Handbook for the Management of Public Health Events in Air Transport

Updated with information on Ebola virus disease and Middle East respiratory syndrome coronavirus

World Health Organization

International Health Regulations (2015)

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WHO LIBRARY CATALOGUING-IN-PUBLICATION DATA

Handbook for the management of public health events in air transport: updated with information on Ebola virus disease and Middle East respiratory syndrome coronavirus.
1.Disease Transmission, Infectious. 2.Air Travel. 3.Disease Notification. 4.Disease Outbreaks. 5.International Cooperation. 6.Handbooks. I.World Health Organization.

ISBN 978 92 4 151016 5 NLM classification: WA 55)

Design by Crayonbleu, Lyon, France

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EXECUTIVE SUMMARY

With the adoption of the International Health Regulations (IHR) by the World Health Assembly in May 2005, States Parties agreed to develop, strengthen and maintain public health core capacities for prevention, surveillance, control and response at designated points of entry (PoE) as specified in IHR Annex 1. This includes the establishment and maintenance of public health emergency contingency plans at PoE to prevent the international spread of disease. IHR assigns the World Health Organization (WHO) the responsibility to publish, in consultation with States Parties, guidelines on the development of public health surveillance and response capacities.

According to IHR, competent authorities responsible for the implementation and application of health measures with a defined role at airports (Article 22) are responsible for responding to events that pose a risk to public health, using a multi-sector approach. Events may be caused by biological, chemical or radiological agents. These events are identified through information gathered from air crew or from other competent authorities at the airport during an inspection of an aircraft on the ground. They can also be identified through other informal routes such as media or traveller reports. Event management involves event identification, verification, risk assessment, public health response, monitoring and evaluation.

A wide variety of health events ranging in severity may occur during air transport, requiring different responses or, perhaps, no response. The target audience for this guidance document includes the national focal points (NFP) for the IHR and public health authorities at PoE, as well as national aviation regulatory authorities, airport operators and personnel, aircraft operators, air crew and other stakeholders involved in air transport and emergency preparedness and response to public health events. This document is complementary to other WHO publications addressing risk assessment at a national level, contingency planning at PoE, establishment of capacities and application of emergency plans at the airport level.

Based on input from stakeholders, this document draws on the scientific literature to provide substantive public health guidance on public health events related to air transport. **It is not intended to be a technical, operational guideline.** However, it will support the development of national or site-specific operational guidelines and standard operating procedures, as well as support other air transport initiatives and those developed by the aviation sector.

This version also includes technical documents and lessons learned during the 2014–2015 outbreaks of Ebola virus disease (EVD) and Middle East respiratory syndrome corona virus (MERS-CoV).

This document does not address first aid and emergency medical care which may be required during air transport; the bibliography contains links to relevant and comprehensive sources of information on those issues. The public health information is intended to help competent authorities at airports implement a risk assessment approach to public health events in a consistent manner and assist in determining interventions that are

commensurate to the risks, while avoiding unnecessary interference with international traffic and trade.

The development of this guidance was launched in 2011. It is based on the principles of the WHO technical advice for case management of Influenza A (H1N1) in air transport, which is the product of the collaborative efforts of WHO, the International Civil Aviation Organization (ICAO) and the International Air Transport Association (IATA). This guidance was developed in response to requests from States Parties and the aviation industry for generic guidance on public health events that may occur during air travel, including at airports. The aviation sector was consulted throughout its development, in particular through significant collaboration with the ICAO and IATA. Considerable efforts have been made to consult with stakeholders by providing opportunities for input and feedback in 2013 and 2014.

During the period this guidance was written, the global community experienced two outbreaks. The first of which, EVD, was declared a "public health emergency of international concern" by the IHR Emergency Committee in August 2014. At this writing, the second outbreak, MERS-CoV continues to cause infection in various Member States and regions of the world. The lessons learned from the global response to these outbreaks, particularly in relation to public health measures adopted at PoE, have been incorporated into this guidance, either as direct references or through links to relevant documents. It is anticipated that this guidance document will continue to reflect best practices in the management of public health events in air transport through future reviews and revisions.

ACKNOWLEDGEMENTS

This document has been produced with the financial assistance of the European Union. The views expressed herein can in no way be taken to reflect the official opinion of the European Union.

The following experts participated in the guideline working group and provided input to the preparation and review of the guidelines. Their contributions are gratefully acknowledged.

AVIATION SECTOR

- Anthony Evans, Chief, Aviation Medicine Section, International Civil Aviation Organization, Montreal, Canada
- Claude Thibeault, Medical Advisor, International Air Transport Association, Montreal, Canada and Chairman, IATA Medical Advisory Group
- Jarnail Singh, Civil Aviation Medical Board, Civil Aviation Authority of Singapore Changi Airport, Singapore
- Khalil Khalil, Head of Aviation Medicine Department, Civil Aviation Regulatory Commission, Amman, Jordan
- Dr Nigel Dowdall, Head, Aviation Health Unit, Civil Aviation Authority, Safety Regulation Group, Gatwick Airport South, West Sussex, United Kingdom
- Michiel Vreedenburgh, Aviation Safety Implementation, Air Navigation Bureau, International Civil Aviation Organization

PUBLIC HEALTH SECTOR

- Maria João Martins, International Health Team Coordinator, Health Authority of Lisbon and Tagus Valley, Lisbon, Portugal
- Mohamed Moussif, Chief, Sanitary Control Division, Mohamed V Airport, Nouasser, Casablanca, Morocco
- Rosemarie Neipp, Head of Health and Sanitary Control Unit, Sub Directorate General of Foreign Health, General Directorate for Public Health, Quality and Innovation, Ministry of Health, Social Services and Equality, Madrid, Spain
- Marie-Line Sauvée, Project Manager for the IHR, Ministry of Social Affairs and Health, Paris, France
- Will Miller, Director, Border Health Services, Health Protection Programs Branch, Department of Health, Canberra, Australia
- Mustafizur Rahman, Assistant Airport Health Officer, Hazrat Shah Jalal International Airport, Dhaka, Bangladesh
- Manohar Singh Rajamanickam, Medical Officer of Health at Ports, Ministry of Health, St. Michael, Barbados

- Fabio Rocha, Specialist in Regulation and Health Surveillance, Ports, Airports, Borders and Enclosures, ANVISA, Basilia, Brasil
- Cristiano Gregis, Coordinator for Health Travelers, COSVI-ANVIS, Brasil
- Fiffen Alassa, Coordinator, National Observatory of Public Health, Cameroon
- Kevin Carlisle, A/National Manager, Travelling Public Program, Office of Border Health Services, Public Health Agency of Canada, Vancouver, Canada
- Gina Dumaresq, Director of Border Health Services, Public Health Agency of Canada, Ottawa, Canada
- Ying Qingshuang, Xiamen Entry Exit Inspection and Quarantine Bureau, Xiamen, China
- Zhang Min, Guangdong Entry Exit Inspection and Quarantine Bureau, Guangzhou, China
- Jelena Rjabinina, Chief Specialist, Bureau of Epidemiological Preparedness, Department of CD Surveillance and Control Health Board, Tallinn, Estonia
- Dominque Dejour Salamanca, Agence régionale de Santé Rhône-Alpes, France
- Catherine Guichard, Department of Health Emergencies, Ministry of Health, Paris, France
- Thierry Sauvage, Health of Health Services for Seafarers, Ministry of Transportation, Paris, France
- Mathias Kalkowski, Port Health Inspector, Hamburg Port Health Authority, Institute for Hygiene and Environment, Hamburg, Germany
- Andreas Gilsdorf, AIRSAN, Surveillance Unit, Department for Infectious Disease Epidemiology, Robert Koch Institute, Berlin, Germany
- Maria an der Heiden, Surveillance Unit, Department for Infectious Disease Epidemiology, Robert Koch Institute, Berlin, Germany
- Michael Adjabeng, National Focal Point, Ministry of Health, Korle Bu, Accra, Ghana
- Sujeet Kumar Singh, Deputy Director General, International Health, Nirman Bhawan, New Delhi
- Femmy Bawole Kawangan, Health of Port Health Office, Batam, Indonesia
- Payman Hemmati, Senior Officer, Surveillance Department, Centre for Disease Control, Ministry of Health / Medical Education, Iran
- Tomoy Hirosawa, Deputy Director, Office of Pandemic Influenza Preparedness and Response, Division of Tuberculosis and Infectious Diseases Control, Ministry of Health, Labour & Welfare, Tokyo, Japan
- Param Jeeth Singh, Health Officer, Ministry of Health, Selangor, Malaysia
- Abderrahim Rachdi, Ministry of Health, Tangier, Morocco
- Babu Ram Marasini, Director, Epidemiology & Disease Control Division, Department of Health Services, Ministry of Health & Population, Teku, Kathmandu, Nepal

- Pawel Abramczyk, Chief of PoE Department, Department of International Cooperation & Border Sanitary Protection, Warsaw, Poland
- Janusz Janiec, IHR National Focal Point Coordinator, National Institute of Public Health, Department of Epidemiology, Warsaw, Poland
- Miguel Dávila-Cornejo, Head, Unit of International Alerts, Directorate General of Public Health, Quality & Innovation, Ministry of Health, Social Services & Equality, Spain
- Rosa Maria Lopez Gigosos, Port Health Authority, Malaga, Spain
- Vichan Pawum, Chief Medical Officer, International Communicable Disease Section, Department of Disease Control, Ministry of Public Health, Nonthaburi, Thailand
- Afif Ben Salah, Director of Primary Health Care, Ministry of Public Health, Bab Saadoun, Tunis, Tunisia
- Yahya Alamese, Manager, Environmental Health Officer, Directorate General of Health for Border and Coastal Areas, Health Control Service, Istanbul, Turkey
- Eirian A Thomas, Principal Health Protection Scientist, International Research & Development, United Kingdom
- Martin Walker, Port Health Officer, Suffolk Coastal Port Health Authority, Felixstowe, United Kingdom
- Nicole Cohen, Associate Chief of Science, Quarantine & Border Health Services Branch, CDC Division of Global Migration & Quarantine, Atlanta, Georgia
- Susan Lippold, Air Activity Lead, Quarantine & Border Health Services Branch, CDC Division of Global Migration & Quarantine, Atlanta, Georgia
- Lucia Alonso, Deputy Director, Epidemiology Division, Ministry of Public Health, Uruguay
- Birgitta de Jong, Senior Expert, Epidemic Intelligence & Response Section, ECDC, Stockholm, Sweden
- Barbara Mouchtouri, WHO Collaborating Centre for the International Health Regulations: points of entry at University of Thessaly, Greece

The Contributions of the following WHO personnel from WHO headquarters, regional offices, are also acknowledged:

WHO REGIONAL OFFICES

- Fernando Da Conceicao Silveira, Medical Officer, Regional Office for Africa, AF/IDS Integrated Disease Surveillance, Libreville, Gabon
- Roberta Andraghetti, IHR Regional Advisor, Regional Office for the Americas, Washington, DC
- Thomas Hofmann, IHR Area Coordination, Regional Office for Europe, Copenhagen, Denmark
- Rana Bardan Jun, Medical Officer, Regional Office for South-East Asia, New Delhi, India

WHO HEADQUARTERS

- Daniel Menucci, Global Capacity Alert and Response
- Ninglan Wang, Global Capacity Alert and Response
- Candice Vente, JPO, Technical Officer, Ports, Airports & Ground Crossings
- Camille Cellier (Intern)
- V. Susan Clay (Consultant)
- Sebastien Bruno Francois Cognat, Global Capacity Alert and Response
- Magdi Samaan, Global Capacity Alert and Response
- Pierre Nabeth, Global Capacity Alert and Response
- Dr José Guerra, Global Capacity Alert and Response

ACRONYMS

ATS	Air Traffic Services
EVD	Ebola Virus Disease
HACCP	Hazard Analysis Critical Control Point
IAEA	International Atomic Energy Agency
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IHR	International Health Regulations
ILI	Influenza-Like Illness
MERS-CoV	Middle Eastern Respiratory Syndrome–Corona Virus
NFP	National (IHR) Focal Point
OH	Occupational Health
PHA	Public Health Authority
PLF	Passenger Locator Form
PPE	Personal Protective Equipment
PoE	Points of Entry
SARPs	Standards and Recommended Practices
SARS	Severe Acute Respiratory Syndrome
SOP	Standard Operating Procedure
UN	United Nations
WHO	World Health Organization

DEFINITIONS

If not included in this section, words have the meaning as defined in the International Health Regulations (IHR) *(1)*. The IHR were adopted in 2005 and came into effect in 2007. This report assumes the IHR referred to are those from 2005 unless otherwise mentioned.

"Affected area," means a geographical location specifically for which health measures have been recommended by WHO under the International Health Regulations.

"Aircraft operator" A person, organization or enterprise engaged in or offering to engage in an aircraft operation, including air crew and ground crew.

"Air crew" Personnel of an aircraft operator who are employed for duties on board the aircraft, including:

- cabin crew personnel working in the cabin;
- flight crew personnel working on the flight deck.

"Air Traffic Services *(2)*" A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service

"Competent authority" means an authority responsible for the implementation and application of health measures under these Regulations.

"Contact" refers to a person or animal that has been in such association with an infected person or animal or a contaminated environment as to have had opportunity to acquire the infection.

"Contact investigation" refers to the process of identification, assessment and follow-up of close contacts of index cases.

"Ground crew" includes personnel who provide and maintain onboard aircraft services, including water and waste systems, grooming and routine maintenance.

"Hand hygiene" refers to any action of hand cleansing, performed by washing one's hands with either soap and water or an antiseptic hand rub for at least 15 seconds.

"Hazard" (3): An agent or a source that has potential to cause adverse health effects in exposed populations.

"National health authorities" refers to the States Parties national health authority.

"Onboard ill person" means a person with an illness that may present a public health hazard and may result in transmission to other travellers.

"Points of entry (PoE)" means a passage for international entry or exit of travellers, baggage, cargo, containers, conveyances, goods and postal parcels as well as agencies and areas providing services to them on entry or exit.

"Port health" refers to health authorities responsible for public health at a specific PoE (in this document, generally refers to an airport).

"Public health authority" means the national or local States authority to manage public health.

"Public health emergency of international concern (PHEIC)" means an extraordinary event, which is determined, as provided in the International Health Regulations (IHR):

(i) to constitute a public health risk to other States through the international spread of disease;

(ii) to potentially require a coordinated international response.

"Risk" is the probability or likelihood of harm or damage occurring from exposure to a hazard, and possible consequences.

"Risk assessment" *(3)*: A systematic process for gathering, assessing and documenting information to assign a level of risk to human health to an event.

"Serial interval" means the mean time interval between onset of illness in 2 consecutive patients in a chain of transmission.

"Social distancing" includes measures such as school closures or the cancellation of large gatherings.

Chapter 1. Introduction

With the increase in global transport of passengers and cargo, the potential transmission of communicable disease or exposure to other agents of public health significance has increased substantially. According to the World Health Organization's (WHO) *International Travel and Health (4)*, "more than 900 million international journeys are undertaken every year. Global travel on this scale exposes many people to a range of health risks."[1]

While a competent authority must include a risk assessment as part of the decision-making process, the very nature of air transport limits the time available for the risk assessment process. Itineraries, the environment at departure, conditions during flight and passenger volumes all contribute to the challenge of managing public health events during air transport. Airports are places where travellers, the public and airport workers may interact in close surroundings, particularly when embarking or disembarking.

Passengers arrive from international or domestic destinations with their baggage, and air cargo may originate from different parts of the world to be loaded or offloaded on aircraft for transport. Passengers and cargo may be in-transit to be transported from airports to other destinations, frequently connecting with other airlines or other international or domestic conveyances. All these activities provide opportunities for interactions among persons and their environment, with the potential for exposure to and/or transmission of disease. The need to prepare and maintain the capacity to respond to public health events in this complex air travel environment has been highlighted by recent public health events, including the outbreak of severe acute respiratory syndrome (SARS) (2003), the H1N1 pandemic (2009) and the radiological concerns following the earthquake in Japan (2011). Many countries, not just those directly affected by these events, have gained experience in identifying and responding to diverse public health events. The knowledge and experience gained during these events has resulted in best practices developed by both public health and aviation sectors.

The IHR, a binding legal agreement that 194 WHO Member States have signed, sets forth the requirements to develop core capacities for prevention, detection and response at designated points of entry (PoE), both for routine operations and public health emergency response, aimed at enabling a rapid and harmonized response to public health events globally. With the adoption of an «all-hazard approach» to public health risk, event management in air transport requires a multidisciplinary, multi-sector approach and must be implemented in the context of IHR, other intergovernmental agreements and national and regional rules and regulations. This framework of regulations, agreements, plans and protocols informs the roles and responsibilities of the involved parties, including: aircraft operators, airport operators, aviation regulatory authorities, supporting industry to the aviation sector, public health authorities and other stakeholders.

In the aviation sector, the Convention on International Civil Aviation is the legally binding document that underpins all civil aviation activities related to safety, security and efficiency. Article 14 of the Convention requires countries to prevent the spread of communicable diseases, in collaboration with other agencies. The International Civil Aviation Organization (ICAO), a specialized agency of the United Nations (UN) is responsible for developing international Standards and Recommended Practices (SARPs) which countries use to form national

1 - http://www.who.int/ith/en/

legislation. The SARPs can be found in 19 annexes to the Convention. Several annexes contain SARPs related to the implementation of the IHR. More information on the regulation of the aviation sector can be found in chapter 2, below.

Because of the disparate nature of the public health and aviation sectors, it is essential that efficient and effective lines of communication be established between stakeholders. Although often a major challenge, this will facilitate coordination and collaboration in the development of preparedness plans, reduce the risk of misunderstanding and assist in the development of coordinated plans.

It is recommended that either an existing or newly formed committee[2] be established between the civil aviation authority, airport and aircraft operators and public health sector to enable all sectors to coordinate public health preparedness plans and any other issues relating to the management of public health related events at the airport or on aircraft. Public health procedures must be included as a component of the aerodrome emergency plan and other relevant airport contingency plans.

1.1 PURPOSE AND SCOPE

This document has been developed to assist competent authorities with public health event management in the aviation sector using a multi-sector approach. It refers mainly to events related to communicable diseases, but as directed by the IHR, also considers the «all-hazard approach» to briefly address issues related to public health risks of biological, chemical and radiological nature. The guidance in this document should assist competent authorities at airports with the job of conducting risk assessments in the context of IHR, to respond in a consistent manner to events and to make decisions on interventions that are commensurate to the risks while avoiding unnecessary interference with international traffic and trade. This document may also assist authorities in establishing national or site-specific operational plans and standard operating procedures (SOPs) to manage public health events during air transport.

This document targets personnel responsible for event management at airports such as personnel working in port health, public health, medical, veterinary, environmental, customs and immigration, occupational health (OH) services, airport management, air traffic control provisions, as well as other emergency responders and aircraft operators. This advice may also be useful to IHR national focal point (NFP) personnel. Medical care and treatment are beyond the scope of this document.

The establishment of contingency plans is a prerequisite to managing all types of events. This guidance should support or be useful in the development of the public health component of the aerodrome emergency plan. For technical guidance in developing public health contingency plans, please consult WHO's guide for public health emergency contingency planning at designated points of entry (5) as well as the aviation-related guidance, as discussed further in the document.

