

PROTOCOL TO BE FOLLOWED IN MEDICAL AIR EVACUATION OF PATIENTS SUFFERING FROM THE EBOLA VIRUS

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Once the competent institutions have decided to evacuate, all the operational steps are taken to evacuate Ebola patients.

1. AIM:

To standardise the preparation and for and the evacuation of Ebola patients from the airport in the country of rescue to the reference hospital on home territory.

2. CHOICE OF PERSONNEL:

A medical team specialized in handling patients with infectious diseases and trained in infection prevention and control practices will be assembled.

Bearing in mind the nature of the illness, the patient to be repatriated will be accompanied by the required personnel during the trip.

It is recommended that an 'observer' oversee others' movements at all times so as to instruct them how to proceed at certain times and insofar as possible to avoid actions or manoeuvres that may pose a risk of contamination (putting on and taking off suits, arranging equipment, etc.).

3. CHOICE OF AIRCRAFT:

The aircraft to be used must be fast to ensure that the patient is not in the air longer than is strictly necessary, spacious inside to permit mobility, well sound-insulated so that the personnel can communicate among themselves and with the patient as necessary, well lit and must provide for easy loading and unloading.

Of the aircraft available in Spain the A-310 and Boeing 707 were found to be suitable for this kind of medical evacuation.

4. PRE-FLIGHT PREPARATION:

4.1. PERSONNEL

- A first information meeting with the personnel involved in the evacuation and the aircrew will be held before the flight. The fullest possible information must be provided on the mission to be undertaken.
- Before the outward journey the medical team will explain to the flight crew the

significance and correct use of the areas of the air ambulance and the correct use and placing of personal protection equipment (PPE).

- During the trip, the medical team and the crew will agree on the medical measures to be taken into account during collection, transfer to the aircraft and flight.

4.2. MEDICAL EQUIPMENT

- The chief physician will always be responsible for the appropriate use of medical equipment and materials.
- The specific health equipment for the infectious patient must include the following:
 - basic monitoring: a disposable pulse oximeter, electrodes and a digital thermometer;
 - oxygen therapy equipment/nasal glasses;
 - peripheral venous cannulation kit: 100 cm. extension, 3-way needle-free tap;
 - vesicular sounding kit: clip and spare collecting bag
 - adult containment diaper
 - pads and gauzes
- Negative-pressure isolation chambers may be set up. Spare chambers should be taken along if available.
- At least four complete personal protection sets, including goggles and masks, must be made available for each member of the medical crew, plus one for each member of the flight crew. Extra suits will be carried in case of any unexpected incident during the mission.
- Waste will be collected in the standardised containers approved by the Ministry of Health, bearing in mind the capacity and space available in the aircraft to be used.
- Personal Protective Equipment (PPE)

The Personal Protective Equipment of the medical staff and anyone who may come into direct contact with the patient must consist of the following:

- hand protection: using nitrile or latex gloves¹;
- body protection: biological protective suits (diving suits)²;
- respiratory protection: FFP-2 and FFP-3 filtering masks³;
- eye protection: splash protection eyewear⁴;

¹ These must comply with European Standards UNE-EN 14126:2004, UNE-EN 420:2003+A1:2010, UNE-EN 420:2004+A1:2010 and UNE-EN 374-1:2004

² These must comply with European Standard UNE-EN 14126:2004

³ These must comply with European Standard UNE-EN 149:2001+A1:2010

⁴ These must comply with European Standard UNE-EN 166:2002 and UNE EN 170:2003

- feet protection: rubber boots⁵.

4.3. AIRCRAFT

The aircraft must be made suitable for transferring the patient, to which end it shall be adapted as follows:

- The rear galley should be partly or entirely removed, given that the patient should preferably enter and leave by the rear door of the aircraft or, failing that, the side door.
- Delimitation of a dirty or contaminated zone, a transit zone and a clean or uncontaminated zone, as described at section 5.1.
- Loading and correct stowage of the isolation chambers with the stretchers, control posts and medical material. One seat must be reclined for every chamber installed.

5. INFECTION PREVENTION AND CONTROL MEASURES

5.1. AIRCRAFT

- Delimitation of zones in the aircraft:
 - An aft zone will be created to contain the isolation chambers (five or six rows), to be called the **DIRTY OR CONTAMINATED ZONE**, to which it is advised that the air crew do not have access, for which reason they must transfer everything they need for their work to the forward zones of the aircraft. Access shall be permitted only in case of extreme need or emergency, always subject to prior notice to the medical team, due protection using isolation suits, masks, glasses and gloves and always accompanied by a member of the medical team supervising movements to avoid accidental contamination. Time spent in that zone shall be kept to a minimum, and the instructions of the medical personnel must always be followed.
 - In that zone all the seats must be protected using bags and pads, and the floors and walls of the aircraft must be protected using impermeable plastic material.
 - Access to that zone should be insulated using plastic or another material that is as insulating as possible to act as a door.
 - A second area shall be created forward of the dirty zone: the **TRANSIT ZONE**, over three rows of seats, where the staff with access to the dirty zone must change before entering and after leaving the dirty zone. This must have waste containers, boxes of gloves, masks and isolation suits in both aisles. The seats and the floor in this zone must be prepared in exactly the same way as in the dirty zone.
 - Forward of that, two rows of seats shall be considered the **CLEAN OR UNCONTAMINATED ZONE**. It is recommended that a toilet be exclusively

⁵ These must comply with European Standard UNE EN ISO 20347:2013

reserved for this zone.

