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The Importance of Infection Control for Healthcare Workers

[1]Faisal Maush N. Alanazi, [2]Fahd Jaber K. Al-Anazi,[3]Talal Saeed Al Shehri, [4]Faris abdullah saleem Alsobhi, [5]Yahya Alhasan Ibrahim Abu Mansour, [6]Waleed Abdu Mohammed Hazazi, [7]Amal Ali Almaghrapy, [8]Abdulrahman Mohammed AlZahrani,[9]Mohammed Mishal Hamoud Alnihier

[1] Anesthesia technician, Prince Sultan Bin Abdulaziz College For Ems King Saud University
[2] Anesthesia Technician, Prince Sultan bin Abdulaziz College for Emergency medical Services King Saud University
[3] Physical Therapy Technician, , Prince Sultan College for Emergency Medical Services King Saud University
[4] Technician Operation Rooms, Prince Sultan bin Abdulaziz College For Emergency Medical Services King saud university
[5] Technician Operation Rooms, Prince Sultan bin Abdulaziz College For Emergency Medical Services King saud university
[6] Technician-Medical Devices, Prince Sultan bin Abdulaziz College For Emergency Medical Services King Suad University
[7] Specialist health administration, Prince Sultan Bin Abdulaziz College for EMS King Saud University
[8] Anesthesia Technician, Prince Sultan bin Abdulaziz College for Emergency Medical Services, King Saud University
[9] Specialist-Laboratory, Hospital: National Guard Health Affairs / Hail Health Center

Abstract

1. Introduction

Healthcare workers (HCWs) face significant infection risks regardless of their specialty or practice setting. From caring for HIV patients in private hospitals to Ebola exposure in isolated areas, many HCWs unintentionally transmit infections to otherwise healthy patients or family members, highlighting the potential for spill-over effects. Preventing such spill-over is crucial since healthcare-associated infections (HCAIs) involve patients who acquire infections during their care, posing different challenges for infection control. Multi-drug-resistant organisms proliferate due to overcrowding, antibiotic misuse, and inadequate control practices, complicating containment efforts. Effective infection control relies on a broad range of personnel, including environmental health officers, laboratory scientists, nurses, and

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medical practitioners, rather than exclusively infection control specialists. Compliance with established guidelines for global standards is essential. HCAIs, defined as infections do not present at admission, lead to significant morbidity, mortality, increased hospitalization duration, and treatment costs, affecting both developed and developing countries. The prevalence of HCAIs is reported at 15% in developed nations and can rise to 37% in Intensive Care Saudi Arabia, HCAIs contribute over $4.5 billion in expenditure, mortality rate linked to these infections. In developing countries, infection rates can reach 40%, exacerbated by poor control practices and overcrowded facilities. The misuse of antibiotics further enables multi-drug-resistant organisms to thrive, making HCAIs a critical challenge for healthcare systems globally. Stakeholders call for diverse strategies to address this issue, emphasizing the need to implement and establish effective infection control measures, guided by standard protocols based on the best evidence to ensure uniformity among HCWs worldwide.

Methods

Infection is a global concern in health facilities. Micro-organisms that cause infection pose enormous dangers to both patients and healthcare workers. Infection control is a vital part of health facility programs that aim to ensure safe practices and lessen the harrowing consequences of health care-associated infections. Worldwide, healthcare-associated infections are the most common complication in health services. They affect hundreds of millions of patients worldwide, especially in developing countries. The risk of spreading diseases is especially high where the contact of a healthcare facility exposes both the patients and healthcare workers to a different array of infectious materials. Infection linked to health care has plagued every community. It is a source of major worry for government, private, religious, and civil welfare organizations. Healthcare-associated infections are broadly classified into two major groups. Due to wrong personnel decisions, increasing population density, lack of qualified personnel, and poor staffing, a huge burden is shifting to government health services. Despite efforts to fully understand the magnitude of the problem, mainly due to the risk of under-reporting and the widespread expectation that the problem would decrease, the burden imposed by healthcare-associated infections has shown no sign of decline.

conclusion

This focus on infection prevention and control (IPC) is a concerted effort to augment efforts aimed at ensuring quality healthcare and optimizing cost-effectiveness of public health care delivery systems in Nigeria. It has been reported that despite high rates of hospital admission in deck countries, high quality of patient care could not be ensured due to low levels of human resources to engage in safe healthcare practices. Ensuring optimal quality of care in healthcare facilities requires making enable resources (human, equipment, infrastructure)

