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Global health's newest threat: MERS-CoV

May 30, 2014

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Medical Director, Communicable Diseases

Disclosure statement

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I have no relevant financial relationships to disclose.

MERS-CoV

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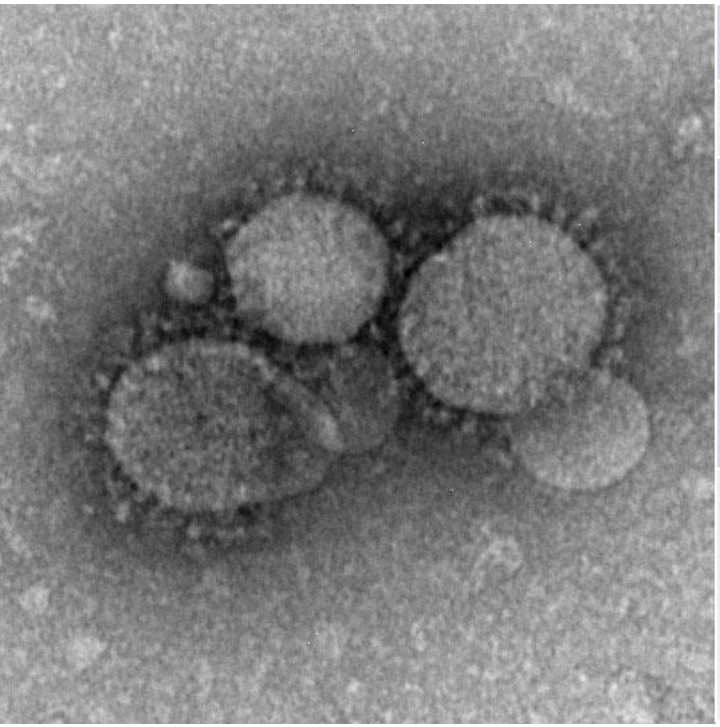

HCoV-229E	Ubiquitous Pediatric URI Immuncompromised— pneumonia
HCoV-OC43	
HCoV-NL63	
HCoV-HKU1	
SARS-CoV	2003-2004 8098 cases, 774 deaths
MERS-CoV beta coronavirus Lineage C	2012-present 636 cases, 193 deaths

Cynthia Goldsmith/Maureen Metcalfe,
Azaibi Tamin

http://www.cdc.gov/CORONAVIRUS/MERS/photos.html;
http://www.who.int/csr/don/2014_05_28_mers/en/

Chicago Tribune

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MERS case puts many in isolation

50 caregivers, man's family watched to stem virus' spread

BY JUAN PEREZ JR. AND ANDY GRIMM
Tribune reporters

The man authorities cite as the nation's first confirmed case of Middle East respiratory syndrome and about 50 hospital workers who first came into contact with him are being isolated from the public, an effort by officials and public health experts to contain the potential spread of a deadly new pathogen.

Medical workers at the Indiana hospital who now have contact with the patient must wear gloves, masks, gowns and eye protection. The man, who flew into Chicago's O'Hare International Airport from Saudi Arabia last month and was hospitalized days later, is being kept in a room designed for patients with respiratory infections, segregated from the hospital's air circulation system.

The patient needed oxygen during the first part of his stay, officials at Community Hospital said Mon-

Turn to MERS, Page 8

ZBIGNIEW BZDAK/TRIBUNE PHOTO

The initial tests for the unnamed MERS patient were conducted in this lab at Community Hospital in Munster, Ind.

High court OKs prayer at meetings

Split decision allows Christian message in government settings

BY DAVID G. SAVAGE
Tribune Washington Bureau

WASHINGTON — A divided Supreme Court cleared the way Monday for local officials to open public meetings with explicitly Christian prayers, ruling that the Constitu-

an" references, such as the "Almighty" or "Heavenly Father."

Rather, the court said Christian clerics may be invited to deliver prayers that invoke the name of Jesus Christ so long as no one is forced to join in saying the prayer.

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MERS call to action

Virus reaches U.S., and public health system springs into action

sengers on the April 24 flight that brought him from the Saudi capital of Riyadh to O'Hare International Airport. Through passenger manifests, credit card receipts and other clues, they have also traced people who rode with the man on the bus he took from the airport to northwest Indiana on April 27.

So far, nearly all the fellow travelers — about 112 — have been traced, and none has tested positive for the crown-shaped virus that causes MERS.

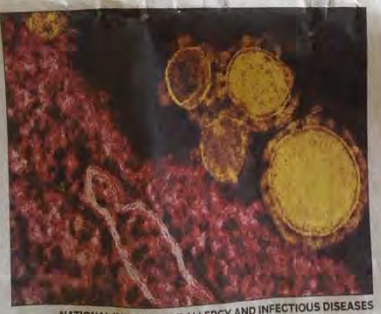
On May 9, the MERS patient was cleared to leave the hospital and authorized to travel, while dozens of Community Hospital workers who were sent home and told to remain in isolation have tested negative for the deadly virus and been cleared to return to work.

But as officials in Munster announced the end of their MERS scare, health

Last week, a third U.S. MERSA case was reported — an Illinois man who, officials said, did not require medical care and is reportedly feeling well. On Monday, the Illinois Public Health Department announced the man is not contagious.

The virus, which kills about one-third of those it infects, first appeared two years ago on the other side of the world, on the Arabian Peninsula. Since then U.S. epidemiologists have waited and prepared for the day it would appear in this country.

"Anyone is a planeload



NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES

The MERS virus, colorized in yellow in this electron microscope image, was first reported in Saudi Arabia in 2012.

Asia.

MERS, which has also been found in camels and bats, does not appear to be as contagious as SARS, however. It seems to spread through prolonged and close contact, meaning relatives of victims and health care workers tending to victims are the most vulnerable.

But when it hits, it often is deadly. There is no treatment, so MERS patients get standard "supportive" care for respiratory infections, such as medication to reduce fevers and oxygen to aid breathing.

The World Health Organization reported that as

When they learned that he worked at a medical facility, the team, aware of MERS because of CDC warnings, alerted Indianapolis that a possible MERS sample was being sent there for testing.

On the afternoon of M 1, a respiratory epidemic gist in Indianapolis pho the CDC.

The sample was posi

The next day, the CD did its own test, confirm the state's finding and deployed a team to work with state and local offici to contain the threat.

The man's relatives we tested and told to stay home and to wear masks they had to go out. The hospital used video surve lance and GPS-like device worn by staff to determin which employees had encountered the patient. They were tested and sen home for two weeks of isolation.

