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Mini Review

Proposing a Quick Checklist for Responding to Pandemic Diseases at Airports

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Abstract

The global outbreak of COVID-19 in the early 2020 has substantially impacted the global aviation industry including airport revenue or even airline survivability. While emergency response programs (ERPs) are mandatory for airlines and commercial airports, the formats of ERPs vary. The less-than-adequate "Learning-by-Doing" approach involving the allocation of hardware, software and professionals has been the mainstream process for airports to cope with ill passengers as well as protect ground crews and airport properties. Due to the lack of a specific airport response program specifically for pandemics, the main objective of this study is to generate a quick checklist for large airports to review. The checklist could also serve as the partial essence of the ERP so that airports can promptly adapt, revise or adjust to counteract the danger of communicable diseases. Using the systematic process of Etiology Trace & Barrier Analysis (ETBA) as the qualitative methodology, the authors reviewed massive existing manuals, books, guidelines, handbooks, best practices, interviews or the like and extracted contents and items forming a quick pandemic emergency checklist for the airport safety managers.

Introduction

The global transport network for infectious diseases was established due to the increasing speed and scope of human mobility [1]. Airports, as the public entities and the custodians of air transportation, had to maintain the operation and facilities during pandemic events such as tuberculosis, severe acute respiratory syndrome (SARS), Ebola, and Middle East Respiratory Syndrome (MERS) [2]. From 31 December 2019 to 3 January 2020, 44 patients in total were diagnosed with respiratory disease caused by a novel coronavirus (COVID-19) in Wuhan City, Hubei Province, China [3]. Most patients had a recent history of exposure to wildlife animals at one seafood market in Wuhan city [4]. Wang et. al. [5] suggested a timeline of early stages of COVID-19 outbreak (Figure 1).

To reduce the risk of spreading quarantinable diseases via air travel, airports need a detailed and circumstantial response and containment strategy. The unprecedented epidemic of Coronavirus disease (COVID-19) outbreak in January 2020 has shed light on the urgent need of a more prompt and effective response plan at airports, in particular at the major hub airports, which accommodate a significant amount of passengers.

The Methodology

Etiology Trace & Barrier Analysis

Etiology Trace and Barrier Analysis (ETBA) is rooted in the original advocate of an energy-related (visible or invisible) analytical tool and is a qualitative research arm of the U.S. Department of Energy. While the original purpose of conducting ETBA is to systematically identify energy hazards and gauge the adequacy of countermeasures against the related risks, ETBA is also a plausible system safety tool to mitigate etiological virus, bacteria or fungus agents [6].

Vincoli & Arani [7] reported the feasibility of using ETBA to identify etiology-related hazards and outlined the processes of performing the ETBA as the following:

a) Initial system layout and source of etiology/virus

b) Identification of hazards and targets (avoid human and object conduct)

c) Identifying adequate barriers and standards (Figure 2)

In the detailed handbook of MIL-STD-882E System Safety Standard Practice, the categories of etiology barriers/controls are

a) Function (control and minimize),

b) Location (on energy source, between energy and targets, and on the targets)

c) Format (physical and procedural) [8]

It is highly encouraged to provide multi-layered barriers including two or more categories from Figure 3.

Qualitative Research Reliability and Validity

Giorgi [9] & Popper [10] both believed that reliability/replicability could be possible either by having another researcher re-perform the analyses. Thus in this study, categories/contents identified were examined by two more reviewers to assess the logic and mitigate content bias at different timeframes. For research validity, Creswell (1998) contended that the process of verification occurred throughout the data collection, analysis, and report writing [11]. Creswell's statement had been further echoed by Berg (2001) and defined validity as the "systematic and specific" ways of describing and explaining reality [12]. It is noteworthy that
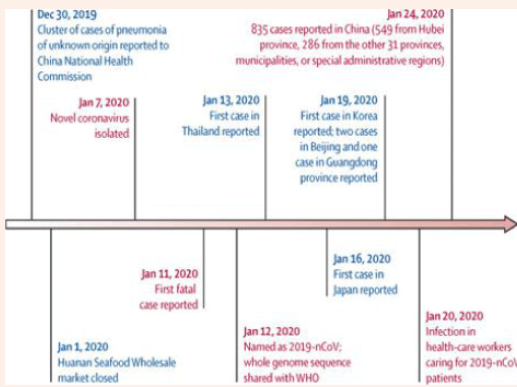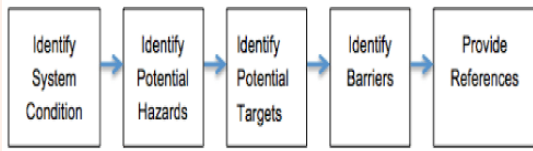
Figure 1: Global transport network.

