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Papers

Entry screening for severe acute respiratory syndrome (SARS) or influenza: policy evaluation

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The appearance of severe acute respiratory syndrome (SARS) and recent outbreaks of avian influenza have raised the question of how best to protect the population of England and Wales from such infections. Entry screening is at present of unknown benefit.

We assess the possible benefit of entry screening for SARS and pandemic influenza should an epidemic occur.

Methods and results

Throughout this analysis, we assume that effective exit screening is in place, that symptomatic patients will not be allowed to board flights, and that the value of entry screening is to detect people who develop symptoms in flight.

We estimated the incubation periods for influenza and SARS from published sources.[1,2]. We used these distributions to estimate the proportion of individuals with initially latent SARS and influenza infection developing symptoms during a flight from any of the top 100 sources of international airline passengers to the United Kingdom, given information on the mean duration of a direct flight from these destinations (www.britishairways.com/travel/schedules/public/en_gb). For influenza, given an overall prevalence of individuals with latent infection, we used existing transmission models[2] to estimate the proportion expected to have been infected one, two, etc days previously, during the increasing phase of the epidemic. We back calculated corresponding proportions for SARS from the incidence of infection in Hong Kong at the start of the epidemic.

For SARS, the probability of in-flight progression rises slowly with the duration of the flight. During a six hour transatlantic flight, an infected passenger would have a 0-11% chance of progression, depending on the time since infection. Between 1% and 21% of such infected individuals arriving from East Asian cities (10 hour flight) would be expected to be detected.

Influenza has a much shorter incubation period than SARS, so the probability of progression during the flight is higher. A passenger infected two days before departure would have a 50% chance of progression during a 10 hour flight. As most flights are of much shorter duration, the mean predicted proportion of people infected with influenza and progressing during the flight was less than 10%. The proportion of infected individuals detected is highest from cities with the longest flight duration (table). Screening passengers from the Far East and Australasia therefore derives the most benefit. Even then, the sensitivity for cities in these areas would still be low.

Comment

Entry screening is unlikely to be effective in preventing the importation of either SARS or influenza. The incubation period for SARS is too long to allow more than a small proportion of infected individuals to progress to symptomatic disease during a flight to the UK from any destination. Removing a maximum of 9% of infected individuals will have a negligible impact on the course of any subsequent epidemic. The proportion of individuals infected with influenza that is potentially detectable by screening is larger but still small, and most would be missed. The short period between generations of cases of influenza means that it would take little time for those missed by screening to infect secondary cases, replacing those detected.

We have ignored the possibility of in-flight transmission. Such transmission has been documented for SARS as well as influenza.[3–5] However, because time would be insufficient for new secondary cases to develop symptoms and become detectable by screening, this omission will tend to overestimate rather than underestimate the proportion of infected individuals detected by entry screening. Adopting a policy of quarantining all exposed passengers on the detection of a single case could, however, substantially increase the benefit of entry screening. However, this still leaves the principal problem that the sensitivity of entry screening is low.

Contributors: See bmj.com

Statistical methods are on bmj.com

Predicted percentage of initially asymptomatically infected individuals (detectable cases) arriving in the United Kingdom from the most common sources of international passengers, who would be expected to develop symptoms en route

	Mean % of individuals symptomatic on arrival (range)			
	SARS	Influenza	No of airports	No of seats available/day
Europe	1 (0-3)	4 (1-9)	35	86 001
Middle East	3 (2-4)	10 (7-12)	8	6986
Africa	4 (3-5)	12 (10-15)	4	3751
North America	4 (3-9)	13 (10-23)	13	28 918
East Asia	6 (4-9)	17 (12-23)	12	12 489

What is already known on this topic

In the event of a new SARS or influenza epidemic, air travel would represent the principal route of international spread

Airport entry screening has been advocated, but not formally evaluated as a means of protecting populations from these infections

What this study adds

Entry screening is unlikely to be effective in preventing or delaying an epidemic resulting from the importation of SARS or influenza

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