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available at every stage of patient care in hospitals. These requirements are even more pressing in Developing Countries (DCs) where disproportionate levels of infectious diseases would normally be expected. Regulatory agencies need to be more vigilant and proactive in enforcing cleanliness in all public facilities. Research findings on the health risks faced by HCWs in Saudi Arabia hospitals should be available and published in well-reputed journals. Infection prevention and control must be core into the curriculum of medical and nursing schools and teaching institutes across the country. Infection control and environmental health officers should be appointed in all secondary and tertiary hospitals in Saudi Arabia. Effective multi-pronged messaging strategies are also needed to further enhance HCWs knowledge and compliance with infection prevention and control.

Keywords – essential ,strategies, emphasizing, complication, community

2. Understanding Infection Control

Healthcare-associated infections (HCAIs) constitute a major public health problem worldwide. HCAIs are infections that were acquired in a healthcare setting where the patient was in the hospital or during the treatment. The rate of HCAIs varies by need and does vary widely within the same country. In developed countries, the rate of HCAI is reported to be 5-10% for all hospital admissions estimated while 10-20% for surgical patients. In developing countries, this figure is around 25-30%. Worldwide, HCAIs are one of the major causes behind preventable morbidity and mortality (Gichuhi et al., 2015).

Infected patients shed microorganisms in a variety of ways which can be transmitted to susceptible patients by health care workers (HCWs), visitors or others in the healthcare stream, or the environment. Persons performing most invasive procedure encounter blood and body fluids every day. Blood-borne infections (BBIs) such as Human Immunodeficiency Virus (HIV), Hepatitis B virus (HBV) and Hepatitis C Virus (HCV) account for a majority of health care associated infections (HAIs). Various studies have reported 0% to 70% of underreporting of needle-prick injuries among health care workers. In most developing countries, this rate may be higher, compounded by lack of preventative measures, guidelines and compliance to available ones. The risk of injury while for surgeons may be due to a lack of adequate training (Iliyasu et al., 2016).

Effectively controlling and preventing HCAIs will not only help to improve morbidity and mortality but also minimize the burden on the healthcare system through the reduced length of stay for hospitalized patients. Implementation of effective infection control practices takes time and continuous monitoring with proper accountability. Even simple strategies such as hand hygiene may substantially reduce hospital-acquired common infectious disease and outbreaks. Education is the key component to improve compliance among stakeholders in the medical profession. When people are ignorant of infectious disease transmission or not

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correctly informed how to prevent it and adherence to it, even the best guidelines will be useless.

2.1. Definition of Infection Control

Infection control can be defined as the set of techniques and methods that prevent the transmission of infectious agents in human beings. The objectives of the infection control are basically to eradicate all sources of pathogens by actions/interventions against the human host, the environment and the transmissional means respectively. In healthcare settings, infection control measures are primarily achieved in two ways, namely at the time of contact with patients (a set of measures known as standard precautions) and in case of risk of exposure to infectious aerosols (an additional set of measures known as airborne precautions). Infection prevention and control (IPC) is a standard approach designed to protect patients and healthcare workers from healthcare-associated infections and risks associated with antimicrobial resistance. An infection occurring in a patient during care in a healthcare facility that was not present or incubating at the time of admission is considered a healthcare-associated infection. It is estimated that 1 in 10 patients acquire a healthcare-associated infection and places the number of annual deaths in the United States as a result of these infections at 75,000 in hospitals, potentially contributing to higher long-term morbidity and mortality. Furthermore, these infections are thought to double the length of stay and triple the cost in some cases. Countries in the Developing World bear up to 25% of the global burden of disease but only spend 10% of the global health budget. This inequity fosters excess morbidity and mortality among patients in the Developing World, with an estimated annual toll of 30 million women and children. Therefore, improving hospital infection control in the Developing Country context is important not only to reduce patient morbidity and mortality but also to improve efficiency in the allocation of declining healthcare resources. Evidence shows that effective IPC interventions involve a combination of control measures with a balanced investment of resources. The majority of these measures could be easily and inexpensively applied without requiring elaborate technical resources. While the implementation of these measures in Developing Country hospitals is challenged by but not limited to shortages of pharmaceuticals/equipment, limited professionalism and technical expertise, as well as lack of planning, policy and procedures, the implementation of some of these measures is feasible. This has been successfully demonstrated in several hospitals in Developing Countries.

