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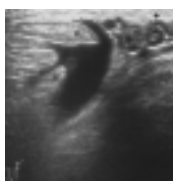
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Editorial Office Address

Editor
 Singapore Medical Journal
 Singapore Medical Association
 2 College Road
 Singapore 169850
 Fax: (65) 6224 7827
 Email: smj@sma.org.sg
 Website: www.sma.org.sg/smj

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**Cover Picture:**

Hernia. Longitudinal US image shows loops of bowel (B) with surrounding fluid extending from the inguinal region into the scrotum. This structure was peristaltic (not shown). Associated varicocele is also seen (arrow).
 (Refer to pages 196-202)

SARS: two years on...

P A Tambyah

As I write this editorial, it is reaching the second anniversary of the day that an alert infectious disease physician notified the Ministry of Health about three women who had returned from Hong Kong with a mysterious form of atypical pneumonia. The rest, as they say, is history. This journal was one of the first in the world⁽¹⁾ to report the clinical features of the first emerging pathogen of the 21st century. We have learned many lessons from the severe acute respiratory syndrome (SARS) outbreak. Unfortunately, most of these lessons have been anecdotal⁽²⁾ as we, in Singapore, have not had a major public review of the processes and procedures that followed that alert from Tan Tock Seng Hospital (TTSH).

Those of us who followed the Nicoll Highway inquiry have been fascinated by the detail to which the inquiry team looked into the processes involved in a major construction project, including all the checks and balances, the interaction between the different government regulatory agencies, and the different providers of goods and services. Hong Kong⁽³⁾ and Canada⁽⁴⁾ have done detailed inquiries into the entire SARS episode and these are available online^(3,4). While we had more healthcare worker deaths than Canada, we have yet to have a major, comprehensive review of the entire episode on the scale of the Canadian review.

Hindsight is always 20/20 and it is notoriously difficult to detect and respond to emerging infectious diseases. In fact, it is striking that when the entire US public health system was on the alert for smallpox, an outbreak of a related poxvirus – monkeypox – smouldered unsuspectingly for days⁽⁵⁾ before the CDC got wind of it. The big difference is that a single infectious disease epidemic is unlikely to cripple the US economy or affect the lives of every American, Canadian or mainland Chinese. SARS, however, has shown us that a novel, nosocomial infectious disease can devastate our economy and have an impact on every Singaporean. Hence, surveillance and epidemiology of emerging infectious diseases in Singapore have to be an order of magnitude **higher** than what exists in the US and Canada. It is not a matter of some infectious disease where physicians or public health specialists are lobbying for more staffing, but one of national security.

In that light, it is critical for the medical and scientific community to review the data and to draw meaningful lessons from the SARS epidemic in order to prevent another such catastrophe. Two papers in this issue of the journal are excellent examples of the kind of work that has to form the evidence base for any future plans to control SARS or any other new emerging infection.

The first paper by Chong et al⁽⁶⁾ is a review of the Tan Tock Seng Hospital (TTSH) emergency department (ED) experience during SARS. While this

Department of
 Medicine
 Division of
 Infectious Diseases
 National University
 Hospital
 5 Lower Kent
 Ridge Road
 Singapore 119074

P A Tambyah,
 MBBS, DABIM
 Consultant and
 Associate Professor

Correspondence to:
 Dr Paul Ananth
 Tambyah
 Tel: (65) 6779 5555
 Fax: (65) 6779 4112
 Email: mdepat@
 nus.edu.sg

study is limited by the authors' inability to confirm whether the patients did indeed have SARS as they did not have access to the confirmatory serologic results, their data are very interesting. After TTSH had been designated the SARS hospital, they screened 11,461 patients and admitted 1,386. Of these, 117 were classified as probable SARS and 146 suspect SARS. Strikingly, 5% of patients had no exposure history, 8.4% had no fever and 40% of patients had no cough. Five percent of patients had no chest radiographs done in the ED and 22% of probable SARS patients had normal radiographs. Healthcare workers took an average of 4.2 days of symptoms before presenting to the ED for screening which is very long considering the amount of surveillance that was ongoing at the time. As the authors also point out, "travel history was less common in probable SARS cases than in suspect SARS cases because the disease was mainly due to local transmission."