1.2 METHODOLOGY

This guidance document utilizes methodology used to draft similar WHO guidance documents, including collaboration with the aviation sector and public health experts. A drafting group was established and consultation occurred by teleconference and email exchange. The preliminary document was presented for discussion in an informal consultation meeting

2 - ICAO has a requirement for the establishment of a Facilitation Committee to address issues relating to handling travellers at airports. The Facilitation Committee could provide the structure for multisector collaboration in the development of preparedness plans.

in Bern on 17 June 2013 with broader opportunity for input and informal consultation in Lyon on 14/15 April 2014.

LITERATURE REVIEW

A literature review was undertaken by WHO in 2013 to support the development of this guidance document. Landmark studies and significant findings are referenced throughout.

The objectives of the literature review were threefold:

- to ensure that the guidance document addresses current and emerging public health issues;
- to provide a theoretical and evidence base for the guidance document;
- to identify any gaps in research or evidence concerning public health event management.

The following search terms were used:

a) disease, infection, infectious, illness, sickness, syndrome, public health risk, public health hazard, public health event, disease transmission, disease importation, airborne, droplets, person-to-person, exposure, chemical, radiological,

b) tuberculosis, TB, measles, influenza, flu, respiratory syndrome, MERS, corona virus, SARS, Norovirus,

c) airplane, aircraft, air transport, air travel, flight, onboard, airport, airliner, passenger, travellers,

d) virus, vector, mosquito, bug, pathogen, insect, microbe, microorganisms, bacteria, biological, zoonotic.

The researchers used the following search engines: Medline, Science Direct, Gift (Global Information Full Text provided by WHO libraries) and Google. The following websites were also searched for relevant guidance documents:

- International Civil Aviation Organization (ICAO) www.icao.int/ and www.capsca.org
- International Air Transport Association (IATA) www.iata.org
- Airports Council International (ACI) www.aci.aero
- Aerospace Medical Association (AsMA) www.asma.org/
- Food and Agriculture Organization (FAO) www.fao.org/
- Federal Aviation Administration (FAA) www.faa.gov/
- U.S. Centers for Disease Control and Prevention (CDC) www.cdc.gov/
- European Centre for Disease Control (ECDC) www.ecdc.europa.eu/

EXCLUSIONS

The focus of this literature search was traveller health, and more specifically, public health issues related to traveller health during air travel. Research and guidance aimed solely at OH issues for workers are excluded from this report.

Although the literature search did not pre-set time limits, most documents were written between 1990 and 2013. Where there is a significant body of work on a single topic, this document focuses on the most current research results or guidance documents.

Although the original literature search did not include EVD or MERS-CoV as specific search terms, nevertheless, during the course of development, this version the guidance document

has been updated to reflect advice and various guidance documents developed to support the 2014-2015 Ebola virus disease (EVD) and Middle East respiratory syndrome corona virus (MERS-CoV) outbreaks.

RESULTS

The literature search yielded 160 relevant documents, including medical and epidemiological studies, literature reviews, guidance documents and operating protocols developed by epidemiologists, researchers, the aviation sector and regulatory agencies, the medical profession and public health authorities.

The search identified guidance documents and protocols related to aircraft cleaning and disinfection. Vector control, in particular aircraft disinsection, was the subject of a number of papers. New tools for public health risk assessment associated with air travel that have been developed or are in development were also identified. A significant number of the relevant studies were related to infectious diseases in humans. Case and outbreak reports of diseases spread directly or indirectly via food, water and arthropod-borne diseases associated with air travel were identified and are discussed in detail in this document.

A number of recent studies evaluated the effectiveness of selected public health measures, including travel restrictions, border controls, quarantine and isolation used as part of a public health response to the SARS and influenza outbreaks/pandemics. Other documents related to public health measures included risk assessment, risk communication and the challenges of contact tracing during travel.

The search also identified a considerable body of work related to in-flight public and medical emergencies. This includes protocols for dealing with a variety of medical emergencies in-flight; guidance for health professionals who may assist during emergencies; and guidance for air crew in managing public and medical emergencies and deaths on board aircraft.

Documents developed by or in collaboration with the aviation sector provide operational guidance on many aspects of travel-related health considerations, including some of the challenges faced by the sector in responding to changing global health issues.

A number of documents related to OH issues for airport and crew, including the radiological hazards of air travel; if the document focused on OH issues only, these documents are not discussed further.

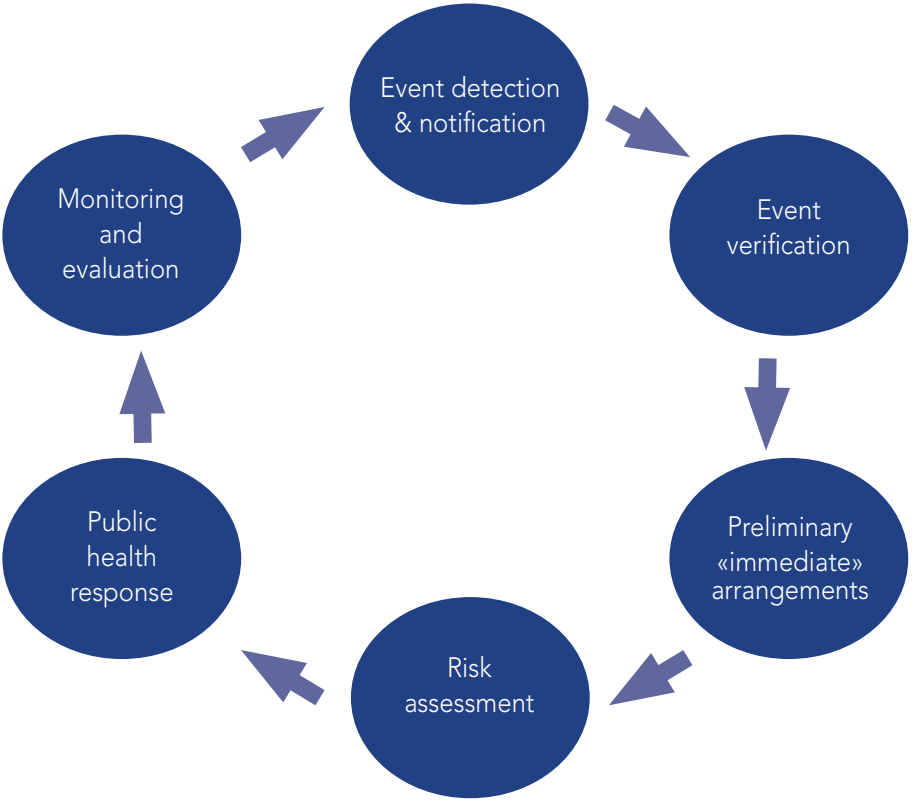
There was minimal literature available on chemical exposures as a public health issue associated with air travel with the exception of pesticide exposure during disinsection.

1.3 Approach to risk assessment

The risk assessment approach set out by the IHR was incorporated as a general principle, including the use of IHR Annex 2 "Decision Instrument for the Assessment and Notification of Events that may Constitute a Public Health Emergency of International Concern". Figure 1 sets out the basic framework for public health risk management that has been adopted for this document.

The *Rapid Risk Assessment of Acute Public Health Events (3)* is a useful reference on the risk assessment process. Other relevant risk assessment guidelines for selected infectious diseases transmitted in air travel *(6)* are referenced in the document or included in the bibliography, where appropriate. The selection and discussion of public health measures/responses draws on evidence and guidance from multiple sources identified in the literature review.

Figure 1. Risk management model for document



Chapter 2. Legal and ethical dimensions of international public health response

The increase in global travel and recent public health events has triggered a corresponding increased interest in international health law, including the development and implementation of the IHR. As part of public health planning and response, State Parties must consider both legal and ethical dimensions.

For the purposes of this guidance document, only the primary legal authorities based on WHO, IHR and ICAO are included. State Parties should refer to national and regional legal authorities for other applicable legislation.

2.1 WHO and the IHR

WHO is the directing and coordinating authority for health within the UN system. It is responsible for providing leadership on global health matters, shaping the health research agenda, setting norms and standards, articulating evidence-based policy options, providing technical support to countries and monitoring and assessing health trends. WHO Member States led the IHR revision recognizing that health is a shared responsibility, involving equitable access to essential care and collective defence against transnational threats[3].

The goal of the IHR is to provide a legal framework for the prevention, detection and containment of public health risks at the source, before they spread across borders, through the collaborative actions of States Parties, WHO and all relevant stakeholders. The IHR were adopted in 2005 and came into effect in 2007. All State Parties who accepted the IHR without reservations are legally bound to implement them accordingly.

The IHR includes protection for the human rights of persons and travellers, setting out as a principle that "the implementation of these Regulations shall be with full respect for the dignity, human rights and fundamental freedoms of persons" (Article 3). This is in acknowledgement that public health measures which impose limits on movement or require other interventions at a personal or community level may at times be warranted for the 'public good' but must be balanced by ethical considerations.

2.2 ICAO and the Chicago Convention

A specialized agency of the UN, ICAO, was created in 1944 to promote the safe and orderly development of international civil aviation throughout the world. It sets standards and regulations necessary for aviation safety, security, efficiency and regularity, as well as aviation environmental protection. The organization serves as the forum for cooperation in all fields of civil aviation among its 191 Contracting States. Its work is underpinned by the Convention on International Civil Aviation, the "Chicago Convention", which is legally binding[4] . Compliance by each State within the Convention with the Standards and Recommended Practices in its 19 annexes is audited by ICAO and the results posted on ICAO's public website. Article 14 of the Convention is titled Prevention of Spread of Disease and it encourages contracting States to take "effective measures to prevent the spread of communicable diseases" and to collaborate with other relevant agencies to this end.

3 - WHO http://www.who.int/about/en/
4 - http://www.icao.int/about-icao/Pages/default.aspx

Relevant annexes and other documents for public health include the following:

- Annex 6 – Operations
- Annex 9 – Facilitation
- Annex 11– Air Traffic Services
- Annex 14 – Aerodromes
- Procedures for Air Navigation Services – Air Traffic Management
- Annex 18 (Doc 9284) - Technical Instructions for the Safe Transport of Dangerous Goods by Air *(7)*.

According to the ICAO website[5] :

The Collaborative Arrangement for the Prevention and Management of Public Health Events in Civil Aviation (CAPSCA) exists to prevent and manage the spread of communicable diseases that cause, or have the potential to cause, a public health emergency of international concern. A multi-sector initiative, it facilitates communication and collaboration between all stakeholders, particularly the public health and aviation sectors, in order to develop and test public health emergency preparedness plans in aviation. It assists States to implement the relevant ICAO Standards and Recommended Practices and to comply with the World Health Organization International Health Regulations (2005). Founded on the need to address hazards and risks associated with infectious diseases that affect aviation, the work is also fundamental to managing other public health emergencies of relevance to aviation, such as those from a nuclear power plant accident.

5 - http://www.icao.int/safety/Pages/crisis-management.aspx. and www.capsca.org.

Chapter 3. Communication of public health events

3.1 Travellers, the public and media

Both the traveller and the aviation sector have responsibility for protecting individual and public health during air travel. State Parties and public health authorities have a responsibility to communicate potential public health risks in a timely and appropriate manner. The availability of electronic information sources has improved public health authorities' as well as the aviation sector's ability to communicate public health risks to travellers.

3.1.1 Departing travellers

Individuals who are planning a journey by air should seek information on any potential travel hazards as part of their travel planning. This should include considering their personal health status and any contra-indications for travel at various points in their itinerary. The aviation sector provides information regarding medical clearance for travellers with health conditions that may impact their suitability for air travel *(8, 9)*. WHO and other public health authorities provide comprehensive travel health information online for travellers to consider in planning a journey. The WHO Global Outbreak and Alert Response Network includes current information on outbreaks around the world[6]. There are also mobile computer program applications, so-called apps, to help departing travellers stay current with emerging situations including disease outbreaks (e.g. http://healthmap.org/en/). Travellers should be advised to visit a travel health clinic or international vaccination centre to collect health information about the country they are going to visit and be vaccinated if needed. Travel agents may also provide information regarding possible health risks to travellers during travel planning or ticketing.

In the event of a serious public health hazard or emergence of an infectious disease threat, State Parties may issue travel alerts, including providing health information at airports. As an example, WHO has provided a template of information related to EVD for use by State Parties[7]. This includes an infographic related to air travel[8]. The aviation sector has also provided sample scripts to be read on board aircraft travelling to or from affected areas (Annex 1). The use of consistent public health messaging by countries and the air industry increases the potential for traveller awareness of potential risks and actions to take.

State Parties may also request additional information from travellers at the airport about their health status or exposures (see entry and exit screening in section 8.4). Departing travellers should be advised, in advance, if possible, so they can seek advice on any concerns and are prepared for any delays related to the gathering of information. Travellers also have a responsibility to delay their travel if they become ill prior to departure. In addition, as addressed in IHR (Article 24), conveyance operators are responsible for informing travellers of the health measures recommended by WHO and adopted by the State Party for application on board.

3.1.2 In-transit and arriving travellers

Travellers who are ill, have been exposed to a potential health risk during travel, or are arriving in an area where an illness or event has occurred may be asked to provide personal contact information in case future follow-up is required. They may also be provided with information on any potential risk, as described in the following section on risk communications. This includes

6 - http://www.who.int/csr/outbreaknetwork/en/
7 - http://www.who.int/csr/disease/ebola/travel-advice/en/
8 - http://who.int/csr/disease/ebola/infographic/en/

travellers who are making connections between terminals or are transiting between different modes of transportation (from airline to rail or cruise ship, for example).

3.2 Public health risk communications

During a public health event, travellers, workers, media and the general public require relevant and timely information in a readily accessible format. The development and dissemination of appropriate information can be challenging due to the pressures of the event and the competing demands for information for various audiences (i.e. media, personnel and all agencies involved including international reporting).

A technical report by the ECDC *(10)* concluded that risk communication messages often fail to reach the intended communities, including those people most at risk of the diseases. During air travel, the challenges of reaching travellers is inherently difficult due to factors including the volume of travellers to near and far points across the globe, language barriers and other challenges related to building public trust.

Information provided on screens, monitors or static displays at airports in boarding or arrival lounges may be one of the best methods of raising awareness of public health issues. Future changes to the availability of electronic communication during flight may assist public health authorities in providing timely messages. As an example, many travellers carry mobile devices with email or messaging capability. If a traveller allowed access to their email or telephone numbers in order to receive travel updates, similar to that of flight arrival and departure information, public health authorities could provide near real-time updates to travellers or transmit email and/or text messages directing travellers to other online resources. Social media may also play a role in informing travellers of potential public health risks. However, travellers should be wary of inaccurate or misleading reports from non-public health sources.

While the aviation sector may facilitate this information exchange, public health authorities are responsible for providing the information to be disseminated[9]. A key feature of successful communication is the "one voice" where one agency, preferably the national or regional public health authority (PHA), provides consistent and timely information.

Internal communications between public health, the airport authority and airline operators should be described clearly in airport contingency plans (i.e. a communications plan for public health event) and tested during regular preparedness plan exercises.

9 - An example concerns the system for disseminating notices to airmen (NOTAMs) by the national civil aviation authority (CAA). Such notices provide operational information to pilots and may include details on public health-related aspects of flight operations e.g. traveller restrictions or landing refusal. While the procedure for disseminating such information lies with the aviation sector, any information being distributed concerning public health will almost invariably originate from a health authority and not from the CAA itself.

Chapter 4. Public health preparedness in airports and on aircraft

The importance of emergency planning and the need to consider public health events in contingency or business continuity plans is widely recognized and supported by the aviation sector. This work is multisectoral and includes collaboration between international civil aviation and public health agencies, aviation industry associations, air traffic services (ATS), airport operators and stakeholders, aircraft operators and national and local public health authorities.

For public health authorities, preparedness planning should recognize any limitations of authority to implement public health measures in the aviation sector during a public health event.

4.1 Public health preparedness in airports

The IHR (Annex 1B) outlines core capacity requirements for State Parties and designated airport authorities that must be present at all times and during events that may constitute a public health emergency of international concern. Annex 1B 2(a) requires that designated airports have public health emergency contingency plans; the WHO IHR checklist for core capacities at PoE includes an assessment on how the PoE plan is coordinated with national and regional public health emergency contingency plans.[10] WHO has published a guide for public health emergency contingency planning at designated points of entry, which may be consulted as part of the planning process *(5)*.

ICAO supports the inclusion of planning for public health events in ATS and airport contingency plans. Through the CAPSCA initiative, stakeholders representing civil aviation authorities, public health authorities, aircraft operators, airports and ATS collaborate to prepare for public health events *(11)*. This collaboration includes assistance to State Parties to develop national public health preparedness plans and "assistance visits" to countries and international airports to facilitate the development of public health emergency plans in accordance with the IHR and relevant aviation-related documents. Annex 9 to the Convention on International Civil Aviation requires States to have a "National Aviation Plan for a Public Health Emergency". Annex 14 requires airports to have an aerodrome emergency plan, including procedures for public health emergencies.

As with all emergency preparedness, public health contingency plans must be documented and tested through "real time" exercises with all parties involved.

4.2 Public health preparedness on aircraft

In addition to numerous guidance documents for the in-flight management of public health events, the trade association for airlines (International Air Transport Association, IATA) has produced a template for air carriers to develop an Emergency Response Plan for Public Health Emergencies[11] *(12)*.

4.3 Surveillance at points of entry

Effective surveillance systems drive public health action. Similar to contingency plans, surveillance systems must be established and maintained in advance of an event in order to detect changes in the pattern of morbidity or mortality. The IHR requires State Parties to meet core

10 - WHO may provide certification of airports at the request of State Parties, including the presence and functioning of public health emergency contingency plans (IHR Article 20 paragraph 4).

11 - http://www.iata.org/whatwedo/safety/health/Documents/airlines-erp-checklist.pdf

capacity requirements for surveillance and response (IHR Annex 1 A1 (a)).

To enable the early detection of public health risks requiring rapid investigation and response (an IHR requirement, known as Early Warning and Response, *13*), the efficient collection of pertinent information is critical, in addition to disseminating information to competent authorities who can carry out appropriate response measures.

The information generated at PoE including ports, airports and ground crossings has to be reported on a timely basis to the national health surveillance system (NHSS). Conversely, PoE have to receive, on a timely basis, all pertinent information generated from the NHSS and from elsewhere, which may contribute to their public health surveillance objectives.

Existing surveillance activity at airports may be limited in terms of effectiveness in identifying emerging illnesses and outbreaks because of the speed and scope of global air travel. WHO has published advising principles for the *Coordinated public health surveillance between points of entry and national health surveillance systems (14).*

Beyond requesting surveillance and response core capacities at the local, intermediate and national level, WHO plays a vital role in disseminating information to all countries. This exemplifies a unified global surveillance approach, which is beneficial during global public health events. For example, during the 2014-2015 EVD outbreak, WHO as part of the Ebola Response Roadmap[12] in collaboration with State Parties and regions, tracked morbidity and mortality and supported the public health event management in a variety of ways, including predicting the potential trends in affected countries, resource needs and effectiveness of the response.