A telephone hot line w set up for people to call fo

US cases-Indiana

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~60 yo M S. Arabia HCW in Riyadh
4/18 low grade fever, mayalgia
4/24 travel from KAS→UK→Chicago→Highland, IN
4/27 SOB, np cough, fever, rhinorrhea
4/28 admit and CXR with RLL infiltrate and CT chest with b/l infiltrates
5/9 sx resolution and was discharged

HCW: 53 contacts before airborne and contact precautions
Asymptomatic and screened negative monitored x 14d
Household/other: voluntary quarantine

Conveyances: ~80 passengers contacted for serologic testing

US cases-Florida

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~40yo M HCW in S. Arabia
5/1 travel from KAS→UK→Boston→Atlanta→Orlando, FL
5/1 sx started beginning of trip: myalgias, fever, chills, slight cough
5/9 Hospital ED “acute viral syndrome”
5/19 d/c from hospital

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FIGURE 1. Number of confirmed cases of Middle East respiratory syndrome coronavirus infection (145 fatal and 391 nonfatal) reported by the World Health Organization (WHO) as of May 12, 2014, by month of illness onset — worldwide, 2012–2014

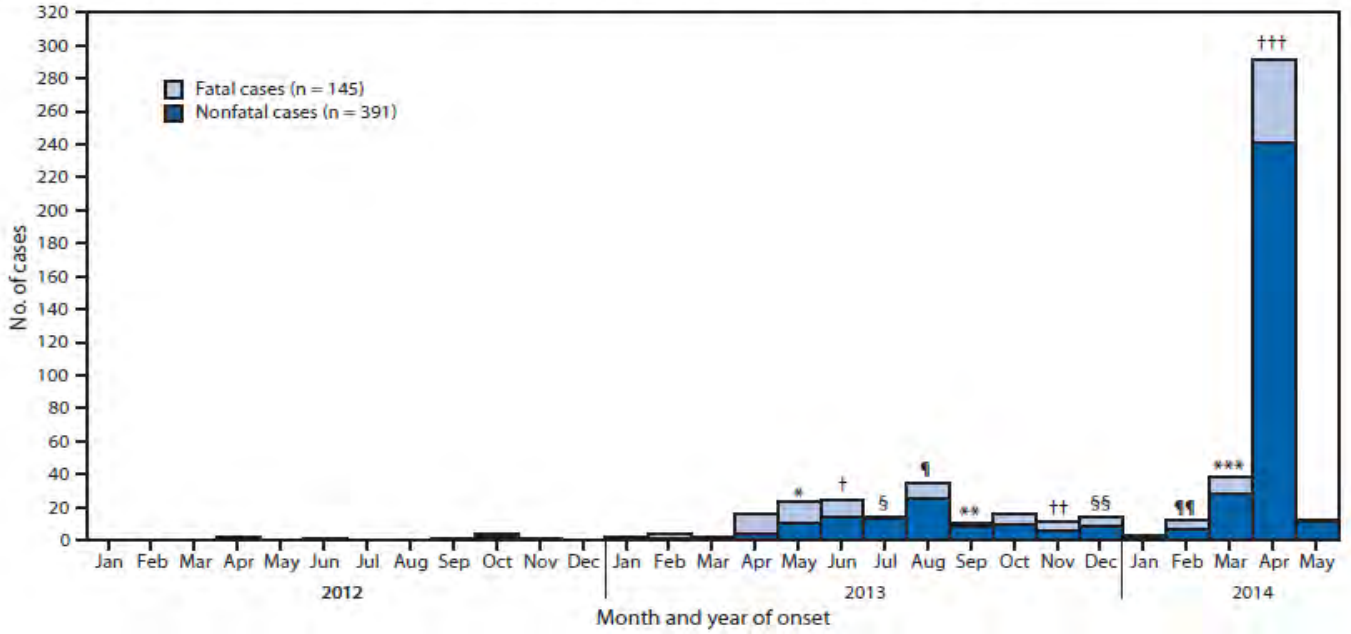

FIGURE 1. Number of confirmed cases of Middle East respiratory syndrome coronavirus infection (145 fatal and 391 nonfatal) reported by the World Health Organization (WHO) as of May 12, 2014, by month of illness onset — worldwide, 2012–2014

Epidemiology

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All cases directly or indirectly linked to:
Saudi Arabia, UAE, Qatar, Oman, Jordan, Kuwait, Yemen and Lebanon

Travel associated:
UK, France, Italy, Greece, Egypt, Tunisia, United States, Netherlands, Malaysia, Philippines

From the 636 total cases:
Median age 48 years (range, 9months-94 years)
391 (61%) males
113 (18%) healthcare workers

62% severe respiratory illness
5% mild symptoms
21% asymptomatic

193 (30%) fatal: 127 males, median age 60 and 123 with comorbidities

Bialek, SR et al. MMWR, May 16, 2014 / 63(19);431-436; updated from May 28th COCA transcript

Epidemiology

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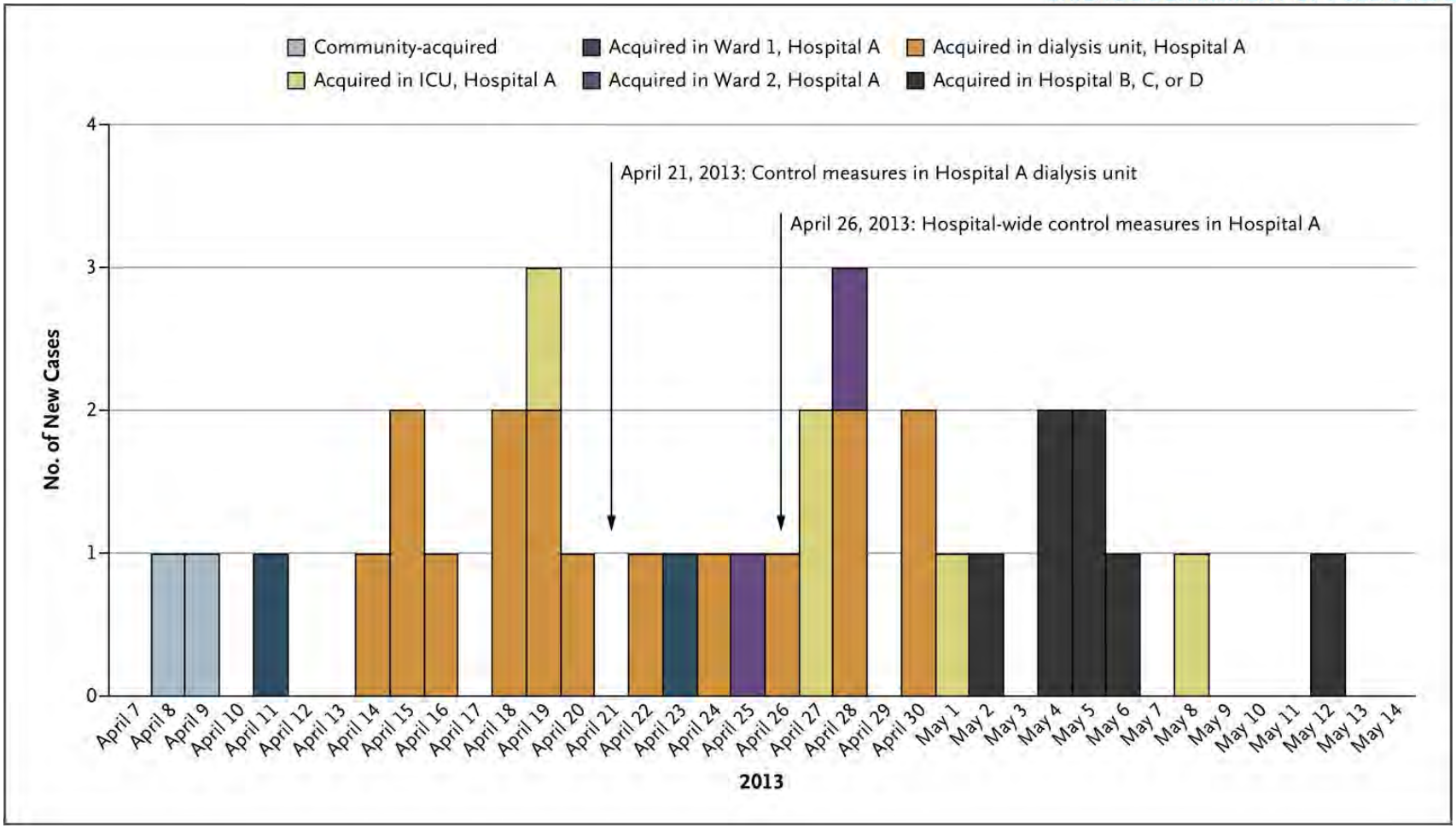
28 spatial-temporal clusters, all with household or healthcare settings

