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Analysis of Infection Prevention and Control Activities in Jeddah's Ministry of Health Hospitals in Saudi Arabia: A Three-Year Project

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Abstract

Background: The objective of this study was to analyse the infection prevention and control practices in twelve hospitals in Jeddah in order to monitor, assess, and then develop a standardized infection control program that could be implemented in these hospitals aiming for better patient safety.

Methods: After an initial assessment of all twelve hospitals, a qualified professional from the infection control administration, who acts as an auditor, visited each hospital every four months from January 2009 to December 2011 providing feedback after every visit. The auditor used a set of performance indicators that were based on the British Infection Prevention Society's auditing tool for monitoring infection control standards and were modified based on the nature of the local practice to reflect the clinical environment of Jeddah hospitals. Compliance with all 55 performance indicators tested was recorded during each visit. The overall compliance for each hospital was calculated yearly and hospitals that were at least 60% compliant were labeled as acceptable. Results: Routine audits after the completion of the study revealed that only 36% (37/104) of the infection control departments (ICDs) in the Jeddah hospitals were supervised by specialized personnel. In addition, 44% (44/101) of ICDs supervised and managed isolation rooms properly, and 50% (52/104) of hospital sinks were equipped with the required tools for hand washing. Decisions that were made by the infection control committee were followed by 45% (47/104) of ICDs, and 53% (55/104) of infection control committee decisions were implemented.

Conclusions: Development of a standardized infection prevention and control program with regular audits and feedback resulted in improved infection control procedures in Jeddah's Ministry of Health hospitals. We believe that this program would also be of great use for improving infection control practices in other regions of the Kingdom as well.

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Introduction

The government health system in the Kingdom of Saudi Arabia is run by different sectors, including the National Guard, the Armed Forces, the Ministry of Interior, and the Ministry of Health. Each sector has its own hospitals and its own infection prevention and control program. Implementation of each program differs from one sector to another. In addition, there may be significant variability in the quality of practice between programs. In Jeddah, the infection prevention and control program of the Ministry of Health, which is the largest sector, was never standardized. Moreover, each of its hospitals has independent plans, programs, and targets. Thus, the objective of this study was to analyze the infection prevention and control practices in the twelve Ministry of Health hospitals in Jeddah in order to monitor, assess, and then develop a standardized infection control program. The hope being that this in turn will improve infection control practices and patient safety. Jeddah is an important commercial hub and the principal gateway to the holy cities of Makkah and Medina. It is the second largest city in the Kingdom and has twelve government hospitals. The Ministry of Health oversees Jeddah's health system and provides free medical care to Saudi citizens and legal non-Saudi citizen workers. Infection control programs in the Jeddah hospitals are supervised by the infection control administration. Members of the administration follow the day-to-day services in the infection control departments. These administrators possess the authority to advise staff and to implement and enforce up-to-date infection prevention and

Table 1: Variables Tested and Rates of Compliance.