2.2. Historical Context

Infection control in health care facilities has evolved into a highly structured professional discipline after a relatively recent beginning, approximately 50 years ago. In many areas of the world, infection control is firmly institutionalized and is a university-based specialty. In poorer countries, hospitals struggle to offer even rudimentary measures to control infections.

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This paper examines how infection control as a discipline has developed, its relationship with public health, its current state and challenges. The needs of the developing world in terms of essentials of infection control are outlined. More than 1 million patients across the world are estimated to get infections every year during their stay in hospitals (A. Goldrick, 2005). A significant proportion of these infections are thought to be preventable, if only simple infection control precautions are taken. These include the need to wash hands, before and after contact with patients, to use protective equipment when dealing with blood, body fluids, and open wounds, and to clean and disinfect instruments. In developed countries, infection control practices have been championed and resisted for decades. In developing countries, however, these practices are often absent. Simple procedures and measures that could prevent infections have not been taken because of the lack of guidance, support, and resources (Gichuhi et al., 2015) unless patients have the means to pay for it themselves.

Nurses and other professionals involved in direct patient care undertake activities, which put them at risk of exposure to infections such as tuberculosis, HIV/AIDS, Hepatitis B, Hepatitis C, and diverse bacterial infections. They have a critical role to play in the prevention and control of infection. Because nurses have more interaction time with patients and some of the high-risk patients, they need to have good knowledge and good practices for infection prevention and control. At the same time, health care systems need to provide safe working environments. Health care-associated infections (HCAIs), and exposure of health care workers to infections (HCWs), are global issues that have attracted renewed interest and research attention in developed countries. Concerns have increasingly been raised about the status of infection control in developing countries, particularly with the recent emergence of new pathogens, risky health care practices, and health systems globalization.

3. Types of Infections in Healthcare Settings

Due to the nature of healthcare delivery, the healthcare environment is conducive to the transmission of infectious agents. A healthcare-associated infection (HCAI) is an unintended injury or disease sustained by a patient undergoing a healthcare procedure, resulting from exogenous or endogenous biological agents (Ilyas et al., 2019). These agents may originate from the environment, healthcare workers (HCWs), or other patients. HCAI is one of the most common adverse events reported in healthcare systems worldwide and is associated with increased morbidity and mortality rates. HCAIs result in many deaths each year, especially in low-income and middle-income countries. Most caregivers are aware of the factors contributing to the occurrence of such infections, yet HCAIs continue to occur, highlighting the need to restrict their occurrence (A. Alrebish et al., 2022). HCAIs are significant determinants of the quality of care in the healthcare system. The disease burden of HCAIs is challenging to measure due to differences in the definition of the population of interest, the disease category, the occurrence of illness, the method of data collection, and the

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tools and technologies used to measure the disease burden, producing estimates that vary by several orders of magnitude. The lack of uniformity in measuring HCAI burden limits the opportunity for comparisons across countries and locations and impedes efforts to monitor global progress and target interventions. As a result, accurate estimates of the burden of HCAIs are essential to nationwide planning and management. The occurrence of HCAIs endangers patients' safety, prolongs hospitalization, increases healthcare costs, and increases resistance to antibiotics. They constitute the most pressing challenge for patient safety. The risk of acquiring a new infection while receiving care from a healthcare facility is approximately 1 in 15. More than 1.4 million people worldwide suffer from infectious complications with varying severity; a significant number of these complications lead to severe infections, disability, or death. More than 25% of those properly diagnosed with an HCAI die within 30 days of diagnosis. Robust answers to this fundamental health question can be obtained if healthcare delivery systems in different countries are fully assessed by experts from various fields and if adequately funded healthcare facilities can be constructed and adequately supplied with the most up-to-date devices and medicines.

