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Can You Catch It? Lessons Learned and Modification of ED Triage Symptom- and Travel-Screening Strategy

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Section Editor: Andi Foley, DNP, RN, ACCNS-AG, CEN

CE Earn Up to 8.0 Hours. See page 941.

Contribution to Emergency Nursing Practice

- The current literature indicates that prompt identification and isolation of both common illnesses (eg, seasonal influenza) as well as highly hazardous communicable diseases (eg, coronavirus disease 2019 and Ebola virus disease) can mitigate exposures to and transmissions of these diseases in clinical settings.
- This article contributes to the finding that this practice improvement project led to a decrease in the number of infection control exposure investigations in the emergency department.
- Key implications for emergency nursing practice found in this article are that the availability of this electronic screening algorithm arms emergency nurses to identify promptly and isolate both at-risk patients with common illnesses and highly hazardous communicable diseases, thereby reducing subsequent exposure.

Abstract

Introduction: Efficient identification and isolation of patients with communicable diseases limits exposure to health care workers, other patients, and visitors. In August 2014, our team developed and implemented an algorithm to triage suspected cases of Ebola virus disease in a midwestern United States emergency department and outpatient clinics based on patient travel history and symptoms. Here, we present the lessons learned and modifications to update the tool.

Methods: Two strategies were developed and utilized to properly identify, isolate, and inform on patients with suspected highly hazardous communicable diseases: 1) a robust electronic symptom and travel screen with decision support tools in the electronic medical record, and 2) the availability of workflow protocols for Ebola virus disease, Middle East Respiratory Syndrome (MERS), and coronavirus 2019 (COVID-19) once a person under investigation is identified. After action reports provided opportunities to modify the algorithm and improve the identification and isolation processes.

Results: Since our screening and travel electronic medical record inception 5 years ago, modifications changed iteratively to further enhance the screening process. Since 2018, staff have identified 5 patients at risk for MERS; in all cases, identification occurred during the check-in process. Exposure investigations in the emergency department decreased significantly after algorithm implementation in January 2019, from 30 in 2018 to 0 in 2019.

Discussion: Although highly hazardous communicable diseases like Ebola virus disease and MERS are of concern due to their mortality rates and limited treatment options, these same

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J Emerg Nurs 2020;46:932-40.
Available online 16 April 2020
0099-1767

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https://doi.org/10.1016/j.jen.2020.03.006

concepts may be applied to the early identification and isolation of patients suspected of having more common communicable diseases like measles and influenza, emphasizing the importance of protocol-based screening in the healthcare environment.

Key words: Ebola; Patient isolation; Disease outbreaks/prevention and control; Emergency service,hospital; Communicable disease control/methods

Introduction

The initial assessment of clinical symptoms is the cornerstone of triage in the emergency department. It is important to identify efficiently and isolate patients potentially infected with communicable diseases such as influenza and measles to limit exposure to health care workers, other patients, and visitors. Symptom assessment, paired with travel history, can identify patients who are at risk of highly hazardous communicable diseases such as Ebola virus disease (EVD), Middle East Respiratory Syndrome (MERS), and coronavirus disease 2019 (COVID-19), which emerged in December 2019.

EVD is caused by a group of viruses within the genus *Ebolavirus*. Ebola virus causes a clinical syndrome known as viral hemorrhagic fever, which carries a mortality rate of up to 90%.[1] Ebola virus is transmitted via direct contact with infected bodily secretions, putting close contacts, including health care workers, especially at risk. Multiple outbreaks of EVD have occurred in Africa since the discovery of Ebola virus in 1976, but the West Africa outbreak in 2014-2016 was the largest ever recorded, with more human morbidity and mortality (more than 28,000 cases and more than 11,000 deaths) than all previous outbreaks combined.[2] As of this writing, the second-largest outbreak of EVD is ongoing in the Democratic Republic of the Congo.

