



REVIEW ARTICLE

# Management of Hospital Infection Control in Iran: A Need for Implementation of Multidisciplinary Approach

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Received: April 29,  
2014  
Revised: June 1, 2014  
Accepted: June 2, 2014

**KEYWORDS:**

infection control,  
nosocomial infection,  
risk management

**Abstract**

Nosocomial, or hospital-acquired, infections are considered the most common complications affecting hospitalized patients. According to results obtained from studies conducted in the Children Medical Center Hospital, a teaching children's hospital and a tertiary care referral unit in Tehran, Iran, improvements in infection control practices in our hospital seem necessary. The aim of this study was to identify risk management and review potential hospital hazards that may pose a threat to the health as well as safety and welfare of patients in an Iranian referral hospital. Barriers to compliance and poor design of facilities, impractical guidelines and policies, lack of a framework for risk management, failure to apply behavioral-change theory, and insufficient obligation and enforcement by infection control personnel highlight the need of management systems in infection control in our hospital. In addition, surveillance and early reporting of infections, evaluation of risk-based interventions, and production of evidence-based guidelines in our country are recommended.

## 1. Introduction

Infection prevention and control (IPC) relies on the appropriate management systems, integrating IPC into management at all levels [1].

Infection control provides a framework for identification of a hazard and development of an action plan to

eliminate the hazard or minimize its effect through control measures [2].

Nosocomial, or hospital-acquired, infections are considered the most common complications affecting hospitalized patients [3]. According to results obtained from studies conducted in the Children Medical Center Hospital, a teaching children's hospital and a tertiary

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care referral unit in Tehran, Iran, improvements in infection control practices in our hospital seem necessary. The aim of this study was to identify risk management and review potential hospital hazards which may pose a threat to the health as well as safety and welfare of patients in an Iranian referral hospital.

High rates of antimicrobial resistance [4,5], high prevalence of methicillin-resistant *Staphylococcus aureus* (MRSA) strains [4–6], the increased frequency of vancomycin-resistant *Enterococcus* (VRE), and rapid rise in the number of *VanA* isolates [7], high prevalence of extended-spectrum beta-lactamases-producing *Escherichia coli* isolates, as well as high prevalence of *bla*CTX-M gene [7,8] and high frequency of multi-resistant *Pseudomonas aeruginosa* [8] could be because of a lack of infection control management and specific consideration of infection risk. We reviewed the key factors in the infection control program in order to ascertain whether infection control fits into a hospital management structure and provides a framework for organizational change and strategies for the prevention of nosocomial infections.

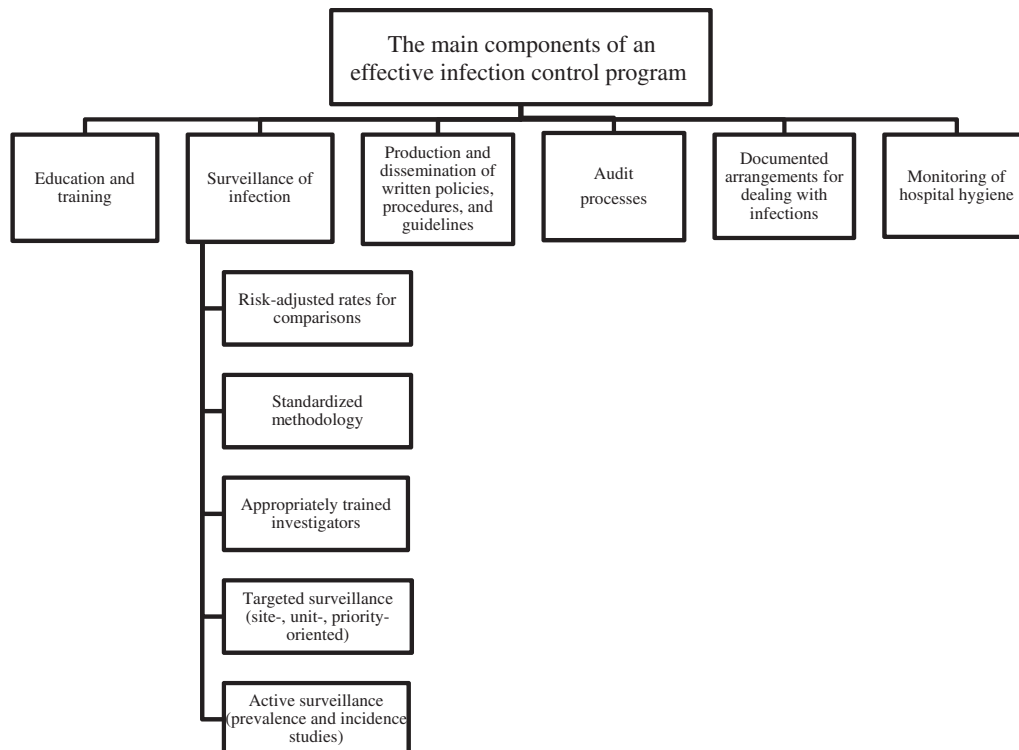
Several key elements (e.g., governance, policy/procedure, education/training, surveillance, and monitoring of hospital hygiene) have been identified as essential components of an IPC program and should be addressed by all services (Figure 1). Infection control without management strategy, or with little clinical and managerial influence, has limited effectiveness and impact [1]. Managerial interest at a strategic level to ensure that

