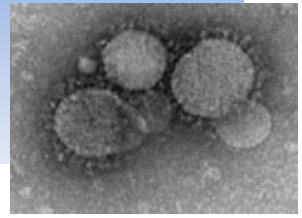


Handling MERS-CoV cases

Dr. Azmi Abdul Rahim
KLIA Health Office

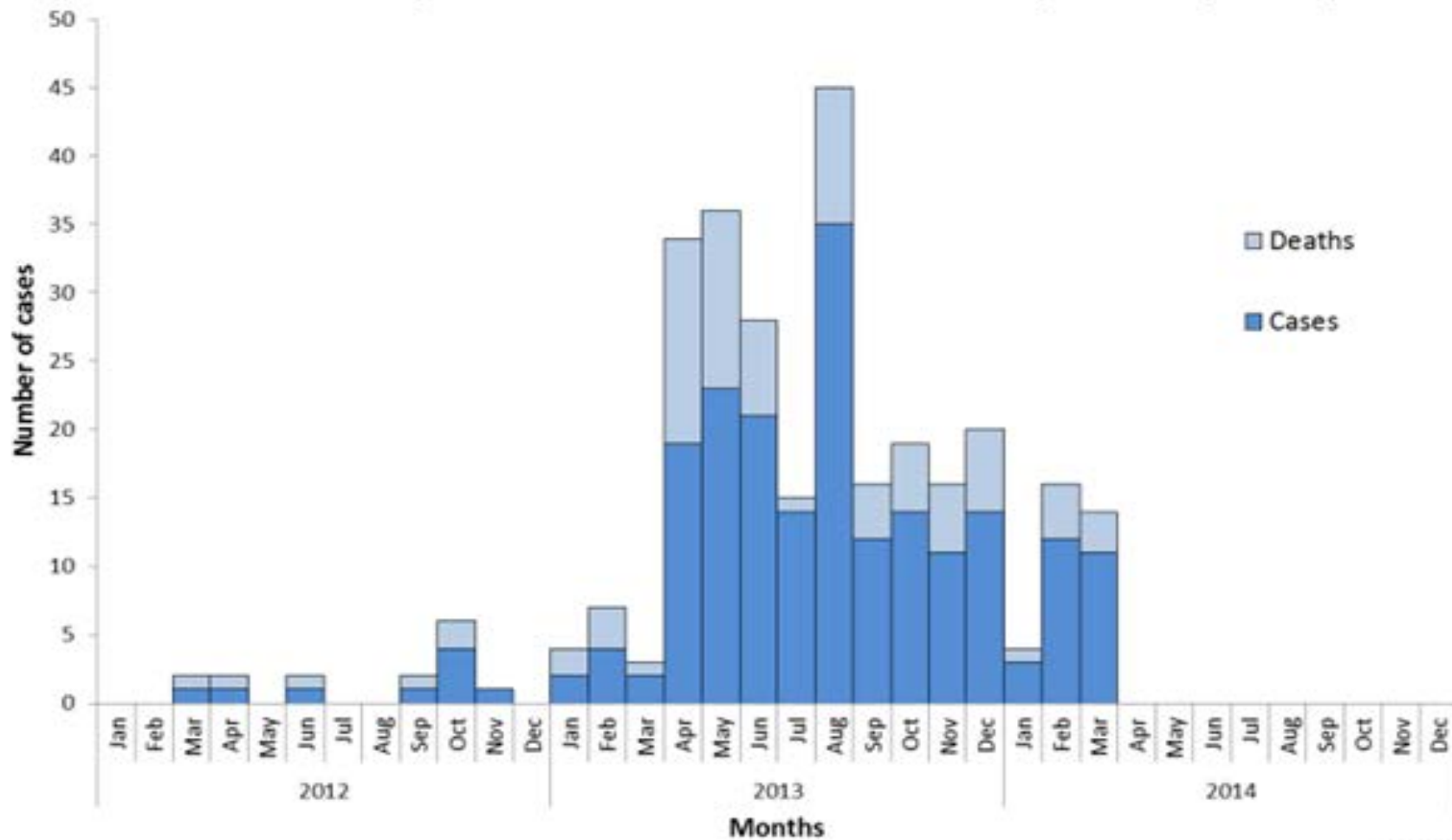
MERS-CoV: Introduction



- MERS-CoV is one of the family members (strains) of the coronavirus
- It is a large virus family groups made up of a variety of strains that can infect humans and animals
- SARS has shocked the world in 2003, is one of the strains of the coronavirus
- However, MERS-CoV and SARS coronavirus are two different strains of each other
- **Since April 2012 until 16 May 2014, 614 laboratory-confirmed cases** of human infection with Middle East Respiratory Syndrome Coronavirus (MERS-CoV) have been reported to WHO **including 181 deaths (Fatality rate = 29%)**

Figure 1. Laboratory confirmed cases of MERS-CoV infection by approximate time of onset, March 2012 through March 2014

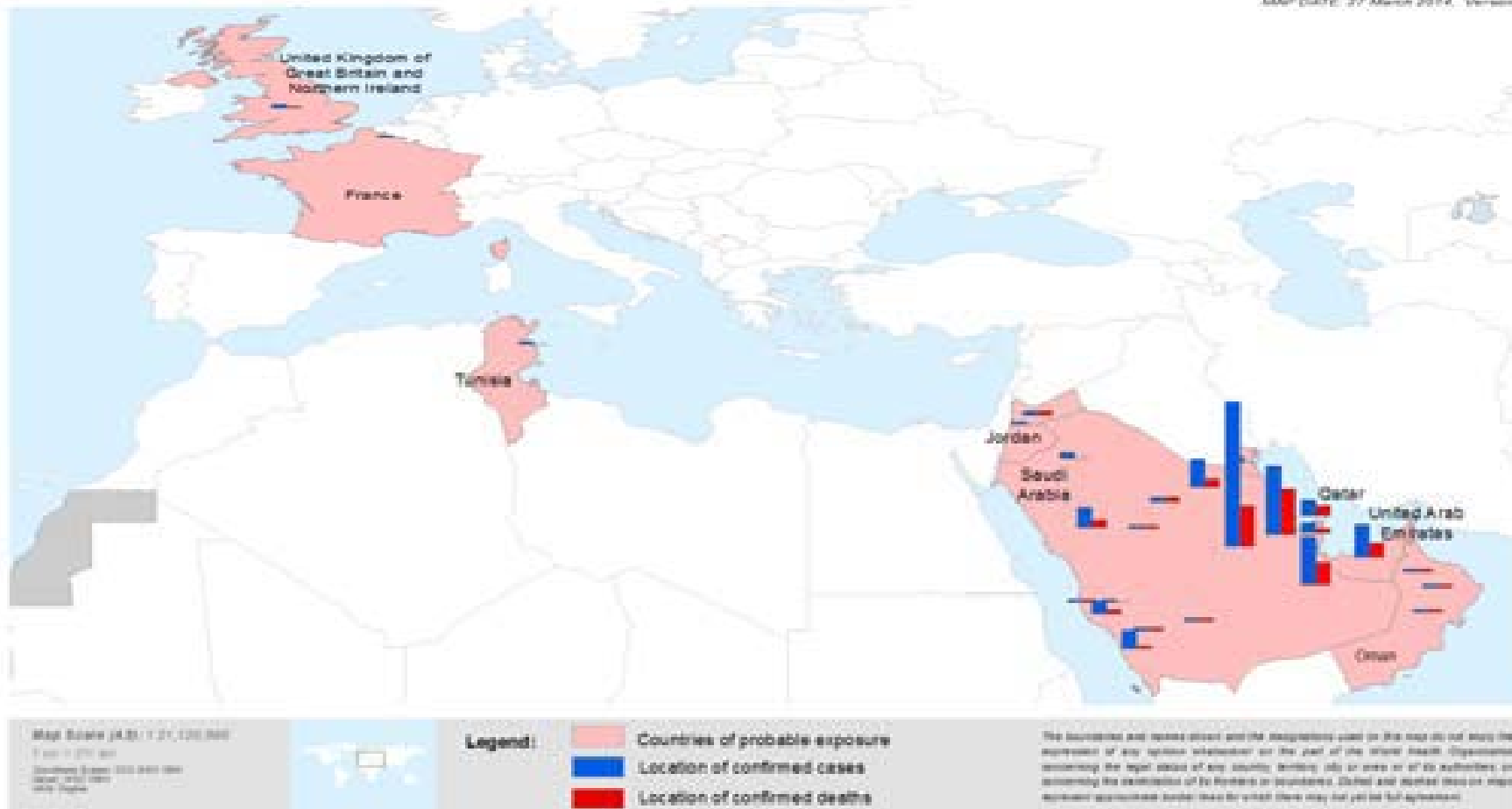
Laboratory-confirmed cases of MERS-CoV by month (n=206)



Data valid 26.03.2014

CONFIRMED CASES OF MIDDLE EAST RESPIRATORY SYNDROME - CORONAVIRUS 2012 - 2013

MAP DATE: 27 March 2014, Version



By 9 May 2014, the affected countries are:

Middle East: Jordan, Kuwait, Oman, Qatar, Saudi Arabia (KSA), United Arab Emirates (UAE) and Yemen;

Africa: Egypt and Tunisia

Europe: France, Germany, Greece, Italy and United Kingdom

Asia: Malaysia and Philippines

North America: United States of America (USA)

All of the cases recently reported outside the Middle East (Egypt, Greece, Malaysia, Philippines and USA) recently travelled from countries inside of the Middle East (KSA or UAE)

MERS-CoV infection

- ▶ **Source of *infection and mode of transmission*) has yet to be identified**
- ▶ **The spread of infection as a whole is not known**
- ▶ **There is no vaccine for MERS-CoV**
- ▶ **Currently, the WHO has not issued any travel advisory or issue any ban visits to the countries involved.**

Scientific literature: MERS-CoV-source of infection

- ▶ An investigation in Egypt, using real time polymerase chain reaction (RT-PCR) detected **MERS-CoV in 3.6% (4 of 110) apparently healthy dromedary camels** in a slaughterhouse.
- ▶ Genetic sequence of the viruses demonstrated small differences from a reference strain previously taken from a human case.
- ▶ The investigators also tested sera collected from **52 of the camels** and from 179 slaughterhouse workers.
- ▶ MERS-CoV reactive antibodies were detected in 92% of camels but none of the workers.
- ▶ The camels that tested positive were all imported from either Sudan or Ethiopia.

▶ Reference: Chu DKW, et al. MERS Coronaviruses in Dromedary Camels, Egypt. Emerg Infect Dis, 2014 Jun, Vol 20, 6. Available at: <http://dx.doi.org/10.3201/eid2006.140299>

MERS-CoV summary– as of 27 March 2014

- The age and gender distribution of cases vary depending on the presumed type of exposure that led to infection.
- Primary cases: those who have no history of prior exposure to other human cases, are on average older and a larger percentage of them are men than secondary cases

DEMOGRAPHIC	MED AGE (YRS)	%MALE
Primary cases	58	80
Secondary cases	45	58
All cases	52	67

Scientific literature

- The Saudi Arabian Ministry of Health provided an in-depth analysis of 25 (23 confirmed and 2 probable) MERS-CoV cases associated with an outbreak in Al-Hasa region of Saudi Arabia.
- The outbreak involved **patients, their family members and health care workers from four different hospitals, including a haemodialysis unit, an intensive care unit and other inpatient units.**
- **Human-to-human-transmission** was considered the likely source of infection for most of the cases.
- The estimated median incubation period was 5.2 days (**95% confidence interval 1.9 to 14.7 days**)

Reference: Assiri A et al. Hospital outbreak of Middle East Respiratory Syndrome coronavirus. *New England Journal of Medicine*. Published online 19 June 2013. DOI: 10.1056/NEJMoa1306742

<http://www.nejm.org/doi/pdf/10.1056/NEJMoa1306742>

Scientific literature: Lower respiratory sample

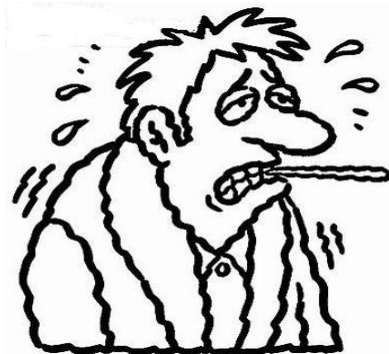
- ▶ German investigators published a viral load profile of a patient infected with MERS-CoV treated in Germany in March 2013.
- ▶ They found very **high viral loads in lower respiratory tract samples** from the patient compared with upper respiratory samples, and **low concentrations of the virus in stool, urine and blood.**

Reference: Drosten C et al. Clinical features and virological analysis of a case of Middle East respiratory syndrome coronavirus infection. *Lancet*. Published Online 17 June 2013.