4. Transmission of Infections

Transmission of infections can occur through many means, even when proper precautions are followed. Infection control guidelines for healthcare workers help protect not only the workers but also their families and friends. Better compliance with infection control measures reduces the incidence of transmission of infections. There are a number of significant infectious diseases. Pathogen characteristics that influence transmission, e.g., infectious dose, reservoirs, and duration of excretion, differ greatly among diseases. Some pathogens do so in part by changing disease patterns. Increased contacts outside of the usual chain, including domestic travel by workers and patients, increases the likelihood of viral dissemination. All personnel who work in health care must assess (often daily) the infectious disease risks faced by their work; focus care and precautions on those pathogens; and following analysis, abide by those others deemed prudent (R. Cohen & Ondecko Ligda, 2014).

Transmission of novel infections that have not yet been described in published literature can occur. This can occur through pathogens with peculiar degrees or modes of virulence; unusual exposures or routes of infection; amplification in unique reservoirs; overly virulent strains that infect ever-quicker or more severely; and misuse of bio-warfare microbes or syndromes. There may be a particular challenge determining exposures of fearsome pathogens whose prevention, surveillance, and treatment are obfuscated. Furthermore, the means of transmission are not solely biological. Attackers can disrupt systems using explosives or chemicals, or by non-communicable means, e.g. via tampering with food or water supplies. Such clandestine attacks might occur acutely at places clearly anticipated or instead target countless victims at disparate sites. In this scenario, each health worker may

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have to be astute to the non-infectious potential of malevolent actions (Branch-Elliman et al., 2015).

5. Role of Healthcare Workers

Healthcare-associated infections (HAIs) can affect anyone receiving or providing care in healthcare settings, they are a major source of morbidity and mortality for patients and a significant source of infections and stress to healthcare professionals. HAI is defined as infections that are acquired after exposure to health services. Infection control and prevention is the process of preventing the development and transmission of infections. Proper attention to infection control principles minimizes the risks to patients and healthcare workers. Infection control practice is one of the essential standard precaution measures, including practices that are minimally required.

It is a standard for healthcare workers (HCWs) to follow infection control measures. In the global scene, particularly in developing countries, compliance to standard precaution is outraged. If infection prevention and control measures are not practiced globally, it can result in an increase in a wide range of multi-resistant healthcare-associated infections, more outbreaks affecting patients and staff, and unsuccessful implantation of safer health procedures. Outbreaks of multi-resistant healthcare-associated infections have been documented in Africa, leading to increased morbidity, mortality, and health service costs. However, vulnerabilities regarding infection prevention are often neglected in Africa.

Globally, a considerable number of researches have been conducted to measure compliance with infection prevention performance among HCWs. However, there is a scarcity of studies on the problem in the newly established generic standard precaution policy in Ethiopia. Thus the aim of this systematic review was to estimate the magnitude of HCWs' compliance with standard precautions and associated factors in Bahir Dar Town, Ethiopia (Ossabo Babore et al., 2024). Health workers provide proper education about standard precautions. Assessors emphasize the availability and the accessibility of infection prevention supplies in patient care areas during reports. Moreover, to increase and maintain compliance with standard precautions performance, administrative control measures need to be enforced and the infection prevention team should work on work overload (M. Khatrawi et al., 2023).

6. Infection Control Guidelines

Infection prevention practices were initiated as Vascular Access Device (VAD) insertion and maintenance were recognized to be a significant contributor to patient morbidity and mortality due to hospital-acquired, device-related healthcare associated infections (Ely Tarrac, 2008). Most hospitals now utilize some form of a central line bundle, a set of interventions meant to be implemented concurrently to prevent infection. However, in addition to regular monitoring for compliance with CVC insertion and maintenance care

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bundles, audits are required to monitor Indications, Frequency, Duration, Insertion, and Cessation. The use of strict criteria to audit indications ensures that line placement is appropriate. A CVC cannot be deemed to be for the right indication if the initiation date is prior to hospital admission and especially within the preceding 30 days of admission, although temporary lines placed in the emergency department are also accepted on occasion. VAD insertion mechanism, a procedure often overlooked, is audited to determine whether a qualified person (doctor or online nurse) was responsible for the insertion as well as adherence to strict hand hygiene protocols and use of sterile, single-use kits. Cessation is scrutinized to determine non-compliance with 48-hour reviews on whether a line is still indicated, as risky lines are often very slowly or not removed at all, leading to unnecessary HCAI risk.

