The early detection of infectious diseases on board aircraft, in conjunction with timely risk assessment, is crucial when initiating a public health response.

When a public health risk is detected, contact tracing passengers who were exposed during a flight is an essential step towards containment — and a major challenge to public health experts worldwide.
RAGIDA (‘risk assessment guidelines for infectious diseases transmitted on aircraft’) -- report commissioned by the European Centre for Disease Prevention and Control (ECDC), coordinated by Katrin Leitmeyer at ECDC, and produced by Robert Koch Institute, Berlin, Germany (inputs from ICAO and IATA)

- evidence retrieved from scientific literature
- expert knowledge

............. to provide viable options for decision makers when faced with having to make a decision on whether to contact trace air travellers and crew that were exposed to infectious diseases during a flight.
Over 3 700 peer-reviewed articles and grey literature sources were systematically reviewed in order to evaluate the exact circumstances that led to the transmission of these infectious diseases on board aircraft.

In addition, systematically searched guidelines on risk assessment and risk management of these infectious diseases from international aviation boards and national or international public health agencies.

For additional input, 73 experts from 38 countries were contacted and asked for advice.
The number of articles reporting confirmed onboard transmission for any of these diseases was surprisingly low, especially when considering the large number of potential contacts.

The total number of events with on-board transmission is probably also quite low.

Although it is difficult to draw any conclusions on the number of infections arising through on-board transmission, it seems likely that the potential for spreading infectious diseases on board is not higher than on the ground.
Contact tracing (CT) is an investigation procedure aimed at acquiring contact information in order to approach contacts that were potentially exposed to pathogens.

CT can be comprehensive (contacting all passengers and crew) or follow a more restrained approach: passengers will only be contacted when they meet certain criteria as published in existing guidelines,

- defined contact categories (close contact = +/- 2 rows in front of/behind the index case;
- highly exposed contact = coughed or sneezed at).
Less than 50% can be contact traced successfully

Final tally of possible infection spread in flight -- < 1%
Tuberculosis:

- WHO suggests that contact tracing should be limited to flights that took place in the past three months prior to the notification of the public health authorities.
- According to WHO, the minimal duration of exposure (on the basis of total flight duration) that mandates contact tracing is eight hours.
- Contact tracing is only recommended if a person was likely to have been infectious during the flight/s. For non-infectious persons, contact tracing is not recommended. Crew members are not normally considered close contacts of an index case.
- If an infectious or potentially infectious case is recognised before boarding, he or she should be denied boarding.
- If an infectious or potentially infectious case is noticed during the flight, the ill passenger should be given a surgical facemask to prevent dissemination of infectious droplets. If no mask is available or a mask cannot be tolerated, the passenger should be provided with an adequate amount of either paper tissues or towels and instructed to cover nose and mouth, at least while speaking, coughing or sneezing.
- The first public health authority to be informed should be the authority of the country where index case was diagnosed. Public health authorities should also be provided with the index case’s recent air travel history.
Contact tracing for SARS

WHO defines a ‘contact’ of a suspected SARS case as:
• a passenger seated in the same row as the suspected SARS case;
• a passenger two rows in front or behind the suspected SARS case;
• a person providing care for the suspected SARS case;
• a person having intimate contact with the suspected SARS case;
• a person having contact with respiratory secretions of the suspected SARS case;
• a person living in the same household with the suspected SARS case; and
• all crew members.

If a crew member happens to be a suspected SARS case, all passengers should be regarded as contacts.
Contact tracing for measles events

It is particularly important to consider the epidemiological situation of measles in the index case’s country of origin and in the destination country, especially in regard to IHR 2005 relevancy.

Contact tracing for measles events in the EU cannot be generally recommended since measles are vaccine preventable and the majority of air passengers can be considered as non-susceptible.

Unvaccinated pregnant women are particularly vulnerable: measles during pregnancy are associated with spontaneous abortion and premature delivery as the clinical course of measles is likely to be more severe during pregnancy. When considering contact tracing, this group deserves special attention.