[http://dx.doi.org/10.1016/S1473-3099\(13\)70154-3](http://dx.doi.org/10.1016/S1473-3099(13)70154-3)

MERS-CoV Infection

- -The main symptom among MERS-CoV cases is a respiratory infection that occurs in acute and serious, the fever and difficulty in breathing
- Most cases have pneumonia and there are also some cases detected with gastrointestinal symptoms such as diarrhea
- For individuals who suffer from chronic diseases and immune deficiency infections (immunocompromised), symptoms of infection may occur in a non-typical (atypical)



Current Status:

**Implementation of Preparedness Activities
For Facing Middle East Respiratory
Syndrome Coronavirus (MERS-CoV)**

Defination PUI 'Patients under investigation'

*A) A person with an acute respiratory infection, which may include history of **fever and cough and indications of pulmonary parenchymal disease (e.g. pneumonia or ARDS)**, based on **clinical or radiological evidence of consolidation**, who requires admission to hospital.*

▶ *In addition, clinicians should be alert to the possibility of atypical presentations in patients who are immunocompromised;*

▶ ***AND any of the following***

Defination of PUI 'Patients under investigation'

- ▶ *The disease is in **a cluster**1 that occurs within a 14 day period, without regard to place of residence or history of travel, unless another aetiology has been identified*
- ▶ *The disease occurs in **a health care worker** who has been working in an environment where patients with severe acute respiratory infections are being cared for, particularly patients requiring intensive care, without regard to place of residence or history of travel, unless another aetiology has been identified.*

Definition of PUI 'Patients under investigation'

- ▶ *The person has **history of travel to the Middle East** within 14 days before onset of illness, unless another aetiology has been identified.*
- ▶ *The person **develops an unusual or unexpected clinical course**, especially sudden deterioration despite appropriate treatment, without regard to place of residence or history of travel, even if another aetiology has been identified, if that alternate aetiology does not fully explain the presentation or clinical course of the patient*

Defination of PUI 'Patients under investigation'

- B)
- *Individuals with acute respiratory illness of any degree of severity*
- *who, within 14 days before onset of illness, were in **close physical contact with a confirmed or probable case of MERS-CoV infection, while that patient was ill.***

Respiratory Infections Surveillance

MALAYSIA, 2013: MERS-CoV & Avian Influenza A(H7N9)

Bil.	Jenis Virus	Cumulative (2013)		
		No of Sample Receive	+ve	-ve
1.	MERS-CoV	324	0	324
2.	Influenza A(H7N9)	7	0	7

2014 (As of Epid Week 13/2014):

- MERS-CoV: 85 samples
- Avian Influenza A(H7N9): 3 samples (1 +ve)

Preparedness for Coping with MERS-CoV: Pilgrims / Umrah

- **Umrah pilgrims:**

- Health Advice (Health Advisory) to Umrah pilgrims as contained in the Press Release DG of Health in 2013
- Health Advisory Circular (Health Advisory) in collaboration with the Association of Travel Agencies Malaysian Bumiputera (Bumiputera Travel & Tour Agents Association of Malaysia; BUMITRA)

- **Hajj pilgrims:**

- Work together Lembaga Tabung Haji (LTH)
- Monitoring MERS-CoV among pilgrims performed Haj since 1433H/2012M
- Health education to the Haj pilgrims 1434H/2013M through Hajj Intensive Courses & Course Hajj pilgrimage undertaken by the Tabung Haji

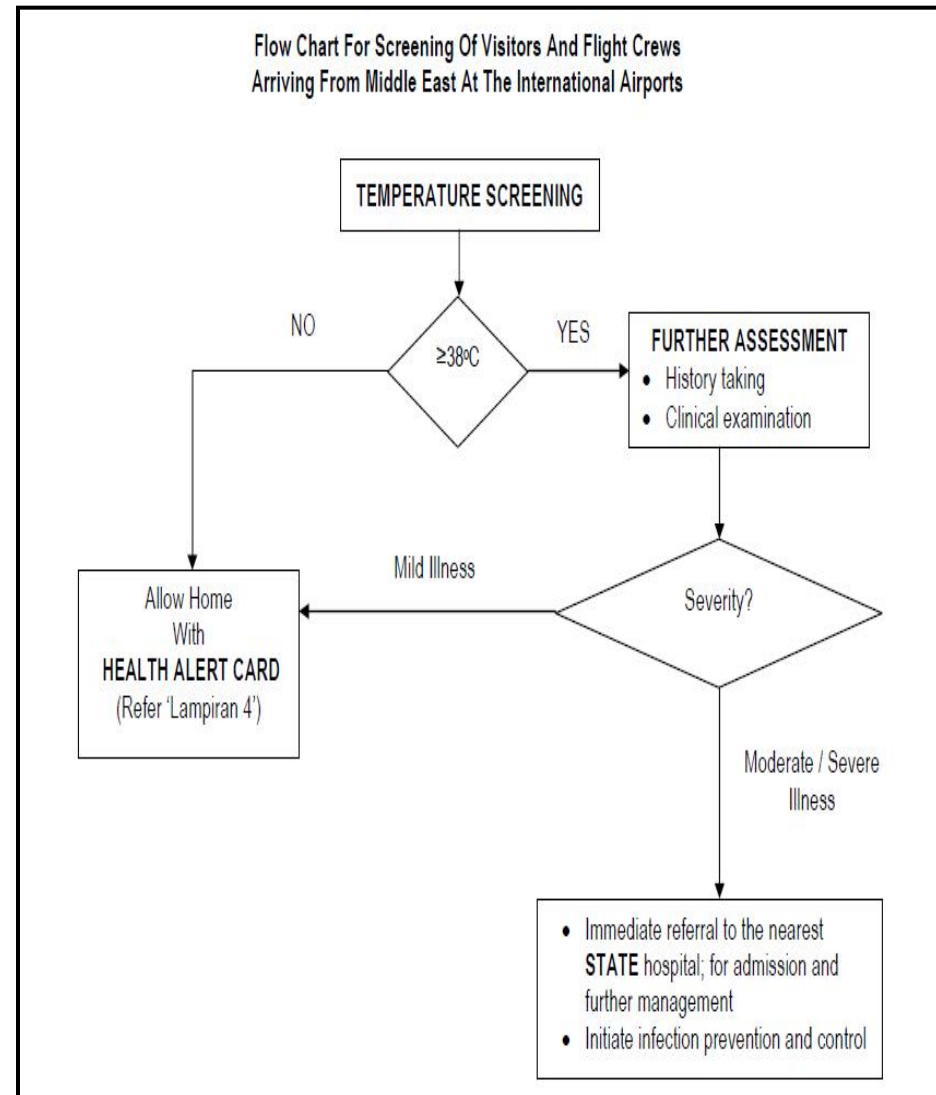
Preparedness for Coping with MERS-CoV: Pilgrims / Umrah(2)

- **Hajj Pilgrims :**

- The provision of the mask to cover mouth & nose and hand sanitizer at certain quantities for pilgrims
- Encourage the pilgrims to bring additional supplies mask for their own consumption
- Encourage the pilgrims to get vaccinated against influenza & pneumococcal
- Update on the MERS-CoV periodically to medical team who work with Tabung Haji during pilgrimage operations - while in Malaysia and in the Holy Land
- Health advisory issued by the Ministry of Health will be uploaded by the LTH website
- Information about MERS-CoV case detection will be notified by LTH to the MOH in Malaysia from time to time
- Sharing information current health status of pilgrims in the Holy Land by LTH to Disease Control Division, Ministry of Health through access to the Phis system (Pilgrim Health Information System) owned by LTH

Screening at the Entry Point

- Body temperature screening (to detect symptoms of fever) among the visitors who come from a country / region that are affected
- Visitors detected fever on fever screening will be re-examined by the medical staff to confirm fever
- Circulate Health alert cards (health alert card)
- Referred all moderate or severe to hospital

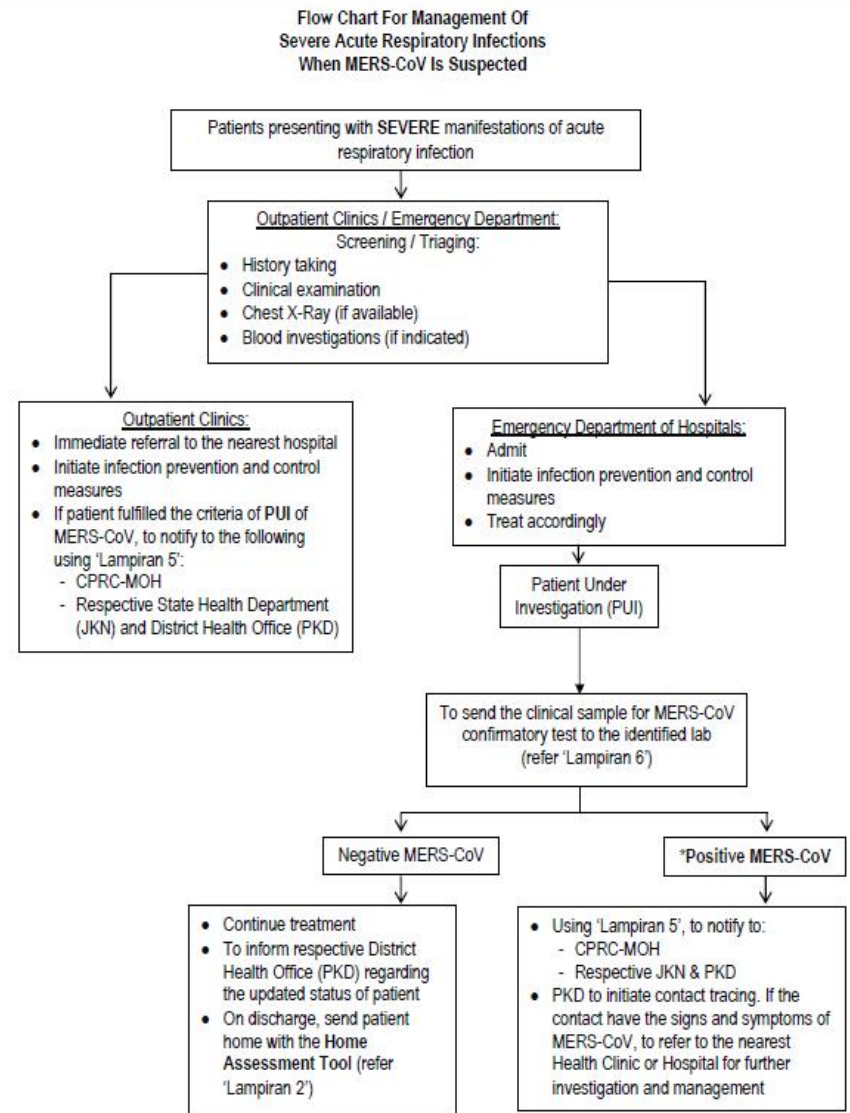


Respiratory Infections Surveillance

- Continuation sentinel surveillance of influenza-like illness (ILI) and severe acute respiratory infection (SARI)
- For surveillance activities MERS-CoV virus being carried out by the Institute for Medical Research (IMR) and the National Public Health Laboratory (MKAK) Sg. Buloh
- Surveillance activities MERS-CoV virus has started since November 2012, to date no positive samples detected from these activities except 1 cases died from Batu Pahat
- Overall coordinator of respiratory infection surveillance activities at the national level is Surveillance Branch, Division of Disease Control, Ministry of Health

Management of Patient with Respiratory Infection

- Clinical examination by a medical practitioner who treats are critical
- For cases with mild symptoms (mild), to be supplied by the Health Self-Assessment Procedure (Home Assessment Tool)
- Any patient cases under investigation (PUI) or positive-MERS-CoV - notified immediately



Middle East Respiratory Syndrome Coronavirus
(MERS-CoV):

Specific Health Advice To Pilgrims Hajj / Umrah And Visitors

- Always adopt a high level of personal hygiene such as frequent hand washing with soap and water or detergent hand (hand sanitizer), especially after coughing, sneezing or after shaking
- During the visit, always bring along a mask (medical mask) and detergent hands (hand sanitizer) to be used when necessary
- During the visit, do not touch raw or not fully cooked, touches of fruit or vegetables that are not washed prior to use or drinking untreated water

- Those who return to Malaysia with respiratory infection symptoms (fever, cough, runny nose and sore throat) are advised to wear masks (medical mask)
- If symptoms experienced persistent and worsen, seek immediate medical attention and inform about their travel history to the attending doctor



