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## REVIEWING LESSONS LEARNT OF SARS IN SINGAPORE DURING PLANNING FOR INFLUENZA PANDEMIC

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### ABSTRACT

There were many lessons learnt in Singapore's fight against SARS, and they have proven to be all the more important in our preparations for an influenza pandemic. The following lessons are discussed in this paper including: the widespread ramifications among the various sectors in Singapore (individuals, organizations, community and economy), the first principles of outbreak response, need for enhanced infectious disease control measures, high demands on the healthcare system, the role of management policies implementation and dissemination, multidisciplinary involvement, importance of communication, and business continuity planning.

Keywords: SARS, lessons, Singapore, business continuity, outbreak response

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## BACKGROUND

Severe respiratory distress syndrome (SARS) was Singapore's most prominent global health threat. A new entity then in 2003 that caught everyone off-guard; contributed no doubt to the fact that SARS was a novel variant of coronavirus.<sup>1-4</sup> The global outbreak had both an insidious and yet formidable onset. By the time there was a suspicion that the world had an unprecedented pathogen in mid-March 2003, it had already culminated as simultaneous outbreaks in 28 countries. Singapore was one of those severely affected. By the beginning of June, there was a cumulative total of more than 8430 probable cases and close to 800 deaths, of which Singapore had 238 probable cases and 31 deaths.<sup>5,6</sup> As Asia makes preparation for an influenza pandemic, it is useful to review those lessons learnt from SARS.

**Table 1. SARS in Singapore. Profile of Probable Cases (n=238)<sup>7</sup>**

	No.	%
Healthcare workers	97	40.8
Family / household members	55	23.1
Inpatients	31	13.0
Visitors to hospital	20	8.4
Social contacts	15	6.3
Imported	8	3.4
Co-workers in market	3	1.3
Taxi drivers	2	0.8
Flight stewardess	1	0.4
Undefined	6	2.5

## OBJECTIVES

This paper aims to describe the key lessons learnt in the management of SARS within the Singapore perspective.

### **Lessons Learnt from the SARS “Battles”**

SARS was a wake-up call for many of us. As individuals, it made us realise how vulnerable we were even when we lived in an affluent society with advanced healthcare

facilities. As a country, it tested virtually all sectors – health, economy, environment and our individual socio-cultural well-being.

**Lesson 1: SARS Affected Many Sectors in Singapore**

Working adults, especially healthcare workers, were predominantly affected (Table 1).<sup>4</sup> Besides direct patient caregivers like doctors or nurses, paramedical staff such as scientists, laboratory technicians (handling patient biological samples), radiographers, medical students and cleaners, were also at risk.<sup>7-10</sup>

Transmission was not confined within the hospital and spread to the community. Other workplaces and workers including storekeepers at the Pasir Panjang Wholesale Market and taxi-drivers, were affected (Table 2).

**Table 2. SARS in Singapore. Location of Transmission (n=238)<sup>7</sup>**

	No.	%
Hospital/Nursing Home	178	74.8
Household	33	15.5
Overseas	8	3.4
Community	7	2.9
Pasir Panjang Wholesale Market	3	1.3
Taxi	2	0.8
Flight	1	0.4
Undefined	6	2.5

Besides causing clinical respiratory infections, there were a number of SARS associated medical conditions that arose in caregivers. Anecdotal incidents included work-related stress, hand dermatitis due to repeated alcohol hand washes and pressure facial dermatitis due to prolonged use of respirators.<sup>11</sup>

- There were social implications that could not be ignored and had to be managed with sensitivity. This included:
- Irrational fear and paranoia. Healthcare workers from the designated SARS hospital (Tan Tock Seng Hospital) were reported to be discriminated against; patients themselves did not want to be treated at Tan Tock Seng Hospital.

Singapore schools were also pressured by the public to close for a period of time following reported cases of SARS. Selfish behaviour such as those who flaunted their home quarantine orders (openly or otherwise) demonstrated the other extremes of human behaviour.

Social and cultural mindset changes. These had to be modified to promote personal and environmental health. Examples were the enforcement of no-spitting or disposal of contaminated objects (like tissues with sputum) in public areas.

Any suspected case could transmit SARS at the workplace; thus any organisation was a potential source for community spread. The organisations had to introduce measures to prevent SARS including temperature checks, use of personal protective equipment and have alternate shifts for critical operations.

