

# Impact of Severe Acute Respiratory Syndrome (SARS) on Travel and Population Mobility: Implications for Travel Medicine Practitioners

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The severe acute respiratory syndrome (SARS) outbreak, as a result of its rapid international spread, predilection for medical personnel, and relatively high case fatality ratio, captured the attention of professionals, politicians and the public worldwide. Although the number of deaths from SARS was limited to 916 worldwide, which is significantly lower than the annual mortality figures for many other infectious diseases such as influenza, HIV infection or malaria,<sup>1</sup> it created panic among health care professionals and the public all over the world and severely disrupted businesses and travel to affected destinations. Based on figures from the World Tourism Organization (WTO), it reduced international passenger traffic by 2.6% in the first 4 months of 2003.<sup>2</sup> Travel to Asia Pacific countries dropped by 10% to 50% in late March to April 2003,<sup>2</sup> and this was related to the emergence of SARS. Tourist arrivals to Hong Kong in April and May, the peak SARS-affected months, dropped by 64.8% and 67.9% respectively.<sup>3</sup> Anecdotal reports suggest that public concerns about SARS have increased travel-related enquiries to travel medicine practitioners and health care professionals. As travel medicine practi-

tioners are in a unique position to discuss health issues related to travel, such as SARS, revisiting common principles of travel medicine practice in the era of emerging infectious diseases would be useful.

In this paper, we outline some key health-related concerns that travel medicine practitioners should discuss with their patients regarding steps that they can take to prevent SARS exposure and infection.

## Epidemiology of SARS

SARS, resulting from a novel coronavirus,<sup>4,5</sup> originated in November 2002 in the Guangdong Province of China, and by February 2003 had spread to Hong Kong and subsequently to 29 countries or regions on most continents, infecting about 8,422 patients and resulting in over 900 deaths.<sup>6</sup> The overall case fatality ratio is approximately 15%, ranging from < 1% in those aged less than 24 years to over 50% in those aged over 65 years.<sup>7</sup> The mechanism of transmission of the agent is mainly through droplet secretions, fomites or personal contact. In Hong Kong, much of the transmission was limited to health care workers and family members through droplet secretions. In the Amoy Gardens outbreak in Hong Kong, aerosolization of fecal waste contaminated with the SARS agent has also been proposed to have contributed to transmission.

The infection was transmitted to Hong Kong by a physician from Guangdong. The physician had been experiencing symptoms before travel, but the absence of border health controls permitted unhindered passage into Hong Kong. He stayed in a local hotel and infected other guests from Hong Kong, China, Vietnam, Singapore and Canada.<sup>8</sup> These individuals subsequently spread the contagious virus as they returned to their respective countries, thereby initiating the global SARS epidemic.

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Although many health care workers were infected with SARS, the spread to the general population was largely limited. However, a number of unusual super-spreading individuals played a major role in the spread of the disease. For instance, the Hong Kong index case is thought to have infected individuals who subsequently infected over 300 patients in Amoy Gardens in Hong Kong and over 60 patients in Singapore.<sup>9–13</sup> These latter two clusters may have resulted from two individuals who were both undergoing hemodialysis treatment. A further hemodialysis patient has been involved in the transmission of SARS in Toronto, so it is interesting to hypothesize that such patients, who may therefore have a relatively depressed immune system with associated high viral loads, may be unduly (or unknowingly) facilitating transmission of the virus. According to the World Health Organization (WHO), 29 secondary cases involving five international flights have been associated with the transmission of SARS from symptomatic probable cases to passengers and/or crew.<sup>7</sup> Only one of these flights resulted in a superspreading event, which accounted for 24 probable cases. However, the route of transmission on flights remains undetermined—droplet, contact, fecal–oral and limited airborne transmission, or a combination of modalities, are all plausible.<sup>7</sup>

The SARS outbreak highlights how the nonspecific disease presentation, coupled with a relatively long incubation period (6.4 days)<sup>9</sup> and, initially, the absence of a reliable diagnostic test limited the understanding of the magnitude of the outbreak. Furthermore, widespread global travel readily spread the virus around the globe in a matter of days, giving an indication of the speed with which we may need to deal with the next emerging infectious disease.

### **SARS as an Emerging Infectious Disease**

The emergence of new infectious diseases, such as HIV/AIDS, Ebola, dengue and now SARS, and the resurgence of old ones, e.g., malaria and tuberculosis, pose major threats to population health and place enormous pressure on the global public health community. The emergence of new pathogens can be attributed to changes in the characteristics and risk factors of patients, the widespread use of antibiotics, changes in the environment, xenotransplantation, and international air travel.<sup>14</sup> As these practices are likely to continue, the threats of microbes, both existing and as yet unknown, to health will remain, and preparations should be made to deal with future outbreaks.

