Letter to Editor

Patient isolation pods for the evacuation of COVID-19 infected patients – Is this the answer?

Dear Editor,

The coronavirus disease (COVID-19) pandemic has changed the way we function on a daily basis and practice medicine. As the safety of health care workers (HCWs) is paramount when handling COVID-19-infected patients, there has been considerable discussion about the use of patient isolation pods (pods) during the evacuation of these patients.[1] Therefore, we analyzed if pods are the ultimate solution to the problem. An isolation pod is a collapsible personnel isolation apparatus with a base used for avoiding unwanted contamination of harmful biological and chemical materials. The cover is connected to the base by a zipper. Several glove box ports are provided to permit rapid and expedient treatment of the patient.[2]

In June 2020, literature searches were performed on PubMed, Ovid, Embase, and the Cochrane Database to identify studies about the aeromedical transfer of patients with COVID-19 or other highly infectious diseases. Our search strategy is outlined in Appendix A.

There has been a consensus that there was little advantage to be gained in moving patients with COVID-19 in isolation pods and patients are best managed in a sitting position, with supplementary oxygen if required, or on stretchers for those who can be best managed lying down. Only the Norwegians (Norwegian Air Ambulance Service) had experience in using patient isolation pods, and they reported mixed results. Some patients who may have been managed best in a sitting position, were required to lay flat or semi-recumbent, and this had potentially compromised oxygen perfusion.[3] The United Kingdom Royal Air Force and Australian Defence Force experts emphasized the difficulty in managing ventilated patients in isolation pods and believed that the risks imposed outweighed any benefit.

The consensus for COVID-19 management was as follows.[3-9]

General

1. A risk assessment by a clinician expert in an aeromedical evacuation should be conducted before any decision to move the patient, especially those with evident symptoms of respiratory distress
2. An air transport isolator or negative pressure isolation chamber to move COVID-19 patients is not required
3. Social distancing (2 m) should be enforced strictly, where possible, during the move

4. Hand hygiene, face hygiene, and respiratory etiquette should be practiced
5. Personnel not required for the evacuation should not travel on the aircraft
6. Personal protection equipment (PPE) guidance throughout the various stages of the evacuation is driven by the health care context (hospital, ground ambulance, aircraft, etc.)
7. Ventilated patients should have a high-efficiency particulate air filter in the circuit.

Medical personnel's PPE comprises of:

1. Nitrile gloves
2. Plastic apron
3. Eye/face protection (if the risk of splash present)
4. Fluid-resistant surgical mask (FRSM) to be worn when within 2 m of the patient
5. Filtering facepiece particles class 3 (FFP3) masks to be worn during aerosol-generating procedures (intubation or if continuous positive airway pressure/bilevel positive airway pressure is being given)
6. FFP3 masks need to be fit-tested to ensure they are *particulate tight*.

Aircrew

1. Aircrew unable to stay outside a 2 m radius of the patient must wear PPE comprising of:
   a. FRSM
   b. Nitrile gloves
   c. Plastic apron
   d. Eye/face protection.
2. Where it is safe to do so, aircrew/cockpit areas should be screened using suitable, easy-to-clean material
3. Where possible, cockpit/aircrew areas should have ventilation isolated from the cabin.

Movement Support

1. Senior specialist aeromedical evacuation clinician advice must be available 24/7
2. Loading and unloading procedures must be developed for the aircrew, clinical staff, and patient
3. Appropriate aircraft stairs and lifts must be planned for and provided to the evacuation team.

Aircraft decontamination

The aircraft decontamination process depends on the aircraft type.

1. Cargo-style aircraft:
   a. *No* disinfectants should be fogged, atomized, or finely sprayed inside the aircraft because it could damage the avionics or the electrical systems
   b. Soap and alcohol are effective (World Health Organization and European Centre for Disease Control)
   c. Aircraft foam washing fluid can be used, or 98% isopropanol (this is highly flammable).
2. Passenger-style aircraft (where there are a lot of soft furnishings):
   a. Misted disinfectant approved through the European Union Aviation Safety Agency approved process, can be used for decontamination.