Median incubation period ~5days, range 2-14 days

No sustained community transmission and no evidence of transmission from asymptomatic individuals

Epidemiologic Plot of Confirmed and Probable Cases of MERS-CoV Infection in Saudi Arabia, April 1–May 23, 2013.



Assiri A et al. N Engl J Med 2013;369:407-416

Transmission Map of Outbreak of MERS-CoV Infection.

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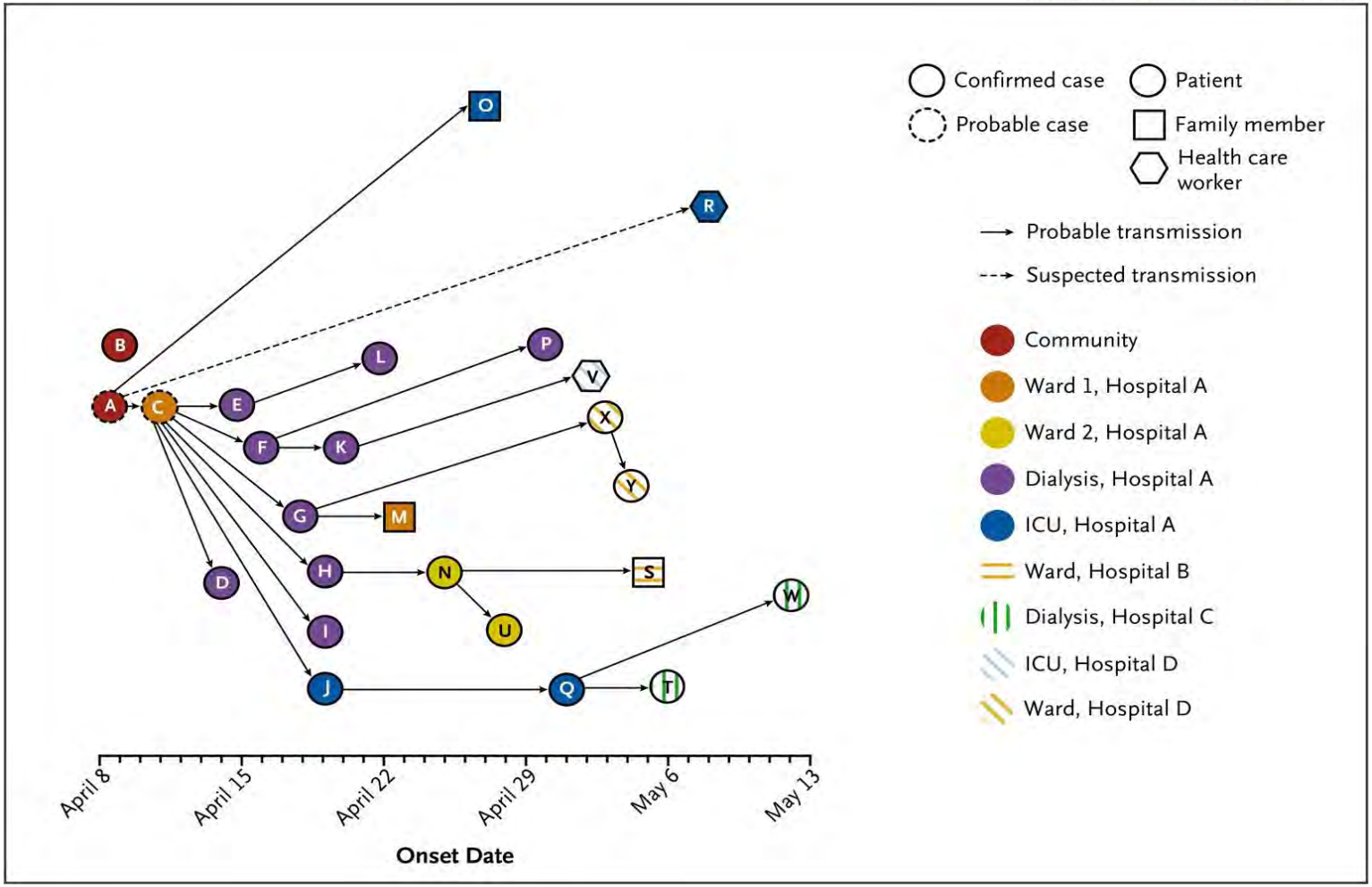

Assiri A et al. N Engl J Med 2013;369:407-416

The NEW ENGLAND JOURNAL of MEDICINE

Table 1. Characteristics of Health Care Workers with Confirmed MERS-CoV Infection.*

Characteristic	Health Care Worker						
	1	2	3	4	5	6	7
Age (yr)	42	29	46	39	59	28	56
Sex	Female	Female	Female	Female	Female	Female	Female
Result of chest radiography	Normal	Normal	Normal	Normal	Normal	Normal	Normal
MERS-CoV PCR test	Positive	Positive	Positive	Positive	Positive	Positive	Positive
Viral load (Ct value)	33	37	38	34	35	30	37
Coexisting condition							
Diabetes mellitus	Yes	No	No	No	No	No	No
Other	No	No	No	No	No	No	No
Symptoms							
Feverish feeling	Yes	No	Yes	No	No	Yes	Yes
Fever, measured	Yes	No	No	No	No	No	No
Cough	Yes	No	No	No	No	No	Yes
Sore throat	Yes	No	Yes	No	No	Yes	Yes
Runny nose	No	No	Yes	No	Yes	Yes	Yes
Muscle aches	Yes	No	Yes	No	No	No	Yes
History of exposure	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* For more details, see the table in the Supplementary Appendix, available with the full text of this letter at NEJM.org.
Ct denotes cycle threshold, MERS-CoV Middle East respiratory syndrome coronavirus, and PCR polymerase chain reaction.

