International Journal of Medical Toxicology & Legal Medicine Volume 27, No. 2S, 2024
e-ISSN: 0974-4614
p-ISSN: 0972-0448

The Role of Public Health in Infection Control within Healthcare Institutions: Strategies, Challenges, and Impact on Patient and Practitioner Safety

Saud Abdullah Ghazi Alodyani[1], Walaa Abdulrahman Abualnaja[2], Hajer Mohammed Algarfan[3], Fahad Nayif Fahad Aldawood[4], Ayshah Hamad Hamadan Almtairy[5],Faisal Rajeh Albaqami[6], Manal Odah Murdhi Alanazi[7], Adel Abdullah Ghazi Alotaibi[8], Abdurahman Abdullah Gazi Alotaibi[9], Muhammad Abdulaziz AlBarakat[10], Majed awaidh almotairi[11], Mohammed Sulaiman Alduraibi[12], Naif Mohammad Bawazeer[13]

[1]Social worker,King Fahd Center
[2]Optometrist, King Fahd Health District Center - Riyadh Second Health Cluster
[3]Assistant Pharmacist, King Fahad Medical City- Riyadh Second Health Cluster
[4]Dentist,Riyadh Second Health Cluster
[5]Specialist-Dental Hygien, Riyadh Second Health Cluster
[6]health administration, King Faisal Health Center
[7]Public Health, King Fahad Healthcare Center
[8]Nursing technician. Hos.KingKhaed
[9]Nursing Specialist,Royal Court Clinic
[10] Physician, Riyadh 2nd Health Cluster
[11]X-ray technician,Diriyah General Hospital
[12] Dentist,Riyadh First Health Cluster
[13]Pharmacist, Prison health

Received: 18.08.2024 Revised: 13.09.2024 Accepted: 21.10.2024

ABSTRACT
Public health infection control is very important for healthcare institutions because it focuses on the prevention and management of infectious diseases. Some effective practices include the stringent use of hand hygiene, limited use of personal protective equipment, and sustenance of a sterile environment. Infection rates are picked up through surveillance systems employed by the health organizations to detect and track infection rates in good time for appropriate response to the outbreaks. Poorly solved, these problems seriously impact patient and practitioner protection, as healthcare-associated infections can also lead to increased morbidity, mortality, and costs of healthcare. Success in infection control policies hence goes beyond the level of individual organizations and contributes to improving the health of populations and lessening burdens on healthcare systems. Ongoing education, multidisciplinary collaboration, and evidence based practice are basic contents in the enhancement of infection control efforts and safety culture in healthcare settings.

Keywords: infection control, Safety, public health, Health care, challenges

INTRODUCTION

Public health is an endeavor to improve population health. Though it involves some medical care, it places greater emphasis on preventive measures and education than personal medical care delivered to individuals in a clinical setting.Infection prevention constitutes a primary responsibility of public health services(1). The responsibilities of the institutions are delineated, and public health services are mandated to conduct hygiene control inspections. Medical facilities must adhere to the recommendations established by the German Commission on Hospital Hygiene and Infection Control, and counties are mandated to publish hygiene regulations(2). Consequently, significant advancements in hygiene management within medical institutions were attained. The discussion addresses the causes of inadequate behavior prevention, such as hand hygiene and ventilation, as well as the absence of situational prevention measures, including cleaning. Permanent improvements cannot be attained without revisiting the essential mandatory rules, and the assumption of responsibility.Each healthcare professional is essential in reducing the danger of cross-infection. Infection prevention and control (IPC) practitioners possess the expertise and abilities necessary to enhance staff engagement inside organizations and play a crucial role in this endeavor(3). IPC practitioners has competencies

in clinical practice, teaching, research, and leadership, which guarantee superior patient care and facilitate staff engagement techniques. There are numerous public health initiativesto reduce national health care costs. For example, a vaccinated population requires less costly treatment for vaccine-preventable diseases. Reducing obesity and encouraging healthy lifestyles can offset the future need for expensive non-communicable disease treatment. Public health education programs often facilitate early diagnosis of communicable diseases, thus controlling these diseases and averting waste from excess morbidity and mortality. A well-funded public health infrastructure can reduce overall national health care expenditures, such as those to compensate workers for lost productivity and companies for lost revenue. It is for these reasons that public health initiatives are predicted to save trillions of dollars over time(4). This article emphasizes the necessity of IPC practitioners' abilities and competencies in infection prevention and enhancing worker involvement. Engaged personnel yield favorable results for both patients and staff, which is advantageous for all healthcare organizations.