12 - http://apps.who.int/iris/bitstream/10665/131596/1/EbolaResponseRoadmap.pdf?ua=1

Chapter 5. Event detection and notification

Timely detection and notification of a potential public health risk is critical to the management of a public health event. The aviation sector is faced with increasing challenges in ensuring travellers are healthy enough to travel prior to boarding, partly because of increased use of advance online check-in procedures. If a communicable disease is suspected on board an aircraft in flight, flight crew are required to notify public health authorities.

The first steps in the management of public health events in air transport relate to detection and notification of the event (Figure 2).

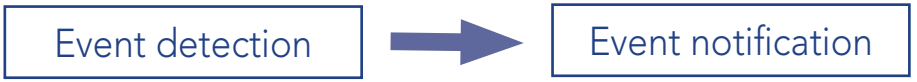


Figure 2. Event detection and notification of public health events in air transport

5.1 Event detection and notification/information sharing

During air transport, a potential public health risk may be detected at various points, depending on the nature of the exposure, status of global alerts and awareness of various parties (Figure 3).

Figure 3. Potential points of public health hazard detection or notification

5.1.1 Pre-travel: detection at the point of origin

Detection at the point of origin is done through the working surveillance systems of the State Party. If a country or region is experiencing an increase in infectious disease or has been affected by a biological, chemical or radiological event, national health authorities may issue a health travel alert. Depending on the risk assessment, a health travel alert may be implemented as a national response, or on the unified advice of WHO in coordination with other international agencies (e.g. the International Atomic Energy Agency, IAEA, for radiological events).

If a traveller with a potentially communicable disease is identified at the point of origin (e.g. by a physician at a health centre or travel health clinic), the traveller should be advised to delay travel until they have recovered. If the traveller has a notifiable communicable disease that may pose a health hazard to the public (examples include TB and measles), the public health authorities should be alerted for case management and contact investigation.

If an area is affected by a potentially serious outbreak of disease, WHO or other countries may implement travel advisories or notices, including recommending against travel to that area. The latter is an unusual action with potentially significant socioeconomic impacts *(15, 16)*. IHR Article 2 specifically encourages State Parties to avoid unnecessary interference with international traffic and trade.

Travel alerts may be issued for contagious diseases as well as chemical or radiological incidents. Recent examples include:

- Coronavirus infections, e.g. MERS-CoV: http://www.who.int/csr/disease/coronavirus_infections/en/
- Ebola Virus Disease in West Africa: http://www.who.int/csr/disease/ebola/travel-advice/en/
- Fukushima radiological event - travel information: http://www.imo.org/MediaCentre/PressBriefings/Pages/22-japan-update.aspx and http://www.icao.int/Newsroom/Pages/current-radiation-levels-in-japan-and-travel-advice.aspx.

5.1.2 During the boarding process

A competent authority (airport health authority) or other authorities may detect an illness or a potential health hazard at the time of departure in either travellers (airline passenger agents, security and passport control inspectors, cabin crew) or cargo (air freight operators).

TRAVELLERS

Unusual or severe illness in departing travellers may be detected by port health or other authorities. In this event, passengers may be interviewed or subjected to a health assessment before being allowed to board. (See entry and exit screening in section 8.4.)

Passenger agents for some airlines and airports are given training to help identify travellers who appear to be unfit to fly, either at the counter, in the passenger lounge prior to boarding or at the time of boarding. Passenger agents should seek medical advice before allowing the ill passenger to check in or to board the aircraft. The traveller may be requested to delay travel until they are well enough or have received medical approval to travel (8,9,). If a traveller refuses to delay his/her travel, the airline may exercise their right to refuse boarding.

The aviation sector is faced with increasing challenges in ensuring travellers are healthy enough to travel due, in part, to the use of online booking, advance check-in and self-tagging of baggage. This reduction in passenger contact, along with some airlines using unassigned seats, may also impair an airline's ability to support public health authorities during disease investigations.

CARGO

Shipping of cargo by air requires "chain of custody" documentation to identify its origin and nature as an essential part of safe handling. Based on examination of the documentation, the competent authority for cargo (usually customs/border services) for each State Party may subject suspect or potentially contaminated cargo to undergo visual, X-ray or other screening and/or inspection. In order to facilitate the handling of cargo, pre-screening and certification may be available; however, this will not eliminate the possibility of visual or other screening by a State Party.

Following screening, if cargo is suspected of being a potential public health hazard, it may be refused entry or required to undergo further testing or decontamination prior to receiving permission to enter the country and be transported[13] . The competent authority responsible for cargo should work closely with public health authorities to ensure appropriate methods for communication and cooperation are planned, tested and implemented at airports and airfreight hubs.

13 - As example, *Aedes albopictus* in shipments of 'Lucky Bamboo'. Accessed online 3-Dec 14 @ http://e-m-b.org/sites/e-m-b.org/files/JEMCA(32)14-16_0.pdf

5.1.3 During flight

Once passengers or cargo have been boarded and the flight is in progress, event detection will rely on the awareness of the cabin crew. As noted, cabin crew are responsible for the safety of passengers during flight but have limited capacity to detect and respond to medical or potential public health events.

If a medical emergency occurs, the cabin crew may be able to seek advice from a ground-based medical service provider or the assistance of a medically trained passenger on board. In serious cases, the pilot in command may consider diversion in order for the unwell passenger to receive the required treatment. In all cases, communication between the air crew and ground operations is necessary to ensure all parties are aware of the situation.

The reporting of illnesses and deaths on board to public health authorities (via ATS) is mandated in many countries *(17)*. In all cases, the pilot should notify air traffic control, as per ICAO provisions *(2- Annex 11)* of any suspected cases of communicable disease or evidence of a public health risk on board. IHR Annex 9 "Health Part of the Aircraft General Declaration" is available to be used after landing to report an ill person on board. Although not all State Parties require its use, it provides a communication tool for State Parties to acquire information regarding health conditions on board during an international voyage and health measures applied to the aircraft. If required, the State Party and airport should include the procedure for its use in emergency planning documents.

During the 2009 Influenza A H1N1 pandemic, WHO, in collaboration with ICAO and IATA, developed H1N1-specific event management guidance in air travel, with recommended procedures for cabin crew *(18)*. This guidance supports the IHR and may be useful for application during similar events or for developing preparedness plans.

The aviation sector has continued to collaborate with WHO[14] and public health authorities to support effective management of the 2014-2015 EVD outbreak.

5.1.4 Upon arrival and/or during transit to next transport

If evidence of infection or contamination is not detected during the flight, it may be detected upon arrival at an intermediary or final destination by port health or other authorities in the airport. An example of this measure is the public health 'entry screening' of flights originating from an EVD-affected country (see entry and exit screening, section 8.4).

Passengers and/or cargo may be subject to an epidemiologic investigation conducted by port health if the itinerary information suggests there was any travel in or near an affected area or other possible contacts with infection or contamination prior to arrival. If, for instance, a flight is arriving from a region or city that is known to be affected by an infectious disease or by biological, chemical or radiological exposure, an investigation may be conducted. At the request of port health, airlines may also request some or all passengers provide information on their itinerary and contact details. This information may be collected on a voluntary basis on public health Passenger Locator Forms (PLFs) from arriving travellers[15] .

Blank PLFs should be stored on site by port health at a designated airport or be available from regional or public health authorities for all airports. Because of the resource requirements necessary to securely store and utilize the personal information from PLFs, it is important that SOPs are developed to indicate when to request a PLF, from whom and where and how the

14 - Letter of collaboration ICAO-WHO August 29, 2014 accessed 3 Dec 2014 http://www.capsca.org/Documentation/Ebola/067e.pdf
15 - Public health PLF http://www.icao.int/safety/aviation-medicine/Pages/guidelines.aspx

information from these forms will be used and subsequently stored or destroyed. For further information, refer to contact tracing, section 8.5.

5.1.5 Final destination

Travellers arriving from an affected region or who may have been exposed to a potential public health risk during air travel may be contacted by public health authorities at their final destination to ascertain their health status. Cargo may also need to be assessed for potential disease reservoirs on arrival. Passengers who are ill or become ill after arrival may self-refer to a local physician or health centre.

The IHR requires State Parties to maintain core capacity for surveillance at all levels and at all times to ensure that public health events are detected and reported to the appropriate authorities.

Public health events can be detected through the national health surveillance system and related to travel afterwards. These events may require follow-up measures at PoE and must be communicated to PoE health authorities. Risk assessment should be performed once the public health authorities are notified that a contagious patient has travelled within the previous days/weeks, and appropriate measures should be taken (e.g. contact tracing) according to national or other guidelines for that disease.

5.2 information to travellers

When a suspected public health event has occurred during a flight, in addition to the use of the PLF and Traveller Public Health Declaration (Annex 5), disembarking travellers may be provided information on precautions to take in the event of illness, information sources for any updates on the event and PHA contact information for subsequent enquiries. A template information sheet should be developed in advance and included in the public health emergency plan. In 2014, during the EVD outbreak, public health authorities in several countries developed traveller notices to be distributed to disembarking passengers, informing them of signs and symptoms and where to seek medical support *(19)*.

IHR Articles 9 and 10 discuss the need for WHO and State Parties to collaborate and share information related to a public health event. If a State Party is providing specific information to travellers in relation to an international air travel event, the State Party may wish to communicate with WHO to ensure all parties are aware of the event and the actions taken.

Chapter 6. Immediate arrangements for travellers, aircraft, airport and other stakeholders

Once a public health event has been detected, it must be verified. Before the risk assessment is complete stakeholders must be prepared to provide immediate arrangements to mitigate the potential risk of the event. Preliminary standard response protocols should be included in airport, aircraft operator and public health contingency plans and exercised to ensure all parties are able to implement as required when needed.

Sharing information is key to ensure stakeholders are aware and prepared to respond. Because notification may be received with very limited time prior to flight arrival (due to delayed radio communication, flight diversion or other reasons), the planning of standard preliminary responses is of utmost importance. These standard responses should be included in the public health component of the aerodrome emergency plan as well as in the national aviation plan[16]. Preliminary standard response protocols should be applied once a potential public health event has been detected and verified, without awaiting the results of a full risk assessment.

6.1 Event verification and preliminary risk assessment

Once a potential public health event has been detected and competent authorities have been notified, there must be an attempt to verify the facts of the event to the fullest extent possible. Information may be collected from multiple sources, including the traveller, the aircraft operator, ground-based medical services for aircraft in flight (when available) or the agent responsible for the baggage or cargo.

The following basic information should be collected and documented in writing to support the preliminary risk assessment:

- Country of origin
- Airport at origin
- Flight number(s)
- Intermediary airports (during transit)
- Country and airport at destination
- Final destination including transport from airport to destination
- Type of exposure (infectious agent, chemical or radiological)
- Estimated time of exposure
- Number of persons exposed/cargo exposed
- Care and/or treatment provided
- Signs/symptoms if illness has occurred
- Current status of persons exposed, including medical assessment, release, hospitalization or death
- Nationality of passengers.

16 - Note: This is a required core capacity for designated PoE under the IHR. ICAO Annex 14 – *Aerodromes* – provides information on Aerodrome Emergency Planning requirements.

Additional information, if available, will inform the preliminary risk assessment:

- Where did the ill traveller sit during the flight (seat number, cabin area)?
- Who were close contacts (cabin crew, on board medical personnel, family and travelling companions)?
- Was there any contamination? If yes, where (e.g. seats, toilets) and what materials (e.g. blood, vomit)?
- Were there any travel delays? If yes, how long? If aircraft has an air recirculation system, was it on or off?

This information will be used by public health authorities during the preliminary risk assessment to determine what intervention, if any, may be applied: complete and accurate data collection is important. Information for event verification may be available from State Parties at the country of origin or destination, aircraft operators, ATS, Airport operations, on-the-ground medical support, port health, customs or security (police).

Table 1. Questions to guide preliminary risk assessment and immediate arrangements for travellers/aircraft

Question	Specific options for action	Other considerations
Has a potential public health event been reported from an aircraft?	Pilot to communicate with ATS in accordance with ICAO Doc. 4444 (2). ATS will forward the message to the arrival airport. This will be communicated with the PHA, aircraft operator and airport stakeholders in accordance with the aerodrome emergency plan so necessary arrangements can be made for receiving ill and healthy travellers.	Time available to organize immediate response may be short.
Has the traveller received medical assistance on board/during the flight?	Collect information from flight crew and any medical assistants prior to arrival. After notification of the event through the ATS, further communication with an aircraft in flight for public health purposes must be through the aircraft operator's own communication channels – not via ATS. Arrange medical assessment upon arrival at the airport.	Was there a universal precautions kit on board and if so, was it used? Were appropriate medical supplies available and used?
Does the traveller require medical attention upon arrival? What are the clinical signs and symptoms among travellers, including severity?	Arrange for first responders and possible transfer to medical facility by ambulance.	Identification of the receiving medical facility. Communication to first responder: Note if communicable disease is suspected.

Question	Specific options for action	Other considerations
Is a public health event suspected with potential for in-flight transmission? How many passengers were exposed?	Alert port health to meet the aircraft at the arrival gate. Ensure sufficient port health staff are available.	Access to gate by first responders.
Is the aircraft coming from an affected area where WHO has recommended public health measures?	Consult WHO website for recommendations on health measures. If exit screening was recommended, request information on implementation and affected traveller(s).	If appropriate, ask for support and information sharing from other authorities/experts.
Are there a large number of ill travellers or those suspected of being ill on the arriving aircraft?	Identify space requirements for interviews and health assessments of arriving travellers.	The space should have access to toilet facilities and seating.
Is the use of PLFs warranted in order to conduct follow-up contact tracing?	Ensure PLFs are available on board the aircraft or from port health at the destination airport. Determine which travellers should be requested to complete the PLF.	Have the capacity to collect, use and securely store personal information on PLFs. Plan for their use, confidential storage and subsequent safe disposal.
Do disembarking travellers require information in the event of subsequent illness?	Prepare in advance basic health information to be used in the event of respiratory or gastrointestinal illnesses. Provide regional or national public health contact information in the event of subsequent illness. If PHEIC, customize templates provided by WHO, if available.	Know the language requirements for the health information. Known or unknown mode of transmission?
Have any deaths been linked with the event?	Arrange for judicial authority to be present at the gate upon arrival. Investigate cause of death and ensure that an autopsy has been arranged, if necessary. Ensure that the death has been registered.	Monitor the event, obtain new information and undertake risk assessment. Plan for holding/storage of dead bodies and transport following medical examination.
When is the aircraft scheduled to depart? Are there a large number of connections to international or domestic flights?	Prepare for triage to minimize flight disruptions. Plan ongoing communications with airline, airport and ATS.	Plan for communications to travellers related to delays or missed connections.
Is the event related to a hazard where other authorities/experts should be involved (i.e. chemical or radiological)?	Communicate with airport operations to request advice from port health or authorities/experts (e.g. clinicians, epidemiologists, environmental or OH specialists).	The aircraft manufacturer should be consulted in order to consider any potential damage to aircraft components arising from the hazard. Arrange for support from persons with necessary expertise.

Question	Specific options for action	Other considerations
Will the aircraft require disinfection or decontamination prior to further departure?	Alert the ground handling crew, communicate any potential public health concerns and provide guidance, if requested.	Ground handling staff should have contingency plans that include requirements for cleaning and disinfection or decontamination, including the use of PPE. Ensure any disinfection or decontamination is conducted using products licensed for use in the country occupied and approved by the aircraft manufacturer.

6.1.1 In flight

IATA provides guidelines for cabin crew to manage a suspected communicable disease or other public health emergency on board *(20)*[17].

INFECTION CONTROL

The practice of infection control during flight is an important means of preventing or reducing the transmission of a communicable disease. IATA has produced a series of infection control guidance documents for cabin crew, cargo and baggage handlers, aircraft maintenance and cleaning staff and passenger agents, among others. The guidelines include basic infection control procedures in the event of a potential communicable disease case[18]. IATA has also published procedures to manage a potential foodborne illness *(21)*.

The success of any infection control procedure begins with the initial identification of the health condition. If illness is detected during flight, depending on the cabin seating and passenger load of the aircraft, there are limited opportunities for containment.

GENERAL CONSIDERATIONS

If an illness has the potential to be communicable, regardless of the agent that is causing it, the following immediate steps may be taken to reduce exposure and limit transmission to airline, port health staff or other personnel who have contact with the traveller:

- Designate one cabin crew member to look after the ill traveller, preferably the one that has already been dealing with this traveller;
- Practice hand hygiene (hand washing or hand rub);
- Use appropriate personal protective equipment (PPE) when handling blood, body substances, excretions and secretions;
- Handle any blankets, trays or other personal products used by the traveller carefully;
- Practice environmental cleaning and spills-management;
- Handle all waste in accordance with regulatory requirements or guidelines.

In addition to standard precautions, specific measures for disease syndromes or communicable disease may be applied. All potential illness must be documented in writing.

17 - http://www.iata.org/whatwedo/safety/health/documents/health-guidelines-cabin-crew-2011.pdf
18 - www.iata.org/whatwedo/safety/health/Pages/diseases.aspx

GASTROINTESTINAL ILLNESS

- In the event of a gastrointestinal illness, ill travellers should be moved to a seat near a washroom if several empty seats are available so that seating arrangement can be made without increasing the risk of contamination. (i.e. if the ill passenger has already soiled the seat or area, other passengers should not use that seat]; that lavatory should be restricted to their use, if possible, or if not possible, the lavatory should be cleaned following use by the ill travellers.
    - o If a public vomiting or faecal incident occurs, cabin crew must follow the protocols established by their airlines, including the use of appropriate tools/procedures to limit the contamination.
- If the flight is not full, a better solution is to move the surrounding passengers away from the ill passenger.

If available, cabin crew should use the universal precaution kit, recommended since November 2009. The kit, which should contain dry powder for spills, a germicidal cleaner, skin wipes, eye/face mask, impermeable full length long sleeved gown that fastens at the back, pick-up scoop with scraper, large absorbent towels, gloves and biohazard disposal waste bag will assist with infection control *(2 - Annex 6)*.

RESPIRATORY ILLNESS

- In the event of a respiratory illness, an appropriate (surgical or procedure) mask should be provided to the traveller, if available and tolerated by him/her. If the ill traveller cannot tolerate a mask, healthy travellers adjacent to the ill traveller may be offered masks.
- In all cases, the adjacent seat(s) should be left unoccupied, if feasible.
- Ensure the flight crew maintain continuous operation of the aircraft's air recirculation system (HEPA filters are fitted to the majority of large aircraft and will remove some airborne pathogens, depending on the size of the particulate or microorganism. This may vary with the specifications of the HEPA system).

ILLNESS TRANSMITTED BY DIRECT CONTACT WITH BODY FLUIDS (BLOOD, VOMIT, DIARRHOEA) (I.E. EVD)

- In the event of illness in a traveller from an affected country who exhibits signs or symptoms related to that illness, cabin crew should follow the protocols established by the aviation sector, their airline or as provided by WHO.
- Isolating the ill traveller by relocating travellers in the adjacent seats is advisable, if feasible.
- Cabin crew may wear masks when assisting the ill travellers.
- Universal precaution measures should be implemented by the cabin crew if they could be exposed to body fluids when assisting the ill traveller or when cleaning up spilled body fluids.