Memish ZA, Zumla AI, Assiri A. *N Engl J Med* 369; 9: 884-6

Potential exposures

Exposure history							
Total Duration of exposure/s:							
<1 hr	+	-	-	+	+	-	+
1-2 hr	-	-	-	-	-	-	-
3-4 hr	-	-	-	-	-	-	-
>5 hr	-	+	+	-	-	+	+
Type of exposure/s to patient:							
Change linen	-	+	+	-	-	+	+
Feeding	-	+	+	-	-	+	+
Bathing	-	-	+	-	-	+	+
Lifting	-	-	+	-	+	+	+
Give meds	-	+	+	-	-	+	+
Place IV or other catheters	-	+	+	+	-	+	+
Presence during high risk procedure (aerosol generating)							
Intubation	+	+	+	+	-	-	+
Airway suctioning	-	+	+	-	-	+	+
Sputum induction	-	-	-	-	-	+	+

Memish ZA, Zumla AI, Assiri A. *N Engl J Med* 369; 9: 884-6

Use of personal protective equipment							
-Surgical (regular mask)							
Always (100% of time)	-	-	+	+	-	+	-
Often (>50% of time)	-	+	-	-	-	-	+
Never	+	-	-	-	+	-	-
-Respirator (n95 or equivalent)							
Always (100% of time)	-	-	-	-	+	-	-
Often (>50% of time)	-	-	-	-	-	+	+
Never	+	+	+	+	-	-	-
-Eye protection							
Never	+	+	+	+	+	+	+
-Gloves							
Always (100% of time)	-	-	+	-	+	-	-
Often (>50% of time)	-	-	-	-	-	+	+
Never	+	+	-	+	-		-
-Gowns							
Always (100% of time)	-	-	+	-	+	-	-
Often (>50% of time)	+	+	-	-	-	+	+
Never	-	-	-	+	-	-	-

Memish ZA, Zumla AI, Assiri A. *N Engl J Med* 369; 9: 884-6

Epidemiological, demographic, and clinical characteristics of 47 cases of Middle East respiratory syndrome coronavirus disease from Saudi Arabia: a descriptive study

Abdullah Assiri, Jaffar A Al-Tawfiq*, Abdullah A Al-Rabeeah, Fahad A Al-Rabiah, Sami Al-Hajjar, Ali Al-Barrak, Hesham Flemban, Wafa N Al-Nassir, Hanan H Balkhy, Rafat F Al-Hakeem, Hatem Q Makhdoom, Alimuddin I Zumla*, Ziad A Memish**

	Patients (n=47)
Fever	46 (98%)
Fever with chills or rigors	41 (87%)
Cough	39 (83%)
Dry	22 (47%)
Productive (sputum)	17 (36%)
Haemoptysis	8 (17%)
Shortness of breath	34 (72%)
Chest pain	7 (15%)
Sore throat	10 (21%)
Runny nose	2 (4%)
Abdominal pain	8 (17%)
Nausea	10 (21%)
Vomiting	10 (21%)
Diarrhoea	12 (26%)
Myalgia	15 (32%)
Headache	6 (13%)

Table 3: **Symptoms of Middle East respiratory syndrome in 47 Saudi cases at presentation**

	Patients (n=47)	Deaths (%)*
Any comorbidity	45 (96%)	28 (60%)
Diabetes	32 (68%)	21 (66%)
Chronic kidney disease	23 (49%)	17 (74%)
Chronic heart disease	13 (28%)	10 (77%)
Hypertension	16 (34%)	13 (81%)
Chronic lung disease	12 (26%)	10 (83%)
Obesity	8 (17%)	5 (63%)
Smoking	11 (23%)	7 (64%)
Malignant disease	1 (2%)	1 (100%)
Steroid use	3 (6%)	3 (100%)

*Proportion of patients who died according to comorbidity.