5.2. PATIENT

The patient may be transferred (this is not a requirement) in an isolation chamber with a negative-pressure system.

It is recommended that an isolation chamber with a hard base be used. If the chamber used has a soft base (like the ISOARK N36), it is recommended that a system based on fitting structures to bear the patient's weight is used:

Fixed system on a reclined seat

1. Two-piece stretcher attached to seat row rails + vacuum mattress

System for moving the patient

2. Light spine board + dense foam mattress + isolation chamber

Both systems may be combined for in-flight security using the strap that attaches the stretcher to the board at the front and at the rear.

It is recommended that pads are placed inside the isolation chamber to absorb the patient's secretions.

5.3. MEDICAL EQUIPMENT

- It is recommended that, whenever possible, **one-piece isolation suits incorporating built-in boots** are used. They should have a rear zip fastener if possible. They should have a **full hood with a screen serving as built-in glasses and mask** attached to a support system, placed on the head, incorporating an air system to avoid the mask fogging up. There are two systems on the market: one has a built-in fan to allow permanent ventilation and the other has an autonomous ventilation system.
- It is recommended that the medical team have a system for communication among themselves and a photophore for clearly lighting the working area without producing shadows.
- The gloves must fit tightly over the suit to allow safe work and must be long so as to fit over the suit.

6. MEASURES TO BE TAKEN AT THE AIRPORT WHERE THE PATIENT IS COLLECTED

- No-one is permitted to have access to the aircraft once it has landed at the airport of destination unless authorised by both the head of the medical mission and the captain of the aircraft subject to the security and isolation conditions laid down.
- If any member of the crew has to leave the aircraft to carry out maintenance or loading duties, he must do so wearing the protection equipment decided in advance and then take it off on returning to the aircraft as instructed.
- It is recommended that a tent be put up for the preparatory treatment of patients at the

airport. This should be light and easily assembled and dismantled. A lighting system should also be provided given that it may be necessary to transfer the patient at night (tent lighting system, suits incorporating lights, a spotlight with its own power unit or that can be powered from the aircraft).

- Infectious patients must be carefully isolated **before** they board the aircraft, on the runway or in any facilities that are available.
- Patients must be loaded in such a way as to guarantee the greatest security, always one-by-one, using the designated door and always at a distant from the crew members.
- As a general rule, the patient in the worst condition will be placed in the zone closest to where the medical team rest.

7. EVALUATION AT THE POINT OF ENTRY TO THE COUNTRY OF DESTINATION

- The airport of entry must preferably be one of the entry points designated in the International Health Regulations (2005).
- The aircraft shall be parked in an isolated part of the airport. No-one may leave the aircraft until the health check (by the Border Health Service) is complete.
- The medical team at the entry point (Border Health Service) shall be made up of an action group of at least two health officials, a doctor responsible for the operation and a nurse and a support group of two additional physicians.
- The control team must put on their personal protection equipment before approaching the aircraft. The physician leading the operation shall board the plane, and the nurse shall remain at the foot of the steps awaiting instructions.
- Inside, the chief physician shall check that the patient to be repatriated is properly installed on a stretcher or isolation bed and shall check that the cabin is properly prepared; the chief physician shall ask for a report from the flight doctor on the patient's state of health and on any in-flight event affecting the patient or the crew. Any such event must be recorded in the Health section of the Aircraft General Declaration form.
- A clinical report on the patient shall be drawn up, recording the medication administered during the flight, for delivery to the transfer team on the ground.
- Once the general situation of the aircraft has been evaluated the authorisation shall be given for the disembarkation of the patient, and this shall be undertaken in coordination with the health teams responsible for the transfer of the patient.
- Once the health measures have been completed the team shall remove their PPEs at a designated location and these shall then be disposed of following the procedure set out at section 8.
- The team shall wash their hands after removing the PPEs rubbing them for 40-60 seconds with a disinfecting solution (chlorhexidine) and drying them with a disposable towel.
- Epidemiological information shall be collected from all personnel who took part in the

operation, specifying the risk level acquired, for subsequent follow-up.

8. CLEANING AND DISINFECTION OF THE AIRCRAFT AND DISPOSAL OF BIOLOGICAL WASTE

- The Health Control Team supervises the cleaning and disinfection of the aircraft and the correct disposal of biological waste.
- The procedure followed is that set out in the WHO 'Guide to Hygiene and Sanitation in Aviation', and specifically the section referring to aircraft disinfection after an event.
- All potentially dangerous material, including PPEs, must be placed in containers suitably labelled as 'biohazard', which must be deposited at the foot of the aircraft steps.
- The disinfection must be carried out by an enterprise that is approved by the Spanish health authorities using biocides with virucidal properties that are authorised for use on aircraft and approved by the Spanish government (Ministry of Health, Social Services and Equality).
- If in the repatriation operation undertaken a product containing peroxosulphates was used which is authorised for use in aircraft And being the product diluted with water and sprayed,,disinfection must be undertaken by specialist personnel, and a three-hour safety period with no-one on board is recommended and the aircraft should be properly ventilated before anyone re-enters it.
- Once all the material has been collected, it must be transported by an enterprise that is authorised to handle biological waste and subsequently correctly destroyed.
- Once the health measures have been completed, the team leader will draw up a report on the steps taken for subsequent distribution to the responsible units.