effective infection control arrangements are in place as well as supporting of senior management and heads of clinical directorates is essential. Prevention of nosocomial infections is the responsibility of all individuals and services providing health care. The selection of appropriate health-related indicators to monitor are considered one of the most important steps in design and surveillance of infection control. Strategic decision-makers without knowledge or without systems to ensure consideration of infection control, and lack of monitoring of a variety of processes, outcomes, and events can put patients at risk [1].

Strategies to prevent infections have been subdivided into several groups (education-based, process-based, and systems-based) [9]. However, other interventions such as “use antibiotics wisely” or “educate and train staff” have been suggested, but the implementation of them might be vague and difficult [10], particularly in developing countries such as Iran.

Existence of a written policy within the facility to closely monitor all of them as well as measurement and feedback of selected infection control process measures and compliance with infection control practices is necessary in our setting. Identification of risk management and management of hospital hazards that may pose a threat to the health as well as safety and welfare of people should occur regularly.

Routine practices such as aseptic techniques, single-use devices, reprocessing of instruments and equipment, antibiotic usage, handling and use of blood and blood



**Figure 1.** The main components of an effective infection control program.

products, as well as effective work practices and procedures, and environmental management practices including management of hospital/clinical waste is fundamental for management of infection control [11].

From the perspective of IPC, there is often a need for information particularly in instances of infection outbreaks, epidemics, and national or local emergencies that have been obtained by the IPC team should be rapidly disseminated to health care workers (HCWs) [12].

## 2. The way communication channels are used within hospitals to communicate with HCWs

It has been reported that HCWs prefer direct modes of communication (e.g., face-to-face and telephone interaction) rather than indirect modes of communication (e.g., computer systems or policies) [12–14]. Although implementation of policies and guidelines is another way of communication, there are some barriers, such as struggling to adopt behaviors that are outlined in such documents [12,15]. Therefore, potential barriers to adopting these factors should be considered in practice by guideline or policy developers. Another key factor is successful training of HCWs, and the infection control team should try to determine what education and training can be performed every day.

## 3. Leadership and management

Ineffective management and leadership, inadequate teamwork and communication between staff, and lack of clarity about responsibilities are the main factors that raise concerns, especially in developing countries such as Iran.

According to the results of the systematic review, leadership style has a strong effect on most patient outcomes [16]. Houser [17] reported that positive leadership behaviors mediated by staff expertise and stability were associated with reduced incidence of pneumonia and urinary tract infection, and were associated with generating a number of models.