Following its introduction, staffing concerns were raised regarding the inability of junior staff to adequately question the validity of the line. A Cardiology Fellow agreed to lengthy attendance to meet the Vascular Access Controller on path to the ward, however, this was not tenable on most occasions, thus junior doctors received an educational session on caval filter benefit/risk ratios and indications. Trickier mechanisms of insertion (temporary/transluminal lines, doctor not on duty) were flagged so that these could be monitored closely initially in case of appointment overloads. The suggestions were to either further monitor on a different report or seek peer review from other agencies. To meet current targets, a plan was in place to remove bulk-billing non-vital VADs on the acute ward.

7. Infection Control Training

Ensuring frontline healthcare workers (HCW) and their patients remain healthy and safe from infection involves providing adequate resources, appropriate systems and processes to manage that resource provision, creating a supportive environment in which HCW feel able to adhere to protocol and encouraging peer and workplace accountability (Qureshi et al., 2022). It has also been suggested that, when there is good adherence to infection prevention protocols by frontline healthcare workers (HCW), the risk of transmission to patients and other staff members appears low. However, healthcare settings continue to report outbreaks, including during the COVID-19 pandemic, with healthcare-acquired clusters of severe acute respiratory syndrome coronavirus—2 (SARS-CoV-2) infection reported among patients and staff. Examples from the UK, Ireland and China demonstrated extensive transmission among patients in geriatric wards. The 118–139 patients and staff became infected in some of these clusters. Ongoing transmission likely occurred due to poor compliance with infection prevention protocols. In a health system that is relatively free of general community transmission, the risk of SARS-CoV-2 outbreaks among HCWs and patients in healthcare settings is increased by ill-preparedness for surges in infections.

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Healthcare workers' compliance with infection prevention and control (IPC) precautions, including hand hygiene, personal protective equipment (PPE), physical distancing, and isolation has been consistently reported to be lower across a broad spectrum of precautions (Ossabo Babore et al., 2024). A comprehensive study of adherence of 500 hospital HCWs to precautions observed that large proportions of HCWs did not adhere to any PPE and isolation precautions and that no HCWs correctly adhered to all precautions. A major cause of transmission is poor compliance with personal protective equipment (PPE). A key factor underpinning this noncompliance is lack of PPE. Other identified reasons include lack of concern about risk of infection, lack of monitoring by superiors, observed noncompliance of colleagues, perceived difficulty using PPE, perceived lack of effectiveness or lack of importance of PPE, perceived inconvenience and discomfort of PPE, lack of infection control guidance, and inconsistent or unclear guidance.

8. Challenges in Infection Control

Establishing an infection control program is an arduous task. One of the first analyses to carry out is a risk assessment to identify local needs. The local context of the community must be understood along with social and cultural issues. Identification of healthcare facilities can be performed after understanding of the current health status of the community and its accessibility and availability for services. In this regard community stakeholders are significant in the identification of such facilities. These facilities also vary in their levels of risk exposure as per the type of services rendered, the population served and other factors. This information can lead to a prioritization of the type of facilities where a program can be launched for infection control strengthening. The focus can be on key facilities like tertiary care hospitals or those facilities with the highest observed need. Health care worker safety is an essential portion of any infection control program and every effort should be made to reduce the risk of exposure to infectious substances. In a wide-ranging assessment of reluctance to participate with an infection control program, attack by clients or relatives was shown to be a significant concern. This factor relates not only to infection control programs but other healthcare issues in developing areas, particularly in the new setting of current pandemic social consequences.

Some efforts should be made to improve the level of general health awareness and supportive policy should protect healthcare and educational facilities. Yet, it is important to remember a good majority of health inspectors at all levels are hard-working and compassionate individuals and they should be recognized at every opportunity. Most research studies in infection control recognize the importance of baseline knowledge and experience on infection transmission and prevention to prepare for a training program. Unfortunately, pre-existing knowledge of infection control often varies widely at all levels but is essential in formulating the next steps. For this reason, facilitators at any level probably need a range of resources.

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This includes written materials for reference so some may be better suited to certain healthcare facilities than others or local laws about HAI. Other materials are needed for reference for facilitators to review prior to a session which are preferable to passively watching film footage. The program will usually cover a range of jurisdictions but each will need to check that all local testing has been accounted for including testing around sedimentation tanks. The students each year do the assessment in one session. Infections also arise within the community which can lead to outbreaks within healthcare facilities. Rumors and misunderstandings can quickly overwhelm local populations leading to cultural and community tensions if the facts are not communicated and dealt with appropriately.