Table 4: **Comorbidities in 47 Saudi cases of Middle East respiratory syndrome**

Lancet Infect Dis 2013 13;752-61

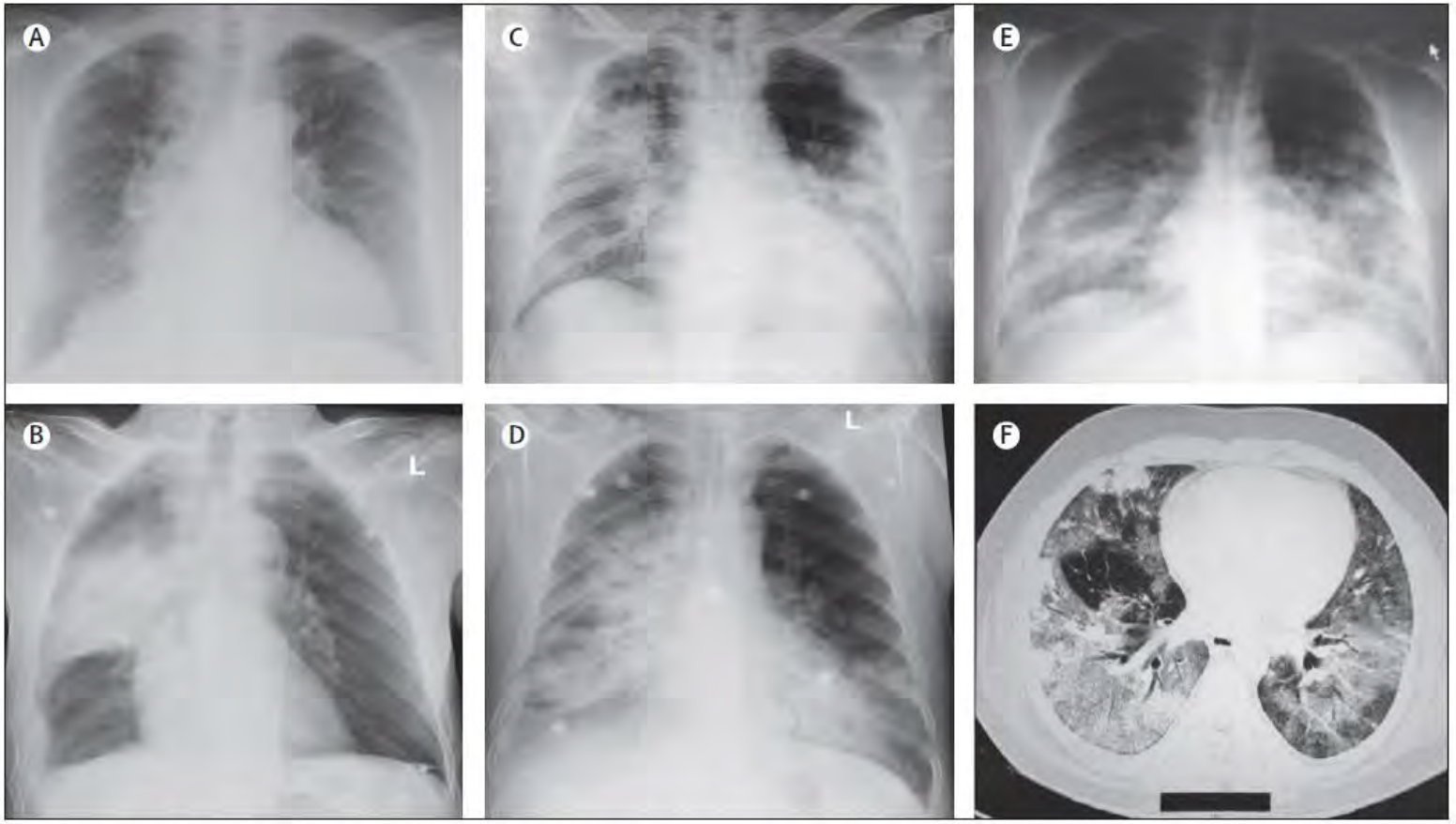

Figure 1: **Imaging findings at presentation in Saudi patients with Middle East respiratory syndrome**
(A) Chest radiograph of a 61-year-old man, showing bilateral fine reticulonodular air-space opacities, increased vascular markings, and cardiomegaly. (B) Chest radiograph of an 83-year-old man, showing right lung consolidation, right basal pleural thickening, and reticulonodular air-space opacities; rib fractures on the right are old. (C) Chest radiograph of a 56-year-old man, showing extensive bilateral extensive diffuse and focal alveolar space opacities, with opacification of the left lower lobe. (D) Chest radiograph of a 67-year-old man, showing extensive bilateral disease, with diffuse alveolar space densities, opacification, reticulonodular opacities, and bronchial wall thickening. (E) Chest radiograph of a 49-year-old man, showing extensive bilateral mid and lower zone disease, with diffuse reticulonodular alveolar space opacities. A thoracic CT scan in the same patient (F) shows extensive bilateral opacities and ground-glass reticulonodular shadowing and bronchiolar wall thickening.

Lancet Infect Dis 2013 13;752-61

Clinical manifestations- pediatrics

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11 pediatric cases:

- median age 13 (range 2-16 yrs)
- 8 female
- 1 death in 2yo with chronic pulmonary disease
- 1 SARI in 14yo with underlying cardiac disease
- 9 asymptomatic

Memish ZA, Al-Tawfiq JA, Assiri A et al. Pediatr Infect Dis J 2014 April 23 (epub ahead of print)

Diagnostics

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- Acute illness:
  RT-PCR: sputum, NP/OP swab combined, serum (gold or tiger top), urine, stool

  Confirmatory testing requires:
  positive PCR on at least 2 specific genome targets OR single positive target with sequencing on a second

- Convalescence (surveillance ONLY):
  Serology: ELISA, immunoflorescence, Neutralizing antibody at CDC

  *wear appropriate PPE when obtaining specimen

http://www.cdc.gov/coronavirus/mers/guidelines-clinical-specimens.html

Treatment

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Investigational therapies:

- convalescent plasma
- interferon/ribavirin
- protease inhibitors
- mycophenolic acid

Vaccine development being pursued

First Confirmed Cases of Middle East Respiratory Syndrome Coronavirus (MERS-CoV) Infection in the United States, Updated Information on the Epidemiology of MERS-CoV Infection, and Guidance for the Public, Clinicians, and Public Health Authorities — May 2014

Stephanie R. Bialek, MD[1], Donna Allen, MS[2], Francisco Alvarado-Ramy, MD[3], Ray Arthur, PhD[4], Arunmozhi Balajee, PhD[4], David Bell, MD[1], Susan Best, DO[5], Carina Blackmore, DVM, PhD[6], Lucy Breakwell, PhD[7,8], Andrew Cannons, PhD[6], Clive Brown, MD[3], Martin Cetron, MD[3], Nora Chea, MD[7,9], Christina Chommanard, MPH[1], Nicole Cohen, MD[3], Craig Conover, MD[10], Antonio Crespo, MD[11], Jeanean Creviston[5], Aaron T. Curns, MPH[1], Rebecca Dahl, MPH[1], Stephanie Dearth, MS[2], Alfred DeMaria, Jr, MD[12], Fred Echols, MD[2], Dean D. Erdman, DrPH[1], Daniel Feikin, MD[1], Mabel Frias, MPH[13], Susan I. Gerber, MD[1], Reena Gulati, MD[3], Christa Hale, DVM[3], Lia M. Haynes, PhD[1], Lea Heberlein-Larson, MPH[6], Kelly Holton[3], Kashef Ijaz, MD[4], Minal Kapoor, MD[14], Katrin Kohl, MD[3], David T. Kuhar, MD[9], Alan M. Kumar, MD[14], Marianne Kundich[5], Susan Lippold, MD[3], Lixia Liu, PhD[2], Judith C. Lovchik, PhD[2], Larry Madoff, MD[12], Sandra Martell, DNP[13], Sarah Matthews, MPH[15], Jessica Moore, MPH[1], Linda R. Murray, MD[13], Shauna Onofrey, MPH[12], Mark A. Pallansch, PhD[1], Nicki Pesik, MD[3], Huong Pham, MPH[1], Satish Pillai, MD[16], Pam Pontones, MA[2], Sarah Poser[1], Kimberly Pringle, MD[1,7], Scott Pritchard, MPH[6], Sonja Rasmussen, MD[17], Shawn Richards[2], Michelle Sandoval, MPH[2,18], Eileen Schneider, MD[1], Anne Schuchat, MD[19], Kristine Sheedy, PhD[19], Kevin Sherin, MD[15], David L. Swerdlow, MD[19], Jordan W. Tappero, MD[4], Michael O. Vernon, DrPH[12], Sharon Watkins, PhD[6], John Watson, MD[1] (Author affiliations at end of text)

"critical role that health-care providers play in considering a diagnosis of MERS-CoV infection in persons who develop respiratory symptoms within 14 days after traveling from countries in or near the Arabian Peninsula. Recent travelers might seek medical care distant from cities served by international air connections and all HCP need to be vigilant"

"be prepared to consider, detect, and manage cases of MERS."