WHO PANDEMIC INFLUENZA/MERS-CoV PHASES

9/2/2014

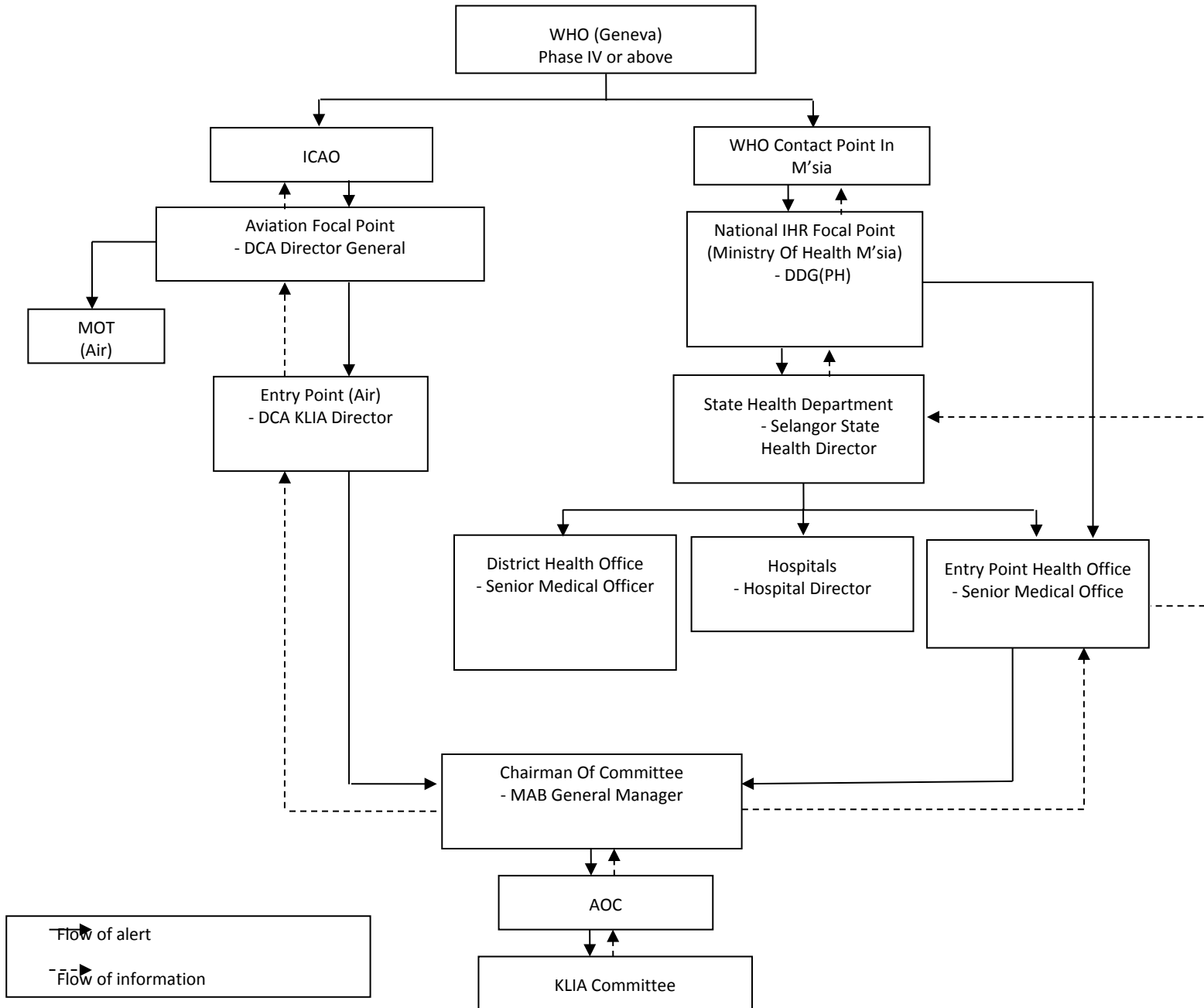
PHASE	DESCRIPTION
PHASE 1	No animal influenza virus circulating among animals have been reported to cause infection in humans
PHASE II	No animal influenza virus circulating in domesticated or wild animals is known to have caused infection in humans and its considered a specific potential pandemic threat
PHASE III	An animal or human-animal influenza reassortant virus has caused sporadic cases or small clusters of diseases in people ,but has not resulted in human-to-human transmission sufficient to sustain community-level outbreak
PHASE IV	Human to human transmission of an animal or human-animal influenza reassortant virus able to sustain community-level outbreaks has been verified

WHO PANDEMIC INFLUENZA/MERS-CoV PHASES

9/16/2014

PHASE	DESCRIPTION
PHASE V	Human-to-human spread of the virus in two or more countries in one WHO region
PHASE VI	In edition to the criteria in phase 5, the same virus spreads from human-to-human in at least one other country in another WHO region
POST PEAK PERIOD	Level of pandemic influenza in most countries with adequate surveillance have dropped below peak level
POST PANDEMIC PERIOD	Levels of influenza activity have returned to the levels seen for seasonal influenza in most countries with adequate surveillance

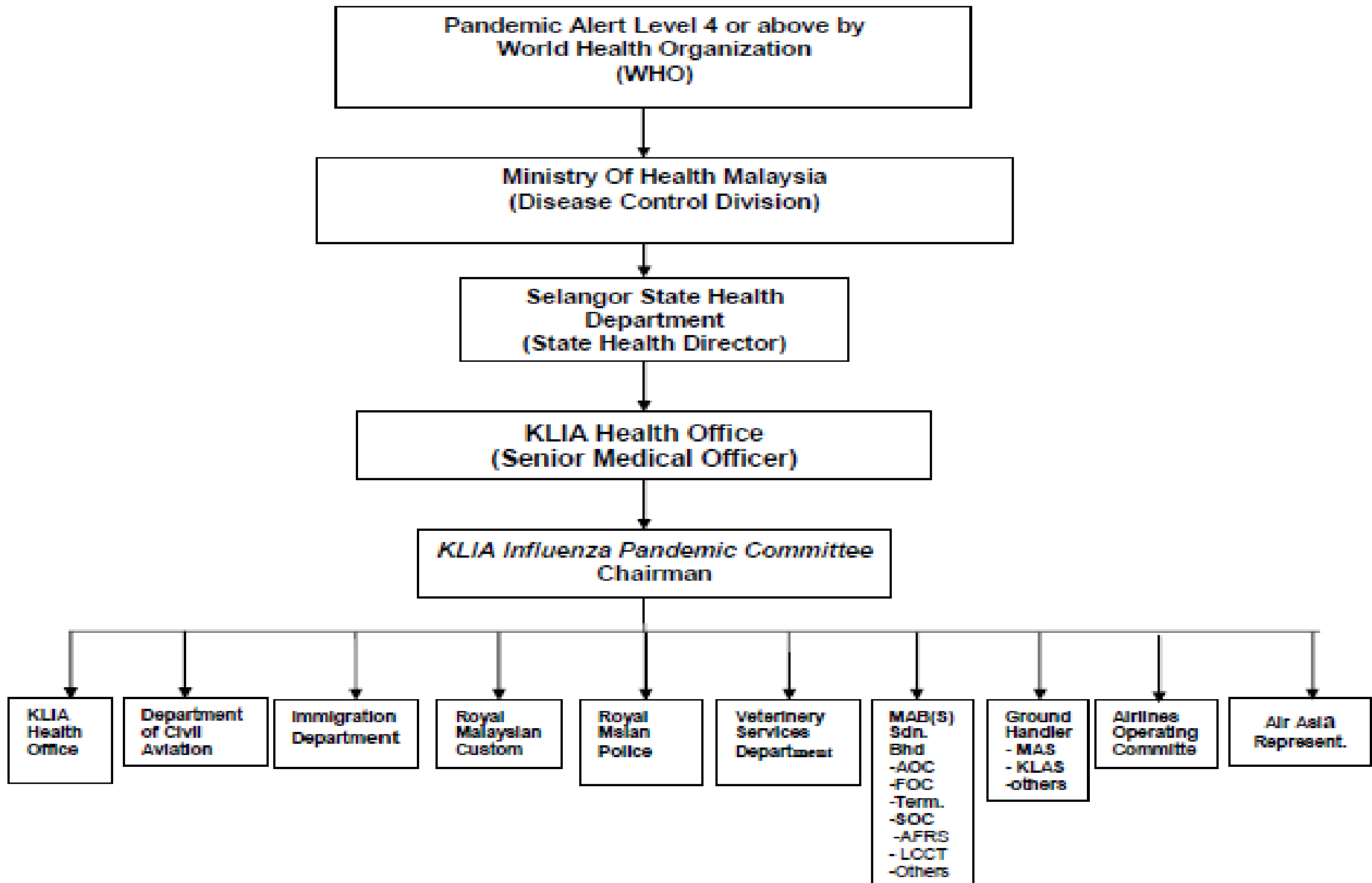
MERS-CoV Alert Mechanism & Flow Of Information



Formation of KLIA Pandemic MERS-CoV

- Chairman: General Manager of MAB(S) Sdn. Bhd
- Secretary: Senior Airport Medical Officer of Health
(Public Health Specialist)
- Other members:
 - KLIA Health Office
 - Department of Civil Aviation
 - Immigration Department
 - Royal Malaysian Custom
 - Royal Malaysian Police
 - Department of Veterinary Services
 - Malaysia Airport (S) Sdn. Bhd.
 - Airlines Operating Committee
 - Malaysia Airline System (MAS)
 - Air Asia
 - Kuala Lumpur Airport Services (KLAS)

ALERT MECHANISM FOR KLIA MERS-Cov PANDEMIC COMMITTEE



In situation WHO declare phase 4/5 – human to human transmission

- Activation of Health Screening at KLIA
Subject to directive from Ministry of Health
 - Health Screening at gate
 - MTB – gate 22
 - LCCT – gate T 17 & T18, KLIA 2 – level 3
 - Distribute Health Declaration

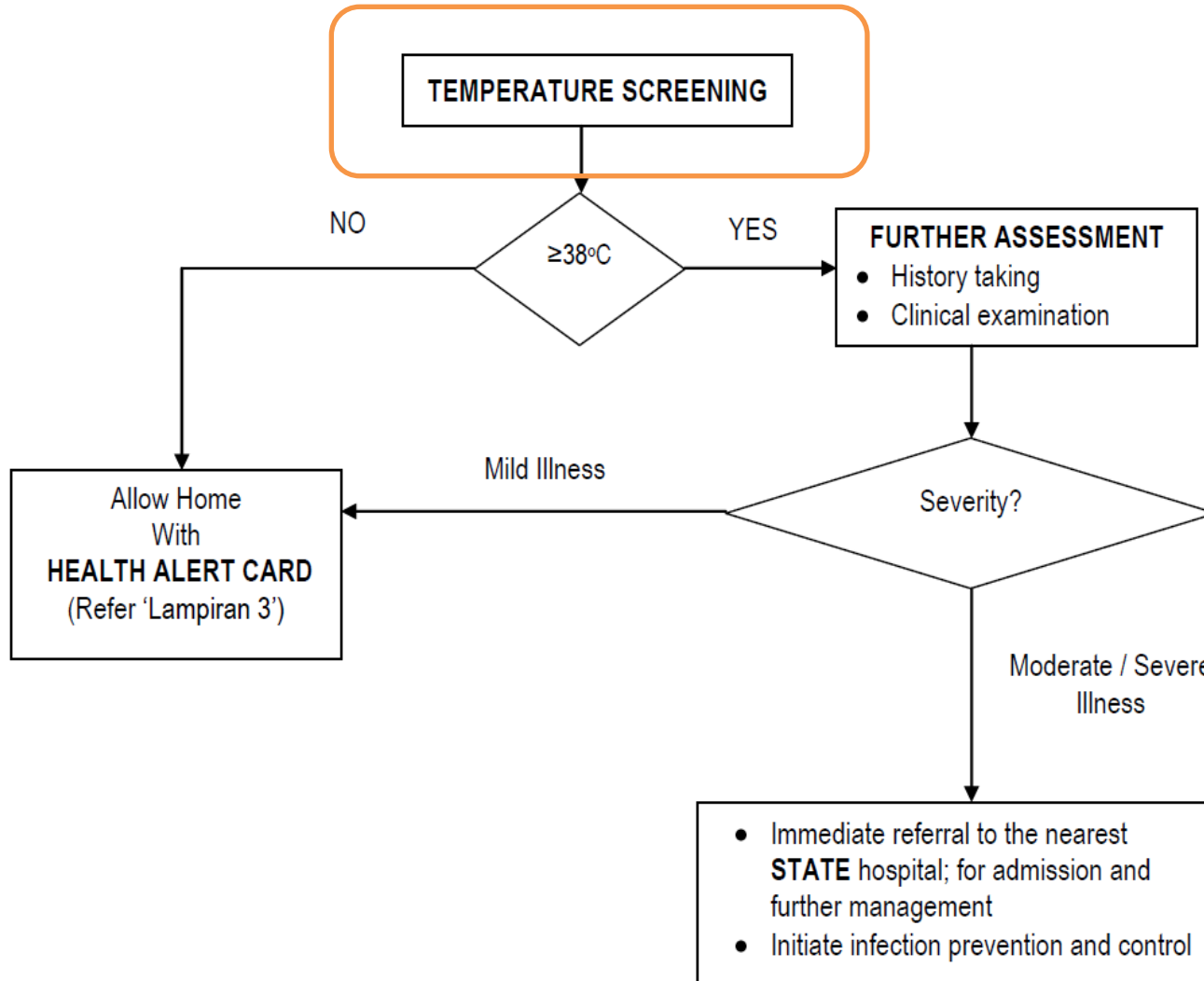
MERS-CoV Screening

- Screening MERS-CoV - only involving planes from countries in the Arab region.