The fallout was the higher operating costs, and resulted in lower profits or losses during this period for commercial companies. For example, 6 local restructured hospitals were reported claiming \$126 million to cover the loss of business due to SARS under their 'business interruption' insurance coverage.<sup>12</sup>

Singapore's economy appeared to be heading for a recovery at the beginning of 2003, until it was hit hard, firstly, by US-Iraq War and then by the SARS outbreak. Almost all the industries were affected, but this was especially so for tourism, hospitality and retail. All sustained increased operational and administrative overheads with the implementation of workplace SARS control measures. It was reported that the Singapore Government had incurred \$192 million in direct operating expenditure related to SARS as of 31 May 2003, and committed an additional \$105 million development expenditure of hospitals for adequate isolation rooms and medical facilities to treat SARS and other infectious diseases.<sup>13</sup> In addition, an economic relief package worth \$230 million was also created to aid businesses hit by SARS.

### **Lesson 2: First Principles Work in Managing an Emerging Infectious Disease**

Uncertainty prevailed in the initial phase of the SARS outbreak. There was little known about the SARS pathogen, clinical characteristics and absence of a diagnostic test.<sup>14-18</sup> What made it more worrying was the probability of mortality which was assessed to be at 14% locally.<sup>14</sup>

Returning to basic principles proved to be an effective strategy in controlling the SARS outbreak. These are briefly summarised as follows (can be applied within the organizational context):<sup>15-19</sup>

1. For those who were or suspected to be infected –
  - Detection
  - Isolation
  - Containment
2. For those who were not infected –

- Protect
  - Monitor
3. For those who may import SARS –
- Safeguard physical entry
  - Restrict access using designated pathways or zones

These first principles provide the cornerstone for managing any infectious disease outbreak, and must be reviewed during any outbreak response management.

### **Lesson 3: SARS is a Nosocomial Infection**

SARS appeared to be primarily nosocomial; and hospitals seemed to amplify the disease.<sup>15,20-22</sup> Cases not contained within the hospital resulted in spread within the community. There were no clusters that originated from the community directly.

Medical facilities thus play a vital role in the control of the outbreak, and strategies targeted here probably reap the greatest yield. Now that the current SARS situation is under control, healthcare workers must continue medical surveillance and infection control measures despite the absence of SARS affected countries globally.<sup>23,24</sup>

Such measures would be effective in the control of emerging infections. However, the pattern of transmission will change drastically if air-borne transmission occurs. Community clusters would become more prevalent in this instance.

### **Lesson 4: Conventional Infection Control Measures May Be Inadequate**

The infection control programmes were the primary means of protecting the healthcare workers. Conventional infection control measures comprise of procedures traditionally referred to as universal precautions; this focused on preventing disease spread from healthcare workers to immunocompromised patients and thus was a form of ‘reverse’ barrier nursing. Infection control programmes comprised mainly of needle stick injury programmes and barriers limited largely to face shields, gowns, gloves and goggles during high risk procedures.

Health authorities quickly realised that conventional means were inadequate, and employed ‘enhanced’ infection control measures. These measures built upon existing isolation and personal protection practices and a list can be found in Table 3.<sup>25-30</sup>

It is thus worth considering the use of enhanced infection control measures during the initial phase of uncertainty for any major infectious disease outbreak. Measures can be progressively stepped down as the disease becomes controlled.

**Table 3 Enhanced Infection Control Measures in Hospitals**

<p>1. Isolation and prevention of disease transmission within and out of medical facility</p> <ul style="list-style-type: none"><li>▪ Centralised management of all suspected and probable SARS cases in TTSH</li><li>▪ Strict enforcement of isolation procedures</li><li>▪ Forward triage for patients and visitors entering hospitals and polyclinics</li><li>▪ Designated ambulance service</li><li>▪ Restrict visitation privileges in hospitals</li><li>▪ Restrict inter-hospital patient movements</li><li>▪ Restrict practice of doctors and nurses to selected hospital</li><li>▪ Responsive contact tracing within hospitals</li></ul> <p>2. Protection</p> <ul style="list-style-type: none"><li>▪ Strict use of personal protective equipment by healthcare workers and visitors</li><li>▪ Positive air-purifying respirator (N99 grade) for high risk procedures</li></ul> <p>3. Monitoring/Surveillance</p> <ul style="list-style-type: none"><li>▪ Temperature taking for staff</li><li>▪ Temperature screening for visitors</li><li>▪ Monitoring of discharged patients</li><li>▪ Surveillance of healthcare and patients for febrile clusters</li></ul>
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**Lesson 5: SARS (and Respiratory Infections) Make High Demands on the Healthcare System**