## 4. Teamwork and multidisciplinary team

Health authorities are required to protect public health by controlling infection. The main infection control team responsibilities are shown in Figure 2. These responsibilities should include ensuring adequate infection control arrangements within hospitals. An infection control committee, which provides multidisciplinary input and cooperation, plays a key role in each setting, particularly for information sharing. The infection control

committee is responsible for the development of policies for the prevention and control of infection by providing basic measures for infection control; education and training of HCWs; identification of hazards; and improved practice to reduce probable risks at all levels of the health facility.

The role of the director of infection control prevention should be to provide a bridge between managers and clinicians with mutual performance monitoring and support [1].

This committee should include wide representation from relevant departments: management, physicians, other HCWs, clinical microbiology, and training services. The committee must have a direct reporting relationship with either administration or the medical staff to effectively promote the program [11].

The infection control team is responsible for the day-to-day activities of the infection control program, including scientific and technical support role such as surveillance and research, supervision of practices, oversight of sterilization and disinfection, and implementation of appropriate staff training in infection control and safety management [11].

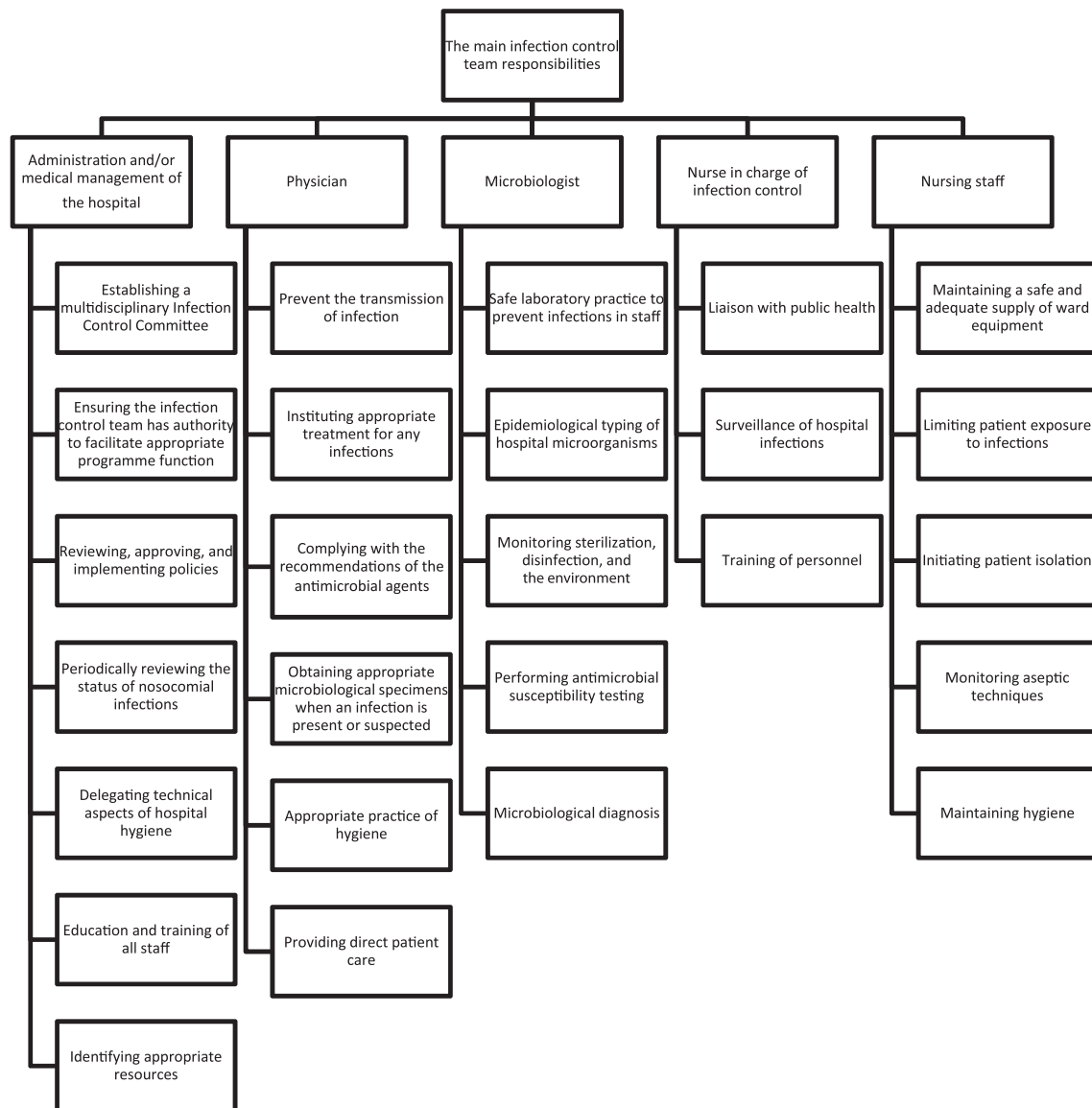
## 5. Behavioral change

One of the most challenging obstacles in some settings especially in developing countries such as Iran, is behavioral change. Infection risk has been shown to be strongly related to staffing levels and staff training [1]. Despite educational efforts, cross-infection of patients by HCWs whose hands are contaminated might occur because of a lack of adherence to standards for hand hygiene, which is generally considered as the single most important method for infection control [3,18].

## 6. Transmission-based strategies

Transmission-based precautions are considered a vital factor related to infection control practices. Frequent patient movement may be an important risk factor in the dissemination of bacteria and nosocomial infections in our hospital. Our previous findings suggest that cross-transmission would be a chief route of colonization or infection for *P. aeruginosa* [19]. The results indicated considerable cross-transmission of *P. aeruginosa* not only among patients in one ward but also among those from different wards. The dissemination of bacteria around the hospital might be caused by a lack of systems-based strategies, proper infection control procedures, and risk management in our hospital.