Variable	2009	2010	2011	Total
General Measures				
The Infection Control (IC) department is in an area that is accessible by the hospital staff.	(13/36) 36%	(22/34) 65%		
The IC department has a sign posted.	(11/36) 30%	(21/34) 62%		
There is a telephone and extension number for the IC Department.	(36/36) 100%			
The IC department is chaired by a specialized personnel member.	(13/36) 36%	(10/34) 29%	(14/34) 41%	(37/104) 36%
The number of staff members is adequate for the size of the hospital.	(34/36) 94%			
The working staff are trained or experienced in infection control procedures.	(26/36) 72%			
Clinical forms for documenting infection control procedures are available and used by the IC staff.	(26/36) 72%			
There is a strong link between the microbiology laboratory and the IC department.	(31/31) 100%			
APPLICATIONS				
Surveillance is actively applied.	(22/30) 73%			
Staff members have surveillance skills.	(20/30) 67%			
Surveillance data are monitored daily and analyzed by the IC Director.	(22/30) 73%			
Cases of healthcare-associated infection are reported directly to the affected department.	(20/30) 67%			
Monthly rates are prepared on time and clearly organized.	(27/30) 90%			
Trends showing increased infection rates are reported to the affected department for action.	(20/30) 67%			
The actions that are taken to solve problems are recorded.	(19/30) 63%			
The IC department manages outbreaks as required.	(21/30) 70%			
The department replaces hospital-wide surveillance with targeted surveillance.		(16/24) 67%		
The IC department regularly monitors the application of standard precautions (SP) before inserting cardiovascular catheters.	(8/15) 53%	(16/18) 89%		
The IC department regularly monitors the application of SP before changing wound dressings.	(13/27) 48%	(28/31) 90%		
The IC regularly monitors the application of SP before urinary catheters are inserted.	(10/26) 38%	(23/28) 82%		
The IC regularly monitors the management of urinary catheters.	(5/26) 19%	(23/27) 85%		
The IC department monitors SP procedures in the Dialysis Department on a weekly basis.	(3/12) 25%	(11/16) 69%		
The IC department conducts weekly monitoring of linen collection and transportation to the laundry to prevent cross-infection.	(10/36) 28%	(26/33) 79%		
The IC department monitors SP procedures in the kitchen at least once a week.	(20/36) 56%	(28/31) 90%		
The IC department conducts weekly monitoring of the cleaning and disinfection of endoscopes in the Endoscopy Unit.	(5/9) 56%	(7/11) 64%		
IC staff members regularly follow hand-hygiene procedures in the hospital.	(23/36) 64%	(29/34) 85%		
The IC committee discusses the feedback that is received from auditing.	(18/36) 50%	(7/34) 21%	(25/34) 74%	
Designated isolation rooms are provided and managed by the IC Department.	(14/33) 42%	(15/34) 44%	(15/34) 44%	(44/101) 44%
There is an actively functioning infection control committee.	(25/36) 69%			
Members are from the departments that have direct impact on IC.	(26/36) 72%			
The committee minutes are recorded properly.	(13/36) 36%	(20/34) 59%	(22/34) 65%	
The committee meets regularly. (The minimum is four meetings per year.)	(21/36) 58%	(21/34) 62%		
The decisions of the committee are implemented.	(16/36) 44%	(19/34) 56%	(20/34) 59%	(55/104) 53%
The IC department follows the decisions of the committee.	(11/36) 31%	(17/34) 50%	(19/34) 56%	(47/104) 45%
The MRSA screening policy is known and applied in the hospital.		(20/31) 65%		
The antibiotic-restriction policy is available and closely followed in the hospital.		(15/34) 44%	(21/34) 62%	
DOCUMENTS				
The surveillance sheet is available and accurate.	(25/30) 83%			
Checklists are properly prepared and completed.		(28/34) 82%		
A detailed poster with the instructions for hand hygiene is available beside each hospital sink.	(30/36) 83%			
Hospital sinks contain all of the required tools.	(16/36) 44%	(17/34) 50%	(19/34) 56%	(52/104) 50%
Liquid soap is provided in a single-use cartridge dispenser.	(19/36) 53%	(26/34) 76%		
Alcohol-based disinfectants are available in all hospital wards.	(36/36) 100%			
Isolation cards are available and up to standards.	(23/33) 70%			

Appropriate leaflets describing required precautions are available to the companions and relatives of patients before being admitted to the isolation room.	(16/33) 48%	(24/32) 75%		
The required types and amounts of PPE are available.	(33/36) 92%			
Leaflets that describe the required precautions that need to be taken during a patient visit are available and distributed.		(24/34) 71%		
Etiquette policies are applied and available in the hospitals, especially in the waiting areas and common meeting rooms.		(25/34) 74%		
STAFF				
Internal continuing education is on-going for infection control staff.		(24/34) 71%		
Staff members are aware of the use and benefits of PPE.	(29/36) 81%			
The IC staff members revise hand-hygiene applications according to recent updates.			(31/34) 91%	
The IC department is generally active in providing educational sessions.	(28/36) 78%			
There is a continuous IC program for the hospital staff.	(26/36) 72%			
The IC department is involved in the orientation program of new staff.	(33/35) 94%			
The IC department has an educational program for medical students.	(16/27) 59%	(19/27) 70%		
Staff members are given the chance to attend IC courses.	(29/36) 81%			
Overall Three-Year Compliance Rate:		(1325/1759) 75%		

control procedures. The administration is led and managed by specialized personnel members.