In addition to the generic guidance developed by IATA, the aviation sector in collaboration with public health authorities, have produced guidelines for specific communicable diseases case management including TB, SARS and pandemic influenza *(22, 23)*. The procedures developed for pandemic influenza (H1N1) *(18)* may be transferable to other potential infectious agents. This document includes recommendations directed to cabin crew to assist in responding to suspected cases of communicable disease in a traveller, with and without medical support. The recommendations also stress the importance of personal protection and hygiene.

During the 2014-2015 EVD outbreak, WHO and the aviation sector collaborated to provide guidance on the handling of ill travellers and those suspected of being ill. The Ebola event management interim guidance *(24)* outlines public health actions to be taken during travel and at PoE.

While the effectiveness of infection control procedures have often been evaluated in health care settings, there has been little evaluation of infection control procedures on board aircraft. A study of the effectiveness of face-masks to mitigate transmission of pandemic influenza (H1N1) determined that passengers who wore face-masks had a reduced risk of being infected *(25)*.

MEDICAL EMERGENCIES

A triage approach is recommended to ensure that any travellers with medical emergencies receive medical assistance as soon as possible. This may include assessment, basic first aid and medical procedures. ICAO standards and recommended practices for aircraft operators include the requirement for aircraft to be equipped with accessible medical supplies; there are also guidelines for the contents of medical supplies and first aid kits. Since November 2009, ICAO, IATA, and the Aerospace Medical Association (AsMA) have recommended airlines carry a universal precaution kit (described above) *(2- Annex 6, 26)*. It is recommended that PLFs are stored with or near the universal precaution kit[19].

The majority of medical issues that present during flight are more common ailments such as near-fainting, dizziness and hyperventilation[20]. Cabin crew should be aware of all procedures to follow, regardless of possible cause.

6.1.2 Upon arrival

Public health authorities will determine the order of disembarkation. Passengers other than those suspected of being ill and close contacts should normally be disembarked first, unless the affected person appears seriously ill and the medical responder is available at the gate when the aircraft arrives[21]. All crew working with ill travellers should follow State Party, local or company OH guidance, including the use of appropriate PPE to reduce the risk to themselves and other travellers. A multi-stakeholder SOP for managing the arrival of an affected aircraft, including timelines, should be developed involving all stakeholders.

Once the travellers with medical emergencies have received attention, port health can assess contacts associated with the public health event (air crew or travellers) either on board or at the gate. Every effort should be made to reduce the time that travellers spend on board an affected aircraft after parking. If port health requests passenger contact information for potential follow up, the PLF should be completed by those passengers identified by public health authorities, collected either by port health or a passenger agent at the gate and always before passengers leave the airport.

The IHR encourage State Parties to limit any measures that may interfere with international traffic (Article 2). Since aircraft and airport operations are highly time critical, thought should be given to the detailed procedure to be followed, once the aircraft is parked, in order to minimize any delay to its return to normal service. Most incidents that require the involvement of public health officers or first responders will not constitute a public health risk and in these cases it is important that time is used efficiently. Public health authorities, with the airport and aircraft operators, are encouraged to consider where delays in returning an aircraft to service may occur and to reduce these to a minimum.

19 - http://www.icao.int/safety/aviation-medicine/Pages/guidelines.aspx
20 - http://www.asma.org/publications/medical-publications-for-airline-travel/medical-guidelines-for-airline-travel
21 - www.capsca.org/Documentation/States/UnitedKingdomManagement ofOnboardSuspectCase.pdf

6.2 Information sharing and possible activation of contingency plans

6.2.1 Port health and first responders

Port health and the aviation sector must collaborate to ensure that relevant information regarding a potential public health event is relayed, according to procedures agreed upon locally and coordinated by the airport operator, to all relevant airport ground operations as soon as possible before landing. Note that ICAO procedures anticipate that the ATS unit serving the arrival airport will be the first to receive notification of a possible public health event on board and procedures should be developed for this scenario. However, notification may sometimes arise first through other channels (e.g. the company's communication system). In order to address all likely possibilities, procedures need to be developed with the involvement of all relevant stakeholders. The following actions should be taken into consideration by port health in collaboration with airport operations and other stakeholders:

- Activate a public health emergency response contingency plan, in consultation with port health and State Parties;
- If feasible, allocate space separate from other travellers or the general public to interview travellers suspected of being ill or affected persons;
- Allocate aircraft parking, either at the gate or on apron, with access for port health personnel and other first responders (the parking position does not usually need to be remote from the terminal building for public health purposes);
- Ensure adequate parking is provided for emergency response vehicles and personnel, including ambulances, hazardous or spill response vehicles;
- Implement security measures when entry or exit screening has been implemented;
- Maintain a log of activities for use in risk assessment and as permanent record of the event;
- Request the pilots to maintain operation of the aircraft recirculation system, before the main engines are shut down after parking. Such communication will usually require notification to the pilot by the airline ground-handling agent.
- If feasible, arrange for port health to provide information within the terminal to inform relatives and friends who may be at the arrivals area. At this stage, it is important to balance the need to provide an appropriate public health response with the need to share information using appropriate risk communication approaches (i.e. port health responders who access the aircraft or terminal with full PPE may cause unnecessary anxiety). In the age of social media, travellers may record the actions of any and all events they see for wider broadcast.
- Port health may assess the aircraft for contamination and any required cleaning/disinfection.

6.2.2 Immigration and customs authorities

Immigration/border personnel have a key role related to travellers and cargo that are intended for entry into the country. These personnel must be informed of the nature of the public health event, status of any ill travellers or suspected cargo and provided sufficient information in order to implement OH guidelines to protect themselves and healthy travellers, as required.

If ill travellers are to be transported to a medical facility, border and customs authorities must participate in case handling. Ill travellers may be approved for full or temporary entry to the country in order to seek medical attention, based on State Party legislation or guidelines (IHR Article 31).

6.2.3 Support services

Support services may include aircraft cleaners, cargo and baggage handlers, water handling services and/or waste removal services.

- Cleaning personnel (including aircraft cleaners) and ground handling service staff must be provided with information regarding the public health event by aircraft operators, airport operations or port health. This will allow all parties to implement special cleaning, disinfection or decontamination procedures and OH guidelines to protect themselves and healthy travellers, as required.
- Cargo and baggage handlers should be provided with information about the public health event by aircraft operators, airport operations or port health, including identification of any potentially affected baggage or cargo so they can implement safe handling and inspection procedures.
- Airport operations should provide water handling information about the public health event. Water servicing may be delayed until the port health environmental health team has conducted the preliminary assessment of the aircraft and issued any recommendations for decontamination or disinfection. Water handlers should receive approval prior to refilling or emptying on board potable water tanks since water from the arriving aircraft may require testing for possible contamination.
- Food catering companies may be advised of potential illness if galleys or catering equipment have been contaminated during the flight or if significant delays are anticipated. Similar to water handling, food from the flight suspected of being contaminated may require testing if a gastrointestinal illness has occurred: in that event, surplus food should not be removed for disposal until approval is received from public health authorities. If food poisoning is suspected, the cabin crew should follow their company protocol, if one exists.
- Waste removal service staff should be provided with information about the public health event. Waste removal may be delayed until the port health environmental health team has conducted a preliminary assessment of the aircraft and issued any recommendations for special waste handling, including disposal to a hazardous waste site in accordance with State Party legislation or airport operational guidance.

6.3 Diversion of aircraft

Aircraft involved in a potential public health event may be subject to diversion to an airport with sufficient capacity to respond or may be directed to a specific area of the destination airport for preliminary assessment. The IHR states that an aircraft should not be prevented from landing for public health reasons, but may be diverted to a more suitable point of entry if the original airport was not equipped to apply health measures that may be required (Article 28.1) [22].

Diversion to an intermediary airport requires the approval of State Party ATS in consultation with the aircraft operator's ground operations. If the aircraft flight plan is changed and involves over-flight of other countries, intermediary State Parties may also be consulted.

Diversion of a commercial aircraft is a major event with safety, health-related, customs/immigration, security and financial implications. Airport public health emergency plans may include the circumstances when diversion may be necessary; in general, this would be related to limited capacity to manage a potential public health risk at the time of the event.

All IHR designated airports should maintain core capacity at all times and in the event of a PHEIC; however such capacity may be temporarily limited due to environmental conditions, civil unrest or other circumstances. If diversion of an aircraft is being considered by port health due to circumstances at the airport, all stakeholders (especially aircraft and airport operators, air navigation service providers that are involved) should be informed as soon as possible.

6.4 Aircraft parking position at airport

Port health will collaborate with ATS and airport operations to determine the designated aircraft parking position at the airport. It is usually unnecessary for an aircraft to be parked on a remote stand for public health reasons. In most instances, parking at the usual gate will facilitate any required activities by medical or public health personnel, unless a risk assessment suggests an alternate parking position would be appropriate.

To reduce the risk of disease transmission, after parking, the aircraft's air conditioning/recirculation should continue to operate until passengers have disembarked. This will require either the aircraft's auxiliary power unit (APU) to operate after the main engines have been shut down, or a ground based system to be applied to the aircraft. Whether or not the aircraft's air conditioning/recirculation system will continue to operate after parking and main engines shut down is an important aspect of the public health component of the aerodrome emergency plan or associated SOPs. If the air conditioning/recirculation system cannot be operated after parking, passengers should be disembarked as soon as possible.

6.5 Port health assessment and recommendations for cleaning and disinfection of aircraft

Port health or other competent authorities may be requested to assess potential contamination of the aircraft related to the on board public health event. The assessment should be conducted following disembarkation of all passengers but may be conducted while the crew is still on board. The presence of air crew will permit the collection of first-hand information.

Ideally, the assessment should be conducted prior to the ground handling crew boarding the aircraft for grooming or to add new provisions. This allows port health to complete their assessment and provide advice on cleaning, disinfection or decontamination. Health recommendations must be provided directly to airline ground operations staff and/or airport staff. Third-party cleaners should be advised by the airline in consultation with port health.

The primary source of information on aircraft cleaning is contained in the WHO *Guide to Hygiene and Sanitation in Aviation (27)*, Part 2. The IATA *Medical Manual (9)* includes chapters on the cabin environment, aircraft operations and hygiene, as well as potential chemical, biological and physical contaminants. IATA includes a guideline for the cleaning crew of an arriving aircraft with a suspected case of communicable disease[23]. The literature review noted the difficulties associated with on board disinfection and highlighted the need for collaboration between public health and the airline. The short turn-around times for many flights increases the challenge of conducting an assessment and ensuring that the necessary clea-

22 - The IHR does not require the publication of designated airports. WHO encourages State Parties to report their designated PoE as part of annual reporting to the World Health Assembly but this is voluntary. WHO will publish the list of PoE that are certified in accordance with Article 20.5.

ning and disinfection is completed without causing significant delays for the airline and its passengers. Note that any disinfectant used on board an aircraft must be approved by the aircraft operator, since some commonly used products (e.g. sodium hypochlorite) are unsuitable.

6.6 Immediate arrangements for airport

IHR Annex 1B (forming Annex 3) sets out core capacities required for designated airports at all times and during public health events of international concern. If the airport at the intermediary or final destination has been designated by the State Party, it should be equipped to support the preliminary arrangements of a public health event, including providing assessment and care for affected travellers. This may be accomplished by establishing arrangements with local medical facilities for isolation, treatment and other support services that may be required.

23 - www.iata.org/whatwedo/safety/health/Documents

Chapter 7. Risk assessment

The WHO *event management for international public health security - Operational Procedures (28)* describes risk assessment as an iterative process that continues from the time the event is first detected to the time the event is "closed". The estimate of potential risk from the public health event is a critical phase to determine which, if any, public health measures may be required to manage the event. The port health authority must conduct this phase in collaboration with other stakeholders who may have information concerning the public health event.

Figure 4. Iterative process for risk assessment

In the risk assessment phase, port health will consider the likelihood of the event and potential impact/consequences for travellers, the aircraft, the airport including other stakeholders and the environment (Figure 4). As noted earlier, the speed of air travel means that a rapid risk assessment process may be required: the ECDC has published an excellent reference on this process *(29)*.

7.1 Impact assessment

The following questions should be considered during the assessment of potential impact/likelihood of the public health event, taking into consideration the questions posed in IHR Annex 2 – Decision instrument for the assessment and notification of events that may constitute a public health emergency of international concern.

1. Can the event be characterized as serious?
2. Does the public health hazard have the potential to affect a large number of susceptible or vulnerable people (e.g. outbreak) during their journey or at their final destination?
3. Is there a risk for introduction of the agent (e.g. disease, vector) in the country (if it is not already endemic or present)?
4. Is there evidence that international spread of the hazard and/or disease has already occurred?
5. Does the event have the potential to interfere with international traffic and trade?
6. Is there evidence that this event has had adverse consequences in public health in the past?
7. Are evidence-based prevention and control measures available, and can they be implemented?
8. What is the likelihood of spread?
    a. For chemical or radiological agents, consider protection for workers during assessment, containment and disposal.
    b. For identified infectious agents, consider the transmissibility and reproduction (Ro) number.
    c. For vectors, consider the potential for damage and establishment in new environments.
9. Is my airport able to deal with the situation?

Table 2 outlines potential risk factors, impact and other factors for consideration, by population or sector.

Table 2. Risk assessment criteria

Population or sector	Potential risk factors or elements for inclusion in risk assessment	Potential impacts	Factors for consideration of likelihood
Travellers	• Itinerary – departure, in-transit and destination • Susceptible population • Seating arrangements in aircraft • Conditions at boarding including delays and over-crowding	• No effect • Mild/short-term illness • Severe/chronic illness • Death • Delay or disruption in travel plans • Medical assessment • Therapeutic measures • Medical treatment Impacts may occur during travel, immediately thereafter or at a future point in a traveller's life In most cases, the impact (illness or injury) will be noted during travel or immediately thereafter, but may be delayed for secondary or subsequent cases	Is the infectious agent known? If yes, what is the natural history or disease (transmission and/or reproduction number)? For chemical and radiological exposure, are specialists available to support port health? It is necessary to consider the ability to contain the release? Are there residual exposure and/or exposure pathways? Is the chemical agent known? Is the product safety sheet available? For radiological exposure, is the mechanism of exposure/isotope known?
Aircraft operator	• Duration of the flight • Type of aircraft • Passenger capacity • Actual occupancy in flight • How many air crew are on the flight and what is their training? • What is the availability of medical supplies? • Is there a health professional on board? • What is the availability of ground medical support?	• Business disruption (delays due to diversion whether in transit or upon arrival) • Customer dissatisfaction and reduction in confidence • Infection among air crew • Occupational risk to aircraft handlers • Contamination of aircraft • Damage to aircraft (on board) • Cost to airlines Impacts may be short term if they are due to delays or disruptions to the schedule Impacts may be medium term if the aircraft requires servicing Impacts may be long term if the business's reputation is affected and/or customers are dissatisfied	• Was the ventilation system functioning on board the aircraft prior to take-off and in-flight? • Were infection control procedures implemented in-flight? • Was notification made prior to landing? • Were PLFs completed prior to disembarkation?

Population or sector	Potential risk factors or elements for inclusion in risk assessment	Potential impacts	Factors for consideration of likelihood
Airport and airline ground handling services	• Are IHR core capacities in place? • Is the public health component of the aerodrome emergency plan in place? If so, was it developed and implemented in coordination with the public health sector and is it being exercised? • Is there access to port health resources? • Is there a vector control programme in place? • Were border services, including cargo, notified? • Were airline ground handling services for water, waste and aircraft grooming notified? • Were food catering services notified? • Were cleaning personnel notified?	• Business disruption to travellers or the public due to delays, cancellations and/or restrictions on travel • Introduction of disease or vectors to the environment and local population • Illness or injury among airport operational staff (physical illness, psychosocial effects) • Contamination of the environment Impacts to the airport may be short term for airport disruptions or longer term if a vector or other contamination is introduced into the environment.	• Is infrastructure in-place and maintained to meet IHR core capacities? • Does the airport emergency plan include planning for a public health event? • Is there a central communication hub for airport stakeholders? • Can the airport provide appropriate space to assess travellers and aircraft?
Environment	• Were environmental controls for contaminated water and waste implemented? • Were there programmes for agriculture and wildlife?	• Contamination of local environment including air, water and waste streams • Introduction of disease to agricultural products or wildlife	Are environmental specialists available to assist in risk assessment?
Port health	• Are airport health resources available onsite or remotely for assessment? • Does the airport have the capacity/ability to prevent further travel, if necessary? • Is the public health component of the aerodrome emergency plan in place? If so, was it developed and implemented in coordination with the public health sector and is it being exercised?	• Affected passengers disperse into the community • Contact tracing is ineffective, resulting in transmission to the community • Affected travellers continue their travel to other countries, resulting in global spread of disease	Does port health have the resources to manage the event locally? Are other resources available to support contact tracing?

The ECDC has published a resource to assist in risk assessment for infectious diseases transmitted on aircraft *(6)* with detailed guidelines on contact tracing (for further information, refer to Section 8.9 Public Health Measures).

7.2 Examples of risk assessments for public health events in travel

Recent examples of published risk assessments, including rapid risk assessment, may be viewed at the following websites:

MERS-COV
http://ecdc.europa.eu/en/publications/Publications/mers-cov-risk-assessment-6-november-2013.pdf

INFLUENZA A (H7N9)
http://www.slideshare.net/charmkey5/who-risk-assessment-h7-n9-13apr13

http://www.ecdc.europa.eu/en/publications/Publications/influenza-A(H7N9)-China-rapid-risk-assessment-4-april-2013.pdf

http://www.phac-aspc.gc.ca/eri-ire/h7n9/risk_assessment-evaluation_risque-eng.php

EBOLA VIRUS DISEASE (EVD)
http://ecdc.europa.eu/en/publications/_layouts/forms/Publication_DispForm.aspx?List=4f55ad51-4aed-4d32-b960-af70113dbb90&ID=1207

http://www.cdc.gov/vhf/ebola/exposure/

CHAPTER 8. PUBLIC HEALTH RESPONSE

8.1 Public health containment strategies

To respond to a public health event, there are a range of public health measures that may be effective when introduced individually or, more usually, in combination. These public health measures may be directed globally, but are generally most effective when administered at the national or regional level.

As discussed in the Strategies for Disease Containment workshop, Gostin noted that "transnational containment measures can be far-reaching: entry or exit screening, reporting, health-alert notices, collection and dissemination of passenger information, travel advisories or restrictions, and physical examination or management of sick or exposed individuals" *(30)*.

In considering the containment of serious infectious diseases such as EVD, SARS or pandemic influenza, there are two principle strategies:

- therapeutic countermeasures (e.g. vaccines and antiviral medications)
- non-pharmaceutical public health interventions, such as infection control, social distancing, isolation and quarantine.

If a traveller has been exposed to a chemical or radiological agent, other containment measures to contain the hazard and reduce the level of contaminant on the traveller or their personal effects may be used (e.g. radiological decontamination).

During air transport, initial containment at the source may be suboptimal and also difficult to assess because of the rapid escalation of the event and difficulty in obtaining information from other countries about local conditions or airline passengers. Public health authorities may impose a variety of measures to prevent or limit the transmission of disease into their country.

This section covers the range of public health containment measures that may be applied as part of a response to a public health event. The quick reference guide in Table 3 highlights when these measures may be introduced; detailed descriptions follow. Treatment or other interventions including medical care at a medical facility is not addressed in this guidance document.