Definition of public health

Infection control includes the practices and policies designed to prevent the transmission of infections in hospitals and other healthcare settings, primarily focused on reducing infection rates. In the early 1950s, infection control was officially established in the United States. By the late 1950s and early 1960s, numerous institutions began to recognize healthcare-associated infections (HAIs) and adopt specific infection control measures. To identify risk factors for healthcare-associated infections (HAIs), infection control programs focused on HAI surveillance and incorporated basic epidemiological data(5). However, rather than being overseen by public health agencies, the majority of infection control projects were developed and implemented by large academic institutions, resulting in variable effectiveness and poor outcomes. Three significant advances in the late nineteenth and early twentieth century signaled the start of a new era in infection control. These included the 1999 Institute of Medicine report on healthcare errors (6), the 2002 Chicago Tribune article on healthcare-associated infections (7), and the 2004/2006 reports indicating that standardizing the central venous catheter insertion procedure resulted in a significant decrease in the rate of bloodstream infections (8). Consumer demands for greater accountability and openness, increased scrutiny and regulation, and expectations of significant decreases in HAI incidence are the hallmarks of this new era in healthcare epidemiology (9). Stopping and reducing the risk of hospital-acquired infections is the main objective of infection control. To that end, there are infection control systems that can help with things like monitoring, isolating patients, managing outbreaks, keeping the workplace clean, educating employees, and implementing policies and procedures to avoid the spread of infection.

Health care facilities must prioritize infection control

Strategies and services aimed at preventing healthcare-associated infections (HAIs) are in high demand. This highlights the critical importance of creating metrics to measure the efficacy of care in this area (10). When it comes to healthcare facilities, ensuring quality and patient safety relies heavily on infection prevention and control (IPC). Limiting the transmission of disease and preventing infections in healthcare settings are the main objectives of infection prevention and control (IPC). The most common way for infectious diseases to spread is by touch, either directly or indirectly, with infected people or objects (11). Hospital care now routinely incorporates infection control techniques. The term "hospital-acquired infection" (HAI) is commonly used to describe a nosocomial disease. Patients, public health officials, infection control experts, and healthcare workers are all concerned about healthcare-associated infections (12). Everyone is vulnerable to the transmission of contagious diseases in hospitals and other healthcare settings (13). Many factors contribute to the prevalence of healthcare-associated infections (HAIs), including patients' compromised immune systems, intrusive medical procedures, insufficient cleanliness standards, and microorganisms resistant to antibiotics. Increased mortality rates, lengthier hospital stays, higher healthcare expenditures, and a heavy load on individuals and healthcare organizations are all serious consequences. Even more concerning is the fact that many HAIs can be transmitted from patients to HCWs (14,15). Hospitals should employ infection control measures to lessen the impact of HAIs. In order to treat and prevent healthcare-associated infections, personal protective equipment (PPE) and good hand hygiene are essential (16, 17).

Strategies for Infection Control

Hand hygiene

Ignaz Semmelweis, an obstetrician from Hungary, did some of the first study on hand hygiene 160 years ago(18). It helped scientists figure out how to keep hands clean and, in turn, keep patients from getting infections. If you use antiseptic hand soaps, like those with chlorhexidine, and alcohol-based hand sanitizers properly, they greatly reduce the number of bacteria on your hands. Even though the benefits of washing your hands have been shown in many situations, people still don't wash their hands consistently, which is a worldwide problem. A recent family-washing program in a Pakistani area with few resources showed that children under 5 years old were 50% less likely to get pneumonia than kids from homes that didn't wash their hands. When kids

under 15 lived in homes where people washed their hands, the number of cases of diarrhea and impetigo dropped by 53% and 34%, respectively. Hand washing with regular soap lowers the risk of getting the diseases that kill the most kids around the world by a large amount (19).