The infection control administration established a scientifically-based program and standardized efforts across the twelve hospitals by following implementation with frequent auditing. Feedback from auditing was immediately provided to the hospitals. The infection control department with the best yearly compliance rate and best overall three-year compliance rate was rewarded.

Methods

This study was conducted in the twelve Ministry of Health hospitals in Jeddah, which serve around 60,000 patients each year. After an initial assessment of all twelve hospitals an auditor from the infection control administration visited each hospital every four months (three visits per year) from January 2009 to December 2011 providing feedback after every visit. Visits were usually scheduled. The auditor used an auditing tool comprised of performance indicators that covered four program areas: 1) general measures, which had eight variables, 2) application, which had 28 variables, 3) documents, which had 11 variables, and 4) staff, which had eight variables (Table 1). The auditing tool was inspired by the British Infection Prevention Society's auditing tool for monitoring infection control standards and was modified to reflect the clinical environment of Jeddah's hospitals [1-3]. The prevalence of healthcare-associated infections (HAIs) in Jeddah's hospitals was determined by dividing the total number of HAIs by the total number of admissions3. The overall rate of HAIs in all of the hospitals was determined for each year by adding the number of HAIs in all of the hospitals with the total number of admissions in all of the hospitals for that year. Proportions were determined and differences in the proportions of HAIs were examined with the chi-square test at a significance level of 5%.

The auditor scored compliance during each visit by marking each performance indicator as yes, no, or non-applicable. The combined annual compliance rate for the twelve hospitals was calculated by adding the total number of 'yes' answers from the three visits (nominator) and dividing this by the total number of 'yes' and 'no' answers from the three visits (denominator). The non-applicable variables were excluded from this calculation.

Fifty-five variables were tested throughout the duration of the study period. The basic application variables were tested during the first year. Variables for more advanced indicators were tested during the second and/or third years. The three infection control departments who obtained the highest annual compliance rates were acknowledged by the Director of Health Affairs in Jeddah and awarded a certificate and trophy at a special ceremony.

Variables were considered to have an acceptable rate of compliance if they scored 60% or above after combining the results of three visits at the end of the year for all twelve hospitals. Acceptable variables were tested only once. Variables that scored less than 60% at the end of the year in all twelve hospitals were retested during the second and/or third year by adding them to the auditing tools for those years.

After the first visit to each hospital, the compliance rate was immediately sent to the hospital. During the second visit of each hospital, only the variables that were previously marked as 'no' were re-examined. Variables that showed compliance during the second visit were changed to 'yes', and the compliance rate of that visit was based on the new scores. We used the same approach during the third visit.

The overall 3-year compliance rate was calculated by adding up all of the 'yes' answers from the last visit for the variables that reached 60% or higher. The final number obtained for each of the variables that remained below the acceptable compliance rate (< 60%) after 3 years was included in the calculation for the overall compliance rate.

Results

The total compliance rate for the first year was 63% (930/1482). The total compliance rate for the second year was 67% (615/921), and the total compliance rate for the third year was 65% (217/336). The overall three-year compliance rate was 75% (1325/1759). The percentage of HAIs declined from 2.9% in the first year to 2.6% in the second year and 1.7% in the third year (Table 2).

Five of the 55 variables (9%) failed to reach acceptable three-year compliance rates (Table 3). These are:1) A lack of specialized personnel to lead the IC department received a compliance rate of

Table 2: Prevalence rate of healthcare-associated infections (HAI) during the three-year study period.

Year	Number of HAI	Number of Admission	Prevalence	P	Chi Square test	Confidence Interval	
2009	1510	50733	2.9	-	-	-	-
2010	1427	54704	2.6	<0.01	1.1	1.06	1.2
2011	912	53604	1.7	<0.01	1.7	1.6	1.9

Table 3: Variables that did not reach the accepted rate of compliance after three years.