MERS is a viral illness caused by Middle East Respiratory Syndrome Coronavirus (MERS-CoV), which produces a clinical respiratory illness with a 30% to 40% mortality rate. It was first reported in Saudi Arabia in 2012 and is epidemiologically linked to contact with camels.[3] MERS-CoV is transmissible via contact with the respiratory secretions of an infected person and has caused multiple outbreaks in the Arabian peninsula (especially in Saudi Arabia), as well as outbreaks in other countries traced to returning travelers. Recently, we saw the emergence of COVID-19 from Wuhan, China.[4] To date, confirmed cases of COVID-19 have been detected in more than 50 countries on 6 continents. Although the current estimated case fatality of around 2% is less than that of MERS or Severe Acute Respiratory Syndrome, the number of deaths attributed to COVID-19 has surpassed the number of deaths caused by the other 2 diseases combined.

EVD, MERS, and other highly hazardous communicable diseases have high mortality rates and limited or no treatment options, making prompt identification and quick isolation especially important to reduce the risk of transmission in the health care setting. As these diseases are initially acquired generally during international travel, travel screening and appropriate clinical and epidemiologic assessment are important tools to implement in emergency departments and other clinical areas of the health care system where patients may initially present for care. The absence of a streamlined process for screening and documenting travel history can lead to missed identification of patients who are potentially infected.[5] To address this challenge, the Centers for Disease Control and Prevention (CDC) in the United States developed an algorithm, termed "Identify, Isolate, Inform," to provide guidance for emergency departments and other health care points of entry on the evaluation and management of persons suspected of having EVD.[6] The algorithm is adaptable, having been modified for MERS, mumps, measles, and Zika; a similar algorithm was developed specifically for emergency medical services (EMS).[7-11]

The development of a readily available screening tool for highly hazardous communicable diseases with up-to-date guidance is, therefore, imperative for successful identification, isolation, and care. The purpose of this project was to update the screening algorithm and process on the basis of the lessons learned since its implementation in 2014 and to describe the tool's practical use in identifying and isolating suspected cases of highly hazardous communicable diseases, including detailing how our hospital recently adapted the tool to initially address potential cases of COVID-19.

Methods

The quality improvement process described here is an intervention modification on the basis of pragmatic lessons learned. In August 2014, at the height of domestic preparations for EVD, our team developed and implemented an algorithm to triage suspected cases of EVD in a Midwest emergency department and outpatient clinics on the basis of patients' travel histories and symptoms; details of the development process were published in 2015.[12] Initially a paper version, the travel-screening algorithm was converted to an electronic format in October 2014 to provide visibility from the initial intake to providers downstream and provide clear and succinct

directions to ensure proper identification, isolation, and care of a suspected patient. Since 2014, the algorithm has become a hardwired process throughout the organization.

INTERVENTION

Two unique strategies were used to identify, isolate, and inform about patients in the emergency department with suspected highly hazardous communicable diseases. One was the use of the robust electronic symptom and travel screen with decision support tools in the electronic medical record (EMR). The second strategy used was the availability of workflow protocols at Nebraska Medicine for EVD, MERS (Supplementary Figure 1), and COVID-19 (Supplementary Figure 2) once a person under investigation was identified. The workflow algorithms, available on the hospital's intranet, are updated at regular intervals to reflect changing needs and best practices. Signage encouraging patients to cover their cough and visitors to refrain from coming to the hospital if they have a fever or cough are displayed in the emergency department and throughout the health system.

All patients presenting to the emergency department or outpatient clinics are screened promptly for symptoms and travel histories as described previously.[12] A greeter nurse (available 24/7) screens each patient as they present to the emergency department. The EMR decision support tool is automated: upon entering a patient's EMR record, the travel-screening questions appear both at registration and for the nursing staff. Although it is possible to bypass the screening questions, the nursing and registration staff are educated and encouraged to complete the EMR tool. Masks and gloves are available in the area where patients initially present; patients with complaints of respiratory symptoms are instructed to use a mask. This early use of masks helps mitigate patient, visitor, and health care worker exposure to influenza, measles, and other communicable pathogens with droplet or airborne transmission.