9. Technological Advances in Infection Control

The purpose of this document is to summarize advances in infection control technologies that have occurred since 2003. In conjunction with that summary, practical information is provided regarding implementation of the technology should the reader choose to pursue it. Infection control (IC) is defined as targeted activities designed to prevent the transmission of microorganisms that have the potential to cause disease. Device-associated and procedure-associated health care-associated infections (HAI) frequently occur in the health care environment. In addition to their direct effects on infected patients, device- or procedure-associated HAIs increase the length of stay, hospital costs, and mortality rates among affected patients. Enormous costs are often incurred yearly in an attempt to prevent the occurrence of device- or procedure-associated HAIs. Microbes that cause device-associated and procedure-associated infections are almost universally able to colonize and proliferate on environmental surfaces. Environmental surfaces are widely recognized as being readily contaminated with bacteria, some of which are recognized as being able to cause HAI and that are involved in outbreaks.

Many of the microbes capable of causing infected device- or procedure-associated HAIs, among them methicillin-resistant Staphylococcus aureus and vancomycin-resistant Enterococcus, can survive on surfaces for weeks to months. Development of methodologies to determine if environmental surfaces are clean or contaminated is necessary for effective IC. Fungal spores, particularly Aspergillus spp, pose a well-documented environmental risk to immunocompromised patients, especially those who have undergone hematopoietic stem cell transplantation. Proper environmental control measures for the elimination of microbial spores in health care environments need to be developed and adopted in clinical practice. Infection control programs have undergone significant evolution in response to external pressures such as the emergence of drug-resistant organisms, advances in basic and clinical science, and potential bioterrorist events.

However, with this evolution in IP practice, many diverse and complex issues continue to hinder effectiveness and modernization of IP programs. An organizational structure spanning

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the continuum of care is necessary for IP processes to be effective in preventing cross-silo pathogen and disease transfer. Infectious diseases epidemiologists and medical informaticists can identify areas for innovation and automation of data management processes, standardization of data capture and analysis, and best practices to improve incident control and harm prevention.

10. Case Studies

In accordance with the recommendations and a hazard assessment already anticipated, in health facilities of various levels in Cotonou and Porto Novo (Benin), a hand hygiene improvement challenge was launched. Obstacles in accordance with national recommendations were identified and logged using a national observatory tool. The challenge comprised of four steps: step 1 was the determination of action points and risk factors; step 2 consisted of actions including trainings and awareness-raising campaigns on the '5 Moments for Hand Hygiene' method, soap distribution, etc.; step 3 included re-evaluation of the main hand hygiene compliance obstacles; and step 4 was sourcing for funds to continue projects and increase infrastructure visibility and athlete awareness. Matched evaluations were performed with the 'Hand Hygiene Jo' application before and after the action point tracking. All health facilities that completed step 4 of the challenge benefited from sterilizers for the brewing of saline solutions as wells as anti-shock clean boxes for dumpsters. This will lead to safer care, more positive images of services provided in the health facilities, improved water access, and increased confidence in physicians and nurses, leading to an increased frequency of consultations (Gichuhi et al., 2015). Considering that non-adherence to standard precautions (SPs) increases the risk of healthcare-associated infections (HAIs), the objective of this study was to identify factors associated with adherence to multi-respiratory SPs among the healthcare workers (HCWs) of a tertiary hospital in Malaysia. The study design was a cross-sectional study using self-administered questionnaires distributed among HCWs who directly cared for patients with multi-respiratory pathogens in academic private hospitals in Malaysia. Data were analyzed using descriptive and bi-variate analyses. Out of the 248 respondents, 234 completed the questionnaires. The hospitals were a mix of 66 (28.2%), 101 (42.7%), and 67 (28.5%) private and academic hospitals. The overall adherence rate for assessing adherence to SPs for multi-respiratory pathogens was moderate (63.3%). Among the SPs actions, adherence to "checking used sharps containers to ensure they are not overflowing" was the least adhered SP (45.3%), while "performing hand hygiene after handling soiled items or waste" was the most adhered SP (85.5%). HCWs were more likely to adhere to SPs when they had received training or education on SPs within the last year. In order to improve adherence to SPs for multi-respiratory pathogens, especially among nurses and HCWs who had never received training for decades on COVID-19 prevention, regular refresher training and education sized more on the importance of adherence to SPs and

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demonstration of the need to ensure adequate supplies of personal protective equipment should be carried out (Musu et al., 2017).