Variables	Rate
Lack of specialized personnel to lead the infection control departments	36% (37/104)
Poor supervision of isolation rooms in the infection control departments of hospitals	44% (44/101)
Hospital sinks did not have the required tools for hand hygiene (anti-bacterial soap, tissue paper, foot-operated garbage container, step-by-step hand washing poster)	53% (55/104)
Incomplete follow up by the infection control departments regarding the decisions of the infection control committee	45% (47/104)
Improper implementation of the decisions of the infection control committee	50% (52/104)

36% (37/104); 2) Poor supervision from the IC department in isolation rooms reached a compliance rate of 44% (44/101); 3) Hospital sinks did not have all of the required tools for hand washing (anti-bacterial soap, tissue paper, foot-operated garbage container, and a step-by-step hand washing poster), resulting in a score of 50% (52/104); 4) The IC department showed incomplete follow through with the infection control committee's decisions, resulting in a compliance rate of 45% (47/104); and5) Improper implementation of the infection control committee's decisions resulted in a compliance rate of 53% (55/104).

Discussion

The study succeeded in establishing a proper scientifically-based infection control program at the infrastructure level. This was clear from the overall compliance rate, which reached 75%, and the prevalence rate of HAIs, which decreased significantly during the 3-year period (Table 2). Providing feedback to hospitals during each quarterly visit increased their awareness and made them more eager to fix the problems that were identified during the visit. Providing feedback from auditing proved to be an effective motivator for performance improvement [4,5]. Furthermore, recognition and appreciation for the IC departments that achieved the highest annual compliance rates increased competition between the IC departments in the twelve Jeddah hospitals [6].

The auditing tool in this study was based on international guidelines, which were published elsewhere, with some modifications to make them more applicable to our hospitals [1,2]. The auditing tool was designed to be basic in order to ensure the program's sustainability [7,8].

Our study revealed that the overall number of HAIs in all of the hospitals combined decreased during the 3-year follow-up period. However, the relationship may be complex. The prevalence rate may not be a strong indication of improvement, but it stills a reflection of improved implementation of methods over time [9].

Only 36% (37/104) of the IC departments in the Jeddah hospitals were supervised by specialized personnel. The shortage of specialized personnel in hospital epidemiology and infection control is a worldwide problem [10,11]. This study demonstrated that this problem also exists in Jeddah hospitals and is unlikely to be resolved soon.

A snapshot of the qualifications of current directors of infection control and their roles in hospitals was obtained. We found that people with qualifications or training in clinical microbiology were more helpful in managing infection control departments relative to those in other fields. However, compensation is not provided, and the workload in microbiology labs is heavy. Therefore, it is difficult for clinical microbiologists to become involved on a full-time basis, and many limit their involvement with IC departments to outbreak situations or when their expertise is inevitably needed. Community health clinicians who are associated with hospitals as hospital epidemiologists have experience in field epidemiology and general disease control strategies. However, they usually have little experience in hospital infection control and only very basic knowledge of clinical microbiology. Thus, they are considered to be field epidemiologists rather than hospital epidemiologists, and their positive impact on our hospitals is somewhat doubtful. The Association for Professionals in Infection Control and Epidemiology (APIC) has clearly identified the Infection Preventionist Consultant title [12]. A background criterion was put in particular for it. Yet, the current study found that the in-charge doctors of the infection control departments in the studied hospitals are still far from the APIC requirements. Local training programs in hospital epidemiology and infection control on consultant levels are urgently needed for newly recruited healthcare professionals who might have some related background and are genuinely interested in this field.

Although the rate of HAIs decreased during the study, our results revealed that only 50% of hospital sinks had the tools required for proper hand washing. Thus, hand washing was not performed properly in half of the hospitals. Continuous and effective hand washing is the single-most important application for decreasing the rate of HAIs in hospitals [13-16]. This finding might indicate that a lack of hand washing tools (anti-bacterial soap, tissue paper, foot-operated garbage container, and step-by-step hand washing poster) had a negative impact on the rate of HAIs in this study. The rates might have decreased even more if all of the hand washing tools were provided throughout the study period. Thus, the lack of these tools might contribute to the poor adherence to hand washing in our hospitals. Accordingly, it would be safe to say that providing all of the required tools for hand washing could improve the performance of hand hygiene in Jeddah hospitals. This is a worldwide phenomenon and concern. Even if all hand washing tools are available, some health care workers do not understand the significance of hand hygiene in reducing the spread of hospital pathogens [17]. Furthermore, although continuous hygiene campaigns exist in Jeddah hospitals, compliance rates for hand hygiene still remain insufficient in our hospitals (unpublished data).