Upon positive screening for EVD, MERS, or COVID-19, the identified person under investigation is moved to a negative pressure isolation room on the basis of information pushed from the EMR algorithm. The intranet protocol(s) then provide clinicians with guidance on proper personal protective equipment selection and donning/doffing, management of family or other persons who arrived with the patient, contact information to notify infectious diseases and infection control specialists, specifics on additional history and screening parameters needed according to CDC case definitions, and proper specimen collection, including instructions for proper handling and collection of nasopharyngeal swabs for MERS-CoV. In addition, the intranet protocols include links for just-in-time videos of personal protective equipment donning and doffing procedures, appropriate clinical specimen collection, and guidance for disinfection and waste management.

STUDY OF THE INTERVENTION

The impact of the intervention was assessed on the basis of a reduction in the number of exposure investigations after the presentation of a patient with a confirmed communicable disease. In addition, positive high-risk cases provided opportunities to modify the EMR workflow algorithm and improve the identification and isolation processes in the protocol. Positive cases (ie, cases that were flagged by the algorithm as a patient meeting the screening risk factors) triggered a review by emergency nurses and physicians, hospital infection control, infectious disease physicians, and hospital management. Collaborative "After Action Reports" were completed by these partners to provide robust observations on the management of these cases and adherence to the screening process and workflow algorithm.

MEASURES AND ANALYSIS

After the identification of a high-risk case, After Action Reports were completed electronically. The ED manager or designee was responsible for initiating the chart review of the patient's medical record and timeline review into a standard After Action Report template. The tool was then disseminated electronically to frontline staff, hospital management, and infection control, all of whom collaborated to review and complete the reports to identify gaps and critical points in the screening process. Moreover, the emergency department and Infection Control Department, in conjunction with the Nebraska Biocontainment Unit, worked together to fine-tune the identification, isolation, and treatment processes and protocols for patients under investigation for highly hazardous communicable diseases through annual competencies and no-notice drills. A review of these After Action Reports and collaboration with multiple partners ensured that the screening process was being adhered to consistently. Quantitative data to describe the proportion of patients presenting to the emergency department or outpatient clinics who were screened using the algorithm and flagged for being suspect patients for a highly hazardous communicable disease, as well as the number of exposure investigations before and after implementation of the EMR algorithm, are based on administrative data estimates from the hospital and ED leadership.

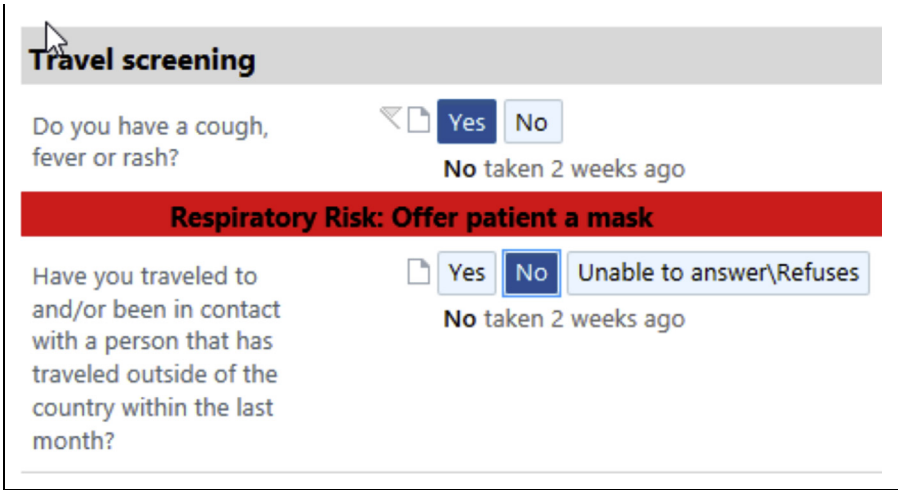

FIGURE 1
Initial screening questions for patients arriving in the emergency department and the result of a positive response.