Therefore, the answer to the question in consideration is not an innovation like the isolation pod, but the knowledge, revision, and clear understanding of practices already in place, as stated above. This can help HCWs in a safe air transfer.

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Conflicts of interest

There are no conflicts of interest.

Shibu Sasidharan, Vijay Singh, Harpreet S. Dhillon[1], M. Babitha[2]

Departments of Anaesthesia and Critical Care and [1]Psychiatry, Level III IFH Hospital, MONUSCO, Goma, Democratic Republic of the Congo, [2]Ojas Hospital, Panchkula, Haryana, India

Address for correspondence: Dr. Shibu Sasidharan, Department of Anaesthesia and Critical Care, Level III IFH Hospital, Goma, Democratic Republic of the Congo.
E-mail: shibusasi@gmail.com

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Appendix A

A literature search was performed on June 16th 2020 on PubMed/MEDLINE (from 1966 through January 2020) with the following terms:

- "Aeromedical evacuation" OR "transportation of patients" OR "air ambulance" OR "HEMS" OR "Helicopter"
  AND
  "ebola" OR "lassa" OR "viral hemorrhagic" OR "highly infectious" OR "highly hazardous" OR "contagious" OR "communicable" OR "Middle East respiratory syndrome (MERS)" OR "SARS" OR "smallpox"
- "Air Ambulances" (MeSH)
  AND
  "Infection Control" (MeSH)
- "Aeromedical"
  AND
  "Infection Control" (MeSH)
- "SARS Virus" (MeSH) OR "Middle East Respiratory Syndrome Coronavirus" (MeSH)
  AND
  "Air Ambulances" (MeSH) OR aeromedical (All Fields).

A similar search strategy was used by authors of a previous literature review of aeromedical transport of patients with highly contagious infectious diseases.

Authors screened abstracts for the following inclusion criteria: peer-reviewed literature, written in English, and which describes the aeromedical transport of persons with a highly hazardous communicable disease. Articles were excluded if they dealt with the retrieval of patients by a transfer team specialized in the containment of the highly contagious infectious disease, or with the use of isolation tents or other specialist equipment.

The definition of a highly hazardous communicable disease is understood to include easily transmissible emerging infectious diseases.

One hundred and twenty-four papers were identified

Thirty were identified as relevant by the above criteria (24 after exclusion of duplicates)

After a review of abstracts:

Exclusions:

- 5 excluded: no abstract
- 5 excluded: not aeromedical
- 8 excluded: use of an isolation tent or pod
- 3 excluded: not specific to highly contagious disease
- 2 excluded: not in English
- 1 excluded: purely editorial.

A 2019 literature review identified 14 studies pertinent to the aeromedical transport of patients with highly contagious infectious disease, by specialized teams using a high-level containment transport system. This review noted that none of the papers described in detail the PPE ensemble nor the donning and doffing protocol. Details on waste disposal and aircraft decontamination were also limited.

To capture the emerging literature on the transfer of COVID-19 patients, and how this might differ from other highly contagious diseases, on March 20, 2020, we searched the same databases for "COVID-19" AND "Airway Management" (MeSh) OR "Critical Care" (MeSH) OR "Patient Transfer" (MeSH).

This search strategy was designed to include articles not specific to the aeromedical environment.

Eighteen articles were identified. Four were identified as being relevant following the review of abstracts.

1. One article on the transfer of COVID-19 patients does not encompass aeromedical transfers but concurs with our recommendations on ground transport[1] (REF transport Liew)
2. Two editorial articles advise on how hospitals can prepare to transfer COVID patients; their recommendations have been included where relevant[2,3]
3. An editorial outlines the preparations needed in a hospital system, but their relevance to retrieval is limited.[4]

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