Research Article

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Preventing SARS-CoV-2 transmission in the emergency department by implementing a separate pathway for patients with respiratory conditions

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Abstract

Objectives: This study aimed to describe the development and implementation of a separated pathway to check and treat patients with a suspected/confirmed coronavirus disease 2019 (COVID-19) in the emergency department (ED) at King Abdullah bin Abdulaziz University Hospital in Riyadh.

Methods: We conducted a retrospective, descriptive longitudinal study from March to July 2020 by analyzing data of all confirmed cases of COVID-19 among ED visitors and healthcare workers in King Abdullah bin Abdulaziz University Hospital.

Results: During the study period, a total of 1,182 swab samples were collected for testing for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), of which 285 (24.1%) tested positive. Of the 285 cases of confirmed SARS-CoV-2 infection, 18 were healthcare workers and 267 were patients. As a result of using the respiratory pathway

for COVID-19 patients, the hospital managed to limit transmission of SARS-CoV-2 not only between patients but also between patients and healthcare workers, while also containing the pandemic. There were no cases of nosocomial SARS-CoV-2 infection recorded among the patients who visited the ED or the flu clinic. All confirmed cases were community acquired and patients were cared for under constrained measures.

Conclusions: Implementing infection control measures and restricting those with respiratory symptoms to the ED pathway prevented nosocomial spread of SARS-CoV-2 infection in the ED.

Keywords: COVID-19; emergency department; hospital-acquired infection; infection control; SARS-CoV-2.

Introduction

Most healthcare facilities provide services to patients with suspected or confirmed coronavirus disease 2019 (COVID-19) during COVID-19 pandemic [1]. This includes healthcare facilities providing both inpatient and outpatient services. Therefore, healthcare facility managers should implement infection control procedures in emergency departments (EDs) to prevent the transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection to patients and healthcare workers (HCWs) [1]. There are three patterns of COVID-19 transmission: sporadic community cases without an obvious source of transmission, family clusters resulting from contact with an infected family index case, and hospital-acquired infections between patients or from patients to HCWs [2, 3]. The main factors contributing to outbreaks include delayed diagnosis, inadequate infection control measures, inadequate triaging, failure to isolate patients with suspected COVID-19 and other high-risk patients with

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respiratory illness, crowding, and patients remaining in the ED for long periods. In most instances, effective control of hospital outbreaks can be accomplished by implementing proper infection control procedures. Prompt diagnosis, isolation, and management of suspected cases are vital, while limiting the number of contacts and hospital visits is also important, to the prevention of SARS-CoV-2 transmission. It is preferable to restrict the movement of patients with suspected COVID-19 to a separate pathway to prevent the spread of SARS-CoV2 among other patients and HCWs [2]. EDs in healthcare facilities are an important source of cases, as they provide care to patients who present without prior appointment, either as walk-ins or by an ambulance. EDs are usually found in hospitals or other primary care centers [4]. Because of the unplanned nature of patient arrivals, EDs must provide initial treatment for a broad spectrum of illnesses and injuries, some of which may be life-threatening, requiring immediate attention. In some countries, EDs have become important entry points for those without other means of access to medical care. Most hospital EDs operate 24 h a day, 7 days a week, although staffing levels may vary according to the patient volume [4].

During infectious disease outbreaks, it is particularly important to separate patients likely to be infected with the pathogen of concern from other patients in EDs. The ED pathway for managing patients with respiratory symptoms or who fit the risk criteria was developed in the context of the COVID-19 pandemic and does not replace routine clinical triage already in place to categorize patients into different urgency categories [5, 6].

This work is based on current data on the COVID-19 pandemic and experiences with other respiratory virus outbreaks in Saudi Arabia, including Middle East respiratory syndrome coronavirus (MERS-CoV) outbreaks between 2013 and 2016 [7]. A separate pathway was created within the ED department for any patient who complained of respiratory symptoms or fit the risk criteria; after initial analysis and diagnostic tests, they would then be discharged home with no ED treatment, discharged home after receiving ED treatment, or admitted to either the ward or intensive care unit.

This study aimed to design and implement a separate pathway in the ED of King Abdullah bin Abdulaziz University Hospital (KAAUH) which is in line with the recommendations of Ministry of health (MOH), to screen and treat patients with a suspected/confirmed diagnosis of COVID-19. It was believed that this respiratory pathway at the hospital would decrease cross-infection among

patients and between patients and HCWs while also preventing the pandemic from spreading among other ED visitors.

Methods

Study design

This retrospective, descriptive longitudinal study was conducted between March and July, 2020, analyzing primary data for all confirmed positive cases of SARS-CoV-2 HCWs at KAAUH.

Ethical consideration

The study was carried out in accordance with the Declaration of Helsinki. The Institutional Review Board of Princess Nourah Bint Abdulrahman University had granted this research and exempt status, with log number 20-0212. The requirement for informed consent was waived because the analysis was based on the use of routinely collected data.

The HCWs reported all patients who were tested in the hospital or the Infection Control Department and who tested positive. A log of was kept of the cases, the probable type of transmission, contact tracing, the symptoms, and the disease progress.