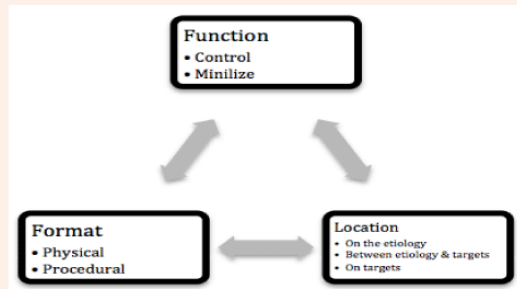**Figure 2:** Identifying adequate barriers and standards.

Figure 3: Multi-layered barriers including two or more categories.

reliability of a qualitative research can be limited [13].

Findings

Based on the requirements, suggestions, and procedures in terms of airport preparedness and responses to the pandemic outbreak from different authorities (U.S. DoT, U.S. CDC, ICAO, U.S. FEMA, U.S. GAO) and existing academic studies, the findings are presented as the following:

While the current widespread of COVID-19 worldwide, what could be the quick checklist for airport operators that could prevent the spread of novel communicable diseases in the future?

While there are various comprehensive emergency response programs available to airlines, airports and travelers, the purpose of this study is to deliver a quick checklist to support an airport's crisis preparedness. It is the users' discretion to extract this quick checklist to more operational and customized details for an individual operation. The quick checklist is categorized into three (3) sections: Air carriers, airports and passengers. Please see Tables 1 & 2.

Conclusion

For the purpose of quick response to any unexpected communicable diseases and to be ready to control the transmission risk via air transportation system, all airports should have an effective and comprehensive response plan to a pandemic outbreak such

Table 1: Quick Checklist Airport Crisis Preparedness.

Section 1: Pre-Incident Response	Yes	No	Remark
1. Identified lines of authority			
a. Lead authority: CDC: Division of Global Migration and Quarantine (DGMQ)			
b. Airport Operations Center or ERP			
c. Emergency Medical Services			
d. State and Local Health Departments			
e. State and Local Emergency Management Authorities			
f. Law Enforcement Agency			
g. Healthcare Facilities			
2. Federal Government			
a. CDC			
b. Customs and Border Protection (CBP)			
c. Immigration and Customs Enforcement (ICE)			
d. Department of Homeland Security including FEMA NIMS			
e. Transportation Security Administration (TSA)			
3. Initial Response Team (IRT)			
a. Team Leader			
b. Team Personnel			
c. CDC Quarantine Station personnel			
d. CBP			
e. Airport Police/ fire department/EMS			
f. Local public health department			
4. Incident Command System (ICS)			
a. Incident Commander			
b. Command Staff (Information Officer's, Liaison Officer's, and Safety Officer's)			
c. General Staff (Operation, Planning, Logistics, and Finance)			
5. Emergency Notification Tree (See Appendix B)			
6. Emergency Reporting Procedures			
7. Emergency Communication Procedures			
a. Internal Communication			
i. Airlines			
ii. Handling agents			
iii. Air traffic control system			
iv. Airport medical service providers			
v. Emergency medical services			
vi. Police, Customs, Immigration, and Security			
vii. Airport retailers			
viii. Customer relations services			
ix. Airport staffs/workers			
x. Other stakeholders (such as contractors)			
b. External Communication			
i. Local/regional/national public safety authority			
ii. Local/regional/national public health authority			
iii. Travelers (before reaching the airport / in the terminal building)			
iv. Other airports in same State/region			
v. Other airports outside State/region			
vi. Travel agents and hotel associations			
vii. Tourism organizations			
viii. Ground transportation – public			
ix. Ground transportation – private			
x. Media - Point of Contact			
8. Emergency Medical Services (EMS) – passengers and crews			
a. Availability of infection control – first aids			
b. Availability of infection control – PPE			
c. Availability of infection control – Equipment			
d. Availability of infection control – Personnel			
e. Capability of assisting public health personnel in the assessment of the ill person			
f. Capability of assisting public health personnel in the assessment of the infected place			
g. The procedure of removing ill person from the airplane and transport to the designated medical facility			
h. The ability of accommodating ill person at the designated medical facility			
9. Aircraft Parking Location			
a. At assigned gate(s)			
b. At remote gate(s)			
c. On the airport ramp			
Section 2: Arrival Response			
10. Planeside Response procedures			
a. Reach the ill person (CDC personnel or local health department personnel board the plane and reach to the ill person(s)			
b. Notification to remaining people on the plane			
11. Passengers Treatment Procedure			

