



Usefulness and applicability of infectious disease control measures in air travel: A review



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Contact tracing

Summary *Background:* Air travel has opened up opportunities for world transportation, but has also increased infectious disease transmission and public health risks. To control disease spread, airlines and governments are able to implement control measures in air travel. This study inventories experiences and applicability of infectious disease control measures.

Methods: A literature search was performed in PubMed, including studies between 1990 and 2013. Search terms included air travel terms and intervention terms. Interventions were scored according outcome, required resources, preparation, passenger inconvenience and passenger compliance.

Results: Provision of information to travelers, isolation, health monitoring, hygiene measures and vector control reportedly prevent disease spread and are well applicable. Contact tracing can be supportive in controlling disease spread but depend on disease characteristics. Exit and entry screening, quarantine and travel restrictions are unlikely to be very effective in preventing disease spread, while implementation requires extensive resources or travel implications. *Conclusions:* Control measures should focus on providing information towards travelers, isolation, health monitoring and hygiene measures. Appropriateness of measures depends on disease characteristics, and the required resources. As most studies analyze one type of measure in a particular situation, further research comparing the effectiveness of measures is recommended.

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1. Introduction

Air travel allows for rapid transportation of people across the globe. However, it also allows for transmission of airborne, food-borne, vector-borne and zoonotic contagious diseases, and therefore creates public health risks [1]. The 2003 SARS outbreak showed how air travel can contribute to the rapid spread of disease, and led many countries and airlines to implement a variety of measures to prevent the spread of infectious diseases through air travel [2]. Measures related to air travel may include entry and exit screening; providing information; quarantine and isolation; contact tracing; hygiene measures; travel restrictions; animal care; vector control; and control of contaminated goods. Those measures aim 1) to identify persons that might be ill and/or infectious on board and 2) to prevent further spread on board, into the community and beyond.

Exit and entry screening are used to identify ill travelers. Exit screening can be carried out on departing travelers in the country where the disease or outbreak is present. Entry screening is done on arriving travelers in countries where the disease is not present or endemic. Screening can be done using health declarations, thermal scanning and follow-up examinations. Providing information to travelers during outbreaks may prompt them to seek medical attention before travel if they are ill, to notify a crew member of their symptoms during travel, or seek medical care more quickly after travel. When an ill traveler is identified, isolation of this traveler and quarantine and health monitoring of exposed travelers can prevent disease spread. In addition, contact tracing can be implemented upon diagnosis of ill travelers after arrival, to identify infected contacts and to prevent further transmission.

Disease spread also can be controlled by hygiene measures, which may include cleaning airplanes, air filtering, wearing facial masks, cleaning footwear and promoting personal hygiene, including respiratory and hand hygiene. Another measure is travel restrictions to prevent travelers with certain diseases or specified symptoms from boarding a flight and potentially spreading the disease to other travelers or into the community. Since animals can also carry diseases, control measures may include monitoring traveling animals. To prevent the spread of vector borne diseases, insecticides can be applied during every flight or residually (every 8 weeks on ground) [3].

While there are various reviews about individual measures, no review has provided an overview of different measures, and the extent to which they prevent transmission of the disease [2,4]. This study examined literature from 1990 to 2013 to identify existing measures and to analyze their added value in limiting transmission of infectious diseases, and their constraints in implementation. Factors that were considered constraints were intense resource and preparation requirements, and passenger inconvenience.

2. Materials and methods

A literature search was performed in Pubmed based on titles and abstracts to retrieve articles on air travel and

interventions related to disease control that were published between January 1990 and September 2013. The reference lists of all articles were checked for additional relevant literature. Search terms included air travel terms and intervention terms. The following structure was used: "air travel term" AND "intervention term". The air travel terms were derived from the RAGIDA literature search on transmission [5]. RAGIDA (Risk Assessment Guidance for Infectious Diseases transmitted on Aircraft project) is a project from the European Centre for Disease Prevention and Control (ECDC), which develops guidelines for public health officials on risk assessment and control measures for infectious disease transmission during flights.

The intervention terms were based on the core capacity requirements in the International Health Regulations, which serve as a guide for installing infectious disease control measures to prepare points of entry [6]. In addition, initial searches were done using the air travel terms, plus control, control measures and standard operating procedures.

The following air travel terms were used: aeroplane, air passenger, air transport, air travel, aircraft, airline, airplane, aviation, flight. The intervention terms were divided in the following 9 groups:

1. Entry screening; exit screening; border screening; thermal scanning; thermal screening; health declarations; self-declarations; medical exam; medical examination; laboratory testing;
2. Traveler information; informing public; traveler; informing authorities;
3. Quarantine; patient isolation;
4. Contact tracing; passenger contacts; locator cards;
5. Hygiene measures; facial masks; facemask; hand washing; disinfection
6. Travel restrictions; suspension; cancel;
7. Animal; animal travel; animal care;
8. Vector control; reservoir; reservoir control; disinsection; insecticide
9. Contaminated materials; contaminated merchandises; infected materials; infected merchandises; luggage; baggage; contamination; cargo

2.1. Inclusion criteria

Articles were selected based on the following inclusion criteria: 1) English language only; 2) described cases, modeling, or experiments; and 3) discussed infectious disease control measures in the context of air travel.

Articles were selected based on their title and abstract by YH. In case of doubt, the complete article was retrieved and reviewed for relevance. If necessary, CS was consulted. During this process, some articles were eliminated, because they did not fit the criteria. For example, control measures were not discussed.

2.2. Analysis

The following information was extracted from the articles: descriptions of control measures and types of diseases for which they could be effective, indicators of measures'

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