Table 3. Quick reference guide to public health measures

Public health measure	When to use	Other considerations
Travel advisories/health alert notices	• Travel health alerts should be used as a risk communication strategy and updated as necessary. • Travel advisories to 'affected regions' should be used cautiously due to potential socioeconomic impacts.	WHO should announce or support travel advisory based on scientific evidence.
Social mobilization	Social mobilization should be implemented as part of the public health response to increase awareness of the disease in local populations.	Cultural barriers and fear may be addressed using social mobilization approaches.

Public health measure	When to use	Other considerations
Airport hygiene		
• Sanitation	Maintain routine sanitation at all times and be prepared for enhanced sanitation during the event.	IHR core capacities.
• Vector control	Maintain the vector control programme at all times. Be sure the surrounding environment is included.	IHR core capacities.
On board infection control (refer to chapter 6.1.1)	To be implemented when a potential communicable disease or public health event is identified.	WHO/ICAO/IATA guidance for basic infection control. (18) This document may be updated, as required, during an emerging public health event, identified pandemic or PHEIC.
Border controls	Routine surveillance is to be maintained by competent authorities.	IHR core capacity.
• Exit screening	May be recommended in countries affected by the public health event.	Exit screening should include both primary and secondary screening at all international PoE.
• Entry screening	May be introduced based on suboptimal exit screening from affected areas, geographically limited regions or where internal surveillance capacity is limited.	Planning for entry screening should take resource implications and effectiveness into consideration.
• Documentation for prophylaxis	State Parties may require proof of vaccination for yellow fever	
• Syndromic surveillance	May be used on a routine basis to identify individual cases or an emerging public health event.	Health Part of Aircraft General Declaration
• Screening technologies	Use of screening technologies, including temperature measurement, may be implemented during a global or regional event.	The natural history of the disease should be considered when determining potential efficacy (i.e. is fever present?)
• Enhanced surveillance	May be introduced during mass gatherings or a pandemic/global health event. This may include monitoring school and workplace absenteeism, health centre utilization and sentinel surveillance.	Resource implications for reporting and data analysis.
• Public health declarations for travellers	Health declarations may be introduced at entry or exit to encourage individual passengers to self-declare illness or exposure. This information is used in association with health and medical assessments.	Data management for handling, storage and final disposition of forms with regard to privacy requirements.

Public health measure	When to use	Other considerations
• Health and medical assessments	May be included in exit, entry or syndromic screening and may be augmented during the public health event.	Consider the resource requirements for health and medical assessments
Quarantine and isolation	Voluntary or compulsory quarantine and isolation may be introduced in response to a serious public health event.	Consider the legal authority requirements. What resources are available for monitoring compliance?
Social distancing	May be introduced during the early phases of a pandemic or emergency response plan. May include school closures, closure of public spaces and public events.	What are the national or regional pandemic plans? Ensure the plans include risk communication to the public.
Contact tracing/ investigation	Introduced following traveller exposure to an identified infectious disease or other event.	Contact investigation to be targeted for effective resource utilization. See EDCD for specific infectious diseases algorithms *(6)*.

8.2 Travel advisories/health awareness campaigns

8.2.1 Travel advisories

Travel advisories are an important vehicle for risk communications during a public health event (See section 5.1). State Parties need to communicate relevant and timely information for travellers, the public and other stakeholders, as well as ensure the international community is fully informed *(31)*.

The IHR encourages State Parties to limit any measures that may interfere with international traffic (Article 43). Travel restrictions may provide a short delay in the introduction of new infections to a country *(32)* but have other potential impacts, including economic losses and infringement of civil liberties. Studies following SARS and pandemic influenza report on the socioeconomic costs of travel advisories *(15,16)*. As Gostin *(30)* notes:

Given the transboundary nature of travel advisories as well as the economic impact they can have on affected countries, it should be left to the WHO to issue transparent and clearly justified travel recommendations in accordance with the revised IHR.

8.2.2 Social mobilization (health awareness) campaigns

In addition to the travel health information provided by many State Parties, social mobilization approaches, including health education campaigns, can be a relatively economical and effective public health measure during a public health event and should be used to inform the public and travellers about other measures that may be in effect (i.e. introduction of voluntary isolation, location of treatment centres that are open for ill individuals, safe burial, etc.).

Social mobilization campaigns introduced during the 2014-2015 EVD outbreak used national and international personnel to reach out to communities to promote a variety of public health measures including hand hygiene, early treatment and safe burials[24]. This is an important aspect of event management in both urban and rural areas; however, it may be of particular importance in addressing complex interrelationships in remote areas with limited infrastructure.

24 - http://www.who.int/mediacentre/news/notes/2014/ebola-burial-protocol/en/

8.3 Airport sanitation, vector control and disinsection

8.3.1 Sanitation at airport

The IHR requires that designated PoE, including airports, have the capacity to ensure a safe environment for travellers at all times (1), including safe food, drinking water and sanitation that includes a vector control programme in and around the airport.

Maintaining a clean and safe environment for travellers will reduce the potential for the transmission of infectious diseases and exposure to toxic substances. Travellers may spend significant time at the airport, at embarkation, while in-transit or upon arrival. New security requirements require earlier check-in while high volumes of travellers may result in crowded conditions, enhancing the potential for exposure to infectious agents from an ill traveller or contact with a contaminated surface. It is important that airports follow a regular cleaning and disinfection schedule. Chapter 2 of the WHO *Guide to Hygiene and Sanitation in Aviation (27)* provides details on the cleaning and disinfection of facilities including aircraft. During a public health event, the airport operators should be prepared to enhance cleaning and disinfection or decontamination when and if warranted based on recommendations from port health or other public health authorities.

All areas of the airport but particularly those open to the public should be included in a sanitation programme. All water used for drinking, personal hygiene and food services should be from a potable water system, which includes a safe source, water treatment as required, a water distribution system and routine monitoring and oversight of the system. The *Guide to Hygiene and Sanitation in Aviation (27)* describes a "water safety plan" for an airport.

Food facilities that serve travellers as well as food catering operations should operate in accordance with the principles of the "Hazard Analysis Critical Control Point" (HACCP) or similar food safety management system. A review of food safety and outbreaks (33) recommends that the HACCP be introduced to flight catering operations. Studies into the microbiology of foods served on board aircraft and in airports *(34,35)* both highlight the need for improved temperature control for foods prepared for service to passengers as well as the need for continuing education on personal hygiene for food handlers. The flight catering industry has been active in promoting food safety in air travel and published the *World Food Safety Guidelines (36)*, which incorporate both standards and guidelines for flight caterers, suppliers and airlines. WHO has published a guide to safe food for travellers *(37)*.

Depending on the nature of the event and the risk assessment results, port health may implement public health measures in a way that is proportionate to the risk. Port health may seek specialist advice where appropriate to determine the necessary control measures and evaluate their effectiveness. Depending on the nature and scale of the event, experts may include: microbiologists, virologists, epidemiologists, toxicologists, chemical and radiological advisers, engineers, etc. It may be necessary to work with different agencies, organizations and regulators who can offer specialist support and advice (diagnostic and analytical capacity, environmental monitoring and assessment, decontamination, etc.).

8.3.2 Sanitation on board aircraft

IHR Article 25 states that State Parties shall not apply health measures to an aircraft in transit at an airport within its jurisdiction but may restrict the aircraft to a particular area of the airport and restrict embarking, disembarking or loading and discharging. However, the aircraft is permitted to take on fuel, water and supplies under supervision of the competent authority.

Inspection of an aircraft, baggage or cargo, for public health purposes, may be required by competent authorities on arrival or departure (IHR Article 23). During the inspection, trained personnel (i.e. environmental health officers) may examine the cabin, galley, lavatories, water and waste holding facilities, cargo compartment and service areas to determine if a public health risk exists. Based on the results of the inspection, a competent authority may determine that further public health measures are warranted, such as disinfection, decontamination, disinsection or deratting (IHR Article 27).

These health measures can be applied to baggage, cargo, containers, conveyances, goods, postal parcels or human remains and, in accordance with IHR (Article 22), be carried out so as to avoid injury and, as much as possible, discomfort to persons or damage to the environment. Once the control measures are implemented, the competent authority should ensure their effectiveness.

All waste or other materials used by the ill traveller should be stored separately in a biohazard bag and identified for handling and disposal upon arrival. Cleaners/ground handlers should be alerted prior to landing that special handling and/or disinfection (and, rarely, decontamination) may be required. During short layovers, priority should be given to areas within the aircraft, including the original and final seat and surroundings as well as the lavatory used by ill travellers. Advice on cleaning, disinfecting and decontamination may be provided by environmental health officers upon arrival; it is critical that all products used on board the aircraft have been approved as safe by the aircraft manufacturer (this is the responsibility of the airline). Annex G of the WHO guide to hygiene and sanitation in aviation *(27)* contains information on recommended attributes for aircraft disinfection.

8.3.3 Vector control

Controlling vectors that may transmit diseases at the airport, during flight or be imported and become established at another destination is an important public health measure. Arthropods, insects and rodents have been identified on board aircraft, gaining access from the environment, via baggage or cargo or can be found on humans or animals as ectoparasites. Vectors on board aircraft can transmit illness on board, introduce diseases and species in new areas, contaminate food products or cause structural damage to the aircraft.

Response measures to vector infestation of aircraft include disinsection, deratting, cleaning and disinfection of the aircraft environment or other objects such as containers, cargo, goods, baggage and postal parcels. IHR Annex 5 describes measures for vector control. WHO's International Travel and Health book can be referred to for identifying areas where vector-borne diseases are endemic *(4)*.

WHO has provided an assessment tool for IHR core capacity requirements at designated PoE, including airports *(38)*. This tool requires that competent authorities have «demonstrable knowledge of the use of correct control methods of relevant vector borne diseases and for hosts and vectors, including disinsecting and deratting». This includes an integrated vector control and monitoring programme in place, including special arrangements or agreement/contract covering the following areas:

- Passenger terminals
- Cargo and container terminals
- Infrastructure and courtyards

- Service provider facilities at the terminal and for conveyance ground support operation
- Surrounding areas of PoE (minimum 400 meters).

Below are the key points to be considered by the competent authority regarding vector control measures:

1. All activities must be carried out safely in accordance with any national or regional regulations.
2. The method of vector control must be applied by licensed and competent specialists.
3. The method of vector control and the pesticides used must be appropriate for its intended use (i.e. in the passenger cabin or cargo bay).

8.3.4 Disinsection

Disinsection is a public health measure routinely applied at airports that have been identified as a potential source of infectious insects. This measure is used to prevent the importation of pests that may affect agriculture and fisheries as well as introduce diseases that affect the human population. This routine preventative measure reduces the potential for the transmission of malaria or other diseases to people and countries where certain insect species and diseases are not endemic.

The literature search identified a number of reports and guidelines that provide the rationale for disinsection on aircraft and discuss the three recommended disinsection methods (residual application; blocks away; pre-flight and top of descent) *(39,40,41,42)*, and a chapter in the IATA *Medical Manual (9)*. In response to the ongoing concern about chemical exposure to disinsection agents, WHO and the International Programme of Chemical Safety (IPCS) conducted and published the *Report on Informal Consultation on Aircraft Disinsection (43)*. Most recently, WHO published G*uidelines for testing the Efficacy of Insecticide Products used in aircraft (44)*; these guidelines support standardizing the results of new disinsection products.

Every aircraft leaving a point of entry situated in an area where vector control is recommended should be disinsected and kept free of vectors (IHR Annex 5). A country may apply vector control measures to aircraft arriving from an area affected by a vector-borne disease if the vectors for the foregoing disease are present in its territory. The disinsection must be documented and records retained by the airlines to be produced on request.

While some countries require routine disinsection for international itineraries *(45)*, disinsection may also be used as a containment measure during an identified vector-borne illness or outbreak. The emergence of dengue *(46)* in cities, countries and continents where previously unknown, highlights the continued importance of preventing the movement of viruses and vectors by air *(47)*. According to IHR Annex 5, WHO shall publish, on a regular basis, a list of areas where disinsection or other vector control measures are recommended for conveyances arriving from these areas. Information in this regard may be found on the WHO website[25].

Disinsection and/or deratting shall be required if there is visual evidence of vector infestations on board; these measures will minimize public health and safety risks (e.g. rodent damage to infrastructure of the aircraft by chewing on wiring or other equipment). In addition to visual evidence, an aircraft may be regarded as suspect and should be inspected for vectors and reservoirs if there are reports of a possible case of vector-borne disease on board or it has left an affected area within a period of time where on-board vectors could still carry disease.

25 - www.who.int/ith/mode_of_travel/aircraft_disinsection/en/

As stated by WHO on the website,

Passengers are sometimes concerned about their exposure to insecticide sprays during air travel, and some have reported feeling unwell after spraying of aircraft for disinsection. However, WHO has found no evidence that the specified insecticide sprays are harmful to human health when used as recommended.

8.3.5 Cargo and baggage

Public health responses at airports may involve managing the personal effects and baggage of ill travellers. In the event of an infectious illness in a traveller, the primary concern will be with the transit of ill passengers through the facility and the secondary concern is the safe handling of their personal effects and baggage.

Airports may implement special handling of baggage or cargo arriving from affected regions. This special handling may include inspection, fumigation, other decontamination or possibly destruction if the baggage or cargo is considered to be significantly contaminated.

The potential for chemical or radiological hazards in cargo or freight cannot be underestimated, but may pose more of an OH risk to ground handlers/baggage handlers than a public health risk to travellers. If chemical or radiological hazards are suspected, port health will engage specialists to develop appropriate public health measures.

If there is no treatment available to disinfect or decontaminate infected or contaminated baggage, cargo, containers, conveyances, goods or postal parcels, the competent authority may seize the article and require it to be destroyed under controlled conditions. This is an unlikely scenario for an aircraft, but may be an option provided by national legislation.

Unless a risk assessment for a particular disease indicates otherwise, there is no requirement for baggage handlers to adopt different procedures or use additional PPE when handling baggage from an affected aircraft that has potentially carried a contagious passenger, unless the traveller's baggage is visibly soiled.

8.4 Border controls

8.4.1 Overview

The principle application of non-pharmaceutical public health measures is at the national and community level. This includes the use of border controls, which may range from travel restrictions to health declarations, screening[26] or other forms of enhanced surveillance. As stated by an international expert committee, the overall sensitivity of border control is likely to be limited *(48)*. One or more border control measures may be implemented during an outbreak or global public health event, depending upon the legislative authority to enact such controls.

8.4.2 Entry and exit screening

A number of studies reviewed the use of entry or exit screening as border controls to prevent or delay the introduction of a communicable disease or reduce the resulting incidence and mortality; entry screening is most likely to be more effective where the disease has a longer serial interval[27]. Entry screening for influenza may lead to short delays in the introduction of a new disease and allow time for therapeutic measures to be available; however the benefits must be measured against the costs of such a measure *(49)*. Evaluation of entry screening

26 - Screening refers to the identification of unrecognized disease by the application of tests, examination or other procedures which can be applied rapidly. Screening may include visual observation, thermal tests, etc. (Source: JM Last. A Dictionary of Epidemiology, 4th ed.).
27 - Serial interval for SARS is 8-10 days while for influenza is 2 - 4 days.

alone during the SARS epidemic suggests that screening for SARS or other disease with similar natural history may not be effective *(50)* because the overall sensitivity of entry screening is low.

Newer studies on the potential of exit screening for pandemic influenza *(51)* suggest that resources may be most effective when targeted at specific airports in the country/region where the influenza begins. A study that simulated entry screening for pandemic influenza concluded that exit screening in foreign countries greatly reduced the number of infected passengers and may reduce the number of introduced cases and deaths *(52)*.

As part of pandemic planning, "WHO recommends that travellers receive health alert notices, although entry screening may be considered when exit screening at the traveller's point of embarkation is suboptimal; in geographically isolated, infection-free areas (e.g. islands); and where a host country's internal surveillance capacity is limited" *(48)*.

During the 2014-2015 EVD outbreak, the WHO IHR Emergency Committee *(53)* recommended that in countries with EVD transmission, the State Party should conduct exit screening of all persons at international airports, seaports and major land crossings for unexplained febrile illness consistent with potential EVD infection. The exit screening should consist of, at a minimum, a questionnaire, a temperature measurement and, if there is a fever, an assessment of the risk that the fever is caused by EVD. Any person with an illness consistent with EVD should not be allowed to travel unless the travel is part of an appropriate medical evacuation. To support affected countries, WHO published guidance on the implementation of exit screening in November 2014 *(54)*. Entry screening was not recommended, however WHO encouraged countries implementing such measures to share their experiences and lessons learned *(55)*.

During the recent MERS-CoV outbreak, the WHO IHR Emergency Committee has not recommended any restrictions on travel or trade including entry or exit screening[28] (56). WHO published "Frequently asked questions on Middle East Respiratory Syndrome (MERS-CoV)" and "Travel advice on MERS-CoV for pilgrimages" *(57, 58)*.

If entry or exit screening is introduced, the aim should be:

- to identify ill travellers with signs and symptoms consistent with the illness of concern and travellers who may have been at risk of exposure to illness and their close contacts;
- to trigger appropriate public health measures, such as travel restrictions, quarantine, treatment and isolation, that are commensurate with the risks and do not unduly interfere with international travel;
- to ensure proper collection of information and reporting for monitoring and evaluation purposes.

Entry and exit screening do not have the same effectiveness, especially for airports. Entry screening can be supplementary to the exit screening or other health measures adopted at other territories to avoid high-risk contacts, ill travellers and/or those suspected of being ill. During the planning for entry screening, the length of time elapsed since the exit screening was conducted and the availability of health status information on board prior to arrival should be taken into consideration.

If entry or exit screening is considered, it should always be carefully planned and thoroughly communicated to conveyance operators in the context of sharing information about suspected cases on board. Consideration should be given to the best use of available resources (staffing, equipment), the capacity to conduct screening, the country's disease transmission status and the number of travellers arriving from affected countries.

28 - As of date of publication.

If screening is introduced, it is recommended that countries adopt the templates for the Traveller Public Health Declaration (Annex 5) and Secondary Screening form (Annex 6) (as advised by WHO and the aviation sector) to ensure a harmonized approach between countries and to provide assurance to travellers, who will then see the same procedures in use at PoE. The use of standardized forms and templates will also facilitate operations including translation, and later, the assessment and evaluation of results as well as support collaboration between countries and the travel industry.

If screening is conducted on passengers in-transit, health authorities should coordinate with airlines to ensure there is adequate time for them to get through security, customs, immigration or other authorities and still board their departing flights.

Exit or entry screening usually involves two steps.

Step One: Primary Screening

Primary screening identifies travellers who may be symptomatic with, or were possibly exposed to a case of the illness of concern. It consists of the following:

a. Completion of a traveller public health questionnaire consisting of short questions about illness and possible exposures. Completed questionnaires are then reviewed by the primary screening staff;

b Visual assessments for signs and symptoms of illness, including fever, if appropriate;

c. May include temperature measurement using a non-contact thermometer or thermal scanner.

The primary screening staff may refer ill travellers or travellers with possible exposure to the illness of concern for secondary screening.

Step Two: Secondary Screening

Travellers who have been referred for secondary screening should undergo an in-depth interview conducted by a public health or medical professional. The responses to the Traveller Public Health Declaration will be verified and a focused medical examination and second temperature measurement should be conducted.

