

SARS in Singapore: Looking Back, Looking Forward

C C Tan, *MBBS (S'pore), M Med (Int Med)

Introduction

Severe Acute Respiratory Syndrome (SARS) is a new infectious disease caused by a novel coronavirus. In Singapore, an outbreak of SARS was started by a traveler (Patient A) who had stayed at a hotel in Hong Kong, on the same floor as a doctor from southern China who was the index case for the large outbreaks in Canada, Vietnam and Hong Kong.^{1,2} Patient A returned to Singapore on 25 February and developed symptoms the same day. Patient A was subsequently admitted to Tan Tock Seng Hospital (TTSH) on 1 March 2003, was isolated on 6 March 2003 and was only recognised as a SARS case on 14 March 2003 after the World Health Organisation (WHO) raised a global alert.

The SARS outbreak in Singapore lasted for 11 weeks. There were a total of 238 probable cases of which 41% were healthcare workers, 37% were family, friends or visitors, and 13% were inpatients. A total of 205 cases recovered from SARS and 33 (14%) have died. The last SARS case had onset on 5 May 2003 and was isolated on 11 May 2003.

SARS in Singapore: Looking Back

The SARS outbreak was an unprecedented event in the history of Singapore medicine. In March 2003, very little was known about the new infection – how infectious it was, the spectrum of clinical presentations, the causative agent and the measures that were effective in protecting healthcare workers and stopping the spread of the infection. Many of the containment measures used in Singapore were applied empirically and were rapidly modified as new knowledge emerged.

Looking back, there are 3 key lessons which we learnt about the infectiousness and transmission of SARS that were critical in shaping our public health approach.

Firstly, it was recognised early on that SARS is predominantly a nosocomial infection. Out of the total of 238 SARS cases, there were 8 imported cases. Of the remaining 230 cases, 180 (78.3 %) were acquired in the hospital and nursing home setting. It is unclear why this is so. A key reason could be the fact that virus excretion tends to occur relatively late in the course of symptomatic disease, at which time patients are most likely to be in hospital. In addition, the cohorting of ill patients in general wards and the frequency and complexity of patient-patient and patient-staff interactions and movements are important contributory factors. Regardless of the reasons, the significance is that rapid and effective containment of hospital transmission is the key to control of a SARS outbreak.

A second key lesson is that infected patients can manifest

with a broad spectrum of presentations. The SARS case definition required the presence of pneumonia or respiratory distress syndrome and a relevant history of travel or contact. We learnt, at great cost, that patients who are immunosuppressed or have chronic co-morbid conditions may have very atypical presentations of SARS infection. Such patients may have intermittent low-grade fever and may only show features of pneumonia very late in the course of infection. Some patients may even have concurrent bacterial infections that very effectively mask the presence of SARS infection. In recognition of atypical presentations of SARS, we had to modify our detection and containment strategies markedly to minimise the risk of transmission through such cases.

Thirdly, we learnt that most SARS patients are in fact not very infectious. The majority pass on the infection to zero, one or two cases. However, there are a small number of patients who are highly infectious, the so-called “super-spreaders”. Such patients typically infect more than 20 patients each directly. Unfortunately, in the Singapore outbreak, we had 5 “super-spreaders”, 3 of whom occurred within the first 2 weeks of the outbreak. Again, it is not clear why some patients are “super-spreaders”. However, as it is not possible to identify which patients will turn out to be “super-spreaders”, the public health implication is that isolation and quarantine measures have to be cast as widely as possible so as to capture as high a percentage of SARS cases as early as possible.

SARS in Singapore: Looking Forward

Although SARS has been contained globally, the consensus among experts is that there is a serious possibility of a resurgence in the northern hemisphere winter. It is vital therefore that we enhance our level of preparedness so as to minimise the risk of a recurrent outbreak in Singapore.

It is critical for us to carry out broad-based surveillance to detect new or imported cases of SARS early. In setting up such a system, we need to strike a balance between the perceived risk and the cost of running a complex surveillance machinery. In Singapore, surveillance for SARS covers patients with atypical pneumonia who present at our hospitals, in particular those with a history of travel to a previously SARS-affected area in the preceding 10 days, and those who have not responded after 72 hours of antibiotic treatment. The surveillance system also covers patients with prolonged unexplained fever and a history of travel to a previously SARS-affected area in the preceding 10 days.

Temperature screening of inbound persons at our airports, seaports and land check-points is continuing. However, it is

* Director of Medical Services, Ministry of Health, Singapore

Address of Correspondence: Professor Tan Chorh Chuan, Ministry of Health, Singapore, College of Medicine Building, 16 College Road, Singapore 169854.

still possible that new imported cases may be missed. As SARS is predominantly transmitted in the hospital setting, it is therefore critical that stringent measures are in place to try to prevent the seeding of infectious SARS cases within unprotected areas in hospitals. As such, we have maintained the requirement for triaging of patients at Emergency Departments and Specialist Outpatient Clinics. This allows for febrile patients to be managed separately from non-febrile ones, and to be isolated if they are admitted. Healthcare workers in high-risk areas in hospitals and nursing homes are still required to wear N95 masks and other personal protective equipment to reduce the risk of transmission occurring through this group.

Despite these measures, there is still a risk that an externally introduced SARS case may lead to transmission of infection in the hospital. This is because of the non-specific nature of SARS and the absence of a sensitive diagnostic test which can pick up cases early in the course of illness. In view of this, it is essential that hospitals are able to pick up a new cluster of infections early. To achieve this, each hospital needs to have an effective system of temperature monitoring of all its healthcare workers so that it can be alerted to a situation where more than 3 healthcare workers and/or patients in the same clinical area become ill.

A key lesson that we learnt in managing SARS was that early detection and rapid response are absolutely crucial in containment of hospital outbreaks. For hospitals, the critical element of the rapid response component is the ability to quickly generate a complete list of all patients, healthcare and other workers, and visitors who have been in the affected clinical area during the time when active transmission was thought to be occurring. This is not an easy task given the numbers of individuals who pass through every clinical area every day and the complexity of human interactions and movements. Nevertheless, rapid and complete contact tracing is absolutely essential. In view of this, the Ministry of Health has been carrying out exercises with the hospitals to ensure that all of them have the necessary systems and people to respond effectively should the need arise.

If a hospital outbreak is not rapidly contained, there is an ever-present risk that transmission of infection may spill into the community. It is also possible that mutations in the SARS coronavirus may change the pattern of transmission. As such, it is critical that community contact tracing and quarantining of exposed persons can be carried out rapidly and effectively if there is a need to do so. To meet this need, the Ministry of Health has augmented its response capability and capacity by expanding its Operations Group and developing procedures to leverage on other agencies if there is a major surge requirement.

In Singapore and around the world, research on SARS is a major priority. This is vital as the new information emerging from these studies will help us be better prepared in the most cost-effective way. At the same time, it is envisaged that improvements in diagnostic tests and treatments will make the management of SARS cases simpler and produce better clinical outcomes. It is also very important that significant new findings are conveyed to the medical community and to the public in a timely way. This will allow medical professionals to be better equipped to assess patients and to identify and manage suspected SARS cases. It is also hoped that better understanding of SARS may help ameliorate the tremendous public fear which characterised the earlier part of the outbreak. This would help make the work of containment of new SARS clusters easier.

Acknowledgement

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