SARS stretched the various strata of healthcare delivery systems severely. Not only were the healthcare workers at highest risk, the disease outcomes also culminated in about 20% of cases requiring critical care, requirement for isolation facilities (the private wards comprising of single rooms had to be converted to isolation rooms), wards which had suspected SARS cases had to be closed ('no in-no out policy until last patient was discharged) and the nationwide (and global) competing demands for

personal protective equipment.<sup>14,31-37</sup> This was further complicated by the lack of a diagnostic test kit which could positively confirm a case of SARS with relative certainty. Suspected cases could not be differentiated from non-SARS infections (especially influenza that matches the same SARS case definition), and hence contacts of suspected cases had to be quarantined

Aside from respiratory infectious diseases, there are other clinical communicable presentations such as diarrhoeal (e.g. salmonella, rotavirus), haemorrhagic (e.g. dengue), conjunctivitis (e.g. viral conjunctivitis) and neurological (meningococcus). In general, they may be self-limiting, have lower transmissibility (direct contact or require a vector), and there is usually availability of diagnostics, treatment, chemoprophylaxis or vaccines.

Outbreaks of respiratory tract infections thus have the greatest potential to stress the healthcare system. Medical preparedness and contingency planning should place priority on respiratory outbreaks. More research is required to understand local respiratory disease profiles and review clinical policies for respiratory infections. Influenza vaccination has been recommended for healthcare workers and nursing homes, to reduce the “false positives” by the influenza virus thereby cutting down the burden of responding to these triggers and heightened organisational management.<sup>38</sup> Similarly organizations may also want to vaccinate their critical staff or those who travel.

#### **Lesson 6: Implementation of SARS Management Policies at Work Should Be Consistent and Transparent**

In such a national crisis, it was inevitable that there would be national policies which impacted upon each and every Singaporean resident. Indeed such policies impinged into the workplace operations, and they had to be executed in such a manner to ensure compliance while at the same time limiting disruption to the work processes and costs. Examples of such national policies include:

Issue of Home Quarantine Orders (HQO): contacts of both probable and suspected SARS cases were issued with HQOs and were not to leave their home. Organisations had to source for replacements where possible, or the affected employee’s responsibilities may have to be undertaken by his colleague. Some companies have gone further to remove contacts of these persons with HQOs outside of certain critical operations as an added precaution.

Closure of schools: all schools up to polytechnics and the universities were closed during one period when there were a few SARS cases among the students in response to public pressure. Parents with children in childcare were probably the most affected, and working parents had to take leave to take care of their children thus impacting upon workplace operations.

Travel advisories and restrictions: travel to other SARS affected countries was strongly discouraged; travel to Singapore was also advised against in a number of countries during the SARS period. This resulted in some countries relocating their operational headquarters during the interim and also discouraged new investors.

Quarantine of foreign workers: All foreign workers especially those arriving from SARS affected countries were required to be quarantined for a period of 10 days before being declared “free from SARS” and allowed to work.

Workplace policies had to be implemented to ensure alignment with national policies as well as to prevent the transmission of SARS. They can be broadly classified into the following categories:

- Minimise SARS exposure and risk to workers
  - Health declaration and temperature monitoring for all employees.
  - Health declaration and temperature screening for visitors.
  - Restricting travel to other SARS affected countries (and the company may require the individual who has returned from a SARS affected country to stay away from the workplace for 10 days before returning to work if symptom free).
- Protecting the individual
  - Health education to increase awareness and limiting any irrational fear.
  - Use of personal protective equipment such as respirators, gloves for personnel conducting temperature screening.
- Responding to a case of SARS in the workplace
  - Contact tracing important to identify close contacts. Inability to conduct contact tracing effectively may risk closure of the whole unit as in the case of Pasir Panjang Wholesale Market where the whole market had to be quarantined
  - While it is the role of Medical Officer of Health (MOH) to complete the contact tracing, the assistance by the affected company is crucial to identify and quarantine the contacts early by providing the schedule of work, meetings, etc to the contact tracing team. Some companies have also gone ahead to register their employees as they go to different departments or offices either manually or sometimes electronically
- Having additional administrative / precautionary measures to minimise the impact of a SARS case in the workplace including
  - Backup teams or the use of functional units in critical areas of the company (“Team A and Team B” concept; “1 in 3 or more shift” concept i.e. having additional shifts such that there will always be a shift available not in contact with the affected shift)



- Alternate workplaces such as working from home
- Anecdotally, it was this group of measures that proved most costly and caused the most stress to the affected employees. For instance, while having more shifts reduced the duration of work, it usually meant fewer persons per shift and higher work demands during the shift
- Welfare issues including the decision to offer repatriation of foreign staff in Singapore.