May 16, 2014 / 63(19);431-436

Chicago: 4th highest volume of arriving travelers from S. Arabia and UAE for months of May and June

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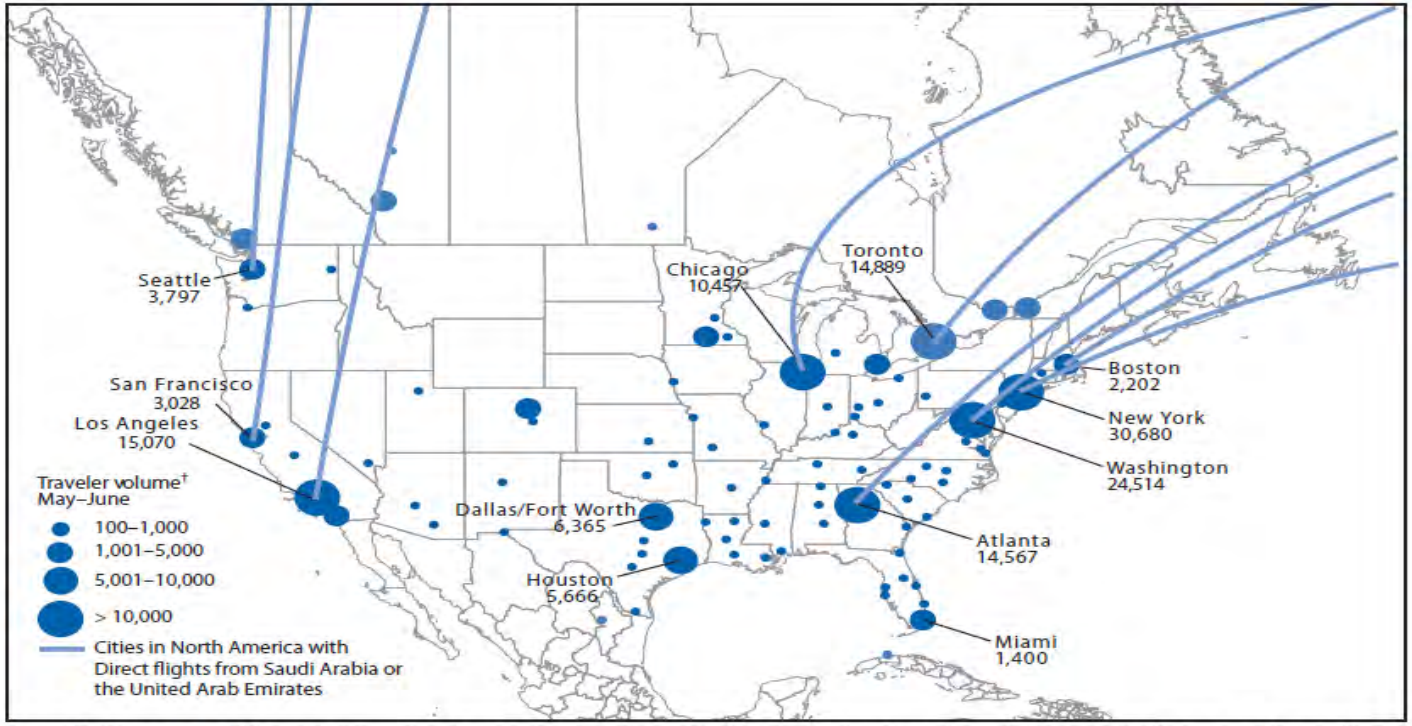

Source: BioMosaic, an analytic tool for integrating demography, migration, and health data developed in collaboration between the University of Toronto, Boston Children's Hospital, and CDC's Division of Global Migration and Quarantine.
* Excludes cities with fewer than 100 travelers from affected areas.
† Based on total number of arrivals at final destination in North America.

FIGURE 3. Points of entry and volume of travelers on flights to the United States and Canada from Saudi Arabia and the United Arab Emirates — May–June 2014*

BioMosaic: analyze International Air Transport Association

HEALTH ADVISORY: MERS

Middle East Respiratory Syndrome

Were you in the Middle East recently?

- Watch for fever with cough or difficulty breathing.
- If you get sick within 14 days of leaving, call a doctor.
- Tell the doctor you traveled.

www.cdc.gov/travel

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Courtesy of B. Puesta, CDC Chicago Quarantine Station, O'Hare International Airport

نصيحة طبية: MERS

متلازمة الشرق الأوسط التنفسية

هل سافرت إلى الشرق الأوسط مؤخرًا؟

- انتبه لأعراض المرض التالية: الحمى المصحوبة بالسعال أو الصعوبة في التنفس.
- إذا أصبت بالمرض خلال 14 يومًا من مغادرتك، فعليك الاتصال بالطبيب.
- أبلغ الطبيب بسفرك.

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

www.cdc.gov/travel

Courtesy of B. Puesta, CDC Chicago Quarantine Station, O'Hare International Airport

Travel Advisory, 5/22/14
Alert level 2: practice enhanced precautions

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No current recs to change travel plans

WHO posted general precautions about visiting farms, markets, barns, or other places with animals

Hand hygiene, avoid sick animals; avoid consumption of raw or undercooked animal products

Higher risk individuals with DM, renal failure, or chronic lung disease, or weakened immune systems should:

- Avoid contact with camels
- Do not drink raw camel milk or urine
- Do not eat undercooked meat

http://wwwnc.cdc.gov/travel/notices/alert/coronavirus-saudi-arabia-qatar

STAY ALERT FOR MERS-CoV

ALWAYS TAKE A TRAVEL HISTORY*

CONSIDER MERS-CoV IN PATIENTS WITH EITHER OF THE FOLLOWING:

A. Fever (≥38°C, 100.4°F) and pneumonia or acute respiratory distress syndrome (based on clinical or radiological evidence) **AND EITHER**

- a history of travel from countries in or near the Arabian Peninsula[1] within 14 days before symptom onset **OR**
- close contact[2] with a symptomatic traveler who developed fever and acute respiratory illness (not necessarily pneumonia) within 14 days after traveling from countries in or near the Arabian Peninsula[1] **OR**
- a member of a cluster of patients with severe acute respiratory illness (e.g. fever and pneumonia requiring hospitalization) of unknown etiology in which MERS-CoV is being evaluated, in consultation with state and local health departments.

B. Close contact[2] with a confirmed or probable case of MERS while the case was ill **AND**

- fever (>100°F) or symptoms of respiratory illness within 14 days following the close contact. (This is a lower threshold than category A.)