ETHICAL CONSIDERATIONS

As a quality improvement project, this work was exempt from institutional review board approval. The implementation of the EMR screening algorithm generated several ethical considerations. For patients who were identified through the screening process as potential high-risk cases for EVD or MERS, there was a risk that care would be delayed for a more common diagnosis while testing for the highly hazardous communicable disease was conducted. As a result, a process was developed to continue diagnostic testing and treatment of the more common illnesses while awaiting test results for MERS or EVD. In addition, there were ethical aspects related to maintaining the isolation of a person under investigation who elected to leave before the test results were available. To address these cases, a process was developed for local public health officials, hospital infection control, and ED providers to conduct risk-benefit analyses jointly on the basis of risks to the public, the option to place a medical hold until the test results were available for cases with public health concerns, and the likelihood of the individual maintaining self-quarantine if the risk was determined to be low.

Results

Since the implementation of the EMR algorithm, on the basis of estimations by our hospital and emergency management leadership, an estimated 75% of the patients presenting to the hospital system's emergency department or outpatient clinics were screened using the algorithm. Less than 1% of these patients were flagged as potential high-risk cases. Moreover, since the implementation of the improved intervention in January 2019, no exposure investigations in the emergency department have had to be performed.

EVOLUTION OF THE ELECTRONIC SYMPTOM- AND TRAVEL-SCREENING PROCESS

Since our screening and travel EMR inception 5 years ago, modifications were made iteratively to enhance the screening process further. Previously, the initial question upon emergency department or outpatient clinic presentation was "Have you traveled outside of the country in the past 21 days?" This question, which was EVD-centric on the basis of the incubation period, was replaced with "Do you have a fever, cough or rash?" A positive response cascaded a red-banner directive to offer the patient a mask, as shown in Figure 1. This promotion of proper infection-prevention practices reduces their exposure to others at the earliest moment of their ED visit.

The second question upon emergency department or outpatient clinic presentation, the travel-screening question, originally only captured individuals who had a pertinent travel history; our updated version included those who may have been in direct contact with someone recently returned from an area with an active outbreak. In addition, the travel period was extended to allow for the use of 1 question for multiple pathogen-incubation periods. Thus, the travel screening question was rephrased from "Have you traveled outside of the US in the last 21 days" to "Have you traveled and/or been in contact with a person that has traveled outside of the country within the last month?"