Also, any immunocompromised passengers and infants < 1 year are at a higher risk of severe clinical courses and should be traced early and provided with post-exposure prophylaxis.
Due to the high transmissibility of measles it would be more sensible to contact trace all passengers and crew members — provided that the epidemiological situation and susceptibility for measles in the countries of origin and destination were carefully considered.
Contact Tracing for Ebola

Key facts about Ebola Virus Disease:

- Ebola virus disease (EVD), formerly known as Ebola haemorrhagic fever, is a severe, often fatal illness in humans.

- EVD outbreaks have a case fatality rate of up to 90%.

- EVD outbreaks occur primarily in remote villages in Central and West Africa, near tropical rainforests.

- The virus is transmitted to people from wild animals and spreads in the human population through human-to-human transmission.

- Fruit bats of the Pteropodidae family are considered to be the natural host of the Ebola virus.

- Severely ill patients require intensive supportive care. No licensed specific treatment or vaccine is available for use in people or animals.
Contact Tracing for Ebola

Key facts about Ebola Virus Disease:

- Ebola then spreads in the community through human-to-human transmission, with infection resulting from direct contact (through broken skin or mucous membranes) with the blood, secretions, organs or other bodily fluids of infected people, and indirect contact with environments contaminated with such fluids.

- Burial ceremonies in which mourners have direct contact with the body of the deceased person can also play a role in the transmission of Ebola.

- Men who have recovered from the disease can still transmit the virus through their semen for up to 7 weeks after recovery from illness.

- The incubation period, or the time interval from infection to onset of symptoms, is from 2 to 21 days.

- The patient becomes contagious once they begin to show symptoms.

- They are not contagious during the incubation period.
Contact Tracing for Ebola

The risk of infection for travelers is very low since person-to-person transmission results from direct contact with the body fluids or secretions of an infected patient.

The risk of a tourist or businessman/woman becoming infected with Ebola virus during a visit to the affected areas and developing disease after returning is extremely low, even if the visit included travel to the local areas from which primary cases have been reported.

Transmission requires direct contact with blood, secretions, organs or other body fluids of infected living or dead persons or animal, all unlikely exposures for the average traveller. Tourists are in any event advised to avoid all such contacts.

No transmission was reported without this direct contact.

Airborne transmission has not been documented during previous EVD outbreaks.
There is a possibility that a person who had been exposed to Ebola virus and developed symptoms may board a commercial flight, or other mode of transport, without informing the transport company of his status.

It is highly likely that such patients would seek immediate medical attention upon arrival, especially if well informed, and then should be isolated to prevent further transmission.

Although the risk to fellow travellers in such a situation is very low, contact tracing is recommended in such circumstances.
3.1. Recommendations for countries

3.1.1. Raise the awareness and knowledge of travellers

Travellers leaving for or arriving in an area where EVD is occurring should be provided at points of entry (e.g. in airports or ports on boarding or arrival areas or at ground crossing points) with information on the potential risk of EVD (see proposed template below). Information should also be spread among communities that may include cross-border travellers and near all relevant international borders.

The information provided should emphasize that travellers or residents in the affected areas of countries can minimize any risk of getting infected if they avoid:

- Contact with blood or bodily fluids of a person or corpse infected with the Ebola virus.
- Contact with or handling of wild animals, alive or dead or their raw or undercooked meat.
- Having sexual intercourse with a sick person or a person recovering from EVD for at least 7 weeks.
- Having contact with any object, such as needles, that has been contaminated with blood or bodily fluids.

Travellers should be informed where to obtain medical assistance at the destination and who to inform (e.g. through hotline telephone numbers).
3.1.4. Screening passengers at points of entry (ports, airports or ground crossing) is **not recommended**

Screening of passengers at points of entry (arrival or departure) is costly and expected to have very limited impact because it is very unlikely to detect any arriving person infected with EVD. This is particularly true for EVD with its incubation period of 2 to 21 days and symptoms that are not specific.