### **Travel as a Vector for the Spread of SARS**

Travel could act as a vector for the spread of infectious organisms. As in the case of SARS, transmission of disease between populations as a result of travel plays an

important role in determining the health of not only those carrying the disease, but also the host nations and the health services of both native and host countries. Travel is undertaken for a number of reasons, including leisure and business, but inevitably the health of the individual can be an issue.<sup>15</sup> Communicable and noncommunicable health problems may develop both before and, more likely, during travel and can then be transmitted within the countries visited. A traveler can pass through several countries or areas within the incubation period of some diseases. If the port health authorities do not recognize the condition, as in the case of SARS with its nonspecific presentation, the host community is very likely to be exposed to the disease. The host environment may also create favorable conditions for the disease to spread. For instance, lack of readily available medical resources or medications may result in delayed diagnosis and treatment, which may be associated with increased mortality, and delayed recognition of a condition, as with SARS, can potentiate spread. Yellow fever, Ross River and dengue viruses are recognized as imported problems in many countries. For example, in 1979 an epidemic outbreak of Ross River virus infection occurred in Fiji, with 30,000 clinical cases, which was later suggested to have arisen from an infected tourist who arrived by air.<sup>16</sup>

The impact of imported and exported cases on the epidemic could be enormous. This could cause a major outbreak in the city/country, affecting many sectors, including the travel industry and medical sector, and the health of the general population. On the other hand, the consequences of an imported or exported “superspreader” could be even more serious. For example, the outbreak in Hong Kong was caused by an imported case, which was then exported to Canada, Singapore and Vietnam, subsequently resulting in the worldwide epidemic.

Travel could also be associated with disease emergence and reemergence, because travelers may be at increased risk due to their activities, such as adventure tours into virgin rainforest or, as possibly in the SARS outbreak, consumption of exotic animal species. Lack of awareness of potential risks or inadequate preventive measures may further contribute to infection, and subsequent transport of the agent to new areas.

### **What Travel Medicine Practitioners Should and Could Do**

#### **Updating of State-of-the-art Knowledge**

Travel medicine practitioners should keep themselves informed of any new infections. This could be done by sharing information and maintaining regular contacts with local health authorities and international bodies, such as the WHO and the Centers for Disease Control and Prevention (CDC). Participation in continuing

**Table 1** Preventative Measures to be Taken in the Health Care Settings

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| Stringent infection control measures in the facilities  |
| Mandatory triage for all health care settings to place those presenting with fever into specially dedicated rooms, to be seen by health care workers with full protective precautionary equipment |
| Temperature check for the physicians and all staff in the clinic  |
| Temperature check for all visiting clients  |
| Washing of hands after touching each patient  |
| Availability and use of masks for each visiting patient, particularly those with respiratory symptoms   |
| Wearing gloves when examining patients or handling specimens  |

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medical education could also be useful in this regard. The International Society of Travel Medicine (ISTM) and other institutions also take initiatives to disseminate information and organize periodical courses on emerging infectious diseases, which should be utilized. The following websites might provide updated information on epidemic areas, travel advisories, current measures at airports, educational opportunities and other related information.

WHO website on SARS: <http://www.who.int/csr/sars/en/>

United States CDC website: <http://www.cdc.gov/ncidod/sars/>

WHO's information site on International Travel and Health: <http://www.who.int/ith/>

ISTM website: <http://www.istm.org/>

#### Understanding the Risk

Although relatively close contact is generally required for transmission, the potential for superspreading of infectious agents (e.g., SARS) poses significant risks to travel health care professionals, their family members, patients visiting them, and the people they meet. For instance, a number of health care professionals had to impose quarantine restrictions on themselves. This resulted in them not taking part in normal household activities and not being involved in any intimate relationships with spouses. A significant number isolated themselves within the hospital premises for extended periods of time. An understanding of the risks to themselves and their visiting clients is important for effective practice. Given the

possibility that asymptomatic individuals could transmit SARS to others, stringent precautionary and infection control measures must be maintained. Our experience in Hong Kong showed that patients were afraid to contact health care professionals, following media reports of the high prevalence of infection in health care settings. Therefore, proper preventive measures (Table 1) should be taken to ensure that the travel health clinic is safe for patients to visit and that there are no or only minimal risks of infecting patients in the clinic. Health care professionals should also be vaccinated against influenza,<sup>17</sup> to reduce potential confusion between the next influenza outbreak and a possible reemergence of the SARS virus.

#### Assessing the Risks

Assessment of the health risks associated with SARS (and other infectious diseases) for those planning to travel or returning from travel should be taken seriously by all practitioners. Inappropriate risk assessment and failure to diagnose the condition resulted in the death of an airline cabin crew member after travel to a malaria-endemic area.<sup>18</sup> Health risks associated with travel could be assessed at pre- and post-travel consultations.