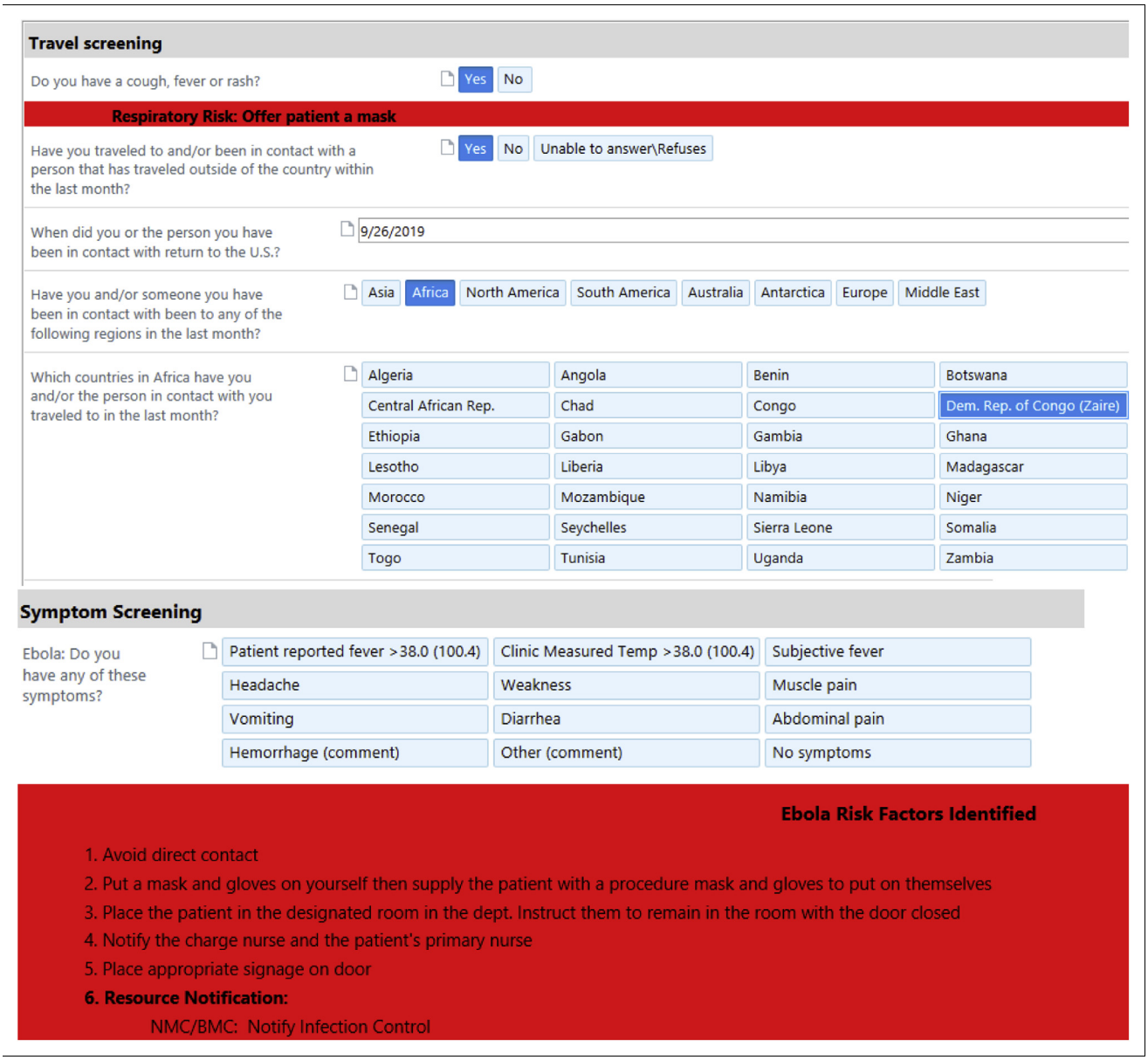

FIGURE 2

Result of a positive travel in the past month and the selection of an active outbreak country.

In the 2014 initial screening algorithm, a patient would screen positive if they traveled to an active outbreak zone and had a fever greater than 38.6°C (101.5°F). The updated version flagged a patient positive for fever, rash, or cough and cascaded a directive if they or a contact of theirs had traveled to an affected outbreak zone within the previous month, as shown in Figure 2. The resulting directive provided information on donning a mask and gloves, isolating the patient, and notifying the appropriate staff.

TRAVEL-SCREENING PROCESS IMPROVEMENT AND HOSPITALWIDE IMPLICATIONS

The symptom and travel algorithm tool built into the admission navigator of the Nebraska Medicine ED EMR has been successful in identifying patients at risk of highly hazardous communicable diseases within minutes of arrival. To date, since 2018, the staff have identified 5 patients at risk for MERS; in all cases, the

identification occurred during the check-in process within a few minutes of arrival.

Moreover, the process significantly reduced the numbers of exposure investigations that occurred in the emergency department. In 2018, before the implementation of the first screening question ("Do you have a fever, cough or rash?") in mid-January 2019, 30 exposure investigations were conducted. The number of exposure investigations in the emergency department for 2019 was 0. The "prompt mask" application upon patient presentation all but eliminated these investigations for health care workers as well as for other patients and visitors exposed in the waiting areas. This translated into hospital cost savings in time, communication, and employee health services.

The outcomes from After Action Reports led to improvements in the process. One such improvement was the inclusion of the symptoms of rash, fever, and other respiratory symptoms; previously, the nursing staff were not alerted until the patient had a documented fever, which created a significant lag between presentation and identification of risk. In addition, the process of reviewing the After Action Report identified the need to specify the location where the patient would wait if the negative pressure isolation room was occupied and until it was made available and how that waiting area would be processed after the patient was moved. Moreover, improvements were made to the evaluation process of other common respiratory causes while maintaining isolation for suspected MERS cases. The reduced turnaround time between specimen collection and laboratory results was an outcome of the creation of streamlined communications among the county public health department, the public health laboratory located on the Nebraska Medicine campus, and ED providers.