a. Ability of person(s) assessment			
b. Ability of person(s) isolation			
c. Alert other responders and designated healthcare facilities to apply appropriate precautions			
d. escort ill passenger(s) from the aircraft for further assessment/treatment			
e. Transported to a designated healthcare facility under isolation measures			
f. Ability of person(s) re-interview			
12. Exposed Passenger Identification Procedure			
a. Personal contact information			
b. Passenger locator cards			
c. Immigration forms			
d. Contacting information of government agencies			
e. Instruction about the signs and symptoms of the disease			
f. Information of personal hygiene or quarantine procedures			
13. Worker Protection Plan			
a. PPE (Goggles, gowns, face shields, gloves, and respirators)			
b. PPE training/briefing			
c. Disinfection spray or agent			
14. Aircraft Cleaning Procedure			
a. Availability of trained personnel			
b. Availability of tools (traditional)			
c. Availability of tools (advanced)			
d. Follow routine operating procedures (If no symptomatic passengers were identified)			
e. Enhanced cleaning procedures (If symptomatic passengers were identified)			
i. Clean porous surfaces - procedures			
ii. Clean non-porous surfaces – procedures			
iii. Clean lavatories used by the symptomatic passenger(s)			
iv. Clean cockpit and cabin interior – procedures			
v. Disposal of any items that cannot be cleaned			
15. Screening Procedures			
a. Visual Inspectors – symptoms			
b. Passenger questionnaire			
c. Temperature Measurement (e.g. Thermal scanners) equipment			
d. Sufficient screening spots			
16. Quarantine Planning			
a. Quarantine location/facility			
b. Staff to sustain, enforce, and provide services to quarantined individuals			
c. Identify supplies needed to sustain quarantine			
d. Identify special needs (children, pregnant women, and disabilities) of quarantined people			
e. Identify medical & mental health needs of quarantined people			
f. Identify financial needs for the quarantine			
g. Addressing Public information & Media			
Section 2: Post-Incident Response			
1. Recovery Plan			
a. Assist the Public			
i. Ability of providing mental health			
ii. Re-book flights			
b. Restore the environment			
i. Decontaminate the airplane			
ii. Decontaminate the quarantine site			
iii. Decontaminate the transportation conveyances			
c. Restore the infrastructure - procedures			
i. Establish systems for tracking and reporting on resources			
ii. Maintain records of equipment and materials			
iii. Document resources committed to incident response			
iv. Replenish resources			
v. Maintain inventories of supplies			
vi. Maintain records of expenditures			
1. Training & Testing Plan			
a. Pre-incident process			
b. Arrival process			
c. Post-incident process			
d. Plan revision			
e. Test contact lists			
f. Test the plan with exercises			
g. Test revised plan			
3. Evaluation Plan			
a. Extent to which public health was protected			
b. Duration of operational disruption			
c. Injury to the airport's reputation			
d. Financial loss			

Table 2: Emergency Notification Tree.