Placement of patients with diseases such as cystic fibrosis (CF) in a single room in which the air is discharged outdoors or specially filtered prior to when it is



**Figure 2.** The main infection control team responsibilities.

circulated to other areas of the health care facility is another risk for cross-contamination of the environment and can provide opportunities for transmission of infection [2]. In our hospital, cross-infection among patients with CF and those without occurred because of a lack of segregation policies and basic hygiene measures. Because the intensive care unit (ICU) in our center admits a variety of patients, including those with CF, transmission of bacteria between those with CF and the other patients in the ICU is probable [8]. Therefore, written policies and procedures that are updated regularly must be developed. Facility design and planning including adequate floor space for beds, appropriate cleaning disinfecting and sterilizing practices, adequate ventilation for isolation rooms and high risk areas such as intensive care areas, as well as facilitation of patient

transport and regulation of traffic flow to minimize exposure of high-risk patients is vital in our hospital.

In addition, airborne transmission of bacteria from environmental surfaces can occur as a result of inadequate cleaning, disinfection, or sterilization [20]. Therefore, policies must be in place that specify the frequency of cleaning and cleaning agents for environmental surfaces and all reused medical devices. Routine cleaning of work surfaces such as patient care equipment, regularly touched surfaces (computer keyboards, handrails, doorknobs, bedside tables, tap handles) should be performed, and monitored and supported by the infection control team. In addition, equipment such as a high-filtration particulate respirator mask is necessary for those who enter the hospital room of patients with diseases such as CF.

## 7. Workforce, workload, and bed occupancy

Another factor relating to infection control management is the bed turnover interval [21]. In hospitals such as our setting with workloads associated with high turnover (the time between a bed being vacated and another patient being put into it), reduction in the duration of environmental cleaning between patients might be seen.

However, lack of proper infection control and development of nosocomial infections may lead to additional days in the hospital and significant mortality. The overall patient nosocomial infection rate in our hospital during 2002–2003 was 3.34 per 100 patients, and the infection rate per 1000 patient-days was 5.27. The lethality rate associated with nosocomial infections was 10% [22].