Saringan MERS-CoV – hanya dijalankan berikut

HARI	BIL	NO.PENERBANGAN	STA	ETA	FROM
JUMAAT	1	MH163	0710	0730	DUBAI
	2	SV2056	0750	0830	JEDDAH
	3	QR844	0825	0845	DOHA
	4	WY825	0825	0845	MUSCAT
	5	EK344	0855	0910	DUBAI
	6	W583	1000	1015	IMAM KHOMENEI
	7	MH151	1100	1115	JEDDAH
	8	SV830	1300	1315	RIYADH
	9	EK408	1350	1405	DUBAI
	10	EY418	1350	1405	ABU DHABI
	11	QR848	1410	1425	DOHA
	12	EK346	1505	1520	DUBAI
	13	MH6123	1525	1540	AZERBAIJAN
	14	TK60	1650	1705	ISTANBUL
	15	QR846	2050	2115	DOHA
	16	EK342	2145	2200	DUBAI
	17	EY416	2210	2230	ABU DHABI
SABTU	1	KC935	0710	0730	ALMATY
	2	MH163	0710	0730	DUBAI
	3	MK646	0750	0815	MAURITIUS
	4	QR844	0825	0845	DOHA
	5	EK344	0855	0915	DUBAI
	6	W583	1000	1015	IMAM KHOMENEI
	7	XY 1	1030	1045	JEDDAH
	8	IR814	1055	1115	IMAM KHOMENEI
	9	MH151	1100	1115	JEDDAH
	10	SV832	1300	1315	JEDDAH
	11	EK408	1350	1415	DUBAI
	12	EY418	1350	1415	ABU DHABI
	13	QR848	1410	1430	DOHA
	14	EK346	1505	1520	DUBAI
	15	TK60	1650	1705	ISTANBUL
	16	MH6145	1820	1850	AZERBAIJAN
	17	QR846	2050	2115	DOHA
	18	WY823	2100	2130	MUSCAT

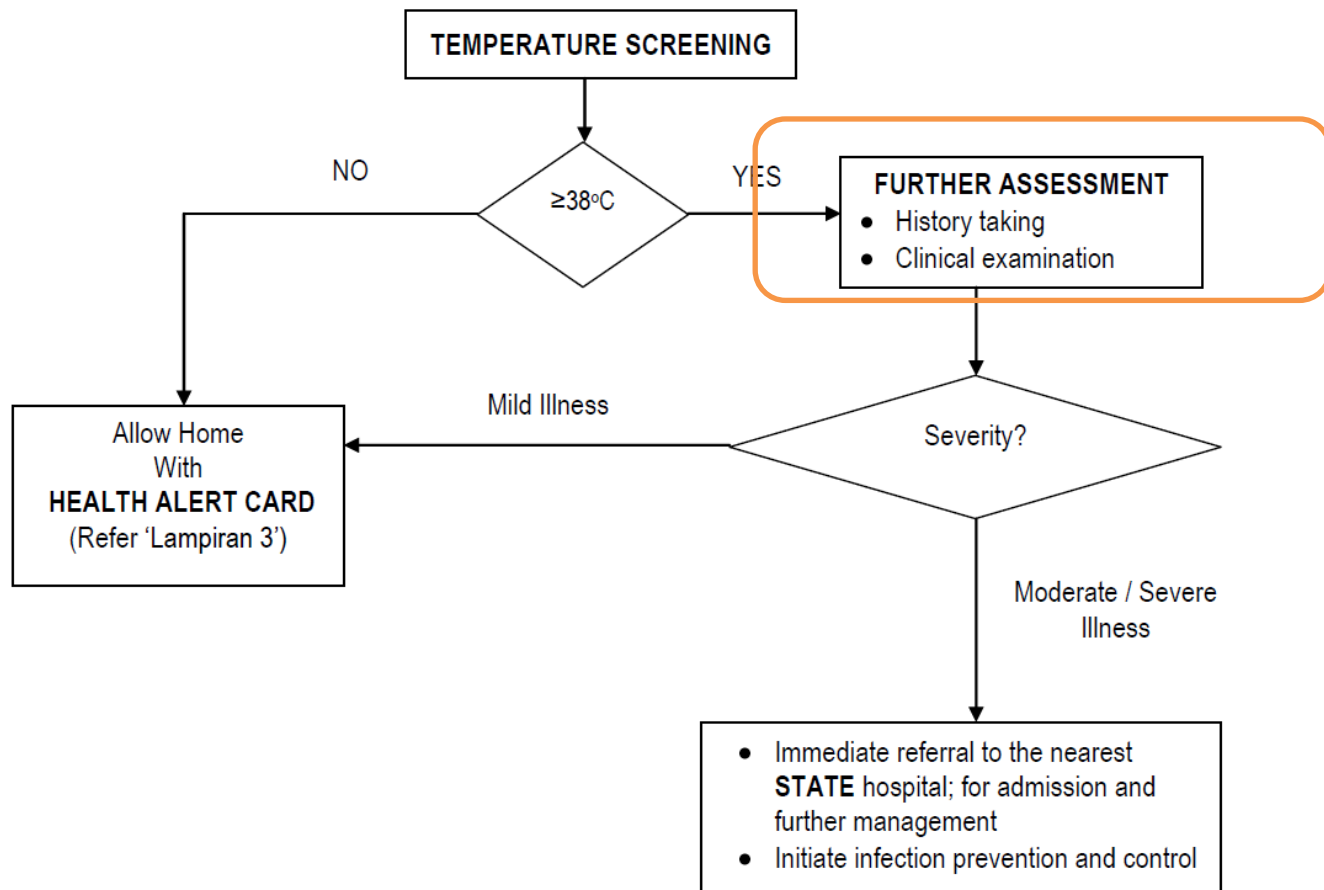
FLOW CHART OF HANDLING MERS-CoV Cases



HANDLING MERS-CoV CASES

- Fever screening
 - All those who have fever by fever screening will be examined further by a nurse using a normal thermometer (oral thermometer)
 - Fever when $T \geq 38^{\circ} \text{C}$

FLOW CHART OF HANDLING MERS-CoV Cases



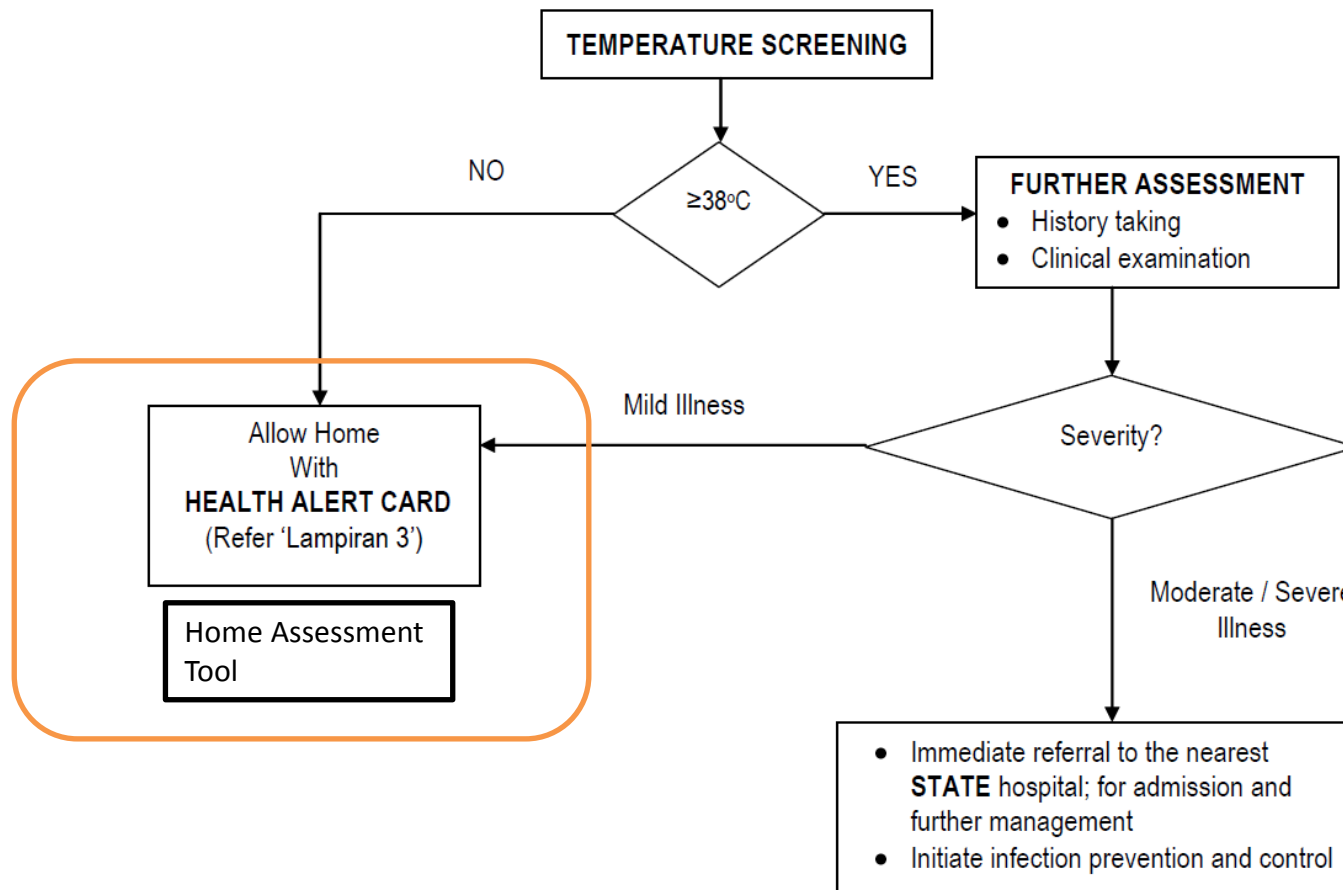
Demam – Further assessment and history

- Further history
 - Duration of fever, cough and difficulty breathing, other symptoms - vomiting / diarrhea
 - The history of contact with patients MERS-CoV
 - MERS-CoV - a history in just 14 days - a place visited or had a friend who MERS-CoV disease, history along with camels, camels milk and go to the slaughter camels

Demam – Further assessment and history

- Further assessment
 - General condition
 - BP – look for evidence of shock – SBP < 90 mmHg, DBP < 60mmHg
 - Capillary refill time > 2 second
 - Altered of conciousness – confusion, agitated or seizures
 - Respiratory system
 - RR (severe cases tachpnoea - RR > 24/min)
 - Inability to complete sentences
 - Use of accessory muscles of respiration, supraclavicular recession
 - Decreased effort tolerance
 - Respiratory exhaustion
 - Chest pains

FLOW CHART OF HANDLING MERS-CoV Cases



Mild cases

- For those who found to have mild cases they will be allowed to return to home base assessment tool
- Those who are coughing should be provided with a mask- to advise them wearing them at all time.
- Isolation of yourself - the common cold duration, 2-3 days,
- They are encouraged to practice good personal hygiene and the following:
 -
- Practice good cough manners;
 - Cover your mouth and nose with a tissue when you cough or sneeze. Shortly after that, throw used tissues in the trash. Wash hands with soap and water or detergent hands after coughing or sneezing;
 - Wear a mask (mask) when forced on / deal with other people;
 - The practice of washing hands after shaking
- Floor or table surface contaminated by mucus, fluid, vomiting or fluid from the nose or mouth can be cleaned menggunakan dry material such as Clorox. The recommended mix is 1 part Clorox to 50 parts water.

Home assessment tool MERS-CoV

1	Respiratory Difficulties: Shortness of breath, rapid breathing or Purple or blue discoloration of lips
2	Coughing out blood or blood streaked sputum
3	Persistent chest pains
4	Persistent diarrhea and / or vomiting
5	Fever persisting beyond 3 days or recurring after 3 days
6	Abnormal behaviour , confusion, less responsive , convulsion
7	Dizziness when standing and/or reduced urine production

Those who have symptoms above are advised to seek treatment.