Hospital outbreak investigations and unfavorable outcomes are more common in facilities with understaffed nurses and overcrowded patients, which leads to low hand hygiene compliance (20). The transmission of methicillin-resistant Staphylococcus aureus (MRSA) can be facilitated in intensive care units (ICUs) by a lack of nurses who pay insufficient attention to basic infection control measures like hand cleanliness. There was a lack of strict adherence to basic infection-control protocols, such as the use of multidose vials and hand hygiene, during an outbreak in a neonatal intensive care unit because the daily census was higher than the unit's capacity (25 neonates in a unit that was meant for 15). Improve patient safety and reduce healthcare-associated infections (HAIs) by consistently using gloves and practicing good hand hygiene. Compared to the costs of treating an infection that has spread as a result of medical treatment, it is more cost-effective. Hand hygiene and the evaluation of healthcare-associated infection sentinel events are part of the Joint Commission's infection control criteria. These events are applicable to long-term care facilities, hospitals, laboratories, behavioral health centers, home health agencies, and ambulatory care centers (21). Each practitioner and every healthcare facility has a responsibility to practice good hand hygiene. Creating a culture of patient safety that is backed by administrative resources and encourages people to wash their hands frequently is crucial for getting good results. The organization should prioritize the promotion of hand hygiene.

Environmental Sanitation

A patient's healthcare environment contains a wide range of harmful microorganisms originating from the patient's undamaged epidermis or infected wounds. Every day, roughly 106 flat, keratinized, dead squamous epithelial cells containing pathogens are desquamated from normal skin(22). Patient gowns, bed linens, and bedside furnishings can quickly become contaminated with patient bacteria. Surfaces in hospital environments can become contaminated with pathogenic organisms (for example, from individuals colonized or infected with MRSA, VRE, or Clostridium difficile) and survive for several days. Contaminated surfaces, such as blood pressure monitors, nursing uniforms, faucets, and computer keyboards, can act as reservoirs for healthcare pathogens and sources of cross-contamination for patients (23). Research has shown that healthcare staff can acquire bacteria on their gloved hands without coming into close contact with a colonized patient by touching surfaces near to one. Another study found that healthcare personnel' hands became contaminated after visiting a conventional patient's room and just engaging with shared objects around the patient, such as bed railings and bedside tables, without making direct contact. Other professionals made equal hand contact in vacant chambers that had been thoroughly cleaned following patient discharge (24). Ungloved hands were found to be contaminated with low levels of harmful bacteria more than half of the time, including from surfaces in rooms that had received terminal cleaning after patient discharge. It is critical to understand the risk of hand contamination, which also includes the external surfaces of gloves if they are used. Furthermore, it is critical to practice basic hand hygiene on bare or ungloved hands to prevent infection from spreading to clean, general-use surfaces.

To minimize direct and indirect transmission channels, routinely touched surfaces must be effectively disinfected, and hand hygiene procedures must be strictly followed, whether after direct contact with surfaces or while wearing gloves (25). Recent study has shown that environmental contamination can stay in a room even after disinfection, increasing the risk of transmission to those who may be susceptible to the infection.

Individuals who have previously been colonized, or who have infections caused by Clostridium difficile or multidrug-resistant pathogens, need. Working with environmental services, nurses can ensure that all medical equipment is cleaned before each patient uses it, as well as keeping patient rooms and surrounding areas as clean as possible. It is critical to often wash one's hands after handling a patient or touching any nearby surfaces. The following scenarios necessitate the adoption of infection control techniques to decrease the risk of cross-contamination:

When cleaning and disinfecting medical equipment that comes in contact with several patients, it is critical to utilize EPA-registered chemical germicides.