Following the interview and examination, the secondary screening officer will make a determination about the need for public health measures. Public health measures may include travel restrictions for ill travellers or close contacts of ill travellers[29], transport to a medical facility for further evaluation, testing and/or treatment, public health observation or self-monitoring information on the implementation of entry or exit screening.

8.4.3 Requirement for vaccination or other prophylaxis

Proof of vaccination or prophylaxis may be required for travellers as a condition of entry to a country only in the case of yellow fever and in special circumstances, such as on the basis of evidence of a public health risk, when it is necessary to determine whether a public health risk exists and as a condition of entry for any traveller seeking temporary or permanent residence.

A traveller in possession of a certificate of vaccination or other prophylaxis issued in conformity with IHR Annexes 6 and 7 shall not be denied entry as a consequence of the disease to which the certificate refers, even if coming from an affected area, unless the competent authority has verifiable indications and/or evidence that the vaccination or other prophylaxis was not effective.

29 - http://www.wpro.who.int/mediacentre/releases/2015/201506010/en/

Vaccination or other prophylaxis must be administered after the agreement of the traveller or his/her parents or guardians. IHR Article 31.2 describes what should happen if the traveller refuses to receive vaccination or other prophylaxis. Further requirements related to vaccination or other prophylaxis can be found in IHR Article 23 (Health measures on arrival and departure), Article 32, paragraph c (treatment of travellers) and Article 40 (charges for health measures regarding travellers).

Vaccines and prophylaxis for travellers administered under the IHR must be of suitable quality and approved by WHO. Vaccination certificates issued must conform to provisions of IHR Annexes 6 and 7.

8.4.4 Use of screening technologies

Screening technologies have been piloted and used during the SARS events and in subsequent influenza outbreaks, with mixed results. An industry study suggested that the use of thermal scanners were effective in identifying fever in arriving passengers during influenza (H1N1) *(59)*. Other studies suggest that the use of thermal scanners, which rely on the presence of 'fever' in arriving passengers, had low sensitivity and positive predictive value; confounding factors that reduced their effectiveness included the unrestricted use of medications during travel and the environment in which they are used *(60,61)*. Another study noted that not all influenzas present with fever (i.e. seasonal influenza B), therefore reducing the potential effectiveness of thermal imaging devices *(62)*.

During the 2014-2015 EVD outbreak, temperature measurement with non-contact thermometers was recommended as part of exit screening, in both primary and secondary screening.

8.4.5 Syndromic surveillance

The health part of the Aircraft General Declaration (Annex 9 of the IHR) includes a list of generic signs and symptoms that may suggest potentially communicable disease, which should be used by cabin crew to identify a possible case of communicable disease. During an outbreak, more specific guidance may be given to cabin crew by public health authorities. Annex 4 provides more specific details on signs and symptoms that may indicate an infectious or serious illness in travellers and may be used by port health as part of traveller screening.

WHO has published an interim guideline on early warning and response with a focus on event-based surveillance *(13)*. The definition of syndromic surveillance in the box is taken from this guideline.

> **Syndromic surveillance:** a method of surveillance that uses health–related data based on clinical observations rather than laboratory confirmation of diagnoses. Syndromic surveillance is used in order to detect outbreaks earlier than would otherwise be possible with laboratory diagnosis-based methods. Case definitions used for syndromic surveillance are based on clinical signs and symptoms, rather than on specific laboratory criteria for confirmation of the causative agent.
>
> Syndromic surveillance by port health may support identification of potentially infectious illnesses such as respiratory illness (e.g. influenza), febrile rash illness (e.g. measles) or gastrointestinal illnesses (e.g. foodborne illness, norovirus)

State Parties may have national legislation (i.e. Quarantine Acts) or guidance that outlines syndromic surveillance used to screen passengers entering or exiting the country. This is in

addition to other forms of active or passive surveillance that may be used in the community to identify clusters or outbreaks of illnesses of concern to public health.

During a PHEIC, WHO and national health authorities may establish syndromic surveillance to include specific signs and symptoms related to the disease or exposure under investigation. Consistent adoption of this syndromic approach assists all countries to identify and report cases and contacts.

At airports that may receive travellers from an area with an ongoing outbreak, syndromic surveillance may be introduced in addition to other screening measures. During the 2014-2015 EVD outbreak affecting African countries, some airports introduced syndromic surveillance in addition to other screening measures for aircraft (i.e. reviewing Health Declaration, dialogue with air crew) arriving from the outbreak area[30]. Depending on the nature of the public health event, additional surveillance by trained public health officials may be more effective than generic screening technologies *(15)*.

8.4.6 Enhanced surveillance

Enhanced surveillance is often part of public health planning for mass gatherings where usual public health surveillance may be insufficient for the event. For example, planning for a large sporting event may include increased surveillance at airports to detect illness in arriving travellers as well as the introduction of other forms of surveillance (e.g. community-based surveillance, event-based surveillance) in addition to the usual routine surveillance.

8.4.7 Public health declarations

Travellers may be requested to complete a public health declaration form as part of entry or exit screening, on a routine basis[31] *(63)* or during a public health event such as the 2014-2015 EVD outbreak. Travel health notices should accompany the declaration form during a public health event. The use of health declarations following international flights is relatively inexpensive compared to other forms of border control because other documents may be reviewed by airport personnel (e.g. Passport control) upon arrival.

In the event of a global alert (e.g. EVD, pandemic influenza) or in-country outbreak (e.g. measles), a personal health questionnaire may be developed by States Parties to be completed by all passengers. The development of a disease-specific questionnaire may not be appropriate due to the time required for development and implementation. The adoption of an existing template, such as the Traveller Public Health Declaration (Annex 5), is preferred to facilitate consistent detection and notification between WHO, national public health authorities and the aviation sector. If reviewed by other authorities, any positive respondents will be referred for further assessment to port health authorities. This is to be considered as a voluntary, non-routine activity in most cases.

If a region or country is considered to be 'affected', authorities may decide to review an individual's travel history to affected areas by checking the travel itinerary before she/he boards the aircraft or at the airport. The purpose is to ascertain if there was any travel in or near an affected area, or other possible contacts with infection or contamination prior to arrival.

If affected areas have been visited, depending on the event, it may be necessary to collect further information or assessment about the passengers and crew who visited those areas. This information could be collected by administering a questionnaire or interviewing passengers and crew.

30 - Personal information (Source; PAGNet).
31 - http://www.ebeijing.gov.cn/feature_2/AInfluenza/GovernmentMeasures/t1050328.htm.

8.4.8 Public health risk and medical assessments

If an ill or potentially affected person is identified through entry or exit procedures, she/he may be subject to a health or medical assessment. This public health measure may be outlined in national legislation (e.g. Quarantine Act) or imposed during a public health event. The IHR (Part V, Chapter III) outlines special provisions for travellers, while acknowledging the right of State Parties to require «medical examination, vaccination or other prophylaxis or proof of prophylaxis», as a condition of entry.

A health assessment or interview may be conducted in order to confirm traveller health and decide if further public health action is warranted. A health assessment should follow a standard approach, as provided by State Party SOPs and may include non-invasive techniques (confirmation of temperature, observation for signs and symptoms of disease). Annex 7 provides guidance on establishing public health assessment interview spaces.

The following actions may follow a health assessment:

- Release to the community – no follow up;
- Limitations on travel – the traveller may be denied entry into the country or denied further travel until the risk of transmission of illness is mitigated. The State Party may be responsible to provide arrangements for the traveller until she/he can return to their country or travel on;
- Release to the community with follow up by local physician or PHA for direct observation or self-monitoring;
- Referral for medical evaluation if port health authority determines a potential for infectious disease that may endanger the public health or if the condition of the ill traveller warrants further investigation. Referral will generally require transport to a medical facility.

Medical examination is a measure implemented by authorities to determine the traveller's health status and the potential public health risk to others. Medical examination can take place at the airport or a health facility, on arrival or departure. The IHR distinguishes medical examinations as follows:

- Non-invasive: medical examination of the ear, nose and mouth, temperature assessment using an ear, oral or cutaneous thermometer, or thermal imaging; medical inspection; auscultation; external palpation; retinoscopy; external collection of urine, faeces or saliva samples; external measurement of blood pressure; electrocardiography. These can be required as a condition of entry or exit of travellers to a country.
- Invasive: the puncture or incision of the skin or insertion of an instrument or foreign material into the body or the examination of a body cavity. Invasive medical examination shall not be required as a condition of entry of any traveller to a country, but there are exceptions such as: on the basis of evidence of public health risk, when it is necessary to determine whether a public health risk exists or as a condition of entry for any travellers seeking temporary or permanent residence.

Any medical examination should be performed after the agreement of the traveller or his/her parents or guardians, following the rules of IHR and national legislation for safety standards, respecting human rights and any other rules of implementation. The IHR specifies in certain circumstances (Article 31.2), a State may compel a traveller to undergo a medical examination, vaccination or additional health measures. The examination should be the least invasive and intrusive possible to achieve the public health objective. For example, a traveller with suspected uncontrolled multi-drug resistant tuberculosis may be required to undergo an examination

that may include X-ray and histological study (smears) to determine the status of the disease and treatment options.

Further details related to medical examination are described in IHR Article 31 (Health measures relating to entry of travellers), Article 32 (treatment of travellers) and article 40 (charges for health measures regarding travellers).

8.4.9 Quarantine and isolation

Containing a health hazard in travellers includes reducing the potential transmission of an infectious agent and/or potential exposure of either an infectious agent or other hazard to other travellers or individuals. Two potential containment measures for infectious diseases are isolation and quarantine (adapted from the IHR).

- Isolation separates an ill or contaminated person or affected baggage, containers, conveyances, goods or postal parcels from others in such a manner to prevent the spread of infection contamination. On an aircraft, there are limited opportunities to isolate ill travellers.
- Quarantine restricts the activities of and/or separates suspect persons from others who are not ill, or separates suspect baggage, containers, conveyances or goods in such a manner as to prevent the possible spread of infection/contamination.

Neither isolation nor quarantine are applicable to inflight travel, however they may be applicable for travellers at origin, in transit or at their destination, if they have been exposed or affected during a public health event. A traveller who has been exposed, or possibly exposed, to a public health risk and is a possible disease vector may be subject to public health observation in order to monitor his/her health status. The traveller may continue an international voyage, if not posing an imminent public health risk and the country informs the competent authority at the destination of the traveller's expected arrival at the point of entry. On arrival, the traveller shall report to the port health or other PHA.

ISOLATION

Symptomatic or contaminated travellers can be isolated for a period to ensure that there is no risk of spreading infection or contamination. For infectious diseases, the length of isolation is usually equal to the period of communicability of the disease. For highly infectious diseases, measures included in the above paragraph must be applied. For some infections, it may be necessary for the isolation room to have independent ventilation and/or negative pressure.

For other agents (e.g. chemical), isolation may be very short, for example until the traveller takes a shower and decontaminates her/his clothing. Guidance on decontamination of individuals can be found in the following documents: *WHO Manual: The Public Health Management of Chemical Incidents (64); the UK Recovery Handbook for Chemical Incident (65).*

Isolation can take place in a health care facility or other institution. Appropriate precautions must be taken when transferring persons in isolation from the airport to land-based establishments. If symptomatic travellers may be transferred to other facilities (in country or to other countries) for treatment, medical evacuation procedures must be planned in advance and all such medivacs must be pre-approved by PHA.

According to IHR Article 32, crew members and passengers shall be treated «with respect for their dignity, human rights and fundamental freedoms and minimize any discomfort or distress associated with such measures". IHR Article 40 describes provisions related to charges for health measures regarding travellers.

QUARANTINE

Following the identification of travellers suspected of being ill, a decision to quarantine them may be made for a period of time to ensure that there is no risk of spreading infection or contamination. For infectious diseases, the length of quarantine is usually equal to the period of incubation and communicability of the disease. For other agents (e.g. chemical), quarantine may be very short, for example until the traveller takes a shower and decontaminates his/her clothing. Quarantine can take place in a suitable facility identified and arranged as part of the public health contingency plan and, depending on the event, may require infection control procedures, including control of food delivery, waste management and laundry services. Specific persons should be assigned as caregivers.

The public health measures of quarantine and isolation have been revisited over the past decade, beginning with the SARS outbreak and the subsequent pandemic influenza outbreak (66). In many cases, the literature suggests that quarantine may still have a role as a public health measure in emerging diseases where vaccines or other pharmaceutical approaches are not available, particularly in the early phases of an epidemic (67). Several countries reported on their experience and challenges with quarantine and isolation to limit the transmission of SARS *(68, 69, 15)*; both measures are resource intensive and if implemented, people subjected to these measures require ongoing community support including financial, food supplies, etc. The WHO writing group, referencing pandemic influenza, suggests that mandatory quarantine and isolation "would probably be ineffective, not a good use of limited health resources and socially disruptive" *(70)*

In order to implement quarantine, public health authorities need to plan for the legal authority and administrative framework *(71)*. Studies of quarantine and isolation measures have stressed the need for the flexibility to modify criteria and approaches as information on the illness becomes available and according to the health system and leadership capacities. The use of quarantine should be guided by scientific evidence and expert public health opinions to avoid contradictory or unnecessary restrictions on individuals.

In the literature review, quarantine and/or isolation were implemented as part of a larger public health response; therefore the independent effectiveness of quarantine was difficult to measure *(70)*. As noted earlier, strict border controls may be most effective in geographically restricted regions; modelling research into the effectiveness of quarantine as a border control measure concluded that a quarantine period of up to nine days or six days with rapid diagnostic testing could delay the introduction of pandemic influenza for small island nations *(72)*. The IHR specifies that, if quarantine is required, it should be undertaken "preferably in facilities away from the point of entry" Annex 1B (2).

SOCIAL DISTANCING

Social distancing may be introduced as a formal public health measure, including the closure of public spaces or schools. Risk communication may also encourage informal social distancing (avoidance of crowded spaces, delay of travel) through clear communication on the potential for disease transmission. Public health acceptance of social distancing and other public health measures should be considered *(73)*; people may be more receptive to social distancing measures during a public health event where the risk has been clearly communicated and the requirements of daily living are considered.

The potential closure of an airport would have a similar impact as a travel restriction, and would also carry social and economic impacts. If a public health event warranted the imposi-

tion of social distancing related to air travel, it may be reasonable to consider restricting entry to airport facilities to only ticketed travellers and persons working at the airport. This could potentially reduce the burden on public health or other competent authorities and may be useful when enhanced entry or exit screening is in force.

8.5 Contact tracing/investigation

An important element of public health investigation is the follow up and investigation of individuals who may have been exposed and may therefore be at risk of developing a disease. Rational decision-making about which individuals should be included in contact investigation and the use of passenger locater forms should be promoted by both the aviation and public health sectors.

Contact tracing or the investigation of persons who have been exposed to a confirmed person with a disease is an important public health response. While contact tracing is most commonly associated with communicable diseases, it may also be applicable to chemical or radiological exposures. Criteria and algorithms, which facilitate the decision-making process in contact tracing, are available and should be consulted; decisions on contact tracing should also consider the risk assessment of the specific event.

The WHO definition for «close contact» *(74)* for tuberculosis is often considered as a starting point for contact investigation:

A person who has been in close proximity in an enclosed environment for a prolonged period (i.e. 8 hours or longer) with a person with infectious or potentially infectious TB and who is therefore considered to be at risk of infection with *M. tuberculosis*. On an aircraft, a close contact is considered to be a passenger who was seated in the same row or in the two rows in front of or behind the index case, i.e. a total of 5 rows.

As previously mentioned, the ECDC risk assessment guidelines *(6)* contain detailed information and recommendations for risk assessment and contact tracing for a range of diseases that may be transmitted from person to person on board aircraft. Their executive summary states:

> *We remain convinced that risk assessment and the decision for contact tracing should be specific for each event and take into account factors such as the potential for epidemiological spread, infectivity and pathogenicity of index patients, functionality of on-board ventilation systems, intensity of contacts, and seating details (6).*

In addition to the ECDC guidance, contact tracing criteria exist for specific infectious diseases *(75, 76)* as well as more general guidelines for passengers who may have been exposed[32]. During the 2014-2015 EVD outbreak, aircraft contacts were considered to be those in seats adjacent to and across the aisle from the ill or suspected ill traveller *(77)*.

The nature of air travel creates additional challenges for contact tracing. Passengers who are tourists will disperse at their destinations, possibly travelling to inaccessible sites or other regions/countries, particularly those travellers who are not part of a formal tour group. The value of using health resources to conduct extensive contact investigations must be balanced with consideration of other public health measures, including travel health notices. Contact tracing could be performed days/weeks after the event if notification was made once the travel has ended, illness is actually diagnosed, and the travellers were distributed to their own countries.

32 - Future resources for contact tracing may be developed as part of the AIRSAN project.

Contact tracing will be facilitated if airlines and/or other agencies cooperate in the provision of timely passenger information, although this must be balanced against passengers' privacy considerations. WHO, ICAO and IATA *(12)* advocate the use of PLF to assist in contact tracing if the event is detected on board the flight. IATA has a passenger contact tracing request form, available online[33].

While airlines are limited in terms of the passenger information retained, other more efficient means of data collection for future contact tracing have been proposed and should be evaluated and considered by public health authorities. Currently, the best way to obtain contact tracing information is for the PHA to ask the airline(s) involved for the specific information they would like to have (mobile phone number, email address, etc.).

During a case, outbreak investigation or outbreak, where contacts are in transit internationally, port health or the competent authority should communicate with the next country based on the risk assessment. The Traveller Public Health Declaration (Annex 5) may provide sufficient information to be transmitted between countries.

8.5.1 Availability of rapid diagnostic tools

Since the speed of travel limits the ability to apply medical and laboratory diagnosis of cases or clusters of illness, there is considerable interest and research conducted on the use of rapid diagnostic tools. While the need and potential for rapid diagnostic tools are recognized, their use is currently limited due to factors including cost-effectiveness and general utility. Currently, most rapid diagnostic tools must be administered by a skilled practitioner and therefore, depending on the public health capacity at an airport, these tools/tests may need to be administered at a medical facility off-site.

8.6 Considerations if significant interference with international traffic

In the event of a major communicable disease outbreak associated with air travel, travel restrictions may be put into place or airlines may choose to cancel travel to affected countries. These travel restrictions may prevent the entry of travellers, including support personnel or cargo/supplies into affected regions, as well as affecting other traffic and trade. Travel restrictions are rarely recommended by WHO because of the potential impact to international traffic and trade (IHR Article 2), but may be implemented by individual State Parties or airlines. During the 2014-2015 EVD outbreak, increased vigilance, not travel bans, were encouraged by WHO[34].

According to the IHR, significant interference with international traffic generally means refusal of entry or departure of international travellers, baggage, cargo, containers, conveyances, goods and the like, or their delay, for more than 24 hours. For aircraft operators, a travel interruption of 24 hours can have a major effect on operations and supporting activities; it is therefore suggested that all procedures in place recognize this and minimize any delay to the shortest time period possible. In making decisions regarding public health measures that may interfere with international traffic and trade, the authority should consider the costs of the interventions and resulting liabilities.