As part of this, the use of thermal scanners that rely on the presence of ‘fever’ in arriving passengers is costly, unlikely to detect any arriving person infected with EVD and is not encouraged.

Travel restrictions, closure of borders at points of entry are not recommended
3.2. Recommendations for international air transport

In case of a passenger presenting with symptoms compatible with EVD (fever, weakness, muscle pain, headache, sore throat, vomiting, diarrhoea, bleeding) on board of an aircraft, the following measures should be immediately considered, in accordance with operational procedures recommended by the International Air Transport Association (IATA):

• Distancing of other passengers if possible from the symptomatic passenger (re-seating); with the ill travellers preferably near a toilet, for his/her exclusive use.

• Covering nose and mouth of the patient with a surgical facemask (if tolerated).

• Limiting contacts to the passenger to the minimum necessary. More specifically, only one or two (if ill passenger requires more assistance) cabin crew should be taking care of the ill passenger and preferably only the cabin crew that have already been in contact with that passenger. This cabin crew should be using the Universal Precaution Kit (see below).

• Hand washing with soap after any direct or indirect contact with the passenger.

• Immediate notification of authorities at the destination airport in accordance with procedures promulgated by the International Civil Aviation Organization (ICAO).

• Immediate isolation of passenger upon arrival.
• Dedicated crew member to assist the ill traveller, should be using suitable personal protection equipment (PPE) such as that recommended by ICAO Universal Precaution Kit (http://www.capsca.org/CAPSCARefs.html) for dealing with the traveller and for cleaning procedures on board as needed.

• The possibility of transmission to other co-passengers and crew on board the aircraft should be assessed by health care providers on arrival.

• If the investigation concludes that the passenger has symptoms compatible with EVD and had a risk exposure in affected countries in the past 21 days, passengers as well as crew members may be at risk if they have been in direct contact with body fluids or heavily contaminated objects.
The following epidemiological measures based upon proximity to the index patient should be considered:

- **Passengers and crew with reported direct contact**
  To gather this information, any records of significant events on the flight should be obtained from the airline. Co-travellers and crew members who report direct body contact with the index case should undergo contact tracing.

- **Passengers seated in an adjacent seat to the index patient**
  As direct contact is the main route of transmission for Ebola virus, only passengers who were seated in an adjacent seat to the index case on the side, in front or behind, including across an aisle, should be included in contact tracing.

- **Cleaning staff of affected aircraft section**
  If the case is suspected or diagnosed after leaving the aircraft, the staff who cleaned the section and seat where the index case was seated should also undergo contact tracing.
At the request of airport or port health authority, airlines may also ask some or all passengers to provide information on their itinerary and their contact details where there is a particular reason to believe they may have been exposed to infection on board of aircraft (e.g. per the ICAO public health passenger locator form).

Additionally, countries may consider requiring arriving aircraft to complete and deliver the health part of the aircraft general declaration (in those cases where the information is not communicated to the airport of arrival while in flight) concerning persons on board with communicable diseases or sources of infection (IHR Annex 9).

Passengers, crew members and cleaning staff who have been identified through contact tracing should be assessed for their specific level of exposure. Passive self-monitoring of temperature (e.g. monitoring temperature only if feeling feverish) and symptoms or active self-monitoring (e.g. by regular temperature measurement twice a day) for those at higher risk level should be continued for 21 days.

These measures should also be considered if an individual, who experienced symptoms during the flight, has been identified as a suspect of EVD after arrival.
References:

IATA guidelines for air crew to manage a suspected communicable disease or other public health emergency on board

IATA guideline for cleaning crew for an arriving aircraft with a suspected case of communicable disease

ICAO Health related documents (1) Procedures for Air Navigation Services; (2) Annex 6 – Medical Supplies

WHO Aviation Guide which includes information on sanitizing of aircraft
Template message for travellers and EVD