The estimation of infection associated with health care in developed health systems in countries such as Australia, Denmark, England, France, The Netherlands, Norway, Spain, and the USA vary between 4% and 10% [21].

Catheter-associated urinary tract infections are considered the most frequent among nosocomial infections [3]. In our hospital, the overall rate of device-associated nosocomial infections was 18%, whereas the rate of catheter-associated urinary tract infection was the highest (67%) [22].

Therefore, specific policies and practices to minimize nosocomial infections must be established. In addition, reviewing and updating as well as compliance monitoring should be performed regularly in our hospital.

## 8. Monitoring hospital hygiene

Infection control teams should collaborate with other relevant staff to monitor the implementation and effectiveness of the hospital's routine procedures on cleaning, housekeeping, disinfection or sterilization of instruments and equipment, improved clinical waste disposal procedures and segregation of clinical and other waste, and kitchen hygiene. An environmental audit cycle involving identifying the problem, relevant education and training, action plan, and reaudit should be performed by infection control teams [23].

## 9. Hand hygiene

Helder et al [24] explored the effect of a multifaceted intervention on hand hygiene practices in a neonatal ICU setting and reported a significant reduction of nosocomial bloodstream infections after the education program.

Nurses can also have a significant effect on invasive device-related infections because of the key role in their management.

The spread of MRSA and VRE usually occurs by transient carriage on the hands of HCWs [25]. In our hospital, because of the high rate of MRSA and VRE isolates, aseptic techniques such as waterless antiseptic hand rubs and use of sterile gowns and gloves must be practiced. In addition, hands must be dried after washing because the residual moisture left on the hands might harbor bacteria [26].

Improvement in the adherence of HCWs to hand hygiene guidelines should prevent the transmission of bacteria, especially MRSA [27].

According to the Cochrane systematic review of 118 trials to evaluate the effects of audit and feedback on the practices of HCWs, such as antibiotic prescribing, hand washing, and glove use, an improvement in patient outcomes was seen [28].

In our hospital, genotyping of *S. aureus* nasal colonization among hospital personnel and clinical *S. aureus* isolates showed identical MRSA strains in HCWs as well as among clinical isolates. This finding indicates that there is a succession of *S. aureus* populations over a period of time. Notably, the highest prevalence of methicillin-susceptible *S. aureus* nasal carriage was found in office personnel because of the lack of direct contact between these personnel and patients [6].

## 10. Antibiotic prescription policy

Another important factor in each setting is the monitoring of antimicrobial use, which requires multidisciplinary and multifaceted interventions [29]. It has been reported that interventions that result in changes in prescribing behavior were most successful [30]. In addition, the primary care setting, patient-based interventions including patient leaflets, nonprescription pads, and improving prescribers' communication skills with patients, have been the most consistently effective in reducing antimicrobial use [31–33]. Although professionals must give patients clear information about the probable symptoms, benefits, and hazards of antibiotics [29], they should know that interventions with the aim of changing patient behavior are more likely to be effective, rather than provide information [31].

However, a toolkit of materials for medicines management teams to facilitate good antimicrobial stewardship as well as intermittent audits should be undertaken to explore changes observed in antimicrobial use, antimicrobial resistance pattern, or concerns about poor patient outcomes (29).

Saizy-Callaert et al [34] tested a multidisciplinary approach designed to reduce unjustified prescriptions of antibiotics. The program included four objectives such as local consensus on a local prescribing guide, a restricted prescription policy for the most expensive antibiotics, and training for prescribers. Based on this approach, prescribing behavior was changed and a significant reduction