Referral Hospital

- Referral Hospital is Hospital Sungai Buloh followed by Klang TAR Hospital
- Medical Officer / Assistant Medical Officer should be telephoned Infectious Disease Physician before sending the case.

Arriving Aircraft With Suspect Case On Board

- Aircraft parked at dedicated wing
- Pax & crew not allowed to be disembarked
- Health Official entered into aircraft & do announcement
- Tagging for suspect (RED) & close contact (YELLOW)

• Measures for suspect case/s

• Measures for other travelers

• Disinfection of aircraft

• Segregation from suspect pax

• Temperature check

• Advisory information – HAC/pamphlets

KLIA
Health
Authority

• Secondary Screening

• Designated
Ambulance/s

• Designated Hospital/s

Health Alert Card for Umrah Pilgrims / Hajj / Visitors And The Crew Return From The Holy Land Or Area Affected Middle East Respiratory Syndrome Coronavirus (Mers-cov)

- ▶ Keep this card for 14 days after returning to Malaysia. Monitor body temperature and beware of symptoms such as fever ($\geq 38^{\circ}\text{C}$), cough and shortness of breath.
- ▶ If you unwell see your doctor immediately.

- ▶ Similarly, if you have these symptoms:
 - ▶ i. Cover your mouth and nose with a tissue when you cough and sneezing. Shortly after that, throw used tissues in a bin garbage. Wash hands with soap and water or hand wash (hand sanitizer) after coughing or sneezing;
 - ii. Practice good cough manners;
 - iii. Wear a mask (mask) when forced to touch / dealing with others;
 - iv. Make sure you take care of personal hygiene at all times.

- ▶ **To Medical Practitioners Who Treat Patients It:**
 - ▶ Individuals who carry this card is a passenger or crew who recently returned from the Middle East (Middle East) recently.
 - ▶ if you found him suffering from symptoms such as fever ($\geq 38^{\circ}\text{C}$), cough and difficulty breathing, please refer to the nearest hospital immediately.

**Home assessment tool*

- ▶ Individuals with symptoms of fever and cough and / or sore throat, it is advisable
- ▶ to seek medical attention if at any time they
- ▶ experiencing any of the symptoms and signs as follows:
 - ▶ • Difficulty breathing - gasping for breath, breathing becomes faster or color
 - ▶ lips turned blue
 - ▶ • Coughing blood
 - ▶ • Chest pain continued
 - ▶ • Diarrhea and / or vomiting continues
 - ▶ • Fever that last longer than 3 days or fever recurrence after 3 days
 - ▶ • Changes in behavior, less responsive, confusion and / or convulsions
 - ▶ • Easy to feel giddy / dizzy when standing
 - ▶ • Decreased urination (than usual – 400 to 2000 ml perday)
- ▶ Practice these simple steps below when you are sick:
 - ▶ • For work / school, use sick leave granted by the doctor
 - ▶ to relax at home
 - ▶ • Limit your interactions with those around you healthy
 - ▶ • Cover your mouth and nose with a tissue when you cough and sneezing. Shortly after that, throw used tissues in a bin trash
 - ▶ • Practice good cough manners
 - ▶ • Always practice a high level of personal hygiene such as frequent wash your hands with water and soap or detergent or hand (hand sanitizer), especially after you cough or sneeze.
 - ▶ Wear masks (mask) when forced on / deal

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**

Summary

Background Middle East respiratory syndrome (MERS) is a new human disease caused by a novel coronavirus (CoV). Clinical data on MERS-CoV infections are scarce. We report epidemiological, demographic, clinical, and laboratory characteristics of 47 cases of MERS-CoV infections, identify knowledge gaps, and define research priorities.

Published Online
July 26, 2013
[http://dx.doi.org/10.1016/S1473-3099\(13\)70204-4](http://dx.doi.org/10.1016/S1473-3099(13)70204-4)

	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)
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

Investigations on admissions

- Platelet ↓ 36%, lymphocyte ↓ 34%,
- Neutrophil and monocytes normal 91%
- ↑increase LDH 49%, ALT 11%, AST 15%
- Other LFT normal
- Blood culture negative

	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

	Total	Dead
None	2	0
1	11	3
2	11	6
3	10	8
4	10	8
5	2	2
6	1	1
Total	47	28 (60%)

Table 5: Number of comorbidities in relation to mortality

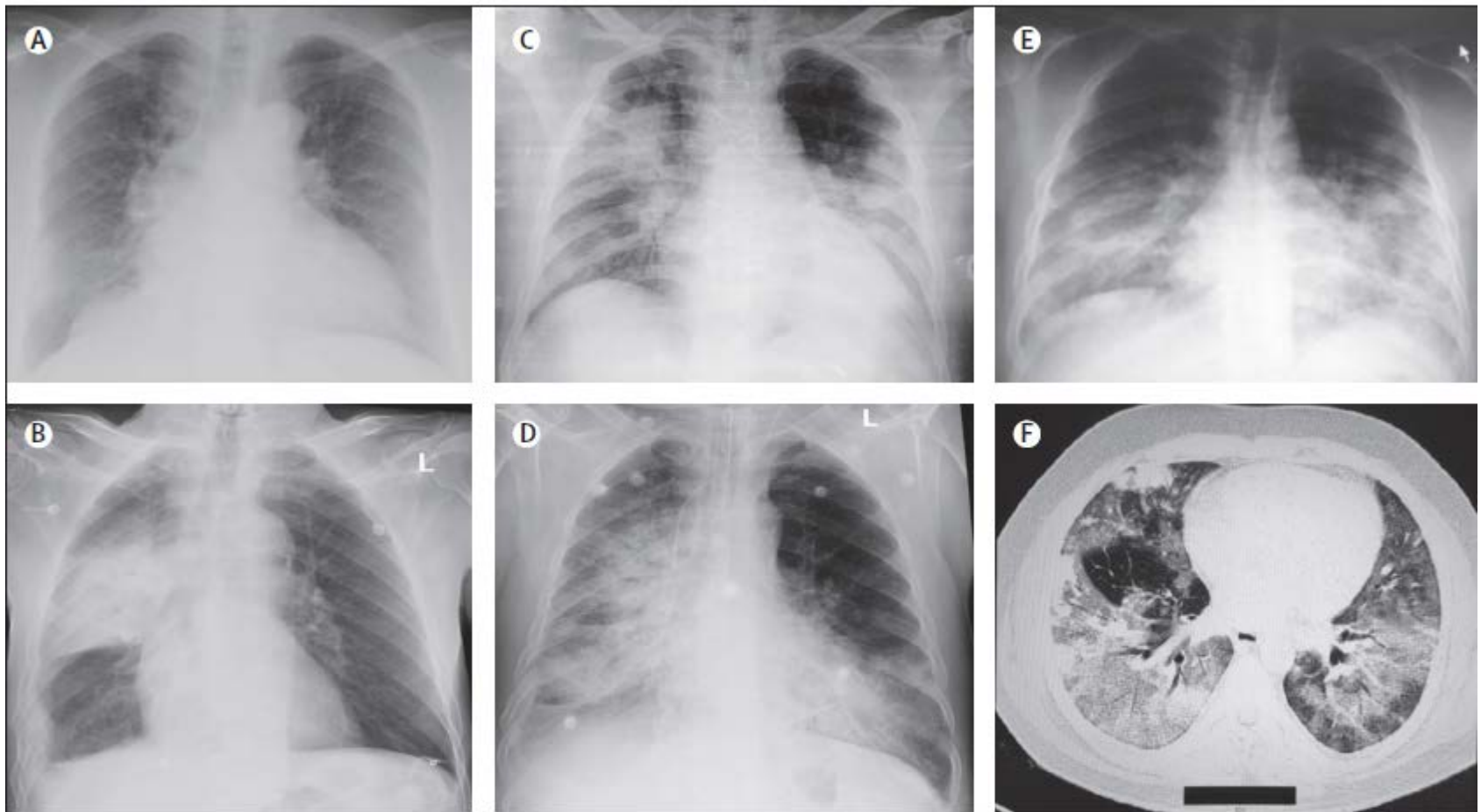


Figure 1: Imaging findings at presentation in Saudi patients with Middle East respiratory syndrome

(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 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.

Clinical symptoms

- Most - pneumonia.
- Immuno-compromised patient - fever and diarrhoea; pneumonia only on CXR.
- Complications
 - respiratory failure
 - ARDS with multi-organ failure
 - renal failure requiring dialysis
 - consumptive coagulopathy
 - pericarditis.
- Co-infections - influenza, herpes simplex, and pneumococcus

First MERS-CoV cases in Malaysia

- Malaysia became the first country in Asia with a laboratory confirmed case when Sultanah Nora Ismail Hospital in Batu Pahat, Johor reported a patient who was positive for MERS-CoV and succumbed to his illness on 13 April, 2014 upon returning from Umrah pilgrimage on 29 March 2014.
- A 64 years old Malay male, known diabetic was seen at Sultanah Nora Ismail Hospital A&E Department on 9 April 2014 complaining of myalgia and was admitted for Community Acquired Pneumonia TRO MERS-CoV.

▶ **Contact Investigation**

- ▶ A total of 18 members identified on the same Umrah group (Tiram Travel) including the deceased
 - ▶ Seven from Selangor (Shah Alam)
 - ▶ Ten from Johor (6 from Johor Bahru, 2 from Batu Pahat and 2 from Kluang)

- ▶ There were two (2) other groups identified during traveling on the same bus with the deceased from Madinah to Mecca of which both belongs to Tiram Travel estimated numbering 22 persons

- ▶ There was another group traveling on the same flight returning from Jeddah (transit in Istanbul) belongs to Andulasia Travel numbering 43 persons

- ▶ There were 62 close family members who were in close contact with the deceased upon returning to Batu Pahat

- ▶ There were 3 healthcare workers at the private clinic attending to the deceased

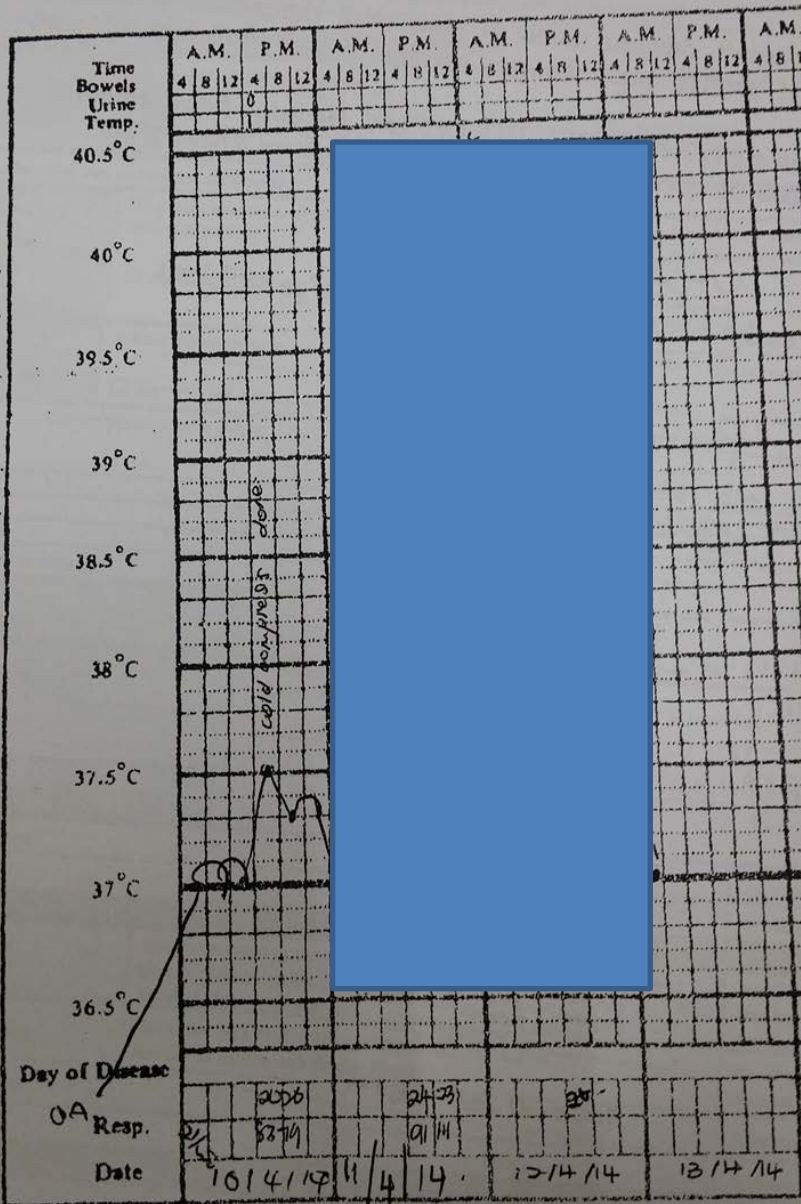
- ▶ There were 52 healthcare workers who were managing the deceased while in the hospital from admission to the day he expired