- Ebola Virus Disease is rare.
- Infection is by contact with blood or body fluids of an infected person or an animal infected or by contact with contaminated objects.
- Symptoms include fever, weakness, muscle pain, headache and sore throat. This is followed by vomiting, diarrhoea, rash, and in some cases, bleeding.
- Cases of Ebola have recently been confirmed in XXX and YYY.
- Persons who come into direct contact with body fluids of an infected person or animal are at risk.
- There is no licenced vaccine.
- Practice careful hygiene.
- Avoid all contact with blood and body fluids of infected people or animals.
- Do not handle items that may have come in contact with an infected person’s blood or body fluids.
- If you stayed in the areas where Ebola cases have been recently reported seek medical attention if you feel sick (fever, headache, achiness, sore throat, diarrhoea, vomiting, stomach pain, rash, or red eyes).
Contact tracing ---- where to get the information?

? Airlines

? Immigration data / Visitor data

? Other sources
**Passenger Locator Form**

**FLIGHT INFORMATION:**
1. Airline name
2. Flight number
3. Seat number
4. Date of arrival (yyyy/mm/dd)

**PERSONAL INFORMATION:**
5. Last (Family) Name
6. First (Given) Name
7. Middle Initial
8. Your sex
9. Mobile
10. Business
11. Home
12. Other
13. Email address

**PHONE NUMBER(S) where you can be reached if needed. Include country code and city code:**

**PERMANENT ADDRESS:**
14. Number and street (Separate number and street with blank box)
15. Apartment number
16. City
17. State/Province
18. Country
19. ZIP/Postal code

**TEMPORARY ADDRESS:** If you are a visitor, write only the first place where you will be staying.
20. Hotel name (if any)
21. Number and street (Separate number and street with blank box)
22. Apartment number
23. City
24. State/Province
25. Country
26. ZIP/Postal code

**EMERGENCY CONTACT INFORMATION of someone who can reach you during the next 30 days**
27. Last (Family) Name
28. First (Given) Name
29. City
30. Country
31. Email
32. Mobile phone
33. Other phone

**34. TRAVEL COMPANION – FAMILY:** Only include age if younger than 18 years

<table>
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<th>First (Given) Name</th>
<th>Seat number</th>
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**35. TRAVEL COMPANION – NON-FAMILY:** Also include name of group (if any)

<table>
<thead>
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<th>Last (Family) Name</th>
<th>First (Given) Name</th>
<th>Group (team, business, other)</th>
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Summary

• Contact tracing requires significant resources (human, money, time) and should be implemented wisely.
• Aircraft manifests lack uniform standards across airlines and passenger manifests are rarely kept after 48 hours, which limits the possibility to trace and detect events.

• Multiple factors need to be taken into account for decision making on contact tracing, such as the following:
  – the epidemiological situation in the country of origin and destination of a flight, the distribution of the disease by geographic region;
  – infectivity of the index case during the flight amidst symptomatic or presymptomatic stage;
  – evidence on potential transmission of disease during flight;
  – susceptibility of the population for the disease;
  – the maximum incubation period, as this reflects the time period during which it is possible to intervene with public health measures. Beyond this, contact tracing could be initiated for scientific purposes;
Summary (contd)

- mode of transmission (airborne, droplet, contact);
- ethical aspects (e.g. is treatment available, are containment and/or mitigation measures acceptable?);
- actions that follow contact tracing should be a part of the decision making (e.g. what are the public health actions taken after identification of infected individuals? What can be offered to the infected individuals identified by contact tracing?);
- possible alternatives for contact tracing (e.g. leaflets for passengers of the flight; information on airports?);
- the susceptibility of the affected passengers;
- level of vaccine coverage;
- pathogen type/subtype, antibiotic resistance and;
- the quality of the cabin air (e.g. influenced by length of ground delay).

Summary (contd)

• Purpose of identifying potential infected flight passengers by contact tracing, for example:
  – to initiate disease containment measures;
  – to initiate disease mitigation measures;
  – to delay spread of the disease;
  – to eradicate the disease.
Thank you for your kind attention!