The authors' conclusions are sobering⁽⁶⁾. While the World Health Organisation (WHO) criteria were helpful guidelines, they could not be used to differentiate "on the ground" between SARS and non-SARS patients. This was true even in an ED which was designated for SARS patients and was spared the "regular" emergency work that had to go on during the outbreak. As the authors pointed out, it is often the skilled clinician that makes the difference. Alternatively, the ED has to be provided with the resources to simply admit patients that they are concerned about, even if more than 80% of them do not have SARS. A combination of those two factors probably helped to keep the epidemic under control. Clinicians working in the wards need to be sensitive to our ED colleagues who have to make snap decisions with limited information. Personally, I would much rather our ED colleagues err on the side of caution, especially where contagious emerging infections are concerned.

The second paper by Escudero et al⁽⁷⁾ on surveillance in the post-SARS period is even more sobering for those who believe that the WHO has successfully mastered the science of SARS. The authors describe a retrospective review of one month's data on post-SARS surveillance using the WHO recommendations. In the space of one short month, they found 27 clusters of staff with acute febrile illnesses and 185 clusters of staff and patients in the same area with hospital-acquired acute febrile illness by criteria, and 4.6 wards **every day** fulfilling the WHO SARS alert criteria. In terms of WHO atypical pneumonias, only five of 27 cases that met the Ministry of Health (MOH) criteria for atypical pneumonia were actually assessed while on atypical pneumonia "isolation rounds". While all this activity was going on, an actual SARS case occurred due to a laboratory accident and one contact was admitted, unbeknown to the team, to a general ward with an acute febrile illness without being picked up by this surveillance mechanism!!

Escudero et al⁽⁷⁾ comment: "The incident highlights how such a surveillance system fails in its ability to detect and differentiate the large volume of febrile cases presenting to our acute hospitals, and its ultimate reliance on frontline clinicians to diagnose, differentiate, and then report unusual cases of febrile illness." Overall, these data show the disconnect between case definitions and surveillance criteria designed by experts in Geneva and the experience of those working in the trenches in Singapore's busy hospitals. It is clear that it is not realistic to expect us to follow the stringent criteria laid down by the WHO to raise SARS alerts at least four times a day, given the experience of the TTSH group. On the other

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Publisher

Singapore Medical Association
Level 2, Alumni Medical Centre
2 College Road
Singapore 169850
Tel: (65) 6223 1264
Fax: (65) 6224 7827
Email: smj@sma.org.sg
URL <http://www.sma.org.sg/smj>

Design and Advertising

Equity Communications Pte Ltd
145 Neil Road
Singapore 088874
Tel: (65) 6324 7822
Fax: (65) 6324 7833
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For advertising matters,
call or email

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Tel: (65) 6324 4337
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Email: gevin_e@equity.com.sg

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hand, we have to accept that any relaxing of the criteria would invariably increase the risk that we will miss the start of the next SARS epidemic. Unfortunately, given the absence of a rapid diagnostic test that is reliably positive at the onset of symptoms, and the lack of infinite resources to isolate every single patient, that is the reality that we have to accept. The challenge will be to respond rapidly to the 10th or 20th case that finally triggers off the alarm bells. This can cause problems as with the "second wave" of SARS in Toronto⁽⁸⁾. Hopefully, we, like the Canadians, have learned enough to keep the epidemic contained at that level before too much damage is done to our economy and the lives of our friends and colleagues.

In 1957, an alert clinician noticed that a number of daily-rated workers reported sick on a public holiday (May Day). That prompted an epidemiological investigation which led to a team of virologists led by Prof Lim Kok Ann of the Faculty of Medicine of the then University of Singapore who were among the first in the world to isolate and characterise the virus responsible for the Asian flu pandemic of 1957⁽⁹⁾. There has been a considerable investment in biomedical research in recent years in a bid to revive those days of medical research excellence. Clinicians all over the world are hoping that our basic science colleagues will be able deliver on the promise of some kind of reliable and rapid test to detect these emerging pathogens at presentation and not five days later by which time the extent of transmission could be devastating. This has happened with HIV, twenty years after the first recognition of the syndrome⁽¹⁰⁾. Hopefully it will not take that long for SARS or pandemic influenza.

The lesson of these two important pieces of original research is clear. Investment in retaining skilled clinicians in large public hospitals is critical to any practical surveillance strategy. In addition, they have to be allowed the time to critically evaluate and assess each difficult case or each situation which a less experienced physician would dismiss.

As the world is brought closer and closer to another influenza pandemic with every new case of avian influenza in humans, we can only hope that we are able to rigorously develop the evidence base required to control and contain emerging infectious diseases. The two scholarly pieces in this issue of the journal hold hope for the future. We hope to see more of the same. **SMJ**

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