware of the importance of infection control and its relevance to safe health care. The medical practitioners

may have a tendency to be focused on individual patients and disinclined to think of them in groups, a viewpoint which undermines basic principles of infection prevention and control. They are often unaware of the need to minimize the risks of health care-associated infections, regarding them as natural or inevitable.

Surveillance for health care-associated infections, outbreaks and bacterial resistance, as well as systematic assessment of compliance with infection prevention and control practices, plays an essential part in developing any infection control policy and measuring its success. These data are not usually complete, reliable or representative in the Region.

An integrated approach to assessment and management of environmental biologic risks for infection prevention and control purposes is needed. Disposal of health care waste is frequently not an integral part of health planning and unsafe waste management is common. A lack of adequate or safe water supply in health care facilities, together with lack of resources or equipment for effective environmental cleaning, are often compounded by significant overcrowding due to insufficient beds to cope with demand. With regard to water safety, there has been systematic attempt to evaluate specific risks of exposure to *Legionella pneumophila* from water systems in health care facilities and to devise feasible options to prevent and control such emerging virulent bacteria. A functional sterilization department is by no means standard in every hospital, even in the larger urban institutions.

Although vaccination is among the most cost-effective means of protecting health care workers against HBV, it is not promoted as a preventive strategy in the Region. In 2003, WHO estimated that only 18% of health care workers in the Region were vaccinated against HBV compared to an immunization rate of 71% in Europe. Lack of availability of post-exposure prophylaxis (PEP) for exposed health care personnel remains a challenge due to stigma and myth.

Translation of evidence into reliable, sustainable practice remains a major impediment to progress in preventing hospital-acquired infections. Even if health care providers and institutions know what to do (based on the best available evidence), they generally do not know how to apply this evidence reliably to improve the structure, processes and outcomes of their infection control programmes.

Policy-making in developing countries is usually based on anecdote rather than evidence. Traditionally, clinical interventions consume most of the available resources and the benefits of public health activities remain unrealized. The redistribution of resources from cure to prevention is not easily accepted.

Finally, with regard to capacity-building, there is only one WHO collaborating centre for infection prevention and control in the Region and efforts to make use of its technical resources to the benefit of the Member States remain negligible.

3.4 Why changes are necessary

Most health care-associated infections can be prevented with readily available and relatively inexpensive strategies. The study on the efficacy of nosocomial infection control in 1974 in the USA showed that effective infection control programmes could reduce infection rates by as much as 32% and be cost-effective (34). In an overview of published reports on the effect of infection control programmes from 1990 to 2002, it was found that between 10% and 70% of health care-associated infections were preventable (35). In a hospital in São Paulo in Brazil, there was a 71% decline in all health care-associated infections in the intensive care unit when an infection control programme was implemented (36). Infection prevention and control measures were shown to significantly reduce health care-associated infections among health care workers in both developed and developing countries. Many other successful strategies have also been documented.

Maintaining a culture of safety in the work place and education of health care workers are key elements of infection control and have reduced HBV transmission and improved infection control

practices remarkably in the USA (37). Studies on health care workers in Egypt suggest that promotion of personal protection leads to increased concern about transmission of bloodborne pathogens in the health care setting and behaviour change in the provision of health care services (38).

4. Proposed actions

An effective infection prevention and control programme can only be achieved when all essential elements are implemented in a systematic way in the context of a specific health care environment. These core components should be implemented both at national and health care facility levels.

The following actions are proposed:

- a) **Organization of infection prevention and control programmes:** infection prevention and control programmes must be established at national and local levels in all countries of the Region, with appointed personnel, clear objectives, functions and a defined scope of responsibilities. The national programmes should be made responsible for all policies, goals, strategies, legal and technical framework, and monitoring for infection prevention and control. Programmes at health care facility level should organize, implement and monitor practices throughout the facility for the prevention and control of both endemic and epidemic health care-associated infection.