If a civil aviation authority or competent airport authority implements the additional health measures referred to in Article 43 of IHR, which significantly interfere with international traffic, then:

33 - http://www.iata.org/whatwedo/safety/health/Documents/request-form-passenger-contact-tracing.pdf
34 - WHO http://www.who.int/mediacentre/commentaries/ebola-travel/en/

• Such additional measures should be reported to the IHR NFP (IHR Article 27);

• NFP shall inform WHO, within 48 hours of implementation, of such measures.

• NFP must provide to WHO the public health rationale and relevant scientific information for the measures. Then, WHO must share this information with other States Parties. After assessing the information provided pursuant to paragraphs 3 and 5 of this Article and other relevant information, WHO may request that the State Party concerned reconsider the application of the measures (IHR Article 43).

8.7 Health measures for events related to risks in the environment

Risks in the environment can be caused by unsanitary conditions, contamination of potable water, disposal of liquid and solid wastes and other waste. The WHO *Guide to Hygiene and Sanitation in Aviation (27)* outlines measures to be taken to ensure good sanitary conditions on board aircraft. In the event of illnesses, particularly those of an infectious nature, on board an aircraft, at an airport or associated with baggage or cargo, the airport health authority should ensure satisfactory cleaning and disinfection is completed by ground handling staff prior to the aircraft's next flight.

8.8 Response measures to events of unknown etiology including chemical and radiological hazards

Events reported to the port health authority will usually be unknown, until the causative agent of exposure is identified. The IHR uses an all-hazard approach intended to capture public health events caused by chemical and radiological incidents (IHR Annex 2).

In the event of a chemical or radiological incident, a multi-agency response is needed. Management of chemical and radiological hazards is usually beyond the responsibilities of most health authorities and interventions should be undertaken in consultation with other competent parties. National guidelines for chemical or radiological emergencies might be available and should be followed.

If the public health event involves the competency of other International agencies, WHO will notify the appropriate agency as stated in IHR Article 6 (i.e. IAEA) and may participate in a joint working group to provide public health advice. For example, an ad-hoc IACRNE[35] Working Group on Air and Maritime Transportation might be convened with other International Agencies including air and maritime transportation and IAEA.

WHO has developed a human health risk assessment toolkit. This toolkit

…provides users with guidance to identify, acquire and use the information needed to assess chemical hazards, exposures and the corresponding health risks in their given health risk assessment contexts at local and/or national levels. ... The Toolkit has been developed for public health and environmental professionals, regulators, industrial managers and other decision-makers with at least some training in the principles of risk assessment and who have a role in assessing and managing human health risks of chemicals (78).

35 - Interagency Committee on Radiological and Nuclear Emergency (IACRNE) is chaired by IAEA. Committee meets regularly to coordinate the arrangements of the relevant international intergovernmental organizations for preparing for and responding to nuclear and radiological emergencies. Both WHO and PAHO are members. http://www-ns.iaea.org/tech-areas/emergency/iacrna/login.asp/.

8.9 Public health measures for animals

Some airlines allow live animals of a certain size to be transported in the passenger cabin while larger animals may be transported in cargo compartments or on separate aircraft. It is possible that smaller animals also may be inadvertent stowaways and arrive dead or trapped in containers or in the cargo bay. Special measures during transportation are required to ensure the welfare of animals in transit and to prevent the transmission of diseases among animals and between animals and humans. IATA has developed Live Animal Regulations[36] for the safe, humane and cost-effective transport of live animals.

The IHR Annex 1B(2b) requires that, in the event of a PHEIC, a designated point of entry has the capacity to provide assessment of potentially affected animals and to be able to provide them care, if needed. This is usually a responsibility for another dedicated authority such as the ministry of agriculture, ministry of wildlife resources or veterinary department. It is important that competent authorities are able to determine the need for isolation and quarantine of animals and be able to provide logistic support for implementation of such measures as well as access to health services for the animals.

8.10 Use of specific health measures to ensure the safe handling and transport of human remains

WHO has developed several references on the safe handling of dead bodies following natural disasters. WHO's position on the potential for transmission from persons dying of an infectious disease is summarized as follows: The risk of transmission of an infectious disease from a dead body is considered to be unlikely[37].

IATA has guidelines supporting the cabin crew in how to manage a death on board, including the handling of the body until landing *(79)*. Upon landing, the competent health authority should be consulted for advice on relevant national legislation or guidelines.

A State Party may have specific requirements for the transport of a body if the person has died from an infectious disease. Before carrying such human remains, the carrier should find out if the destination country has any specific requirements. If not, the carrier should follow the guidelines found in the IATA *Airport Handling Manual (80)*. In all cases, official documentation regarding the traveller's identity and cause of death will be required to accompany the coffin.

If chemical or radiological exposure is suspected, port health should be consulted.

8.11 Safe transport of infectious substances

Today, infectious substances are transported for a variety of different reasons. In the interest of global public health, human and animal specimens need to be transported safely, timely, efficiently and legally from the place where they are collected to the place where they will be analysed. Specimens of human and animal origin that are likely to be infectious should be packaged and transported in such a way as to protect those engaged in transportation from the risk of infection.

To provide practical guidance and facilitate compliance with applicable international regulations for the transport of infections substances and patient specimens by all modes of transport, including air transport, WHO publishes guidance on regulations for the transport of infectious substances[38] and updates it every two years.

36 - http://www.iata.org/publications/Pages/live-animals.aspx
37 - http://www.paho.org/disasters/index.php?option=com_content&task=view&id=971&Itemid=931
38 - http://www.who.int/ihr/publications/who_hse_ihr_2015.2/en/

Chapter 9. Monitoring and evaluation of event response

Data management, monitoring and evaluation are integral to public health event management to support the effectiveness of public health control and containment measures. Monitoring the effectiveness of public health measures allows public health authorities to improve public health response as events unfold and new information becomes available.

Lessons learned and formal evaluations of a public health response support continual improvements to global public health capacity.

9.1 Data management

Data management is important any time health measures are implemented during an event. For example, if health measures include entry and exit screening at PoE, the storing, recording and disposing of data captured during screening is important for evaluation purposes as well as estimating performance indicators.

Therefore, it is advised that the following information is systematically recorded about the number of travellers:

- targeted for screening or other health measures;
- screened (primary screening);
- referred to secondary screening;
- characterized as suspected cases via secondary screening;
- identified as suspected cases via secondary screening on whom a type of health measure was implemented (e.g. public health observation, isolation, decontamination, referral to medical facility, quarantine, vaccination);
- identified as confirmed cases.

9.1.1 Ongoing monitoring

During the active intervention stage, new information and evidence related to the public health risk may become available. This may include clinical and laboratory findings or confirmation of exposure agents, estimation of the R_0 value (reproduction number of infectious disease), serial chain of transmission or availability and efficacy of therapeutic interventions. After monitoring and evaluation of the early response, adjustments are expected to be made to optimize public health measures. New opportunities for public health measures may arise as the effectiveness of other measures diminish (i.e. introduction of vaccines). Risk communications to passengers, the public and other stakeholders should be updated as new information becomes available.

The ECDC technical guidance on evidence-based methodologies for public health *(29)* recommends that monitoring should include the assessment of degree of acceptability and feasibility of implementation.

9.1.2 Evaluation (lessons learned)

A more formal evaluation of the response, including lessons learned, should be conducted and shared with all stakeholders when the public health event is under control or concluded. Evaluations may be comprehensive or focused on specific elements of the response; clearly defined goals and objectives of the evaluation will support this effort.

The SARS event triggered many State Parties to evaluate the strengths and weaknesses of public health response *(81)*; the event and lessons learned have resulted in new legislation and a strengthened capacity for public health response to global public health events.

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Annex 1. Script to be read by cabin crew to passengers prior to arrival

SUSPECTED COMMUNICABLE DISEASE (EVD)

October 2014

If a country asks that a cabin announcement be made on arrival, propose one of the scripts below, which match their requirement.

Script 1 (For use when arriving at a country where travellers from affected countries are asked to self-identify to the public health authority.)

Ladies and gentlemen,

Actions have been put in place by public health authorities in response to the ongoing outbreak of *'disease in question'* in *'country(ies) in question….'*

All travellers (including transit travellers) who have been present in *'country(ies) in question….'* in the last *'varied depending on the disease in question'* weeks are asked to report to the public health authority on arrival at the airport. This is requested as a safety measure even if you are feeling well. Thank you for your cooperation.

Script 2 (For use when arriving at a country that requires passengers to fill out the Traveller Health Declaration Form.)

Ladies and gentlemen,

Actions have been put in place by public health authorities in response to the ongoing outbreak of *'disease in question'* in *'country(ies) in question….'*.

Public health authorities require that all travellers complete a health declaration form before arrival. Your information will be used in accordance with local privacy laws to help fight the spread of the disease. Every traveller must complete a form. A parent or guardian may complete the form for a child. This is required as a precautionary measure even if you are feeling well.

The cabin crew will give out the form shortly. Please hand the completed form to the public health authority representative on arrival.

Thank you for your cooperation.

International Air Transport Association

http://www.iata.org/whatwedo/safety/health/Documents/health-guidelines-cabin-annoucement-scripts.pdf

Annex 2. Excerpt from ICAO Procedures for Air Navigation Services – Air Traffic Management document 4444 atm/501

16.6 Notification of suspected communicable diseases, or other public health risk, on board an aircraft

16.6.1 The flight crew of an en-route aircraft shall, upon identifying a suspected case(s) of communicable disease, or other public health risk, on board the aircraft, promptly notify the ATS unit with which the pilot is communicating, [with] the information listed below:

a) aircraft identification;

b) departure aerodrome;

c) destination aerodrome;

d) estimated time of arrival;

e) number of persons on board;

f) number of suspected case(s) on board; and

g) nature of the public health risk, if known.

16.6.2 The ATS unit, upon receipt of information from a pilot regarding suspected case(s) of communicable disease, or other public health risk, on board the aircraft, shall forward a message as soon as possible to the ATS unit serving the destination/departure, unless procedures exist to notify the appropriate authority designated by the State and the aircraft operator or its designated representative.

16.6.3 When a report of a suspected case(s) of communicable disease, or other public health risk, on board an aircraft is received by an ATS unit serving the destination/departure, from another ATS unit or from an aircraft or an aircraft operator, the unit concerned shall forward a message as soon as possible to the public health authority (PHA) or the appropriate authority designated by the State as well as the aircraft operator or its designated representative, and the aerodrome authority.

Note 1. See Annex 9 — Facilitation, Chapter 1 (Definitions), Chapter 8, 8.12 and 8.15, and Appendix 1, for relevant additional information related to the subject of communicable disease and public health risk on board an aircraft.

Note 2. The PHA is expected to contact the airline representative or operating agency and aerodrome authority, if applicable, for subsequent coordination with the aircraft concerning clinical details and aerodrome preparation. Depending on the communications facilities available to the airline representative or operating agency, it may not be possible to communicate with the aircraft until it is closer to its destination. Apart from the initial notification to the ATS unit whilst en-route, ATC communications channels are to be avoided.

Note 3. The information to be provided to the departure aerodrome will prevent the potential spread of communicable disease, or other public health risk, through other aircraft departing from the same aerodrome.

Note 4. AFTN (urgency message), telephone, facsimile or other means of transmission may be used.

Accessed online: http://www.icao.int. October 2015

Annex 3. International Health Regulations core capacities at PoE, excerpted from IHR Annex 1(B)

Core capacities at all times Annex 1B(1)	Core capacities during PHEIC Annex 1B(2)
Access to medical services and adequate staff, equipment and premises	Public health emergency response contingency plan
Access to equipment and personnel for transport of ill travellers to medical facility	Provide assessment and care for affected travellers or animals
Trained personnel for inspection of conveyances	Appropriate space, separate from other travellers, to interview suspect or affected travellers. If quarantine is necessary, it should preferably be undertaken at facilities away from the point of entry.
Safe environment for travellers using point of entry facilities (i.e. water, food, sanitary facilities)	Apply recommended measures to disinsect, derat, disinfect, decontaminate or other measures to treat baggage, cargo, conveyances, goods or postal packages
Vector control programme and trained personnel for the control of vectors and reservoirs	Apply entry or exit controls for arriving and departing travellers
Provide access to equipment and personnel for the transport of ill travellers to an appropriate medical facility;	Provide access to specially designated equipment, and to trained personnel with appropriate personal protection, for the transfer of travellers who may carry infection or contamination.

Annex 4.Examples of situations that may trigger a response from port health authority

Note: This table is intended to be used by trained medical personnel only; it is not intended to be used by air crew.

Event/syndrome/signs and symptoms	Definition
Persistent fever	Fever of 38°C (100°F) lasting more than 48 hours
Bloody diarrhoea	Three or more loose or watery stools in 24 hours and blood in stool
Severe diarrhoea	Diarrhoea (3 or more loose or watery stools in 24 hours) accompanied by signs of dehydration
Cluster or outbreak of diarrhoea cases	Two or more cases of diarrhoea (3 or more loose or watery stools in 24 hours)
Fever plus one of the following symptoms:	
Skin rash	Areas on the skin with multiple red bumps; red, flat spots, or blister-like bumps filled with fluid or pus that are intact or partly crusted over. Rashes may be discrete, run together and may include one or more areas of the body
Glandular swelling	Enlargement of glands located in the head, neck, or groin, notably of salivary or parotid glands or lymph nodes
Severe vomiting	Vomiting accompanied by signs of dehydration
Jaundice	Yellowish discoloration of skin, eyes and/or other bodily tissues or fluids
Convulsion	Intense, paroxysmal, involuntary muscular contraction or a series of such contractions
Bleeding	Noticeable and unusual bruising or bleeding from the gums, ears and nose or on areas of skin for which there is no obvious explanation
Recent paralysis	New or recently occurring weakness or partial or complete inability to move the arms, legs, or the muscles used for swallowing or breathing
Cough	Lasting for >2 weeks or cough with bloody sputum
Headache	Accompanied by neck stiffness
Decreased level of consciousness	Condition of an ill person when he or she is not fully aware of what is going on around himself or herself, may appear confused, or may be unusually difficult to awaken. An ill person with decreased consciousness may not know the date or their name
Prostration	Total exhaustion or weakness; collapse
Shortness of breath	Gasping for air; unable to catch his or her breath; breathing too fast and struggle to get enough air
Respiratory symptoms (influenza-like illness, ILI)	ILI: A person with sudden onset of fever of ≥38°C (100°F) and cough or sore throat in the absence of other diagnoses
Non-traumatic death	Death resulting from a cause other than an accident

Annex 5. Traveller Public Health Declaration

Note: This form is based on a similar form used in previous outbreaks (e.g. Ebola virus disease 2014-2015) where exit and entry screening was implemented by some countries. It can be adapted for use with other infectious diseases or other exposures by modifying the public health information signs and symptoms and potential risks or exposures in accordance with WHO recommendations in response to specific public health events.

All travellers should complete this form and the records should be kept. This information will be used by public health authorities for further investigation or contact tracing in accordance with applicable national laws.

TRAVELLER INFORMATION:

Flight/ship/train/ground vehicle number/name: .....
Seat/cabin/coach number/name: .....
Last (family) name: .....
First (given) name: .....
Passport country: .....Passport number: .....
Arrival date: Day .....Month .....Year .....
Birth date: Day .....Month .....Year .....
Sex: Male ..... Female .....
E-mail address: .....
Telephone number (include country code or country name): .....
Home address: .....
Addresses for next 21 days: .....

PUBLIC HEALTH INFORMATION:

For signs and symptoms compatible with a communicable disease, refer to IHR Annex 9

Today, or in the past … hours, have you had any of the following symptoms?	Yes	No
a. Fever (38°C/100°F) or higher, feeling feverish or having chills?		
b. Coughing?		
c. Shortness of breath?		
d. Vomiting or diarrhoea?		

This section should be modified to identify potential risks or exposures to the disease of concern, taking into account the incubation period.

In the past … days, have you done any of the following?	Yes	No
a. Travel to affected territory		
b. Lived in the same household or had other contact with a case (any person ill with a xxx illness?		
c. Visited a health care facility where patient has been treated?		
d. Space for event-specific questions		

Countries visited:

List all countries where you have been in the past …. days (including airports, port transit and where you live). List the most recent country first (where you boarded). If you need more space, please use the back of the page.

1. .....
2. .....
3. .....
4. .....

Annex 6. Secondary screening form

**PLEASE ATTACH THE TRAVELLER HEALTH DECLARATION FORM USED AT THE PRIMARY SCREENING TO THIS DOCUMENT

Reason individual referred for secondary screening (Check all that apply):

☐ Signs or symptoms

☐ Potential exposure

☐ Other risk factor

SECTION 1: TRAVELLER INFORMATION

Family name: ..... First name: .....

Other name(s): ..... Age: .....

Date of Birth: ...../...../..... (DD/MM/YYYY) Gender: ☐ Male ☐ Female

Passport #: ..... Passport Country: .....

Head of Household: ..... Village/Town: ..... Parish: .....

Country of Residence: ..... District: ..... Sub-County: .....

Location where traveller either became ill or had exposure:

Village/Town ..... District: ..... Sub-County: .....

If different from permanent residence, dates residing at this location:

...../...../..... to ...../...../...../ (DD/MM/YYYY)

Date of Exposure (If Applicable): ..... / ..... / ...../ (DD/MM/YYYY)

SECTION 2: CLINICAL SIGNS AND SYMPTOMS Temperature

For signs and symptoms compatible with a communicable disease, refer to IHR Annex 9

Has the traveller experienced any of the following symptoms today OR within the past … hours? Date of first symptom onset: ____/____/_____ (DD/MM/YYYY)

In the past … days, have you done any of the following?	Traveller response
e.g. fever (threshold to be determined)	☐ Yes ☐ No ☐ Unknown
e.g. diarrhoea	☐ Yes ☐ No ☐ Unknown
e.g. skin rash	☐ Yes ☐ No ☐ Unknown
e.g. headache	☐ Yes ☐ No ☐ Unknown

SECTION 3: EXPOSURES AND RISK FACTORS

This section should be modified to identify potential risks or exposures to the disease of concern, taking into account the incubation period.

The Screening personnel should ask questions during the public health interview.
In the past... Time period, have you done any of the following?

e.g. Did you work in a health care facility without appropriate infection control procedures?	☐ Yes ☐ No ☐ Unknown
e.g. Did you provide direct care to any person with... while the person was sick?	☐ Yes ☐ No ☐ Unknown
	☐ Yes ☐ No ☐ Unknown
	☐ Yes ☐ No ☐ Unknown
	☐ Yes ☐ No ☐ Unknown
	☐ Yes ☐ No ☐ Unknown
	☐ Yes ☐ No ☐ Unknown

SECTION 4: TRIAGE AND RESPONSE

Complete the table with the measures to be taken based on the results of the assessment

Travel intervention (check one)	Medical assessment and intervention (check all that apply)
☐ Allowed to board flight	☐ Transported to hospital/health facility
☐ Denied boarding	☐ Referred home for symptom watch
	☐ Provided health information
	☐ Other, please specify

Annex 7. WHO EMRO Guidance on establishing public health assessment interview spaces

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Over the past decade, countries have committed substantial resources and efforts to the development of core capacities for managing public health events at points of entry (PoE) in accordance with the requirements prescribed in the 2005 International Health Regulations (IHR). The aim of this material is to set out guidance to support State Parties to meet and sustain the core capacity for a public health assessment and interview space in accordance with IHR, namely to (a) identify appropriate interview space at PoE and (b) establish, equip and administer the space during routine or public health emergencies of international concern (PHEIC) under Annex 1B of the IHR.