10.2. Failures and Lessons Learned

The first study on the impact of an infection control program was conducted at a hospital for patients and their close contacts with diphtheria. Rehabilitation of the patients led to an increase in the number of identified diphtheria carriages and resulted in spread into. In response to this finding, an infection control program was initiated in which isolation and cohorting of diphtheria patients was implemented. Upper and lower limits for the number of carriages per 1000 children on an art or isolation ward were defined. The whole control ward must undergo cycles of disinfection if a significant excess was determined. Establishing a method for reliable assessment of the outbreaks with diphtheria-based TEPAT, which led to the initiation of cohesive infection control programs, improved compliance with infection control measures in such a way that these problems no longer occurred within a reasonably short period after the start of a control program (Iliyasu et al., 2016). This also demonstrated that the same method could be used for other infectious diseases, and other hospitals became involved in a TEPAT-like monitoring with established approach and understanding. Methods for management based on predefined thresholds, monitoring with statistical process control, pilot studies on generalizability of use of test procedures and derivation of performance measures were all very constructive. On two occasions, minor adaptation of the original approach was needed because uncommon and urgent situations called for rapid analysis. Little attention had been paid to this ‘ad hoc’ situation, and factors that turn normal infection control and research tasks into emergent situations were identified. It seems wise to provide access to a few trusted advisors or monitors who have the required opportunistic perspective to support the improvement of the processes in such situations. Usually this is not taken to heart, unless there are compelling incentives. Butter is cheese that has a turn in snow.

11. Future Directions in Infection Control

Infection control practices have come a long way since the 1970s, having been prompted by epidemics of infections that were not adequately controlled and that had devastating consequences. The past 50 years have seen a proliferation of new recommendations for enhancing infection control (IC) practices (A. Goldrick, 2005). However, the emergence of new pathogens and new environments for care delivery provide the impetus for re-examination of the current state of practice and its consistency with the rapidly evolving environment.

Fifty years of infection prevention (IP) program evolution has brought us to a crossroads where diverse and complex issues are on the horizon. These issues include the location for care delivery, current and emerging pathogens, financing, and the IP workforce. There is a

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need to consider how to more effectively address these issues to realize the vision of a structure for infection prevention nationally that spans across the continuum of care and is resilient to mammoth events such as pandemics (Garcia et al., 2022). Concern can only be raised about the ability of the current practice, organizations, and workforce to effectively control transmission of illnesses thereby preventing infection in clinical service based upon recent examples of large numbers of patients becoming infected. Moreover, there is a paucity of IP expertise nationally that limits education and policy as many of the other specialties within public health, especially during COVID-19. Given this context, several important issues for the advancement of IP programs, organizations, and practice in the future have emerged.

Consider the development of pandemic preparedness plans specific to the delivery of care in outpatient settings. Further consider the development of standardized metrics for evaluation of complex HAI situations across settings. Each healthcare organization employs IP practice metrics originating from state regulation or other sources, but few compare metrics or share information. Many organizations have similar types of IC breaches that result in adverse patient events but little is known about the standardization of how these events are detected and reported across organizations. Address the information gaps in areas of risk such as antibiotic resistance, IC breaches, and emerging pathogens among others. Understand the effects of the delivery of care to new patients such as those recently released from incarceration and other custodial settings and the risk of exposing large populations to infection. Given both the demand for and scarcity of qualified personnel, consider the deployment of strategies to ensure that staffing cover all hospital areas including the use of Regionally-Based Infection Preventionist Teams. Consider the use of supplemental disinfection technologies such as portable UV light disinfection systems that fall under the general use category and can be deployed without evaluation by the local regulatory organization.

11.1. Research and Development

Infection Control Program Audit And Other Performance Indicators

Health care-associated infections (HCAIs) are infections acquired following hospital admission or while receiving health care ((A. Goldrick, 2005)). HCAI may occur as a result of invasive and non-invasive procedures and may be associated with the use of medical equipment and devices, contaminated hospital environment or surfaces, circulating air, and health care workers' hands. Infection Control Programs (ICPs) are implemented in health care institutions to prevent, control, monitor, and respond to increases in HCAI rates by using strategies referred to as Infection Control Measures (ICM) ((Gichuhi et al., 2015)).