*** CONSIDER Middle East Respiratory Syndrome (MERS-CoV) if patient has traveled in or near the Arabian Peninsula.**

1. **Countries considered in or near the Arabian Peninsula:** Bahrain, Iraq, Iran, Israel, Jordan, Kuwait, Lebanon, Oman, Palestinian territories, Qatar, Saudi Arabia, Syria, the United Arab Emirates (UAE), and Yemen.
2. **Close contact is defined as** a) any person who provided care for the patient, including a healthcare worker or family member, or had similarly close physical contact; or b) any person who stayed at the same place (e.g. lived with, visited) as the patient while the patient was ill.

www.cdc.gov/coronavirus/mers/hcp.html

To report suspect cases of MERS-CoV, call 312-746-6034 during normal business hours. After hours or on weekends, contact the Communicable Diseases physician on call through 311 (312-744-5000 if calling from outside the city).

INFECTION CONTROL PRECAUTIONS TO BE TAKEN WHEN EVALUATING A PATIENT FOR MERS-CoV

- **Place surgical mask on patient immediately**
- **Place patient in an Airborne Infection Isolation Room (AIIR)**
- **Implement Contact and Airborne Infection Control Precautions**
- **PPE:**
  - **N95 or higher respirators**
  - **Goggles or face shields** (for high risk procedures such as bronchoscopy, intubation, nebulized therapy and tracheal suction);
  - **Gown and gloves**
- **Limit personnel entering patient room**
- **Scrupulous hand hygiene**
- **Notify Infection Control Practitioner on Call**

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Screening Questionnaire for MERS

This questionnaire should be administered to anyone traveling from the Arabian Peninsula or neighboring countries, including the following countries:

Bahrain	Jordan	Syria
Egypt	Kuwait	Tunisia
Iran	Oman	United Arab Emirates
Iraq	Qatar	Yemen
Israel	Saudi Arabia	

Questionnaire

If possible, patients should be screened immediately prior to travel and documented in your records. If not done or no documentation can be found, please conduct the interview immediately upon arrival.

Introductory script:
The University of Chicago has an active and aggressive infection control team that works to protect all patients at UCM, including you. In accordance with recommendations from the CDC, we would like to ask a few questions regarding the Middle Eastern Respiratory Syndrome that has caused pneumonia in some people living in your home country or nearby countries. Have you heard about MERS? *(If no, provide the fact sheet above.)* While we have no reason to believe that you have this infection, it is important that we identify any risk factors as quickly as possible so we can provide you with the best possible care.

1. Within the past 2 weeks, have you had a cough?
   If so, do you have a known medical illness that causes you to cough?
   ** If the patient has a cough but does not have another condition that causes cough, this is an indication for additional screening. See instructions below.*
2. Within the past 2 weeks, have you had any difficulty breathing?
   If so, do you have a known medical illness that causes you to have difficulty breathing?
   **Difficulty breathing without another explanation is an indication for additional screening. See instructions below.*
3. Within the past 2 weeks, have you had a fever?
4. Within the past 2 weeks, have you been diagnosed with a respiratory infection, such as pneumonia?
5. Within the past 2 weeks, have you been in contact with anyone who has been hospitalized with pneumonia or another respiratory illness?
6. Within in the past 2 weeks, have you had contact with anyone who has been diagnosed with Middle East Respiratory Syndrome (MERS)?

**yes to any question indicates a need for additional screening*

Pre-travel: If answers indicate additional screening is required, please contact infection control at the destination hospital. At University of Chicago, 773/702-6800 pager 7025
Already present: If answers indicate additional screening is required, put a surgical mask on the patient and immediately contact infection control at the destination hospital. At University of Chicago, 773/702-6800 pager 7025.

RIC Screening Tool for Suspect/Confirmed MERS Virus Case:

Today's Date: _____ Expected Date of Admission: _____

Patient's Name: _____

Patient's Birth Date: _____ Country of Residence: _____

Referring Facility/Hospital: _____

Clinical History—Case Definition:

Fever(≥38°C, 100.4°F) ❑ Yes ❑ No

Pneumonia or ARDS ❑ Yes ❑No

Diagnostic Test (MERS PCR Assay) ❑Pos ❑Neg

Current Isolation Status ❑ Airborne ❑Contact ❑Droplet

Other Pathogens: □VRE, □MRSA, □C. difficile □ Carbapenem-resistant *Enterobacteriaciae* (examples: *Klebsiella* or *E. coli* with KPC, NDM-1) □ *Acinetobacter*, multidrug-resistant □ ESBL (extended spectrum beta-lactamase) bacteria □ *Pseudomonas aeruginosa*, multidrug-resistant

Assessment of MERS Risk:

Residence/Travel on Arabian Peninsula(<14 days)

❑Yes ❑No

Contact with confirmed/suspect MERS Cases(<14 days)

❑Yes ❑ No

Recent contact with farm animals(Camel)

❑Yes ❑No **When:**_____

Family/Visitors in contact with confirmed/suspect MERS cases(<14days)

❑Yes ❑No *(If YES then follow case definition screening and advise family/visitors against travel to RIC if they meet case definition)*

Additional Comments: _____

If you identify patients who meet the case definitions mentioned above, you MUST do the following:

- Transfer the patient to negative pressure room or transfer to NMH
- Initiate **Droplet** and **Contact isolation** immediately
- Following PPE must be worn: **PAPR** or **N95 mask**, **Gloves**, **Gown**, **Faceshield**
- Perform strict Hand Hygiene
- Immediately inform Infection Control at **X 2914** or page **312-695-9884**

Please forward this to Infection Control

Courtesy of E. Landon (Univ of Chicago) and A. Saiyed/T. Zembower (NMH)

Middle East Respiratory Syndrome (MERS) Patient Under Investigation (PUI) Short Form

For Patients Under Investigation (PUIs), complete and send this form to eocreport@cdc.gov (subject line: MERS Patient Form) or fax to 770-488-7107. If you have questions, contact the CDC Emergency Operations Center (EOC) at 770-488-7100.