Case

- 64 year old man
- cough, fever, SOB, feeling unwell (9 May 2014)
- returned from Middle East 1/52 ago
- underlying DM on medication ,ex-smoker
- BP 100-120/60-70, HR 70-80,
- HFM O2 sats 100%
- Dehydrated, not tachypnoic, lungs reduced breath sounds at the right LZ.
- RBS 27mmol/L - no ketone, acidosis

10/4/14

2³⁰ 06m



Day 1



RIKH	MASA	No.	Date	Mode	CATITAN	No.	Date	Mode	MA
		[REDACTED]	10/04/14	WB			10/04/14	WB	8am
			2211475				2211475		
			00:01				00:03		
		WBC	6.3 × 10 ⁹ / μL			WBC	6.2 × 10 ⁹ / μL		
		RBC	+ 5.60 × 10 ⁶ / μL			RBC	+ 5.65 × 10 ⁶ / μL		
		HGB	13.8 g/dL			HGB	13.9 g/dL		
		HCT	42.5%			HCT	42.4%		
		MCV	- 75.9 fL			MCV	- 75.3 fL		
		MCH	- 24.6 Pg			MCH	- 24.7 Pg		
		MCHC	32.5 g/dL			MCHC	32.8 g/dL		
		PLT	127 × 10 ³ / μL			PLT	120 × 10 ³ / μL		
		LYM%	13.0%			LYM%	12.2%		
		MXD%	2.6%			MXD%	2.2%		
		NEUT%	84.4%			NEUT%	85.6%		
		LYM#	0.8 × 10 ³ / μL			LYM#	0.8 × 10 ³ / μL		
		MXD#	0.2 × 10 ³ / μL			MXD#	0.1 × 10 ³ / μL		
		NEUT#	5.3 × 10 ³ / μL			NEUT#	5.3 × 10 ³ / μL		
		RDW	40.0 fL			RDW	38.4 fL		
		PDW	14.2 fL			PDW	16.8 fL		
		MPV	10.6 fL			MPV	11.0 fL		
		P-LCR	31.7%			P-LCR	34.0%		

	aug/08	Day 1	Day 1							
Hb		13.8								
TWC		6.3								
L%		13.0								
N%		84.4								
Plt		127								
urea	5.2		11.5							
Na			128							
K			5.8							
creat	103		132							
T.bili										
alb			33							
ALP										
ALT										
AST			69							
CK			90							
LDH			470							
PT										

Day 1

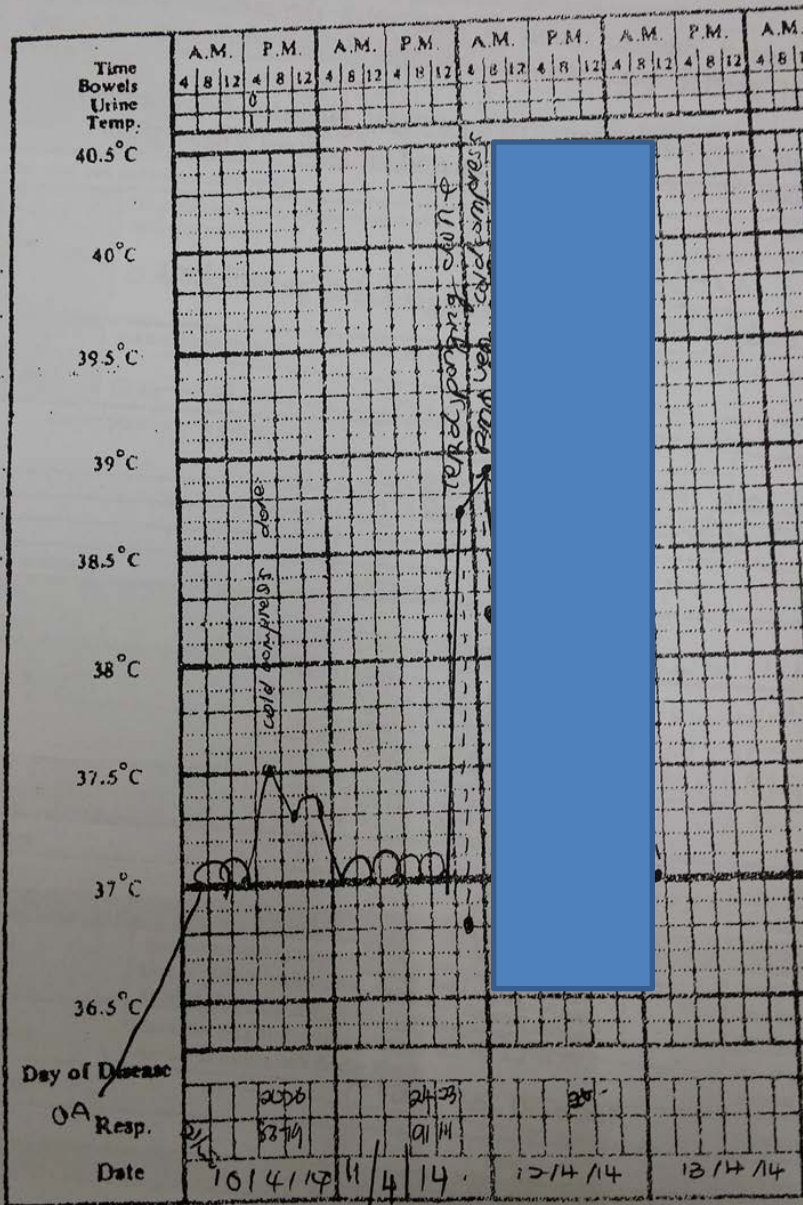
- IV Augmentin, Oral Erythromycin, and oral Oseltamivir.
- throat swap for MERSCoV was ordered
- remained asymptomatic until night - abdominal pain and O2 sats - 78% on room air.
- ABG - type 1 respiratory failure with mild metabolic acidosis.
- electively intubated for respiratory distress.

Day 2

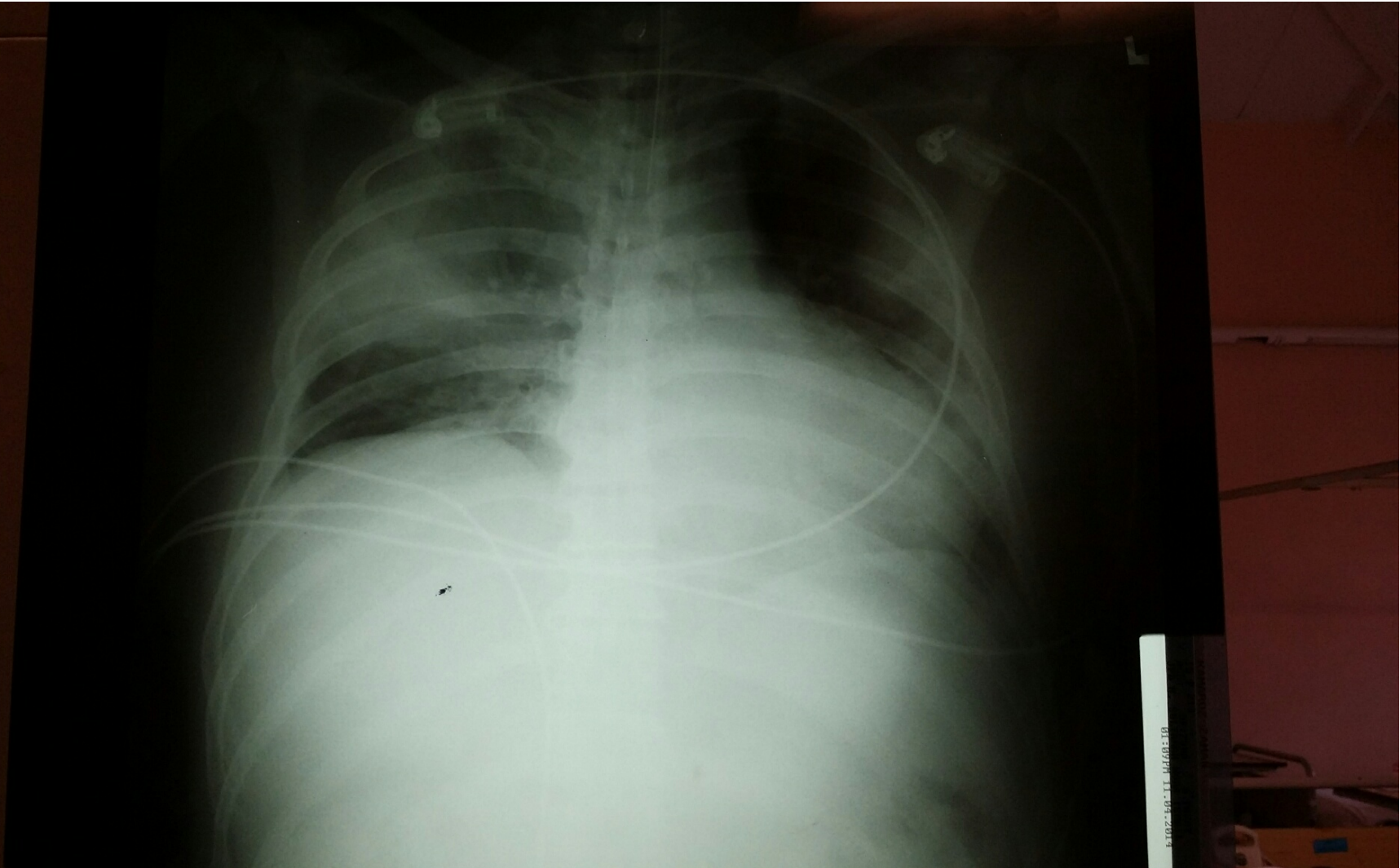
- O2 sats averaging at 90%.
- Tachycardic but BP was stable.
- upgraded - IV Ceftriaxone and IV Azythromycin