#### **Lesson 7: Rapid Evolution of Organisational Policies Was Needed**

As more was known about SARS, new policies were rapidly included and existing ones revised. Organisations and their staff need to be flexible and readily adapt. It is also important for the policy makers to consider ground implementation issues which can be easily overlooked in the fluidity of the situation.<sup>39,40</sup> Feedback and ground audits are thus essential.

#### **Lesson 8: Management Emphasis, Multi-disciplinary Involvement and Accountability is Important**

There must be management emphasis from the highest level within the company to ensure that the difficult measures are complied with. As with any other crisis management, command emphasis is essential and there needs to be the involvement of all departments within the company. The responsibility cannot be merely left to the medical departments within the organization.<sup>41</sup>

A SARS taskforce could be set up to ensure all bases were covered. This is akin to the pivotal role played by the Prime Minister (as shown in his open letter to all Singaporeans) and the creation of the Inter-Ministerial SARS Executive Group which addressed the SARS policies in Singapore.<sup>42</sup>

#### **Lesson 9. Information Management and Communications Are Crucial**

National policies were being created, promulgated and subsequently revised at a rapid rate in response to the outbreak. An organisation must ensure that all its personnel are kept updated and understand the rationale behind both the national as well as the organisation's SARS policies.<sup>43-46</sup>

Where national policies require a change in socio-cultural mindsets (such as personal hygiene, staying away from home if unwell; sharing of food at meals), the organisation has a significant role in workplace education and promotion. It also requires a sensitive and responsive management to prevent social discrimination (such as alienation of those on HQO, or contacts and SARS cases who have returned to work).

#### **Lesson 10: Business Continuity Plans Should Be Prepared**

When the global SARS outbreak was being contained as evidenced by the absence of SARS affected countries, Singapore phased down measures. At the same time, organizations prepared increasing levels of precautionary measures in response to

various SARS risk levels as a form of business continuity in the event of reemergence of disease.<sup>47-49</sup>

Firstly, stratifying the risk based upon transmission both externally and locally. For example, it could be based upon the classification used by the World Health Organisation. Subsequently, the level and type of control measures could then be matched with the risk level thereby forming the basic Business Continuity Plan (see Table 4 for example).

A plan to exercise organisation readiness to SARS recurrence should be done to keep the system “warm”. For instance, the Ministry of Health conducted regular audits and contact tracing exercises in all healthcare institutions.

Table 4. SARS Business Continuity Plan (example)

<b>Risk Level</b>	<b>Routine Areas</b>	<b>Critical Areas</b>
<p><b>Negligible risk.</b></p> <p>No other SARS affected countries globally.</p>	<ul style="list-style-type: none"> <li>• No additional precautions required.</li> <li>• Reinforcement of Good Hygiene Practices – personal and collective during training</li> <li>• Reinforcement of cleanliness within premises</li> <li>• Reinforcement of hygiene practices canteen operators</li> </ul>	
<p><b>Low risk</b></p> <p>SARS affected country outside Singapore</p> <p>Local imported case contained without transmission.</p>	<ul style="list-style-type: none"> <li>▪ Travel restriction for all</li> <li>▪ Monitor and Declaration of area/country</li> <li>▪ Consider home leave if return from affected area/country within incubation period</li> <li>▪ Temperature regime</li> </ul>	

<p><b>Moderate risk.</b></p> <p>Imported with limited transmission.</p>	<ul style="list-style-type: none"> <li>• As above.</li> <li>• Screening for civilians entering premises</li> <li>• May need to consider pre-departure quarantine</li> </ul>	<ul style="list-style-type: none"> <li>• As above</li> <li>• Shifts</li> </ul>
<p><b>High risk.</b></p> <p>Community outbreak.</p>	<ul style="list-style-type: none"> <li>• As above</li> </ul>	<ul style="list-style-type: none"> <li>• As above</li> <li>• Alternate workplace</li> </ul>

## CONCLUSION

The SARS outbreak has demonstrated emphatically both the strengths and weaknesses of the Singapore response. The lessons learnt have proven to be crucial in the changes of the healthcare infrastructure framework within Singapore and assisted in planning for an influenza pandemic.

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