Journal of Hospital Infection 95 (2017) 280–285

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevierhealth.com/journals/jhin

Short report

Resource impact of managing suspected Middle East respiratory syndrome patients in a UK teaching hospital

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ARTICLE INFO

Article history:
Received 5 August 2016
Accepted 8 December 2016
Available online 18 December 2016

Keywords:
Middle East respiratory syndrome
Influenza
Personal protective equipment
Isolation
Polymerase chain reaction

SUMMARY

Clinical challenges exist in the management of hospitalized patients returning to the UK with potential Middle East respiratory syndrome coronavirus (MERS-CoV) infection, particularly with its clinical overlap with influenza, as demonstrated in this case-series and cost-analysis review of returning Hajj pilgrims. These patients were hospitalized with acute febrile respiratory illness, initially managed as potential MERS-CoV infections, but were eventually diagnosed with influenza. Additional costs were small, yet enhanced infection prevention measures created significant burdens on isolation rooms and staff time. Planning for predictable events such as Hajj is important for resource management. Here, in-house MERS-CoV diagnostic testing would have facilitated earlier diagnosis and discharge.

Introduction

Middle East respiratory syndrome coronavirus (MERS-CoV) first emerged in Saudi Arabia in 2012. It has established endemicity in the Arabian Peninsula and has been imported into other countries, including large hospital-related outbreaks in South Korea, demonstrating limited human-to-human transmission. There is no specific treatment or vaccine, and it carries an overall mortality of 30–40%.[1,2]

Current Public Health England (PHE) guidelines recommend that MERS-CoV infection should be considered in any symptomatic patient returning from an endemic area (or who has had contact with a confirmed case) within 14 days, with no alternative explanation.[3] Case definition criteria include cough, fever

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http://dx.doi.org/10.1016/j.jhin.2016.12.010
0195-6701/

≥38°C, with clinical or radiological evidence of pneumonia or acute respiratory distress. However, MERS-CoV may present with a wide spectrum of clinical disease, indistinguishable from other respiratory virus infections.[4] Note that a history of camel contact is not included in these case definition criteria. The potential for aerosol as well as large droplet transmission make the additional healthcare resources required for managing patients with suspected MERS-CoV considerable, particularly the use of negative pressure isolation, enhanced personal protective equipment (PPE) and safe laboratory testing.[5,6]

Although there are few actual cases of MERS-CoV in returning pilgrims, the potential for transmission during large religious pilgrimages, especially Hajj, have raised concerns.[7,8] Given an incubation period of up to two weeks, asymptomatic patients may return unaware that they have contracted the disease.

This case series and cost analysis illustrates the clinical overlap between seasonal influenza and MERS-CoV in these returning Hajj pilgrims, together with the challenges of caring for these patients within an enhanced infection control environment.

Methods

Case reports

Table I supplies data for five patients hospitalized in the Infectious Diseases Unit, Leicester Royal Infirmary, during October 2015.

Two patients were male, three were female, with a mean age of 36 years. All patients developed symptoms within four days of returning to the UK, and presented after mean duration of four days (median: three days). All were febrile ≥37.8°C (5/5, 100%) with at least two respiratory symptoms (coryza, pharyngitis, cough, sputum, wheeze, dyspnoea), and three (60%) had diarrhoea and vomiting. The oldest patient, a female aged 57 years, developed hypoxia, respiratory failure and cardiac conduction abnormalities (2:1 heart block on electrocardiograph) and was transferred to intensive care. One of the female patients was 27 weeks pregnant and felt reduced fetal movements.

Two sets of nose swabs, throat swabs, and sputum were collected from each patient. One set was sent to our local reference laboratory for MERS-CoV polymerase chain reaction (PCR), the other was simultaneously tested in parallel (with appropriate initial sample inactivation) on our in-house assay for influenza/adenovirus/respiratory syncytial virus PCR. Routine bacteriological investigations were performed, including sputum culture and sensitivities.

Isolation precautions

Table II summarizes category of transmission-based precautions used during our admissions returning from Hajj.

All of our patients presented to the Emergency Department, Leicester Royal Infirmary, and were assessed in a single cubicle before transfer to one of two available medium-secure single negative-pressure rooms (negative-pressure isolation room with en-suite bathroom and antechamber) within the Infectious Diseases Unit, where medical and nursing staff should attend annual local training for PPE use and FFP3 respirator fit-testing. Visitors were restricted. Staff interactions were logged and restricted to essential attendances. Required PPE included the use of long-sleeved fluid repellent gown, plastic apron, double gloves, eye protection and FFP3 single valve respirator.

We estimated that it took an additional 15 min per patient contact (don and doff PPE, disposal, complete visitor logs) than standard precautions, for both nurses and doctors, with the consultant being present during the doctors' visits for suspected MERS patients.

Laboratory testing

Testing for routine respiratory viruses was performed at Leicester Royal Infirmary using in-house PCR assays based on previously published protocols.[9–11] This testing covered influenza A and B, respiratory syncytial virus, parainfluenza (types 1–4), and adenovirus.

Local practice is to process all respiratory samples in BSL 3 containment to allow safe inactivation of the suspected MERS-CoV sample in lysis buffer prior to RNA extraction for PCR testing. This in-house respiratory PCR test panel costs £21.60, and would be performed for any patient suspected of a possible respiratory infection, whether or not MERS-CoV infection was also suspected.

A separate set of samples for testing at the MERS-CoV reference laboratory in Birmingham was packaged and sent by courier under Category B (UN3373). The MERS-CoV testing at the Public Health England (PHE) Reference Laboratory in Birmingham was performed using an assay based on a previously published assay targeting the region upstream of the MERS-CoV E gene (upE).[12] This test panel also included non-MERS-CoV viruses, including respiratory syncytial virus (RSV), influenza A (H1, H3; not subtyped further), influenza B, parainfluenza virus (PIV types 1–4), rhinovirus (RV), human metapneumovirus (hMPV), and adenovirus (Adv).[9,10] The cost of the courier and the MERS-CoV testing was covered by PHE.

Results

Clinical cases

Throat swabs from all patients tested positive by in-house PCR assays for influenza A/H1N1, A/H3N2 or B viruses within 31 h (median: 23 h) from collection.

MERS-CoV PCR results were available to clinicians between 25 and 57 h from collection (median: 50 h) and patients remained in medium-secure negative-pressure isolation for a mean of 39 h (median: 45 h).

All patients received oseltamivir (oral, 75 mg, 12-hourly), and three (60%) received intravenous antibiotics as per hospital antimicrobial guidelines on admission. Two of these patients cultured *Haemophilus influenzae* from sputum and were treated with co-amoxiclav, and the third with clinical sepsis was given combination therapy (meropenem, doxycycline, linezolid) (Table I).

All patients recovered, with three (60%) being discharged within 48 h.

Overall cost of admitting and screening a suspected MERS-infected patient

Several aspects of the cost could not be quantified, such as the cost of the individual negative-pressure room ventilation and disposal of the enhanced PPE waste for any particular patient suspected of MERS-CoV infection. These costs were