10/4/14

2³⁰ 06m



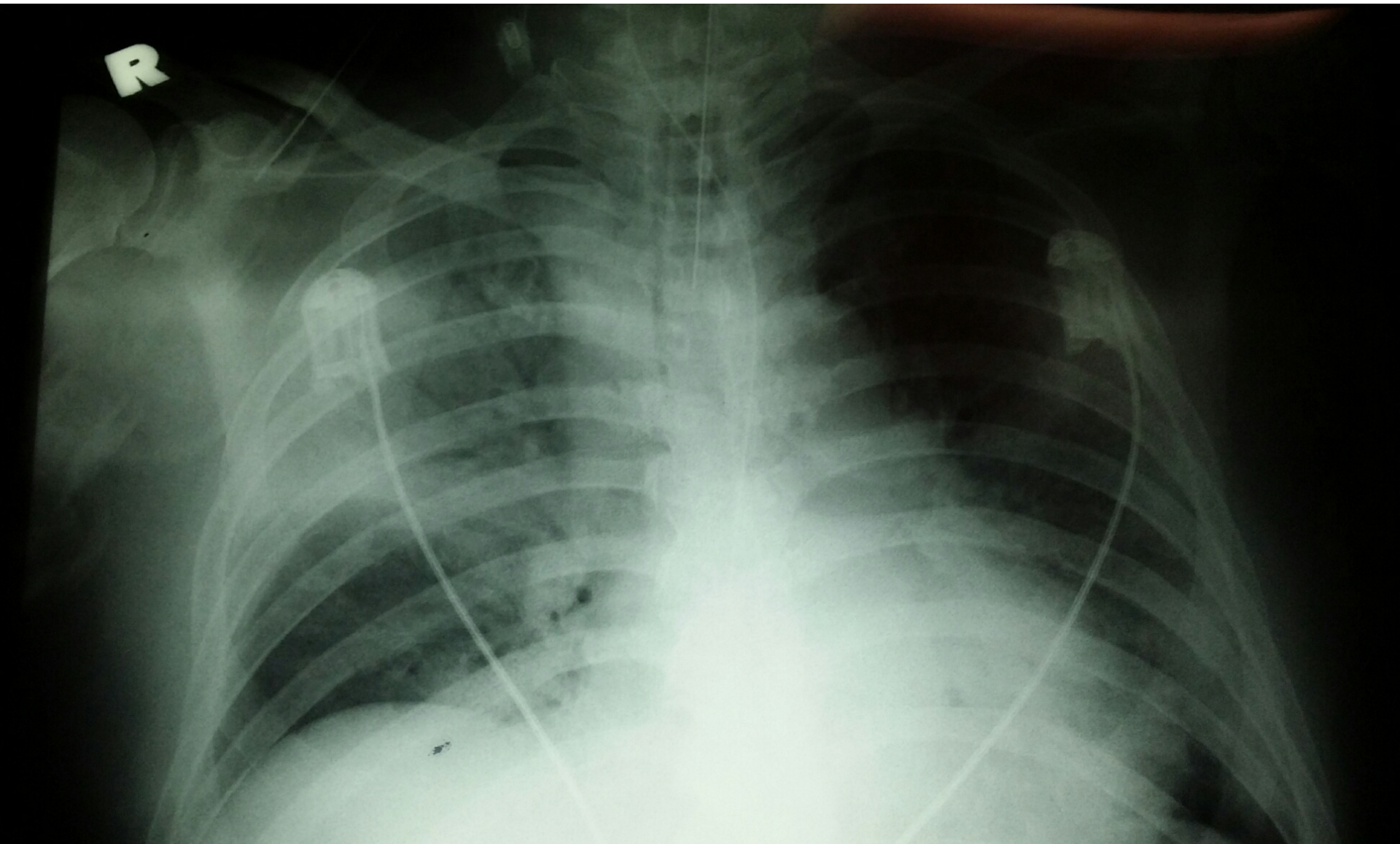
Day 2



D3

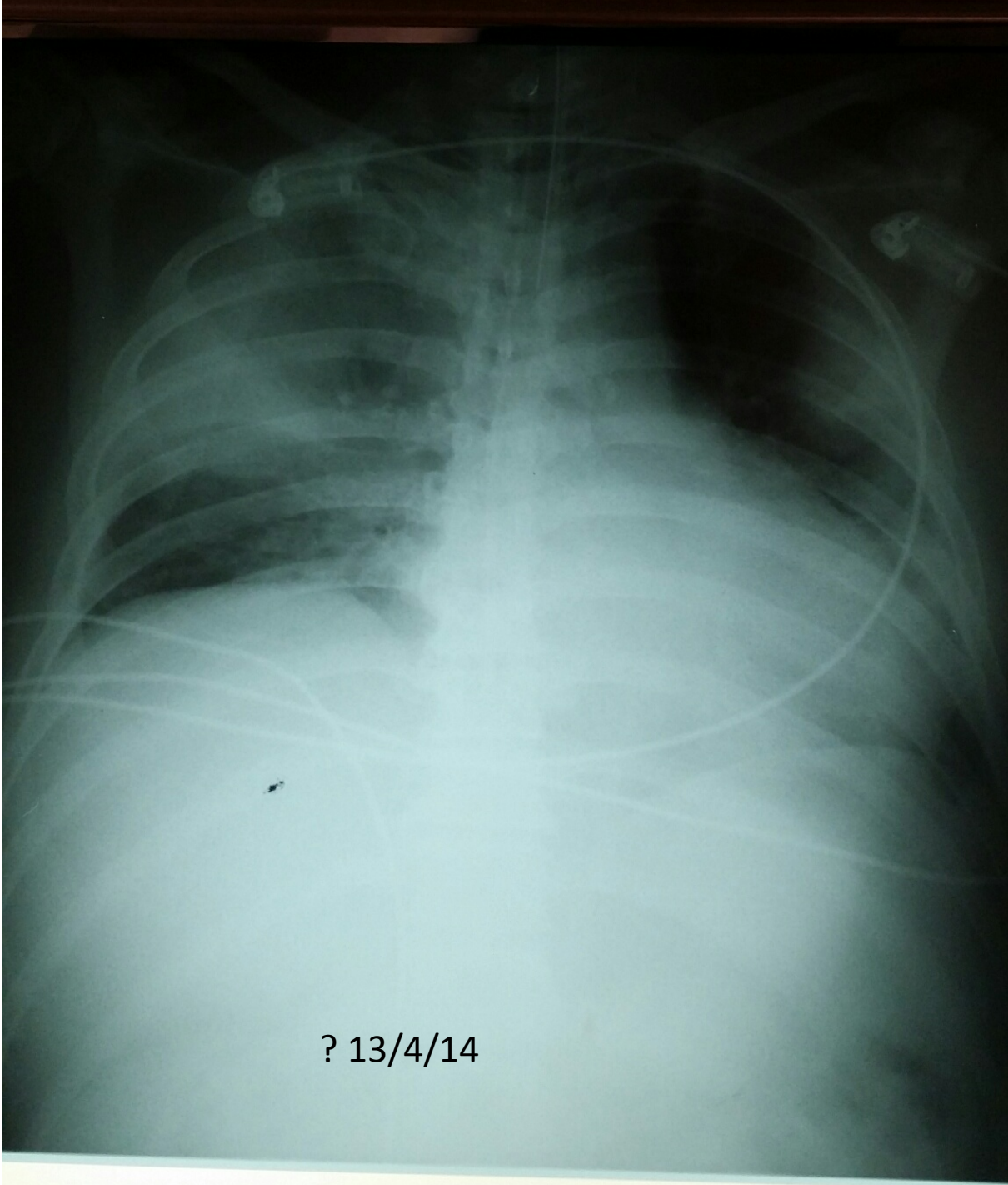
- saturation deteriorated to 40%
- ABG - severe type 1 respiratory failure with worsening metabolic acidosis,
- Fever 38.2C.
- Ceftriaxone to IV Imipenem.

Day 3



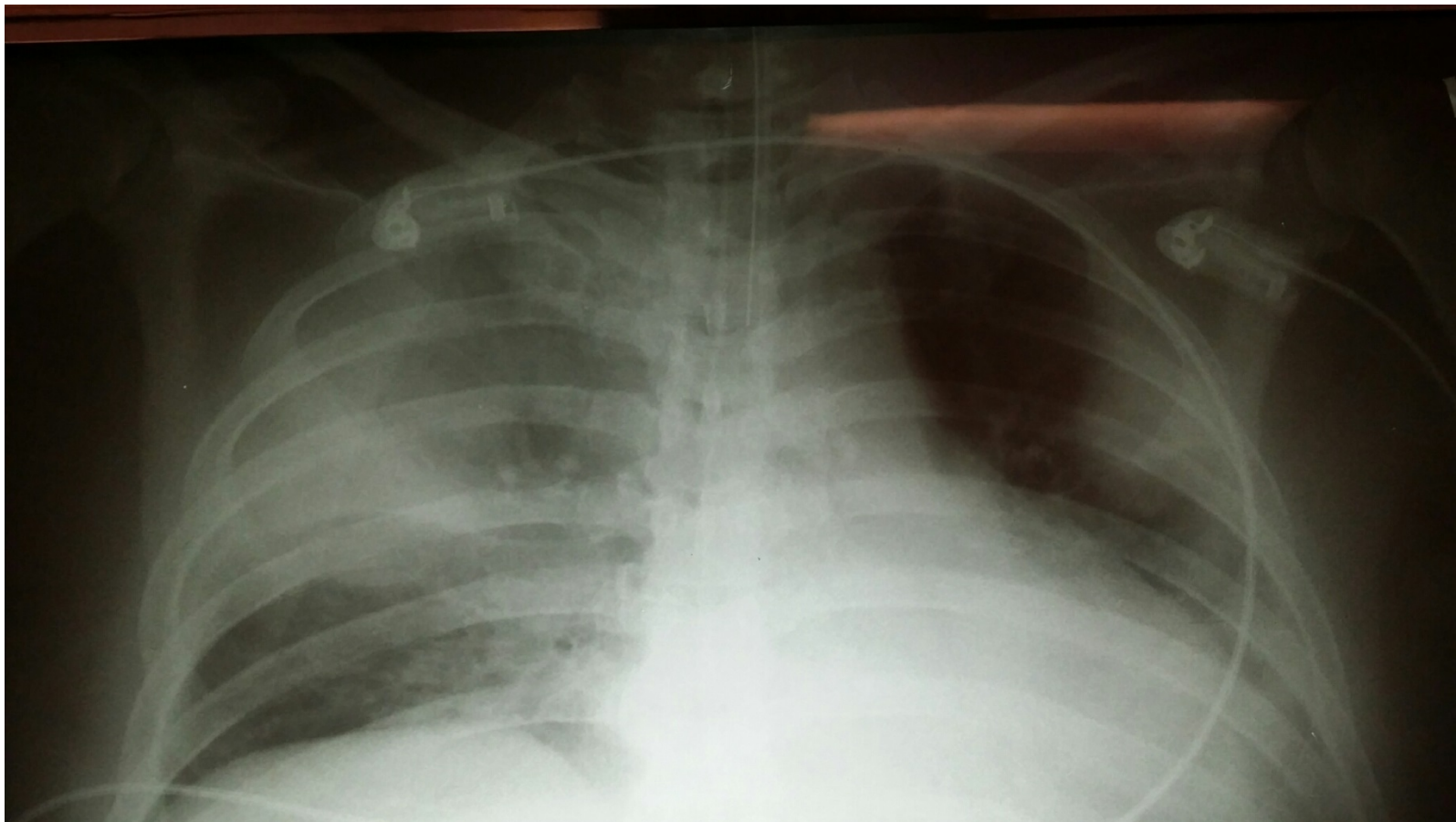
Day 4

- O2 Sats - around 50% on ventilator.
- Death was pronounced at 9.57am.
- Throat and nasal swap samples were sent to the laboratory



? 13/4/14

Close up (13/4/14)



ORIGINAL ARTICLE

Hospital Outbreak of Middle East Respiratory Syndrome Coronavirus

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Zaki N. Alabdullatif, M.D., Maher Assad, M.D., Abdulmohsen Almulhim, M.D.,
Hatem Makhdoom, Ph.D., Hossam Madani, Ph.D., Rafat Alhakeem, M.D.,
Jaffar A. Al-Tawfiq, M.D., Matthew Cotten, Ph.D., Simon J. Watson, Ph.D.,
Paul Kellam, Ph.D., Alimuddin I. Zumla, M.D., and Ziad A. Memish, M.D.,
for the KSA MERS-CoV Investigation Team*

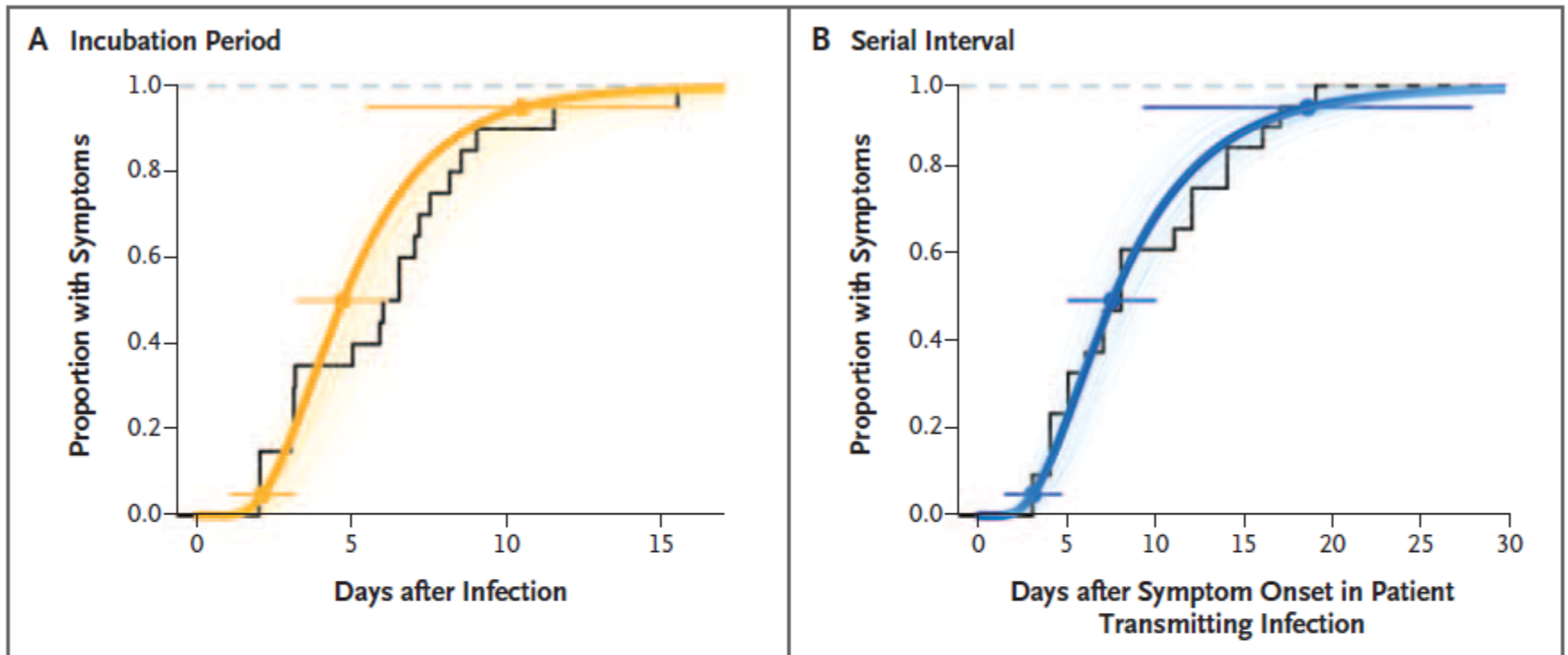


Figure 3. Estimates of the Incubation Period and Serial Interval of MERS-CoV Infection.