On the basis of the After Action Reports, steps were taken to improve the patient experience, which can be long and isolating, particularly when language barriers exist. For example, the staff provided patients details of the testing plans, risks and concerns, and time expectations for test results, and initiated investigations for more common causes of symptoms before the test results were received. An annual competency review and no-notice mystery patient drills have led to better tools, such as new checklists, more appropriate supplies for waste management, and improved means of communication among various departments, including radiology and laboratory services.

ADAPTATION OF THE TRAVEL-SCREENING PROCESS TO COVID-19

The emergence of COVID-19 in December 2019 provided the opportunity to adapt our algorithm for a novel disease. Owing to cases of local transmission of COVID-19 reported in multiple countries, we divided our second screening question (previously, "Have you traveled and/or been in contact with a person that has traveled outside of the country within the last month?") into 2 parts (Supplementary Figure 2): (1) "In the last month, have you had close contact with a person known to have COVID-19, MERS, or EVD?" and (2) "Have YOU traveled outside of the country within the last month?" Positive symptoms and a positive response to the former question flag the individual as a suspected case and prompt directions for isolation. A positive response to the latter question prompts the individual to identify which country. Travel to one of the hot-spot countries (a list of countries is continually updated in the EMR on the basis of current events) and positive symptoms prompt directives for isolation.

Additional screening questions specific to persons under investigation for COVID-19 are asked once the person has been isolated. These include a more extensive travel history and contact investigation. Upon notification of infection control staff, the Infection Control Medical Director determines if the person under investigation meets the COVID-19 case definition per the most up-to-date definition provided by the CDC. The process then includes directions for patients who fit the COVID-19 case definition (contacting county health department, following the MERS ED protocol for isolation and transport, and cleaning and disinfection processes) or for those who do not fit the case definition (notifying the ED provider).

Discussion

The purpose of this project was to detail the revisions that were made to the screening algorithm developed in 2014 to identify quickly and isolate persons under investigation for EVD. On the basis of the lessons learned from the positive screenings in our hospital since its implementation, we revised the tool to enhance infection prevention in the emergency department and apply the process to broader use in identifying and isolating suspected cases of highly hazardous communicable diseases. With the recent discovery and increasing global spread of COVID-19, screening

algorithms such as the one we have developed, implemented, and described here are key tools to disrupting hospital-based transmission and mitigating exposure events.

During the recent outbreaks of EVD and MERS, multiple patients presented to emergency departments around the world with symptoms consistent with these illnesses and were an epidemiologic risk via travel or contact with an infected person. When these patients were recognized, they were cared for as persons under investigation. However, as recognition requires implementation of symptom, travel, and epidemiologic screening, some patients at risk for these illnesses were either not identified or identification was delayed, leading to health care–associated infections in patients as well as health care workers. In South Korea, a single traveler returning from the Middle East with undiagnosed MERS resulted in an outbreak of 186 additional cases after he presented to an emergency department.[13] Although not all regional Ebola and other special pathogen treatment centers in the United States require that a patient with suspected or confirmed MERS be cared for in a high-level isolation unit, this case highlights the impact super-spreaders can have in a health care setting without the most advanced engineering and administrative controls and emphasizes the critical need to identify patients with a highly hazardous communicable disease at the earliest possible time point.

There are many lessons learned from real-world experience with persons under investigation for highly hazardous communicable diseases. A partnership with local public health authorities for the identification process is imperative, especially because patients may present for care accompanied by friends or family members, necessitating public health guidance in case of exposure. In addition, from a public health perspective, consideration should be given to plans for patients who attempt to leave against medical advice. It is important to note that the index patient in the previously mentioned MERS outbreak in South Korea initially denied travel to the Middle East; therefore, inaccurate travel and medical histories are real-world possibilities that should be considered when patients present for care. Early involvement of specialists in infectious diseases is recommended so that they may assist with the epidemiologic evaluation. The availability of diagnostic testing for patients with suspected EVD and MERS is an important aspect of the evaluation of a person under investigation, and emphasis should be placed on timely and appropriate specimen collection, as well as ensuring the availability of laboratory personnel with experience in performing the necessary diagnostic tests. At our institution, a link to a video detailing the process of appropriate respiratory specimen collection is included in our MERS person-under-investigation evaluation protocol. Public health laboratory staff are on-call 24/7, and early laboratory notification is necessary to ensure timely processing of specimens. The Department of Infection Control is involved in the process and should be notified as soon as a person under investigation is identified so that they can ensure adherence to strict infection control practices during the patient evaluation.