9. TRANSFER OF THE PATIENT TO THE REFERENCE HOSPITAL

9.1. PREPARATION

The passenger compartment of the ambulance and the material necessary for handling the patient must be lined with plastic.

- Patient compartment: the roof, floor and walls of the ambulance must be lined separately and the separate linings sealed using duct tape. The window and ventilation bars between the passenger compartment and the driver's cabin must be sealed with plastic and duct tape.
- The material carried in the ambulance must be sealed in plastic or in a double bag, depending on whether it is portable or fixed.
- Other material: biological waste collection bags (red bags), vomit bags, sodium hypochlorite spray, one set of Personal Protection Equipment (PPE) per staff member (to be carried in the cabin of the ambulance) and duct tape.

The ambulance shall be accompanied by a vehicle which, once the patient has been

transferred, will return the medical staff who travelled in the patient compartment of the ambulance to the operations base.

Before coming into contact with the patient the medical staff to undertake the patient transfer should carry out hand hygiene and then protect themselves with a PPE.

9.2. TRANSFER TO THE REFERENCE HOSPITAL

A patient arriving in an isolation chamber shall be transferred to the ambulance in the chamber. If the patient's condition requires removal from the isolation chamber the patient must wear at least a surgical mask and gloves to reduce contamination and an overall suit if the clinical situation permits this.

The ambulance driver, who must wear the appropriate PPE, shall act as the clean man (and therefore not come into contact with the patient) and shall be responsible for opening and closing the ambulance.

At the hospital, the patient will be transferred only by the crew from the patient compartment. The medical staff travelling in the patient compartment will remove their outer booties and gloves before entering the hospital, putting on clean replacements whenever they have come into contact with the patient's fluids.

The hospital health staff will be given the clinical report prepared by the aircraft staff and will be informed of any intervention during the transfer from the airport to the hospital.

Any equipment used for transferring the patient (stretcher) shall be returned to the patient compartment of the ambulance by the personnel who have been in contact with the patient.

Any disposable material used in handling the patient that is biologically contaminated will be placed in bags or containers for such waste.

It is recommended that an ambulance be escorted by a safety vehicle to minimise the risk of a traffic incident during transfer.

9.3 DECONTAMINATION OF PERSONNEL

Once the patient has been left at the hospital and the patient compartment of the ambulance has been closed, the personnel shall return to the hospital to take off their PPE. If the PPE has been splashed by any kind of fluid, it shall be decontaminated before it is taken off by showering or washing.

The material taken off shall be deposited in red bags, which shall be sprayed with 1% sodium hypochlorite before being placed in the waste bins placed in the hospital for subsequent management.

Hand hygiene will be undertaken.

The medical staff must again put on PPE to be carried in the ambulance driver's cabin, and will return to base in that cabin.

At the operations centre they will again take off the PPE, and the waste generated will be deposited in the container specifically designated to that end before taking off the last nitrile gloves.

9.4. VEHICLE DECONTAMINATION

Decontamination shall be undertaken in the following stages:

- At the hospital of destination, the material used when handling the patient shall be put into red bags which shall be sprayed with a 1:100 solution of sodium hypochlorite before they are deposited in the corresponding waste bins.
- At the ambulance operations centre the patient compartment of the vehicle and the material therein shall be decontaminated in the following order:
 - disinfection of the plastic-lined compartment using an appropriate aerosol disinfectant, applied in accordance with the manufacturer's instructions;
 - removal of the plastic: this shall be removed once the time set by the manufacturer for disinfecting the ambulance has passed; The staff carrying this operation out must also wear PPE.
 - reusable equipment needing special decontamination (fans, portable oxygen tanks etc.) must be disinfected using a freshly prepared solution of 1:100 sodium hypochlorite bleach for domestic use;
 - surfaces, materials etc. must be disinfected using a freshly prepared solution of 1:100 sodium hypochlorite bleach for domestic use by the same staff, wearing PPE
 - Everything will then be washed with water and soap or detergent.

Lastly,

- All waste (from handling the patient, personnel and ambulance decontamination) shall be treated as biohazards and shall be managed by an authorised enterprise, which must be informed beforehand what material has been placed in the containers.
- Once the vehicle has been decontaminated and washed, it will be prepared for the next operation

NOTE:

A video summarising the air evacuation of the Spanish Ebola patient may be consulted on the website of the Ministry of Defence via the following link:
<http://www.defensa.gob.es/gl/gabinete/notasPrensa/2014/08/DGC-140807-repatriacion-misioneros.html>