The empirical cumulative density function of the observed cases (the fraction of all observations that fell below each observed value) (black lines) with respect to the incubation period (Panel A) and serial interval (the time between the onset of illness in a case patient and the onset of illness in a contact) (Panel B) is shown, with a plot of the cumulative distribution of log-normal distributions fit to the data indicated by thick yellow and blue lines, respectively. The 95% confidence intervals for the 5th, 50th, and 95th percentiles of these fitted distributions are indicated by the yellow and blue horizontal lines. Yellow and blue shading indicates cumulative distributions of log-normal distributions fit to bootstrapped samples of our observed data.

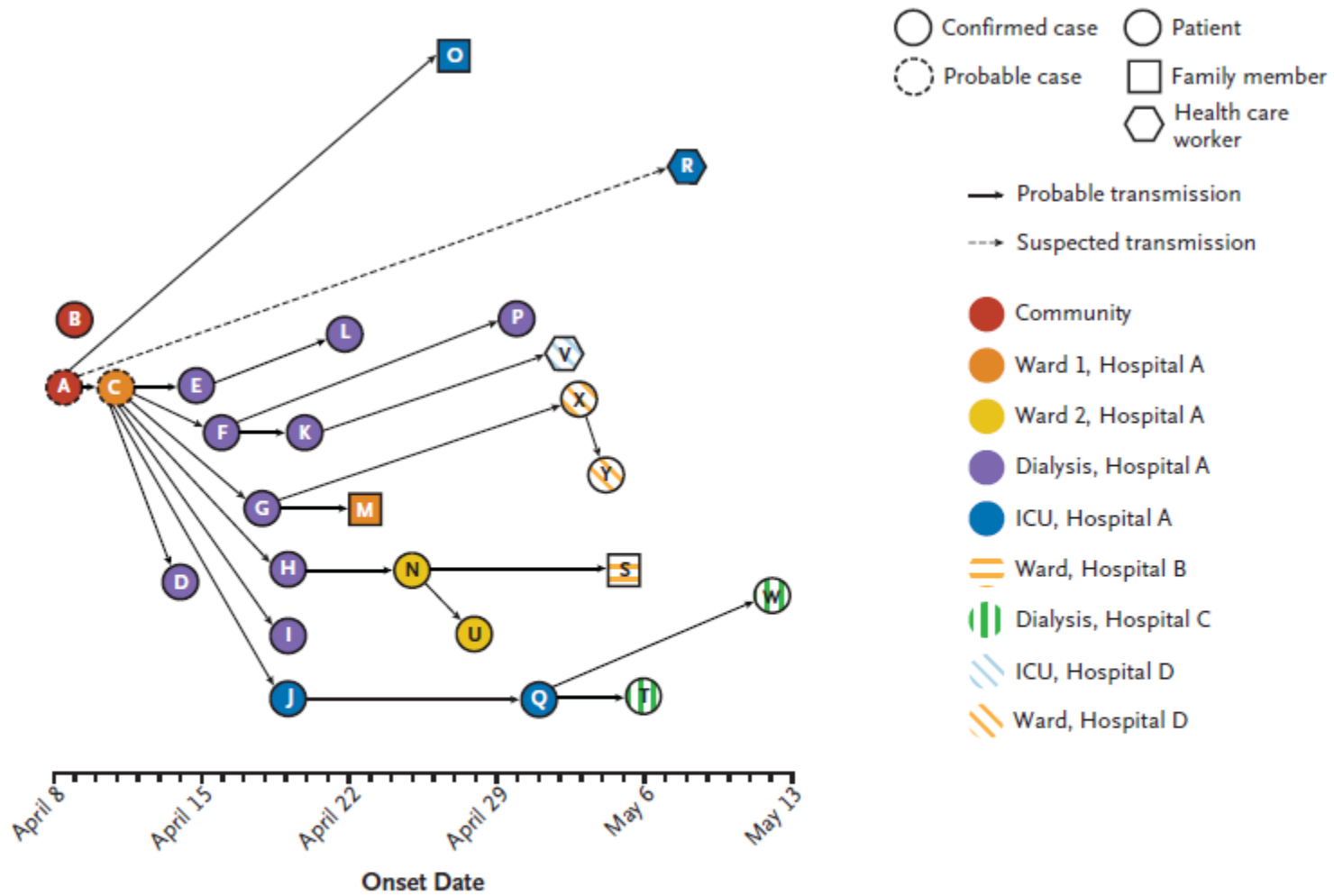
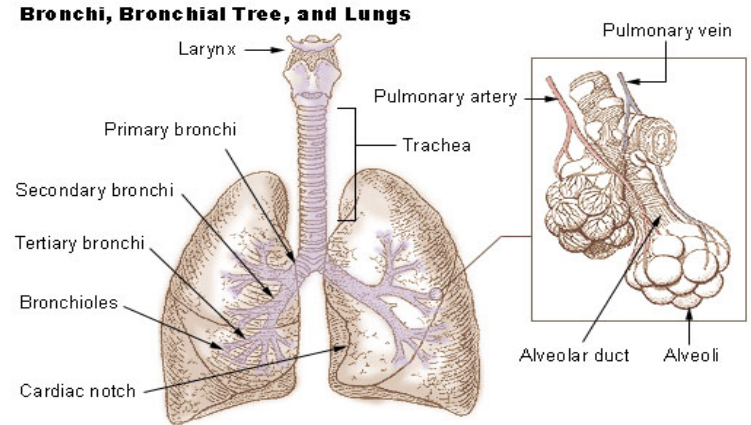


Figure 2. Transmission Map of Outbreak of MERS-CoV Infection.

All confirmed cases and the two probable cases linked to transmission events are shown. Putative transmissions are indicated, as well as the date of onset of illness and the settings. The letters within the symbols are the patient identifiers (see Fig. S2 in the Supplementary Appendix).

Preferred Sample For Testing (WHO Guidelines, Sept 2013)

- **Lower Respiratory Tract**
 - Sputum
 - Endotracheal Aspirate
 - Bronchoalveolar Lavage



- If pt without signs and symptoms of lower respiratory tract infection and if lower respiratory tract specimen NOT Possible or Clinically Indicated
 - Both Nasopharyngeal and Oropharyngeal specimens should be collected
- If initial testing of NP swab is **NEGATIVE** BUT pt is Strongly Suspected of Mers-CoV, pt **MUST** be **RE-TESTED** using **Lower Respiratory Tract Specimen**
- Others: tissue from biopsy/autopsy including lung, whole blood (in EDTA), paired serum for serology (4 weeks apart)

In situation WHO declare phase 4/5 – human to human transmission

- Activation of Health Screening at KLIA
Subject to directive from Ministry of Health
 - Health Screening at gate
 - MTB – gate 22
 - LCCT – gate T 17 & T18.

Management of passengers with symptoms of MERS-CoV

Management of passengers with symptoms of MERS-CoV

- a) The commander of the aircraft is to inform the authorities of the destination airport with regards the number of passengers with MERS-CoV symptoms as soon as possible.
- b) The passengers identified are to be given appropriate protective masks and if possible these passengers are to be shifted to the rear of the aircraft. Otherwise vacate two (2) rows in front, two (2) rows at the back and 2 rows adjacent of the passenger with symptoms.
- c) Designate one cabin crew to look after the sick traveler, preferably the cabin crew that has already been dealing with this traveler. More than one cabin crew may be necessary if more care is required.
- d) A separate toilet is to be identified for use of such passengers only. If not possible, clean the commonly touched surfaces of the lavatories (faucet, door handles, waste bin cover, counter top) with soap and water or available disinfectant after use by the ill traveler.
- e) The crew is to wear protective masks and disposable gloves if they have to handle any of the passengers/ utensils used by the passengers. The utensils (used tissues, disposable masks, oxygen mask and tubing, linen, pillows, blankets, seat pocket items, etc.) used by these passengers are to be packed separately in a biohazard bag if one is available. If not, use a sealed plastic bag with labelling.

Management of passengers with symptoms of MERS-CoV

- f) The commander of the aircraft is to identify the contacts of the passengers. These contacts are passengers sitting in the same row or within two (2) rows in front, behind and adjacent to the ill passenger, all flight attendants on board, anyone having contact with respiratory secretions of the ill passenger, anyone on the flight living in the same household as the ill passenger and if it is a flight attendant who is a mild and severe MERS-CoV, all the passengers are considered as contacts.

- g) Contacts should provide, to the health authorities, identification and details of contact / address for the next 14 days. To assist contact tracing, a 'Passenger Locator Card (PLC)' need to be filled-up by the travelers sitting in the same row or within two (2) rows in front, behind and adjacent to the ill passenger, all flight attendants on board, anyone having contact with respiratory secretions of the ill passenger, anyone on the flight living in the same household as the ill passenger and if it is a flight attendant who is a mild or moderate / severe MERS-CoV case, all the passengers are considered as contacts. (The PLC can be kept on board by airlines or at all destination airports). [\(PLC\)](#)

Function of Airlines -Entry Screening

Measures upon Arrival (FOR ALL FLIGHTS)

Passengers with symptoms of MERS - CoV

- The Airlines staff and the airport authorities with the cooperation of the health authorities are to send the passengers in a dedicated ambulance without delay to the nearest hospital designated for the management of these cases.

Passengers free of symptoms

- All passengers and crew are subjected to health screening.
- The airlines should make available details of the other passengers for follow up should the need arise. The details required are the address while in Malaysia and telephone contact number.

Function of Airlines -REPORT ON MEASURES TAKEN ON BOARD THE FLIGHT

- The authorized airline representative will have to ensure that a report of measures taken on board is sent to the airport health authorities. ([Appendix 9](#))

DISINFECTIONS OF THE AIRCRAFT

- The airline should make the necessary arrangements for the disinfections of the aircraft. Whereas the procedures will be supervised and observe by the Health Inspectors.
- The personnel who are involved in the disinfections of the aircraft are to wear disposable waterproof gloves and facemask.
- All materials used including personal protective equipments are to be disposed off separately and labeled as “hazardous material”. This waste material should not be carried on the aircraft.
- Hygienic practices like washing of hands with water and soap or alcohol based hand sanitizers after removal of the gloves should be made mandatory.

Function of Airlines -REPORT ON MEASURES TAKEN ON BOARD THE FLIGHT

DISINFECTIONS OF THE AIRCRAFT

The disinfectant that can be used are as follows;

ECO TRU 1453

ECO TRU FMD

EEE941A

Lysol or Dettol spray and lotion.

Other measures as outlined in the WHO Disinfections of Aircraft Guidance.



HOME ASSESSMENT TOOL

Individuals with fever, cough and / or sore throat are advised to seek medical care should they develop any sign and symptoms list below :-

- Respiratory difficulties – shortness of breath, rapid breathing or purple / blue discolouration of the lips
- Coughing out blood or blood streaked sputum
- Persistent chest pain
- Persistent diarrhoea and / or vomiting
- Fever persisting beyond 3 days or recurring after 3 days
- Abnormal behavior, confusion, less responsive, convulsion
- Dizziness when standing and / or reduced urine production

* **NOTE :** *This is to be given to the patient and to be kept by the patient within 14 days of receiving it.*



HEALTH ALERT CARD

*Keep this card for the next 14 days after returning to Malaysia. Monitor your body temperature and look out for fever ($\geq 38^{\circ}\text{C}$) and symptoms of cough and/or difficulty breathing. If these symptoms were to develop and you are not feeling well, seek medical advice **immediately**. As such, kindly practice the following*

- i. Cover your mouth and nose using tissue whenever you cough or sneeze. Immediately discard used tissues into waste basket. Wash your hands with soap and water or use hand sanitizer regularly;*
- ii. Always follow cough etiquette and use face mask whenever being in public or close contact with people.*
- iii. Always maintain good personal hygiene and cleanliness*

Attention To The Attending Doctor:

*The person who is presenting this **ALERT CARD** to you had recently travelled or returned from Middle East Countries (within the past 14 days). If the person presents with fever ($\geq 38^{\circ}\text{C}$), cough and breathing difficulty, please refer him/her **immediately** to the nearest hospital.*



TERIMA KASIH