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Measuring and monitoring the performance of Infection Control Programs (ICPs) and their strategies is essential to ascertain their impact on HCAIs. Infection Control Program Audit (ICPA) is used to measure the performance of infection control programs in relation to national infection control guidelines. The ICPA indicators provide an overview of a hospital ICP's performance, as well as an opportunity for hospitals to compare their performance with other hospitals and as a basis for the next step in improving their ICP.

The following ICP audit outcomes shall be used as ICP performance indicators: number of ICP audits, number and percentage of hospitals which conducted ICP audits, number and percentage of hospitals which fulfilled the target icp audit, and percentage of hospitals which accomplished key performance indicators (KPIs) of icp audit.

The overall ICP audit outcome is: number of hospitals with ICP audit results published in their annual reports, key ICP audit findings that were disseminated for feedback, and overall compliance of ICP audit outcomes indicators.

11.2. Policy Recommendations

Development of policies and guidelines that recommend the types of training appropriate for new hires and the continuing education required for experienced staff. The knowledge and skills base for each of these groups should be developed by a clinical nurse specialist or nurse practitioner with expertise in the area of practice. Input from an appropriate physician is also recommended. Policies and guidelines should allow a reasonable period for training new hires and for experienced staff to complete their continuing education requirements. In addition, the policy should specify appropriate assessments of knowledge and skills beyond didactic testing.

Updating of policies and guidelines for infection control yearly and for surgical site infection guidelines every three years. Policies should acknowledge “in process” recommendations, and they should specify that applicable steps should be taken in a timely manner. If steps cannot be taken as recommended, there should be a clear explanation of why implementing the recommendation will not be possible.

Development of a framework for addressing other performance improvement recommendations not within the realm of infection control. Health care organizations are encouraged to pursue these recommendations in order to contribute to knowledge development and to provide the best possible care to patients. The performance measures and criteria, targets, and continuation of care recommendations should be reassessed and updated at least annually. Although there are external and internal standards to guide this reassessment process, it should be assumed that health care organizations will modify this process for local needs, and no recommendations are made relating to the performance improvement process outside infection control.

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12. Conclusion

Based on the current findings, it can be concluded that healthcare associated infections (HCAIs) are widespread among patients admitted into the medical wards with attendant increase in morbidity and mortality as well as increased cost of treatment. In a resource-poor nation like Saudi Arabia where rapid health sector affects and changed the overall health status, HCAIs have far-reaching consequences in terms of permanent disabilities, loss of manpower, loss of production, and overall increased expenditure on health in a nation where healthcare is practically a social service. Infection Control is everybody's business, including the Ministry of Health, Health Management Organisations, Hospital Management, Hospital Regulatory Organizations, Community health care workers, Nurses and midwives, Common citizens, and Traditional medicine practitioners. The Hospital Management of a tertiary referral hospital have an ostensive oversight responsibilities with a view of preventing HCAIs, however, absence of an Infection Control Committee in the last two years of the study period and poor staffing of the Infection Control Unit following massive brain-drain among the health care workers greatly contributed to the observed upsurge in the infection rates.

Measures to reduce the infection rates are numerous and varied but the how, where and who should have prevented what need to be carefully considered and urgently addressed. The delayed outcome measures reported here is a reflection of the myriad of challenges facing the Hospital Management in their effort to stem the tide. Concerted effort should be made to addressing the aforementioned challenges so as to save the Hospital and Country from the crippling effect of resistant organisms. It is anticipated that the recommendations made in this study will assist the Hospital Management in particular and policy makers in general in the plan and execution of a sustainable preventive Health programme against HCAIs for the continuous safety of health services delivery in the Hospital and country. Infection Control in Hospital is an indispensable safety net for patient, healthcare worker and overall population health.

HCAIs prevalence at Medical wards is alarming. C. difficile and MRSA are the most prevalent individual organisms. HCAIs and death cases persist free of the annual pattern of occurrence of HCAIs. Enhanced awareness education on the role of the roommates/visitors and environmental surfaces in HCAIs transmission, adequate provision and management of IPC resources/equipment and enforcement of continuous audit of care delivery and mandatory inservice education for health care workers against HCAIs is recommended.

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