STATE ID:	Today's Date: MM/DD/YY	County:	City:	State:
Interviewer's name:	Phone:		Email:	
Physician's name:	Phone/Pager:			

PUI Definition—Does the patient have: (Please consult CDC website at http://www.cdc.gov/coronavirus/mers/case-def.html)

1. **Acute respiratory infection with fever (≥ 38°C, 100.4°F) and cough?** ☐ Yes ☐ No ☐ Unknown
2. **Clinical or radiographic evidence of pneumonia or acute respiratory distress syndrome (ARDS)?** ☐ Yes ☐ No ☐ Unknown
3. **Travel from the Arabian Peninsula or neighboring countries† 14 days before illness onset?** ☐ Yes ☐ No ☐ Unknown
   If yes, which countries?_____ Date of travel to/from the Middle East: MM/DD/YY | MM/DD/YY

Patient Demographic Information

1. Sex: ☐M ☐F **2. Age:**_____ ☐yr ☐mo **3. Residency:** ☐US resident ☐non US resident, country:_____

Clinical Presentation, History and Risk Factors

4. Date of symptom onset: MM/DD/YY

5. Symptoms (Check all that apply): ☐ Fever ☐ Dry cough ☐ Productive cough ☐ Chills ☐ Sore throat ☐ Headache ☐ Muscle aches ☐ Shortness of breath ☐ Vomiting ☐ Abdominal pain ☐ Diarrhea ☐ Other_____

6. In the 14 days before symptom onset did the patient have close contact with a recent ill traveler from the Arabian Peninsula or neighboring countries†? ☐ Yes ☐ No ☐ Unknown If yes, which countries?_____

7. Is the patient (Check all that apply): ☐ Health care worker (HCW) ☐ US military ☐ Flight crew ☐ Other_____

8. Concurrent risk factors (Check all that apply): ☐ Immunocompromised ☐Pregnant ☐Unknown ☐Other_____

Clinical Outcomes

9. Is/Was the patient:
a. Hospitalized? ☐ Yes ☐ No ☐ Unknown If yes, date: MM/DD/YY
b. Admitted to ICU? ☐ Yes ☐ No ☐ Unknown
c. Intubated? ☐ Yes ☐ No ☐ Unknown

10. Is/Has patient receiving/received a diagnosis of:
Pneumonia? ☐ Yes ☐ No ☐ Unknown
ARDS? ☐ Yes ☐ No ☐ Unknown
Renal failure? ☐ Yes ☐ No ☐ Unknown

11. Does the patient have a non-MERS etiology for their respiratory illness but has not responded to appropriate therapy? ☐ Yes ☐ No ☐ Unknown

12. Has the patient died? ☐ Yes ☐ No ☐ Unknown

Infection Control

13. When hospitalized, is/was the patient in a:
a. Negative pressure room? ☐ Yes ☐ No ☐ Unknown
b. Private room? ☐ Yes ☐ No ☐ Unknown

14. Are/Were surgical masks being used by the patient during transport? ☐ Yes ☐ No ☐ Unknown

15. What personal protective equipment are/were being used by HCW when entering the patient's room (Check all that apply): ☐ Gloves ☐ Gowns ☐ Eye protection (goggles or face shield) ☐ N95/other form of respiratory protection (e.g., PAPR) ☐ Facemask ☐ Unknown

Laboratory Testing

Tests Performed	Results +	–	Pending (Pe)	Not done	Tests Performed	Results +	–	Pending (Pe)	Not done
Influenza ☐A ☐B			☐	☐	Streptococcus pneumoniae			☐	☐
RSV			☐	☐	Legionella pneumophila			☐	☐
Human metapneumovirus			☐	☐	Blood culture If positive_____			☐	☐
Parainfluenza 1-4			☐	☐					
Adenovirus			☐	☐	Other:_____			☐	☐

MERS Testing

Specimen‡	ID #	Date collected	State +	–	Pe	Sent to CDC?	Specimen‡	ID #	Date collected	State +	–	Pe	Sent to CDC?
NP/OP		MM/DD/YY			☐	☐	PF		MM/DD/YY			☐	☐
Sputum		MM/DD/YY			☐	☐	Stool		MM/DD/YY			☐	☐
BAL		MM/DD/YY			☐	☐	Serum		MM/DD/YY			☐	☐
TA		MM/DD/YY			☐	☐			MM/DD/YY			☐	☐

†Countries considered in the Arabian Peninsula and neighboring include: Bahrain, Iraq, Iran, Israel, Jordan, Kuwait, Lebanon, Oman, Palestinian territories, Qatar, Saudi Arabia, Syria, the United Arab Emirates (UAE), and Yemen.
‡NP/OP, Nasopharyngeal/Oropharyngeal swab; BAL, Bronchoalveolar lavage; TA, Tracheal aspirate; PF, Pleural fluid

Version 5.5, 7/3/13

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http://www.cdc.gov/coronavirus/mers/downloads/MERS-investigation-short-form.pdf

Infection control measures while evaluating PUI

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- Immediately place patient in private room with the door closed until AIIR available
- Implement standard, contact, and airborne precautions
- Place facemask on patient whenever patient outside of isolation
- HCP PPE: eye protection, disposable gown, gloves, and N-95 mask
- Dedicate patient care equipment (stethoscopes and BP cuffs)
- Clean patient care environment using an Environmental Protection Agency-registered disinfectant, applied according to labeled instructions, with attention to toilets and frequently touched surfaces

www.cdc.gov/coronavirus/mers/infection-prevention-control.html.

Isolation and Quarantine

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- ISOLATION: ill but not sick enough to be admitted

  Stay home
  Separate yourself from other people in your home
  Call ahead before visiting your doctor
  Wear a facemask while you are in a room with others or when visiting the doctor
  Cover you cough and sneeze
  Wash hands
  Avoid sharing household items

- QUARANTINE: Asymptomatic--Monitor close contacts* for 14 days:
  Fever (≥100˚ F or 37.8˚ C) BID
  Cough
  Shortness of breath
  Chills, body aches, sore throat, headache, diarrhea, nausea/vomiting, runny nose

*Close contact:
  any person who provided care to patient (HCW, family, or similar)
  any person who stayed at the same place (e.g. lived with, visited) as the p
  patient while the patient was ill

http://www.cdc.gov/coronavirus/mers/hcp/home-care-patient.html

Next steps

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Sequencing recent virus
Investigations of current surge in cases
Identify risk factors for transmission in healthcare
Describe the natural history of infection
Define modes of transmission from animals and humans
Describe seasonality of virus

http://emergency.cdc.gov/coca/transcripts/2014/call-transcript-050614.aspa; Susan Gerber, MD

MERS-CoV: TAG/HPP discussion

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- Importance of sensitivity to cultural differences
- Where does MERS fit into existing policies?
  - FRIP/AIRIP plans
  - Toronto SARS plan
- How lethal and how transmissible is MERS-CoV compared to influenza and SARS
  - Supershedders?
  - Airborne opportunist?
- Consider designating a MERS unit/cohorting patients and staff
- MERS-kit in the ED/intake: if significant travel and resp sx, open the kit and ask more questions
- Managing arrival and intake of known suspect cases-mask and escort
- Sign in sheet at door of patient/limit those entering room
- CDC is minimum criteria definition----facility can expand to be more sensitive
- HCW practices when a case is identified: home quarantine or wear a mask at work
- BSL-2 precautions in the lab
- HCF should collect additional NP/OP for routine RVP (IDPH may not test)

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