Since there are no EPA-registered treatments to kill Clostridium difficile spores, surfaces infected with the pathogen should be cleaned with hypochlorite-based solutions (26).

Appropriate Utilization of Personal Protective Equipment

Infection control measures to mitigate healthcare-associated infections (HAIs) encompass the utilization of protective barriers (e.g., gloves, gowns, face masks, protective eyewear, face shields) to diminish the occupational transmission of pathogens between patients and healthcare workers. Personal protection equipment (PPE) is utilized by healthcare professionals to safeguard their skin and the mucous membranes of the eyes, nose, and mouth from exposure to blood or other potentially infectious bodily fluids or materials, as well as to prevent parenteral contact. The Occupational Safety and Health Administration’s Bloodborne Pathogens

Standard mandates that healthcare professionals receive training on protective barriers to mitigate occupational exposures, recognize work-related infection risks, and have access to personal protective equipment and immunizations(27). The appropriate application, maintenance, and removal of personal protective equipment (PPE) are essential to ensure optimal protection for healthcare professionals. Nonetheless, personal protective equipment (PPE) may not provide complete protection; individual work practices might result in exposure (e.g., needlestick injuries), breaches in PPE may happen, and some breaches may remain unnoticed. All personal protective equipment (PPE) must be discarded upon exiting the patient care area. Gloves mitigate significant hand contamination when handling bodily fluids, diminish the probability of microorganisms on personnel's hands being transferred to patients during invasive or other care procedures, and lower the risk of personnel's hands, contaminated with microorganisms from a patient or a fomite, transmitting these pathogens to another patient. Gloves may possess minor, inconspicuous faults or may sustain tears during use, and hands might become contaminated when removing gloves; therefore, hand cleanliness is imperative before donning a new pair of gloves(28). A surgical mask safeguards a patient from pathogens emitted by the wearer and shields the healthcare practitioner from large-particle droplet spatter potentially produced during splash-generating procedures. Gowns are utilized to avert contamination of attire and to safeguard the skin of healthcare staff from exposure to blood and bodily fluids. Gowns specifically engineered to be impermeable to liquids, along with leg coverings, boots, or shoe covers, offer further protection to the skin in the presence or anticipation of splashes or substantial amounts of potentially infectious material. Gowns are utilized in the care of patients infected with epidemiologically significant microorganisms to mitigate the risk of pathogen transmission from patients or their surroundings to other patients or settings(18).

Emergency readiness

Factors influencing disaster preparedness capabilities encompass the public health agency's or government's ability to mobilize human, physical, and financial resources, identify, prepare, and deploy personnel, execute response operations, and communicate with the public (29). The WHO and its member states have acknowledged the imperative for a centralized facility dedicated to disaster preparedness and response, in accordance with the International Health Regulations (IHR) (2005) and the Global Health Security Agenda. In 2020, the WHO urged the UN Secretary-General to activate the United Nations Crisis Management Policy, indicating the highest level of crisis alert and the first activation for a health-related incident. This policy activation empowers the WHO to oversee the COVID-19 Crisis Management Team and to synchronize UN strategies, policy determinations, and plans. In 2021, the WHO established the WHO Hub for Pandemic and Epidemic Intelligence in Berlin to enhance worldwide cooperation in preparation for future outbreaks. Concurrently, many national strategies have been formulated to enhance disaster planning and response capacities.