Respiratory pathway design

The hospital managers created pathways to standardize the process of managing suspected or confirmed COVID-19 cases and minimize the risk of spread of SARS-CoV-2 infection.

Emergency department

The first pathway was created for dealing with respiratory cases in the ED, which was split into two areas: the respiratory zone and clean zone as per the Saudi Arabia Ministry of Health (MOH) recommendation (Figure 1) [8, 9]. Each zone had a separate designated entrance, designated waiting rooms, examination/treatment rooms, and a primary screening area immediately near the entrance door, where an initial triage was carried out by a registered nurse wearing personal protection equipment to prevent droplet and contact spread. The nurse's role was to check patients' temperature, advise them on hand hygiene, provide them with masks, and determine their respiratory symptoms and COVID-19 risk factors as per the MOH/Centers for Disease Control and Prevention (CDC) criteria [9]. If patients who met the criteria accidentally walked into the clean zone, they would be identified immediately and directed to the respiratory zone.

Patients were registered in the respiratory zone electronically, and waited in a specifically designed waiting area equipped with high efficiency particulate air (HEPA) filters and spaced waiting room chairs, in accordance with the social distancing recommendations.

Figure 1: Patients flow in emergency medicine department for respiratory illness cases.

Patients not meeting the admission criteria

Patients were later evaluated in the designated respiratory assessment rooms, and if they did not meet the admission criteria and their vital signs were stable, nasopharyngeal swabs were collected using airborne precautions, and they were discharged home with instructions on home isolation and when to seek medical advice. After each swab had been collected, terminal cleaning was conducted.

Patients meeting the admission criteria

If the patients' vital signs were unstable, or they met the admission criteria, they were guided, individually, through a designated pathway (with a restricted entrance) into the respiratory zone treatment area, where initial management and investigations were conducted. When admission requests were placed, each patient was shifted, wearing a surgical mask, through the same designated pathway to the admission floor, using a designated elevator that was access controlled and labeled the "COVID-19 elevator" (Figure 1).

Transfer to quarantine building

The second pathway was for patient transfer to a quarantine building (a housing building, with single rooms, used to quarantine and isolate asymptomatic positive or suspected COVID-19 patients who do not have appropriate home isolation conditions). When the treating physician decided that the patient was to be transferred to the quarantine building, the infection control team were informed and created a log for the patient. The primary nurse communicated with the emergency medicine services (EMS) team to prepare the designated COVID-19 ambulance, which was then used to transfer the patient.

Patients who had already been admitted were asked to wear surgical masks, and were escorted through the designated elevator to the respiratory zone in the ED, from where they were led to the ambulance for transfer, with the EMS team taking droplet contact precautions. The same route and steps were followed for ED patients who required admission. The ambulance used to transfer patients underwent terminal cleaning and fumigation after each transfer.

Outpatients flu clinic

In addition to receiving patients through ED, a designated Flu clinic was created near to the outpatient department it was equipped with HEPA filters, staffed by family medicine physicians and staff nurses. They were seeing and managing stable walk-in eligible patients (in order to decrease the load on ED) their working hours were the usual office working hours 8 am until 4 pm, and at one point when the number of suspected cases was high their working hours was increased to 8 pm.

The team in Flu clinic did the visual triage, assess the patient clinically, do the swabbing, prescribe medications and issues sick leaves if needed, in case they thought that a patient may need intervention they will refer them to ED, where they will be escorted to wearing surgical mask and social distancing measures.

Results

During the COVID-19 epidemic in Saudi Arabia, a respiratory pathway was created in KAAUH that accepted patients and HCWs with suspected or confirmed COVID-19/

SARS-CoV-2 infection. Swabs were collected from all categories of patients or HCWs with symptoms and those who had been in contact with someone with confirmed SARS-CoV-2 infection. During the study period, a total of 1,182 swabs were collected (Table 1), of which 285 (24.1%) were positive. Of the 285 cases of confirmed SARS-CoV-2 infection, 18 were HCWs and 267 were non HCW. Swabs were taken either at the ED or at the flu clinic. The percentages of swabs performed for patients at the ED and flu clinic were 53.2 and 46.8%, while the same for HCWs were 34.5 and 65.5%, respectively.

The demographic distribution of the patients and HCWs who had swabs collected in the ED and tested positive is shown in Table 2. Of the 285 positive cases, 43.2% were male and 56.8% were female. Of the HCWs, 18/221 (6.3%) tested positive, of whom 11 (3.9%) were males and 7 (2.4%) were females. The total number of infected ED persons was five (four male, and one female).

Table 1: Number of swabs tested for SARS-CoV2 and the results.