Isolating patients with infectious diseases proved to be a significant factor for minimizing the transmission of diseases to other patients and workers [18-20]. However, although most of the hospitals had isolation rooms, they were supervised by the infection control departments in only 44% (44/101) of Jeddah hospitals. Thus, 57% of the isolation rooms were managed by doctors on the wards. Lack of supervision in the isolation room was particularly problematic during the admission process for infected patients and the discharge process for infection-free patients. Isolation guidelines have changed tremendously in recent years. Infection control staff members are more familiar with the guidelines and more knowledgeable than staff on the ward [21]. Furthermore, some treating doctors do not have adequate experience with the required measures for isolating infected patients and the time required for each case to become non-infectious [22,23]. Therefore, some patients may be kept in the isolation room for a longer time period than required, which increases the occupancy of rooms. Conversely, patients may be discharged prematurely which might expose others to infection. Thus, infection control professionals should carefully evaluate each isolated patient to determine the type of isolation and the required precautions and when the patient can be discharged from isolation. This should be done in collaboration with the treating physician.

This study also revealed that only 53% (55/104) of the infection control committee's (ICC) decisions were implemented, and only 45% (47/104) of the IC departments followed the infection control committee's advice. The ICC is a vital part of the infection control program. Members of to the ICC should include infection control personnel, who perform the day-to-day infection control duties, in addition to different representatives from different departments and specialties. They should come from clinical departments, such as surgery, medicine, and emergency. As well as other specialties such as nursing, the microbiology lab, central sterile supply, pharmacy, and housekeeping, or from other units that have patients who are prone to HAIs, especially the Intensive Care Units (ICUs) or burn unit [24]. The Chair of the ICC should be a person with authority, such as the hospital director or his deputy, to allow decisions to be made with the necessary speed and power [19]. ICC members should hold a leadership position in their departments and also should be interested in infection control and hospital epidemiology and are willing to serve the committee. However, we found that most of the members were not directly compensated for their membership. Instead, members had to add this responsibility to their other duties at the request of their department head or the hospital director. Lack of compensation may reduce the interest levels of members. In addition, the efforts of members may be minimized as they try to implement the decisions made by the ICC. Members of the ICC should meet regularly, preferably monthly, especially in big hospitals [11,19]. Meetings should be recorded with properly written minutes, which should then be distributed to the relevant wards/departments for required action.

This issue creates a serious obstacle to the success of infection control programs, as the IC departments would then have to ensure implementation of required actions in different wards and departments. Therefore, ICC members must be willing to serve on the committee in order to effectively implement and follow all of the decisions with the help of the IC department until each issue is closed.

Our study has some limitations, which were based on the type of hospital. Seven out of the twelve hospitals were general hospitals. The rest were specialized hospitals, including hospitals for maternity and children, drug addict victims, psychiatry, and eye disease. Therefore, some of the variables might have been more applicable to the general hospitals more than the specialized ones. Moreover, the checklist (auditing tool) might have been slightly general for the specialized hospitals. Although the healthcare-associated infection rate decreased, the total prevalence rate was based on the admission number. This might be a crude indicator of rate improvement but is not specific or accurate for comparing types of infections based on specific risk factors or sites of infection. Finally, we managed to monitor the availability of hand washing tools for successful hand hygiene programs in the hospitals. However, we were unable to measure the use of anti-bacterial hand rubs, which were also available in the hospitals in this study. This might have a slight impact on the results.

Conclusion

Our findings helped to monitor, assess, and then standardize an infection prevention program in the twelve Ministry of Health Jeddah hospitals. In addition, our study helped the hospitals become more meticulous in the way they manage infection control-related issues. Finally, it also helped to standardize the process of infection control according to international standards. It is worth pointing out that this study did not need many resources except for manpower, dedication, and continuous follow-up. We feel that the methodology we applied is relatively simple and straightforward and can be used as a template in other hospitals in our country, especially if advanced tools are not available.

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