The creation of comprehensive, readily accessible protocols, along with mechanisms for initial and ongoing training of health care workers, is the cornerstone of preventing the spread of infectious diseases in the health care setting. Although communicable diseases such as EVD and MERS are of concern owing to their high mortality rates and limited treatment options, these same concepts may be applied to the early identification and isolation of patients suspected of having more common diseases such as measles and influenza, emphasizing the importance of protocol-based screening in the health care environment.

This process improvement project had some limitations. Owing to the challenges in extracting aggregated data through our hospital EMR, the percentage of patients presenting to the emergency department or outpatient clinics who were screened and flagged, as well as the number of exposure investigations conducted before the implementation of the EMR algorithm, are all estimates from the hospital and ED leadership. As such, the collection method for this data relies on experts' reporting and is not comprehensive or robust. Systematic data collection is recommended for hospitals looking to implement and quantify the impact of implementing such an algorithm. In addition, although we believe that the described algorithm is straightforward and concise, screening outcomes rely on human factors for compliance and implementation.[14] In this case, the process rests on greeter nurses and registration staff posing the screening questions to every patient entering the emergency department or other health care entry point, regardless of visible symptoms. Education on the importance of the algorithm and the critical advantage of identifying and placing a mask on symptomatic individuals early is needed to ensure that those interacting with patients implement the process. In addition, diseases are ever evolving, and outbreaks undoubtedly will emerge in different regions of the world. As such, there is a need for health care teams to monitor current disease threats around the world continually and to update the system to match those events. Last, the travel-screening algorithm has undergone a number of revisions over the last 5 years and will continue to be updated on the basis of the lessons learned. Health care systems adopting a strategy similar to the one we have described must be open to modifying it to fit local, national, and international circumstances and needs.

Implications for Emergency Nurses

Emergency nurses see patients with a variety of symptoms and chief complaints. It is essential that nurses are prepared to recognize the risk and isolate patients potentially infected with communicable diseases such as influenza, measles, MERS, EVD, and other emerging infectious diseases, including COVID-19. When a patient presents to the emergency department with the potential for a highly hazardous communicable disease, it is imperative that the first nurse or health care team member to encounter that patient recognizes the risk and isolates the patient to prevent transmission to other patients, visitors, and health care staff. The current intake process in many emergency departments leaves nurses unprepared to provide prompt recognition, and the lack of consistent tools places them in situations in which they have little information to recognize the risks. The implementation of a standardized screening process, such as the one we have described, that includes symptomology and travel history built into the EMR can arm emergency nurses with the tools they need to identify patients quickly and recommend isolation precautions; a workflow algorithm readily available on the intranet and used consistently provides a standardized and effective way to identify, isolate, and inform and can improve communication, efficiency, safety, and patient experience. Moreover, in our experience, implementation of this symptom- and travel-screening strategy has reduced staff exposures to more common communicable diseases such as influenza and measles, thereby reducing the need for postexposure prophylaxis and treatment.

Conclusions

The use of EMR tools for symptom- and travel-screening in the emergency department and outpatient clinics should be used to optimize effective communication, coordination, and collaboration. Millions of international travelers visit our communities each year, and with them comes the risk of lesser-known but highly consequential communicable diseases. The lack of a direct threat of a highly hazardous communicable disease event within the United States has resulted in waning attention and vigilance toward preparing emergency departments for these types of diseases since the West Africa EVD outbreak in 2014-2016; however, as we once again face the threat of a highly hazardous communicable disease event with the emergence of COVID-19, now is the time to implement processes and strengthen our systems. Emergency departments often represent the first line of response to a domestic case of a highly hazardous communicable disease, and the implementation of efficient and effective screening tools that improve identification and reduce exposures in the emergency department can truly determine whether we will be dealing with a single case, a cluster, or an outbreak.

Author Disclosures

Conflicts of interest: none to report.

Supplementary Data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jen.2020.03.006.

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