Monitoring of diseases

The diseases and the bacteria that are linked to them are both part of communicable disease monitoring. It includes both passive and active monitoring, as well as syndromes, events, and other useful information, like sales of medications and school attendance (30). According to surveillance data, getting feedback at the right time and in the right way can help with early warnings before or during the spread of common diseases. This can help with figuring out the risk of where and when the diseases will happen and how to treat them. The WHO stressed the need to keep an eye on communicable illnesses at the 21st World Health Assembly in 1968. It was because of this that countries started to set up early warning and monitoring systems for infectious diseases. The United States set up the National Notifiable Illness Surveillance System to keep an eye on communicable diseases, bioterrorism, and other illnesses that don't spread. Test results are sent electronically by laboratories (31). China's National Notifiable Diseases Reporting System lets people report notifiable contagious diseases online in real time. It also collects information about patients' demographics, clinical diagnoses, and epidemiology. Additionally, modern monitoring systems use early warning technology to find out when the rates of certain communicable diseases rise above the normal level.The primary goal of monitoring programs is to assess infection rates and the likelihood of endemicity. Hospitals usually concentrate surveillance for healthcare-associated infections (HAIs) in areas with the highest infection rates, such as intensive care units (ICUs), hematology/oncology, and surgical units(32). The extensive use of electronic health records in most hospitals across the United States has aided this shift, allowing medical personnel to easily access electronic records at patients' bedsides and assess risks and surveillance data for each individual. Many hospitals have developed advanced algorithms within their electronic health systems to improve surveillance and identify individuals at high risk for healthcare-associated infections (HAIs). As a result, a comprehensive surveillance system focusing on a certain pathogen might be developed very easily. Public health agencies require hospitals to report specific infections in order to improve the public health surveillance system (30).

A guideline outlining tactics for strengthening isolation techniques has been produced by the CDC and the Healthcare Infection Control Practice Advisory Committee. These regulations are based on transmission-based

and standard protections. Every single one of our patients, in every single department, is subject to our stringent standard precautions because we operate under the assumption that they may all be colonized or infected with germs. Hand hygiene before and after patient contact, PPE for contact with any bodily fluid, mucous membrane, or non-intact skin, and safe needle practices (using one needle for each single-dose medication at a time, then disposing of it in a secure container) are the main components of standard precautions (31). The naked below the elbows program has been introduced in several countries, including the United Kingdom, where all healthcare workers are required to wear short-sleeved shirts without any jewelry, such as rings, bracelets, or wristwatches. When taking safeguards against transmission, it is important to carefully choose a group of patients according to their symptoms, diagnostic criteria, or the results of confirmatory tests that point to particular illnesses or microbial colonization. Here, it's crucial to take safeguards against airborne, droplet, and contact hazards. Depending on the kind of bacteria involved, these steps try to stop the spread of disease (33).

Tobacco cessation programs have been proven to work. Anti-smoking campaigns in the United States have been successful in reducing the percentage of the adult population that smokes, particularly among those who are socioeconomically disadvantaged. Similarly, nutrition interventions are likely to be costeffective. Numerous interventions to address obesity prevention have been recommended based on public health principles, including those to promote healthy eating behaviors, promote physical activity, change the food and physical activity environment, and change health care environments. Many of these recommendations to change the environment have been implemented, and where studied, have shown positive outcomes. Certain cities have implemented nutrition intervention approaches to prevent childhood obesity (4). Mental health in Central and Eastern European countries may be a global outlier in cost-effectiveness. The region has low levels of disability from major conditions such as heart disease, stroke, and certain types of cancers, likely due in part to policies implemented in the socialist era to reduce tobacco and alcohol consumption and promote healthy eating and physical activity. Mental health increases are likely to be expensive due to high levels of depression and anxiety across populations in the region, and those cost increases may be relevant to economic stakeholders' decisions about transportation investments, retirement age, and trade policies. Taken together, domestic and international case studies have shown that the business case for formal sector primary prevention interventions is becoming increasingly strong, particularly as the reach of an intervention expands (34,35)

challenges

There are significant obstacles to implementing public health programs to reduce future health costs. First, politicians and the public may not uniformly support spending on prevention. Furthermore, funding for preventive services can be difficult to obtain, especially in austere economic climates. For-profit organizations and providers may not be motivated to focus on prevention. In theory, preventive measures in total may cost more than they ultimately save. To be successful, public health programs must overcome a significant number of challenges, including financial, political, cultural, and operational barriers. The United States spends substantial amounts of money on the consequences of obesity, poor lifestyle choices, and the resultant chronic diseases, including health care costs, disability, and reduced productivity. Despite significant public and private investment in the prevention of these conditions, there is an inequitable distribution of these funds for public health, and treatment of disease generally(4).

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