**Pretravel.** Assessing the potential SARS risk of any client should be an important part of medical consultation prior to travel. This should include detailed information of individuals' current health status and travel-related information (Table 2). Travel medicine practitioners should also have an understanding of recent outbreaks around the

**Table 2** Points to be Considered in the Pretravel Consultation

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| Detailed history of current condition: fever, chills, cough, headache, malaise, myalgia and other respiratory symptoms  |
| Vaccination history: whether vaccinated with required/recommended vaccines  |
| Detailed information on personal contacts: who, where and how; whether visited any health care facilities and the nature of those facilities                                  |
| Detailed travel plan: destination countries and regions, mode of travel, duration of stay and travel, accompanying person, planned activities in the host countries or region |
| Detailed medical history: any underlying medical conditions; whether taking any medications   |
| Others: information on other close contacts for any suspected symptoms  |
| Recommendation for influenza vaccination for travelers to SARS-affected areas   |
| Advice to observe good personal hygiene and wash hands frequently   |
| Recommendation to avoid large crowds  |
| Recommendation to contact local doctors for any SARS-like symptoms  |

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world and potential health threats. High-risk groups, such as those with underlying medical problems, the elderly and the immunocompromised, should be assessed for their excess risk. Clients, particularly the high-risk groups or pregnant women, should be warned about the possible side effects of prophylaxis and treatments. For instance, ribavirin, which was prescribed to treat SARS in Hong Kong and elsewhere, despite the unproven benefits in treating this condition, has a risk of teratogenicity. Health professionals should periodically visit the WHO or CDC websites for updated information on recent global outbreaks.

**Post-travel.** Upon return from an epidemic region, travelers should be assessed for any suspected symptoms of SARS. They should be assessed for any possible contacts with infectious agents in the host country, and any visits to hospitals or other health care facilities (Table 3). Although many countries have adopted quarantine laws for incoming visitors or returning residents, the effectiveness of such an approach is not yet clear. Therefore, travel health and other front-line health care professionals should take the initiative to ensure that affected individuals are identified as early as possible and the disease is not spread to the community while they are treating affected individuals. The health care professional should maintain contacts with relevant parties in the host countries to enable the sharing of information.

#### Balancing the Risks Against the Benefits

Given that the etiology of many infectious diseases cannot be established in the early stages of infection, balancing possible harm from the disease-related preventive measures against the risks of being infected with the disease is difficult. During the SARS outbreak, a number of questions were raised, such as whether patients should be advised to avoid public places, not to travel, or to use a mask to reduce risk, or whether physicians overseeing SARS patients should be kept isolated from their family members. The answers to these questions were often unclear. Although the necessity for some policies on actions might be controversial, not supporting them might be harmful if most people believe that these could reduce risks. For example, the use of masks in SARS-hit cities/countries was encouraged during the epidemic. However, whether this should be continued during the nonepidemic season

should be based on individuals' personal choices. Individuals wearing masks might fall under unnecessary suspicion of being carriers of SARS or other infectious viruses. Therefore, any decisions should be properly examined for their possible risks and benefits before being widely implemented. On the other hand, before prophylaxis or treatment is initiated for any condition, the risks of not accepting such prophylaxis or treatment should be balanced against the possible side effects of the available treatments. This is particularly important for those who are pregnant and who have cardiovascular or other serious health problems.

#### Communicating the Risks

For diseases of unknown etiology (e.g., SARS at the early stage) and for those diseases without any effective treatment (e.g., HIV/AIDS), communicating risks in an effective manner could reduce fear among both public and professionals. Effective risk communication should include the following competencies: commitment to openness and acceptance of the need to share uncertainty; familiarity with risk language; understanding of risk perception; and recognition of the benefit of continual learning from experience.<sup>19</sup>

#### Conclusion

Based on our current understanding of its pathogenicity and transmissibility, SARS needs to be regarded as a serious disease, which is associated with travel.<sup>20</sup> Travel medicine practitioners should use SARS as an example to make themselves aware of the potential for the spread of any future infections and the risks associated with these, and to examine containment mechanisms.<sup>21</sup> Understanding and implementing good public health practice would enable policy-makers to strengthen the travel health care service.<sup>22</sup> The current experiences in Hong Kong and elsewhere suggest that there is a need to improve the education of the physician workforce in the field of travel medicine. To carry out the essential practice of travel medicine, they should be well trained in emerging infections and prepared for any new challenges. The SARS epidemic reestablishes the tremendous scope for sharing of information and responsibility among members of the ISTM. The need for continuous training could be emphasized by the ISTM and

**Table 3** Points to be Considered in the Post-travel Consultation

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| Detailed history of current condition: fever, chills, cough, headache, malaise, myalgia and other respiratory symptoms  |
| Detailed information on personal contacts: who, where and how; whether they developed any health problems or visited any health care facilities; and the nature of those facilities |
| Detailed travel history: countries and regions visited, mode of travel, duration of stay and travel, accompanying person, activities performed in the host countries or region      |
| Others: activities after returning to the home country  |

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its affiliated organizations, and appropriate courses on emerging infectious diseases should be offered by these organizations.

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Empty beach at Foa Island, Ha'apai, Tonga. Submitted by Dr. Danielle Gyurech and Dr. Julian Schilling.