The national programme for infection prevention and control should not be a standalone programme. It needs to be integrated with other Ministry of Health infection control entities in the health care system, with qualified dedicated staff and a separate budget sufficient to meet the programme needs. At the health care facility level, the infection prevention and control programme should ideally consist of an infection control committee chaired by an infection control professional, and an infection control team, along with engineering and administrative support and available supplies to ensure the implementation of infection prevention and control measures. Wherever an infection prevention and control programme is placed, it should be integrated with other important activities, including 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; and patients' rights.

- b) **Development, dissemination and implementation of evidence-based guidelines.** Infection prevention and control measures should be consistent with the available evidence of their impact. Development and dissemination of national technical guidelines using the best evidence available should be one of the most important responsibilities of the national infection prevention and control programmes. The health care facilities' programmes should adapt and implement the national guidelines, and produce local guidelines when needed. A basic set of guidelines should include at least: guidance on standard precautions (hand hygiene, prevention of direct unprotected contact with blood/body fluids, sterilization and disinfection of medical materials, prevention and management of injuries from sharp instruments, waste management and environmental cleaning); guidelines on early detection of disease and isolation precautions; guidelines on additional (contact, droplet and airborne) precautions; and guidelines on aseptic techniques and device management (injection safety, use of indwelling catheters, other invasive procedures etc).
- c) **Human capacity-building.** The national level infection prevention and control authority should establish the required contents and elements both for basic training in infection prevention and control for all health care personnel and specialized training of infection control professionals (technical teams). Health care facilities should provide both initial and periodic training to all health care personnel and ensure that infection control professionals receive adequate specialized training. Health care facilities should provide for the proper staffing of the infection prevention

and control technical teams in terms of number, skills and training, in accordance with the national standards developed by the national infection prevention and control programme.

Numerous biological risks to which health care workers are exposed should be addressed. The national infection prevention and control programmes should define, and health care facilities implement, preventive measures and establish the necessary links with other occupational health activities and programmes.

- d) **Surveillance and assessment of compliance with infection prevention and control practices.** Building on existing structures and resources, surveillance for health care-associated infections should be considered as an essential component in health care-associated infection prevention, with the aims of outbreak identification, establishment of endemic baseline rates of infection and evaluation of the effectiveness of infection control measures. The surveillance system can initially cover epidemiological indices according to the assessment of main concerns (e.g. certain surgical site infection rates, antibiotic resistance patterns, bloodborne infections). Assessment of compliance with infection prevention and control practices can be included as part of strategies to improve practices.
- e) **Microbiology laboratory support.** Microbiology laboratory support is essential for an infection prevention and control programme, particularly in highly complex health care settings (e.g. intensive care, dialysis). Identification and characterization of the etiological agents is important to clinicians for informing decisions on treatment options. It is also 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 health care-associated infections and information relevant for policies on the use of antimicrobials and other infection prevention and control strategies. Microbiological laboratories should be able to provide good quality services using standardized techniques and both national and local infection prevention and control programmes should ensure interaction between their activities and microbiology laboratory services. Programmes to strengthen laboratory security and management practices against biological risks need to be considered in order to prevent transmission of infection through inappropriate laboratory practices.
- f) **Environmental requirements for infection prevention and control.** National infection prevention and control programmes should define environmental requirements for infection prevention and control (e.g. provision of safe water, ventilation, hand hygiene facilities, patient placement and isolation facilities, storage of sterile supplies, conditions for building and renovation). The impact of hospitals on the environment should also be considered through rational use of chemicals, health care waste management, etc.
- g) **Monitoring and evaluation of infection prevention and control programmes.** A mechanism that provides regular reports on the state of the national and local goals and strategies should be established. Infection prevention and control indicators should be defined as well as a mechanism that would allow regular monitoring and evaluation of the infection prevention and control activities and infection prevention and control infrastructure of the health care facilities. A process to collect and analyse national indicators should be defined. It is important that discussion of results should be done in a non-punitive, blame-free environment, which should be actively promoted.
- h) **Links with public health and other services/societal bodies.** National infection prevention and control authorities should define procedures for the necessary links between public health services and health care facilities for events of mandatory reporting (i.e. cases of infection, rates of infection, outbreaks) and other communications, and the local infection prevention and control programmes should establish and maintain the links. It is extremely important also that activities

related to patient safety, occupational health, waste management, sanitation, biosafety, antimicrobial stewardship, patients and consumers and health care quality are coordinated with the relevant programmes.