With the arrival of two recent health emergencies – Middle East respiratory syndrome coronavirus (MERS-CoV) and Ebola virus disease (EVD) – the WHO Eastern Mediterranean Region conducted a region-wide assessment in 2014, one of the objectives of which was to identify and develop approaches to address those IHR core capacities that were limited or required strengthening. During the mission, two particular gaps were identified: a) setting up appropriate interview space at points of entry and b) establishing, equipping and administering the space during routine or public health emergencies as stipulated under Annex 1B of the IHR. In response to those gaps and the continuing outbreaks the WHO Eastern Mediterranean Region prepared the following guidance.

This draft guidance was presented in a series of four *Emergency Workshops to Enhance the Capacity of Points of Entry for Preparedness and Response to Ebola Virus Disease*, held from 16 March to 3 May 2015 in four countries within the WHO Eastern Mediterranean Region. Public health professionals from all countries in the region attended, as did the experts and regional representatives from the International Civil Aviation Organization (ICAO). Feedback received from both the public health and aviation sectors during and after the workshops has been incorporated into the guidance.

This document developed by WHO Regional Office for the Eastern Mediterranean addresses a gap identified during WHO assessment missions conducted in 2014, one of the objectives of which was to identify and develop approaches to address those IHR core capacities that were limited or required strengthening. The content of this guidance was presented in a series of four *Emergency Workshops to Enhance the Capacity of Points of Entry for Preparedness and Response to Ebola Virus Disease*, held from March 16 to May 3, 2015 in the countries of the WHO Eastern Mediterranean Region. The dialogue and feedback received during the workshops has been incorporated into the guidance.

Recognizing that planning, operation and maintenance of appropriate space for public health assessment and interviews at points of entry is a common challenge, this guidance might be beneficial to countries outside the Eastern Mediterranean Region as well.

ACKNOWLEDGMENTS

Participants and facilitators in the *Emergency Workshops to Enhance the Capacity of Points of Entry for Preparedness and Response to Ebola Virus Disease*, hosted by the WHO Regional Office of Eastern Mediterranean (16 March–3 May 2015), whose input and feedback throughout the workshops clarified and enhanced the content of this guidance note.

WHO Regional Office for the Eastern Mediterranean

Dalia Samhouri, Epidemiologist, Epidemiology Surveillance and International Health Regulations (ESI), Department of Communicable Disease & Control

Dr Moussif Mohamed, Temporary Advisor

Dr KM Khalil, Temporary Advisor

Susan Clay, WHO consultant

WHO Global Capacities, Alert & Response Support to IHR Capacity Assessment, Development and Maintenance (CAD) Ports, Airports and Ground Crossings

Dr Daniel Menucci, Team Leader, Ports, Airports and Ground Crossings

Dr Ninglan Wang, Technical Officer

WHO Collaborating Centre for the International Health Regulations: points of entry at University of Thessaly, Greece

Christos Hadjichristodoulou, MD, PhD, Professor of Hygiene and Epidemiology, WHO Collaborating Centre for the International Health Regulations: points of entry at University of Thessaly, Greece

Barbara Mouchtouri, MSc, PhD, Public Health Specialist, WHO Collaborating Centre for the International Health Regulations: points of entry at University of Thessaly, Greece

ACRONYMS

EVD	Ebola Virus Disease
IHR	International Health Regulations (2005)
MERS-CoV	Middle East respiratory syndrome coronavirus
NFP	National Focal Point
PHEIC	Public Health Emergency of International Concern
PoE	Points of Entry
SARS	Severe Acute Respiratory Syndrome
SOP	Standard Operating Procedure
WHO	**World Health Organization**

GLOSSARY

'isolation' means separation of ill or contaminated persons or affected baggage, containers, conveyances, goods or postal parcels from others in such a manner as to prevent the spread of infection or contamination;

'medical examination' means the preliminary assessment of a person by an authorized health worker or by a person under the direct supervision of the competent authority, to determine the person's health status and potential public health risk to others, and may include the scrutiny of health documents, and a physical examination when justified by the circumstances of the individual case;

'point of entry' means a passage for international entry or exit of travellers, baggage, cargo, containers, conveyances, goods and postal parcels as well as agencies and areas providing services to them on entry or exit;

'public health event of international concern' means an extraordinary event which is determined, as provided in these Regulations:

i. to constitute a public health risk to other Member States through the international spread of disease and

ii. to potentially require a coordinated international response;

'quarantine' means the restriction of activities and/or separation from others of persons who are ill or suspected of being ill or of suspect baggage, containers, conveyances or goods in such a manner as to prevent the possible spread of infection or contamination.

1. Background

Persons travelling through a point of entry may be ill or be suspected of being affected or at risk of illness from a serious communicable disease or other condition arising from a public health event. The competent authority of a point of entry needs adequate space to assess ill travellers or those suspected of being ill in a manner that limits potential exposure to other travellers, the public and staff working at points of entry (PoE). This public health interview space is not intended to meet the requirements for the diagnosis and/or treatment of ill travellers, long-term quarantine of contacts or isolation of cases.

> *Distinction between public health interview/assessment space and a medical clinic*
>
> *This guidance note refers to the specifications for a public health interview space at PoE, as required by the IHR. It does not set out specifications for a medical clinic that may deliver a variety of medical and/or occupational health services to PoE or travel industry staff, traveller health clinics or to the public. In some PoE, the medical clinic may support public health services; in others, it may operate as a completely independent, private medical facility. In the event that a medical clinic is involved in the public health response (under the direct supervision of the competent authority at the PoE), communication protocols that include the ministry of health and IHR National Focal Points (NFP) must be in place.*

1.1 Core capacities requirements for designated PoE related to public health interview and assessment space, excerpted from the IHR (2005)

At all times, each designated PoE should have the following capacities (IHR Annex 1B 1)

The capacities:

- (a) to provide access to (i) an appropriate medical service including diagnostic facilities located so as to allow the prompt assessment and care of ill travellers, and (ii) adequate staff, equipment and premises;
- (b) to provide access to equipment and personnel for the transport of ill travellers to an appropriate medical facility;

For responding to events that may constitute a public health emergency of international concern (IHR Annex 1B 2)

The capacities:

- (c) to provide appropriate space, separate from other travellers, to interview suspect or affected persons;
- (d) to provide for the assessment and, if required, quarantine of suspect travellers, preferably in facilities away from the point of entry;
- (g) to provide access to specially designated equipment, and to trained personnel with appropriate personal protection, for the transfer of travellers who may carry infection or contamination.

Treatment of travellers: Article 32

- (c) providing or arranging for adequate food and water, appropriate accommodation and clothing, protection for baggage and other possessions, appropriate medical treatment, means of necessary communication if possible in a language that they can understand and other appropriate assistance for travellers who are quarantined, isolated or subject to medical examinations or other procedures for public health purposes.

2. Planning for a public health interview/assessment space

The space or spaces should be identified in advance (prior to an event) during the construction or renovation of PoE facilities or as part of the development of the public health emergency preparedness plan. This planning should be done in cooperation with PoE operators, customs and immigration, security services and other stakeholders at the PoE or related ministries (i.e. civil aviation, transport).

During planning, consider scenarios when small or large numbers of travellers may need to be interviewed/assessed.

- During normal circumstances, the designated public health interview/assessment space described in this document will be sufficient.
- In the event of a large number of travellers to be screened, interviewed/assessed, planning should consider creating a temporary space for travellers to complete screening forms and await interviews.
    - o For travellers who will depart/embark from the PoE, this temporary space may be created by establishing a health check-in counter prior to airline/ship company check-in.
    - o For travellers who are disembarking from a conveyance at the PoE, this temporary space may be created by designating an arrivals hall, separate from other arriving travellers, or by establishing a separate area through the use of screens, moveable walls, curtains or similar devices.

2.1 Permanent facilities

Ideally, the permanent space for public health interviews/assessments should be located within the PoE such that it:

a. is accessible for the users of the facility;

b. is in a location that will facilitate communication and collaboration between competent authorities (i.e. health, immigration, security services);

c. can be securely accessed by paramedic/first responders for travellers who require first aid or transport to a medical facility (Note: those travellers arriving ill and requiring immediate medical attention may be assessed by first responders at the arrivals gate and transported directly to a medical facility);

d. has preferably two doors – one for entry and one for exit including medical transport;

e. includes wheelchair /stretcher accessible doors (i.e. self-closing doors);

f. includes seating space close to the public health interview space for travellers waiting to be interviewed or family/travel companions;

g. is located on an outside wall to facilitate natural lighting and ventilation, if feasible.

2.2 Temporary arrangements during events with increased traveller volumes

During a single event – When an affected conveyance arrives with a single or several ill or suspect travellers or due to information based on fact or evidence of a public health risk, including sources of infection and contamination, are found on board, the public health interview process may begin away from the established interview space.

a. Meet conveyance at gate, and triage on board if possible with the agreement of the conveyance operator, removing traveller(s) who require emergency medical care and transport to a medical facility.

b. Distribute passenger locator forms or questionnaires to travellers who have been identified for possible contact tracing on board or upon disembarking from the conveyance.

c. Use arrivals hall or designated area to separate obviously ill travellers and those travellers identified for public health interview from others who will not be detained for interviews or further assessment.

d. Use privacy screens or queue lines to conduct interviews with potential contacts.

e. Accompany ill travellers or those suspected of being ill to the public health interview/assessment space.

f. Where feasible, separate travellers from the concerned conveyance from other arrivals during border control screening: ensure border control and other relevant stakeholders are aware of the situation.

2.3 During public health emergency of international concern – Forecast of extended time period and high volume of travellers to be screened (e.g. current EVD situation).

- Collaborate with terminal facility to identify and occupy space temporarily near established public health interview space, where feasible.
- Review operational considerations for WHO technical notes on exit and entry screening as applicable according to WHO recommendations or national guidance.

3. Key building and construction specifications for public health interview space

3.1 Basic attributes

Consider that this space may also act as office space for public health staff at PoE. The dimensions will depend upon national building code or public health staff requirements. The space should be large enough to accommodate a desk with telephone/fax/computer/printer and chair; examination table; several chairs for staff and traveller(s); secure, lockable file storage for health records; storage shelving for paper supplies; shelving for assessment equipment (thermometers, syringes, etc.).

a) Walls, floors and ceilings should be in good repair and have a smooth, washable finish.

b) Lighting should meet international or national standards, with sufficient overhead and task lighting. Natural lighting (windows) may facilitate medical examination (i.e. to determine the nature of skin rashes, bruising, etc.).

c) Hand washing sink should be equipped with hot and cold potable running water (separate from toilet facilities); a soap dispenser, towel dispenser and covered waste basket as well as hand antiseptics should be available for use.

d) Separate hand washing facility with toilet connected to a sewage system should also be available; the hand basin should be equipped with hot and cold running potable water; a soap dispenser, towel dispenser and covered waste basket should also be available.

e) Ventilation within the interview area and separate washroom should be controllable in order to reduce the potential for transmission of airborne illnesses, in accordance with international or national ventilation standards.

f) Furnishings (desk, chairs, general waste basket, examination table) should be of a sort that can be easily cleaned and disinfected

g) Sharps and biohazard waste disposal should be available.

h) Internet access should be possible.

i) Health education materials should be available.

3.2 Other related facilities

j) A storage space is required for personal protective equipment (PPE) including masks, gloves, gowns and other PPE (see section 5.3) that may be recommended. The PPE may be stored within the public health interview space or in an easily accessible storage area nearby.

k) Cleaning and disinfecting supplies will be required on a routine basis and should be stored nearby. Special disinfectants effective for specific pathogens will be needed depending on the etiological agent of emergency events.

3.3 Short-term quarantine or isolation space

Quarantine space

A PoE may also provide an onsite, short-term quarantine space. Long-term quarantine accommodation, however, has complex needs including security, sleeping accommodation, delivery of food and hygiene supplies: this type of accommodation may be more appropriately provided in designated housing (e.g. guest housing/hotels, hospitals, private housing). The IHR recommends that long-term quarantine be located away from PoE.

Isolation space

A point of entry may provide short-term isolation while the ill traveller is awaiting transport to a medical facility. The basic requirements for isolation space include separation from other travellers, interview or office space and good natural (windows open to outdoors) or engineered ventilation.

WHO recommendations for managing in-patients with sudden acute respiratory syndrome (SARS)[39] may be a useful guide for consideration in managing short-term isolation. With respect to SARS, the following guidance is given. Probable SARS cases should be isolated and accommodated as follows in descending order of preference:

39 - http://www.who.int/ihr/lyon/surveillance/infectioncontrol/en/

- negative pressure rooms with the door closed
- single rooms with their own bathroom facilities
- cohort placement in an area with an independent air supply, exhaust system and bathroom facilities.

Turning off air conditioning and opening windows for good ventilation is recommended if an independent air supply is unfeasible. Please ensure that if windows are opened they are away from public places.

4. Staffing considerations

4.1 Overall considerations

Staffing for a point of entry public health interview space will depend on a number of factors, including the following.

- Duties of public health personnel:
  - In addition to public health interviews, the public health space may be the full or part time office for environmental health officers, epidemiologists, port health officers/specialists or public health/medical staff. The type and quantity of instruments and other equipment will be derived from the duties and educational background of public health staff that will work at the point of entry (e.g. if personnel are conducting rapid tests, they will require specific equipment).
- Complexity and volume of operations at PoE:
  - An airport that is a transport hub with significant traveller volume may require a larger, more diverse staff to meet the needs of travellers. In the largest airports with multiple terminals, there may need to be more than one public health interview space, coordinated by the competent authority.
  - A port used for cruise ships only may need a limited public health interview space because ill travellers or those suspected of being ill may have been assessed or diagnosed by the onboard medical clinic prior to arrival. Port health staff may have interviewed these travellers onboard prior to disembarkation, in consultation with the cruise ship company. This may be decided on a case-by-case basis, avoiding unnecessary delays of departure, but is preferable because of the reduced exposure to other travellers, workers or the public.
  - A port used exclusively by cargo vessels may also require a small public health interview space due to the small numbers of crew associated with cargo operations.
- Location of PoE:
  - A ground crossing or air/marine point of entry located some distance from a medical facility may need additional space to hold ill travellers or those suspected of being ill until transport can be arranged.

4.2 Recommended minimum staffing requirements at a designated point of entry

As a minimum, there should be one or more port health officers onsite or available and reachable during the operational hours of the point of entry. These officers should have training in public health. If the ill traveller requires clinical assessment, diagnosis, laboratory testing or isolation, they will be transported to a designated medical facility for follow-up.

Larger facilities may retain medical professional staff members (nurses or physicians) who are able to conduct a non-invasive medical examination (as defined by IHR) or offer vaccinations. This level of staffing will require additional space and equipment.

A point of entry with a complex or high volume of travellers may decide to include isolation space or laboratory facilities for diagnosis of clinical specimens. The IHR states that appropriate service including diagnostic facilities should be located so as to allow the prompt assessment and care of ill travelers, without specifying the requirement of proximity. If a point of entry provides these spaces, they should consider the following:

- o Isolation space should meet all related requirements (please refer to bibiliography)
- o Laboratory facilities should be established, equipped and operated in accordance with national or international guidelines including external accreditation or evaluation.

5. Considerations for equipping and administering public health interview space

5.1 Cleaning and disinfection

Public health facilities require routine cleaning and disinfection at all times. The point of entry operatoror third party contractors may provide this service. The frequency of cleaning and disinfection should be described in written arrangements between the port's competent authority(s) and the service provider.

5.1.1 Routine cleaning and disinfection

- Services will include cleaning and disinfecting of toilet and hand washing facilities; cleaning and disinfection of floors and soiled walls or ceilings; cleaning and disinfection of furnishings used by ill or affected travellers; regular removal of general solid waste for appropriate handling and disposal.
- Cleaning and disinfecting agents should be licensed for use in the country. Service providers should have received training in their safe and effective use.
- Linens or towels must be replaced between travellers. It is preferable to use single use items where possible. If linens are used, they must be machine washed, handled in accordance with hospital infection control procedures following use and stored in a clean cupboard.
- All biohazard and waste contaminated by body fluids must be handled and disposed through appropriate hygiene services according to the States Parties guidelines for hospital waste management.
- Cleaning logs should be maintained for each area of the public health interview/assessment space.

5.1.2 Enhanced cleaning and disinfection

When a PHEIC has been declared or when the number of ill or affected travellers with a serious communicable disease is noted, hygiene services should be increased in accordance with ministry of health or other agency recommendations. Written instructions for enhanced cleaning and disinfection should be agreed between the port's competent authority(s), the point of entry operator, and service providers.

- Specific chemical disinfection agents determined to be effective against the infective or contaminating agent may be recommended for application. Service providers may require additional training in the preparation, handling and application of these products.
- Any contaminated items must be handled appropriately to mitigate the risk of transmission.
    - o Disposable items (hand towels, gloves, tissues) should be double bagged and sent to incineration or similar final disposal, according to the States Parties guidelines for hospital waste management.
    - o Reusable items that can be washed and treated/disinfected (gowns or linens) must be tagged and sent to facility for washing and treatment as recommended according to hospital infection control procedures, depending on the type of contamination/infectious agent, if known.

5.2 Interview and related equipment

- All instruments used during interview/assessment should be single use or constructed to withstand disinfection or sterilization in accordance with national or international codes. Note: WHO has recently recommended the use of "smart syringes" to prevent disease transmission especially for medical workers[40] .
- Where possible, non-contact temperature measuring devices should be used and if contaminated, they must be discarded or disinfected in accordance with manufacturer's instructions.
- There should be a written SOP for routine disinfection of equipment.
- Any dated equipment or consumable supplies must be stored with a 'first in/first out' stock rotation and checked on a yearly or bi-annual basis.

5.3 Personal protective equipment

The public health interview space should include or have access to a full range of PPE that may be necessary for conducting screening and interviews of ill travellers or those suspected of being ill. All staff should be trained in the use and handling of PPE. The following PPE are recommended as described in the EVD screening guidance document[41] :

- o disposable gloves
- o long sleeved impermeable gown
- o face mask
- o eye protection (face shield or goggles)
- o close-toed shoes with shoe coverings or gum boots (optional)

40 - http://www.who.int/mediacentre/news/releases/2015/injection-safety/en/

41 - WHO. Exit screening at airports, ports and land crossings: interim guidance for Ebola virus disease. Geneva: World Health Organization; 2014 (http://apps.who.int/iris/bitstream/10665/139691/1/WHO_EVD_Guidance_PoE_14.2_eng.pdf?ua=1).

- Depending on the job duties performed at the point of entry, personnel may also require respirators or other appropriate equipment for environmental assessments. Note that the use of many respirators (i.e. N95) requires initial and routine fit testing for each individual that may be required to use it.

5.4 Operational agreements

The port's competent authority(s) and the point of entry operator should have a written agreement that outlines their respective responsibilities related to ongoing maintenance of the public health interview/assessment space. This document should include routine inspections of the physical facility and a procedure for making any repairs and improvements that may be required. The point of entry operator and the port's health department should ensure all such inspections or maintenance are documented. A specific SOP should be established for all related procedures (i.e. cleaning and disinfection).

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