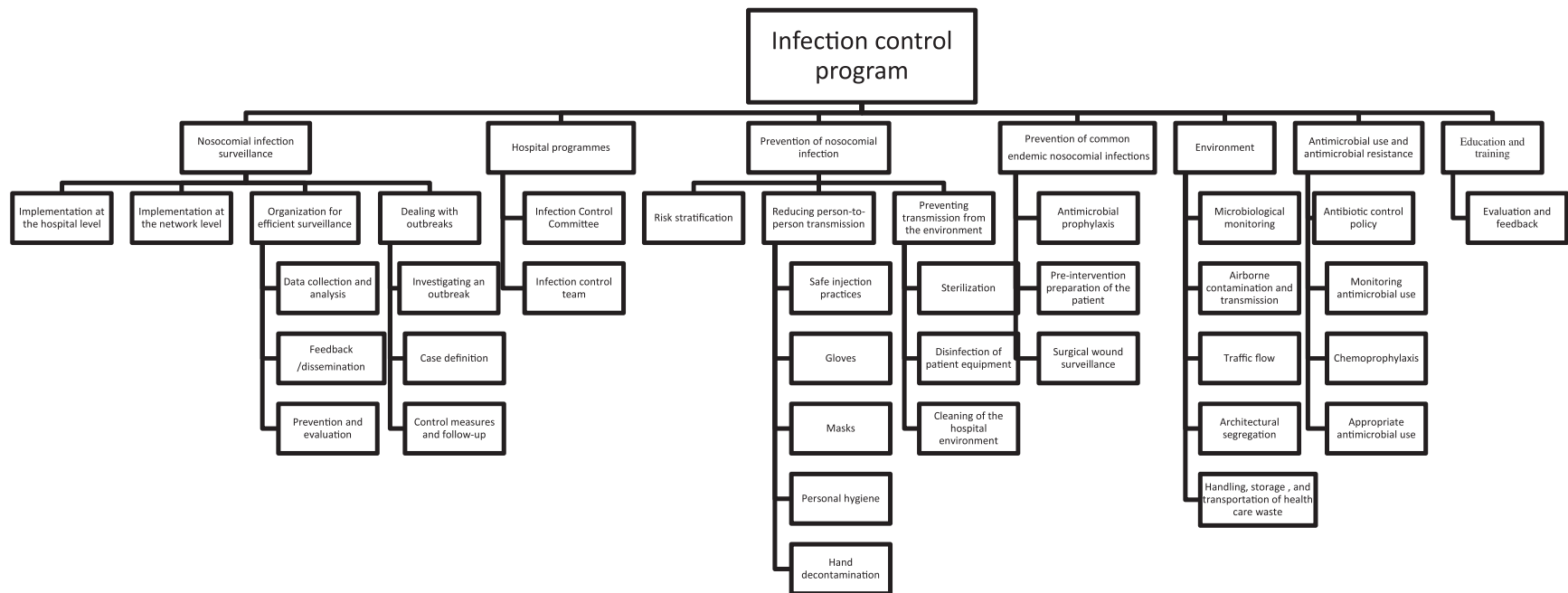


Figure 3. Recommendation for infection control management in our country.

in inappropriate prescriptions, from 6% to 3%, occurred [34].

In our hospital, a series of appropriate guidelines for antimicrobial use and a chart audit should be developed, and physicians must participate in planning the audit and analysis of data and all reasons for inappropriate use of antibiotic should be identified. Recommendations for infection control management in our country are shown in Figure 3.

Presence of an active surveillance system in our setting seems necessary to minimize costs and workload, and promote health care participation with timely feedback. Our hospital should share nosocomial infection data with a network of similar facilities to determine interfacility comparisons and trends. However, passive surveillance with reporting by individuals outside the infection control team, including laboratory-based surveillance, extraction from medical records, and infection notification by HCWs, can be useful especially in developing countries but has low sensitivity. Active surveillance such as prevalence or incidence studies of infection, interpretation, feedback of interventions for preventive action, and evaluation of their effect is recommended.

In conclusion, barriers to compliance and poor design of facilities, impractical guidelines and policies, lack of a framework for risk management, failure to apply behavioral change theory, and insufficient obligation and enforcement by infection control personnel [27,35] highlight the need of management systems in infection control in our hospital. In addition, surveillance and early reporting of infections, evaluation of risk-based interventions, and production of evidence-based guidelines in our country are recommended.

## Conflicts of interest

The authors have no conflicts of interest.

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