	Flu clinic, n (%)	ED, n (%)	Total, n (%)
Number of patients tested	620 (27.9%)	961 (43.2%)	1,221 (54.9%)
Positive	159 (7.1%)	267 (12%)	426 (19.1%)
Negative	461 (20.7%)	694 (31.2%)	1,155 (51.9%)
Number of HCW tested	420 (18.9%)	221 (9.9%)	641 (28.84%)
Positive	19 (0.8%)	18 (0.8%)	37 (1.6%)
Negative	401 (18%)	203 (9.1%)	604 (27.1%)
Total swabs	1,040 (46.8%)	1,182 (53.1%)	2,222
Positive	178 (8%)	285 (12.8%)	463 (20%)
Negative	862 (38.7%)	897 (40.3%)	1759 (79%)

ED, emergency department; HCW, healthcare workers.

Table 2: Demographic analysis of positive swabs for patients and HCWs done in the ED.

Category	Sex		Total
	Male	Female	
Healthcare workers			
Count	11	7	18
% Within sex	8.9%	4.3%	
% of total	3.9%	2.4%	6.3%
Patients			
Count	112	155	267
% Within sex	91.1%	95.7%	
% of total	39.3%	54.4%	93.7%
Total			
Count	123	162	285
% of total	43.2%	56.8%	100%

Discussion

SARS-CoV-2 is mainly transmitted through respiratory droplets generated by an infected person who coughs or sneezes. A recent report by the US National Institutes of Health revealed that respiratory droplets could settle on surfaces and the virus could remain viable for several hours to days [10]. Moreover, transmission can also occur through hands that come in contact with mucosal surfaces, such as nose, mouth, and eyes, of an infected person [3]. KAAUH has applied the specific recommendations and standard operating procedure prescribed by the World Health Organization to deal with all COVID-19 cases [11]. Since the start of the COVID-19 pandemic, all individuals in the community, community health workers, HCWs, healthcare managers, as well as public health and infection prevention and control professionals have begun wearing masks and protective equipment [8, 12]. The same rules have been applied at KAAUH. During the early stage of COVID-19, the symptoms are non-specific [13, 14]. Infected individuals could be symptomatic, displaying malaise, cough, and fever, or asymptomatic and yet infectious. The accuracy of early diagnosis based on combined chest computed tomography and nucleic acid testing can reach 97%. In the late stages of infection, expiratory dyspnea occurs and in severe cases respiratory distress syndrome, acute circulatory failure, or renal failure can occur. Until now, no specific effective therapeutic protocol is known. The current treatment methods are empirical, based on symptoms, and consist of antibiotics and antiviral drugs, as well as respiratory support through mechanical ventilation [13, 14]. The large number of infected persons and the rapid spread of COVID-19 have resulted in an extraordinary public health emergency. This epidemic is a serious challenge to the entire world and in particular to the medical system and its ability to manage such pandemics [15]. Herein, we have described the experience in the ED of KAAUH and the protection measures implemented during the creation of a respiratory pathway. Because of this new pathway and the strict preventive protocols, there have been no additional cases of infection among the medical staff and the patients.

KAAUH is a relatively new hospital, which opened in 2017. The hospital capacity is 192 beds with 23 ED beds. During the COVID-19 pandemic, the hospital efficiently created a respiratory pathway within the ED to categorize patients into different conditions of urgency of either with regard to whether they were suspected to be COVID-19 positive. The pathway does not replace any ED routine already established in healthcare facilities. It has all

requirements such as the “eyeball test” (initial rapid assessment), triage rooms, swab room, negative pressure rooms, and extra rooms with HEPA filters. HCWs staffing the respiratory pathway are all fit, tested for COVID-19, and none of them have chronic diseases or asthma; nurses rotate in and out of the zone, separately from the housekeepers and porters. The pathway is also equipped with a portable X-ray machine, shower rooms, and clothes for all staff, as well as laundry services; however, it does not have separate ablution facilities, eating areas, or a designated card-controlled admission elevator. All patients with respiratory symptoms can benefit from direct admission and high turnover to minimize the time that they spend in the ED. Moreover, it is important for HCWs to stay up-to-date on relevant information and remain on high alert, prepared to handle COVID-19 cases and direct admission requests, which are often made prior to the patients’ arrival. After implementing all infection control measures and separating the ED into the standard ED and the respiratory pathway to control COVID-19 cases, KAAUH managed to prevent the transmission of the infection between ED visitors and HCWs. KAAUH has managed 358 positive cases among patients and HCWs, all of which were confirmed to be community acquired; and no nosocomial transmission has been documented. One limitation to this study is the relatively small number of HCWs and ED visitors, which may limit the generalizability of results. Additionally, this pathway only helps if the patients mentioned that he/she had contact of positive case, otherwise if they presented with a complaint that was not a part of the case definition issued by MOH they won’t be picked up. In order to maintain the future functionality of this pathway extra staff will be required (physicians, nurses, allied health providers, cleaners and security personal) as the number of cases will increase (both suspected and clean cases).

Multiple indicators can be utilized in future to assess the benefits of this pathway, length of waiting time, time of registration until disposition, and staff psychological wellbeing in both ED areas.

Recommendations

Implementing strict infection control measures including designated policies to deal with cases during epidemics/pandemics, and formulating a clear and detailed management plan including movement allocations and steps is of critical importance in protecting HCWs. Simplifying plans using visual aids and concise algorithms proved to be effective in our research and is highly recommended.

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