5. Conclusions

The starting point for preventing health care-associated infections in the Region is to appreciate the burden of such infections, including the associated costs to health care, as an emerging public health problem, and to increase awareness that the majority of these infections are preventable by measures that are simple, feasible and achievable in any economic setting. The wider recognition of health care-associated infections as a growing health problem is the first step towards establishing effective infection prevention and control strategies.

Developing and implementing national policies, strategies and programmes for infection prevention and control require a health system approach and sustained response across all levels of the health care system. There are remarkable disparities between countries of the Region with regard to socioeconomic development, availability of human resources and health care infrastructure. However, evidence has shown that it is possible to achieve substantial progress in minimizing health care-associated infections within such challenging circumstances if effective measures such as standard precautions (i.e. hand hygiene, use of personal protective equipment to avoid direct contact with blood and body fluids, sharps and injection safety, and waste management), safe blood transfusion, safe laboratory practices and proper application of isolation precautions are promoted in health care settings, irrespective of the type of care these settings are providing.

The Regional Office will support Member States in developing evidence-based infection control programmes suitable for their own country context. It can also support periodic assessment, planning, implementation and evaluation of national infection control programmes. The Regional Office will provide leadership and launch regional initiatives to bring together all stakeholders, including national governments, international organizations and networks of regional experts, professional bodies and hospital administrators. Such collaboration will facilitate formulation of a key strategic framework that would establish standards, procedures and methods for prevention and control of health care-associated infections, and suggest minimum standards of infection control to be achieved in each country regardless of its level of development. The Regional Office also has a normative role to play in the field of infection prevention and control with an appropriate advocacy strategy that will promote ownership and harmonization of infection prevention and control programmes across all Member States.

Despite the availability of low-cost interventions for infection prevention and control, the compliance with standard infection control practices remains very low, particularly in low-income and middle-income countries. The current opportunities to organize and develop national programmes for infection prevention and control, including patient safety and quality of care, and to reduce health care costs significantly with low-cost, high yielding interventions should not be wasted. Breaches in infection control measures in health care facilities can undermine every health gain and investment made in the health sector.

6. Recommendations to Member States

1. Establish a national infection prevention and control programme with dedicated and qualified staff and well defined scope and functions as an integral part of the health care delivery system and conduct regular monitoring and evaluation of the programme.
2. Ensure that all infection prevention and control measures implemented in health care facilities are consistent with the available evidence and best practices and that minimum environmental requirements for infection prevention and control are met, including provision of safe water,

ventilation, hand hygiene facilities, patient placement and isolation facilities, and proper storage facilities to ensure sterility of supplies.

3. Progressively build up human resources capacity on infection prevention and control in health care.
4. Ensure that all health care workers are protected against occupational exposure, through addressing biological risk, defining preventive measures and establishing links with other occupational health activities and programmes.
5. Define and establish appropriate methods and priorities for surveillance of health care-associated infections and assess compliance with infection prevention and control practices.
6. Ensure established national infection prevention and control programmes use standardized microbiology laboratory techniques to ensure laboratory biosafety standards.
7. Establish links between infection prevention and control and other public health services for events of mandatory reporting, ensuring coordination of activities related to waste management, sanitation, biosafety, rational use of antimicrobials, occupational health, patients and consumers, and health care quality.
8. Introduce appropriate regulatory mechanisms for accreditation of health facilities in order to ensure that the standards for infection prevention and control are regulated and maintained in designated health care settings.

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