1	Pilot-In-Command notifies:	1. Airline dispatch center
		2. FAA
		3. CDC Quarantine Station
2	CDC Quarantine Station notifies:	1. CBP
		2. Airport police/Fire Department/EMS Dispatch Center
		3. State and local public health departments
		4. Healthcare facility (depending on the nature of the event)
		5. CDC headquarters (depending on the nature of the event)
		6. FBI
3	FAA notifies:	1. CDC Quarantine Station
		2. Airport Operations
		3. CBP
		4. TSA
4	Airport Police/Fire Department notifies:	1. Airport operations center
		2. CDC Quarantine Station
		3. CBP
		4. TSA
5	Airline Operation Center notifies:	1. CDC Quarantine Station
		2. Airport police/fire department/EMS
		3. CBP
		4. TSA
6	CBP notifies:	2. CDC Quarantine Station
7	TSA notifies:	1. CBP

as COVID-19 or the like. Ideally, a comprehensive pandemic response plan must be able to minimize damages by protecting passengers, aircraft and airport facilities. The implementation of a pandemic response plan at airports requires allocation of resources (hardware, software, manpower), adequate planning (policy, procedure and performance), and comprehensive implementation. To be considered as a workable emergency response plan (EMP), the key aspects to mitigate the impact of a communicable disease incident at an airport are presented as following:

a) Lines of Authority and Command Center

b) Emergency Response Team (ERT)

c) Initial Response Team (IRT) / Incident Command System (ICS)

d) Notification Procedure

e) Reporting Procedure

f) Communication Procedure

g) Emergency Medical Services

h) Ill Passengers Treatment Procedure

i) Aircraft Cleaning Procedure

j) Entry & Exist Screening Procedure

k) Quarantine Plan

l) Recovery Plan

m) Evaluation Plan

The checklist was established step by step following the planning of current pandemic response programs from various governmental authorities and could serve as a convenient template for airport operators or airport pandemic response planners

to establish a detailed response plan in the future. In the Pre-incident Response section, the first action will be identifying lines of authorities including an emergency command center, where CDC is the lead authority. According to Title 42 United States Code (USC) Section 264, Division of Global Migration and Quarantine (DGMQ), CDC is empowered to detain and medically examine the suspected case of carrying a quarantinable disease. Existing pandemic response plans suggest that the establishment of the Pandemic Response Team (PRT) or Emergency Response Team (ERT) at airports is necessary. Also, reporting and notification should be the prior concern when planning an airport pandemic response plan. It is because that accurate and timely information flow would yield the most cost-effective result of reducing the transmission risk among passengers, crewmembers, and airport staff workers. For example, if airports receive symptomatic information at the earliest stage, the emergency response team will be able to buy more time to make a decision and take adequate actions in terms of aircraft parking location, cleaning, quarantine planning, etc. The report of Government Accountability Office regarding airports' pandemic response plan in 2015 indicated that communication was also one of the greatest worries for airports since they were not able to receive proper guidance due to the miscommunications between airports and federal agencies [1]. Thus, to develop a valid and reliable response plan to a pandemic outbreak in the airport, the proper procedures in terms of details of reporting, notification, and communications are necessary. Based on the academic studies and current programs of pandemic response, the screening still plays an important role in reducing the risk of communicable disease transmission at airports even though the effectiveness of screening is limited and could be affected by many factors such as incubation periods.

Moreover, given a communicable disease can evolve and self-mutate from time to time, it might be expected that this quick checklist requires regular reviews and revision to ensure the effectiveness of responses.

Limitation

While the authors planned to deliver a quick checklist of the emergency response preparedness for communicable diseases at airports, as there is no one-size-fits-all program, airports are encouraged to use the presented checklist shown in Table 1 as a basis to customize a practical program fitting a local operational nature.

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