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Hiding in the Bunker: Challenges for a radiation oncology department operating in the Severe Acute Respiratory Syndrome outbreak

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SUMMARY

In February 2003, one woman returned from Hong Kong to Singapore with a previously undescribed atypical pneumonia. Two months later, Singapore is facing its greatest ever threat to its population's health and the country's economy. The government has taken strong action to break the chain of infection of Severe Acute Respiratory Syndrome (SARS). As a radiation oncology department in Singapore, we have faced challenges in keeping staff and patients safe while continuing to provide a service to our patients. In this article, we outline the measures taken to curb SARS in Singapore and discuss the implications for Australasian radiation oncology departments.

Key words: *radiation oncology; severe acute respiratory syndrome; Singapore.*

On 23 February 2003, a 45-year-old woman returned home to Singapore from Hong Kong. Six weeks' later, 140 people in Singapore developed Severe Acute Respiratory Syndrome (SARS), nine patients died from SARS and the island nation's health system was devastated.[1] The largest hospital is now reeling from an outbreak that caused 25 staff admissions in one weekend, a second 1500 bed hospital is closed to non-SARS care, and the others have now commenced staff duty rotations to reduce the risk of complete staff cross-infection in the event of outbreaks. Amidst this, the accredited radiation oncology department of the Royal Australian and New Zealand College of Radiologists in Singapore has one of its units closed to new cases and the second is on forced half-staff shifts. Staff wear masks, have daily legally binding temperature rounds, leave via designated routes and avoid having patient contact unless absolutely necessary. All this arising from one innocent person's journey across the South China Sea.

WHY IS THE HEALTH-CARE SYSTEM VULNERABLE TO SARS?

The answer is because SARS is an atypical pneumonia spread by respiratory droplets from the infected person. Infection apparently occurs early in the illness during the initial febrile phase after an incubation period of 2–14 days.[2] The Singaporean health system was initially hit because the original victim was admitted to a major hospital while SARS was an unknown illness and barrier precautions had not been taken. Spread occurred within the hospital through secondarily infected health-care workers and, subsequently, to other patients. Family members and visitors, with often minimal contact to the wards, were also infected. Unfortunately, other hospitals developed cases through discharged patients being readmitted elsewhere often to avoid the outbreak at the initial hospital. A second major outbreak occurred at Singapore's largest hospital, Singapore General Hospital, apparently through an infected surgical registrar servicing multiple wards despite the presence of fever. Eventual containment of the outbreak has become proportional to the timing of barrier protection and the low threshold for early admission of individuals with fever.

NATIONAL HEALTH-CARE INTERVENTION

The Singaporean government acted swiftly and strictly to contain the threat. Its second largest hospital, Tan Tock Seng Hospital, (1500 beds) and site of initial outbreak was closed and designated to be the SARS hospital. Schools were closed and all public events postponed indefinitely. Any febrile individuals

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with history of recent travel to affected areas or contact with the outbreak hospital were diagnosed as suspect SARS cases and admitted for isolation. All primary contacts of these individuals were placed on home quarantine with financial penalties for violation, as well as webcam monitoring if required. All health-care workers have mandatory body temperature recording twice daily with similar penalties not only for the individual but the head of department. Government on-site audits are instituted in hospitals to ensure compliance with all precautions.[3]

HOSPITAL-BASED INTERVENTIONS

In the SARS-designated hospital, closure was enforced for all clinics and non-SARS admissions. Any inpatient at other hospitals that was previously admitted to this hospital at the time of the outbreak were transferred back and isolated. Discharge from hospital was only allowed by law after 3 days of absence of fever. If a SARS case was diagnosed on the ward, then all patient discharges were postponed until 7 days post-potential exposure (one incubation period).

The hospital was segregated into clean and violated areas. Our satellite radiation oncology unit is based at this hospital and thus came under the restrictions. Only current patients were allowed treatment, with other cases transferred to the base department. All staff and patients had restricted access to the hospital proper and were only allowed access via the car park and one lobby lift. Staff are barred from returning to the base hospital or meeting other hospital staff unless 'decontaminated' with 7 days leave at home.

In the other hospitals, to minimize patient contact and deal with the potential increased workload from the SARS hospital, all elective surgery is cancelled as are most outpatient clinics. In order to protect themselves, staff are required to wear an N95 mask, gloves and gown when in contact with all patients. Every attempt is made to streamline workflow to minimize the number of staff in contact with a patient and the time spent with a patient.

Because of the potential risk of an individual health-care worker contaminating a whole department of colleagues, medical units have been divided into small teams who do not have any contact with the other team. Some departments have mandated that one team must be at home to ensure that if another team is quarantined because of exposure, there will still be a clean team available to continue emergency work.

Stations are set up at hospital outpatient clinics to screen entry of both patients and visitors, including the recording of temperature.

These changes have been implemented progressively, and many policies have required alteration as more information became available regarding the natural history of SARS.

CHALLENGES FOR A RADIATION ONCOLOGY UNIT

As a radiation oncology department, we have been confronted with a number of critical issues that are not encountered in the everyday running of a department. Not only the previously described issues of management are present, but also the nature of radiotherapy delivery generates further unique dilemmas.

Patients who are 'at risk' or who are a known contact should be seen and treated in a separate room. This is possible in the outpatient clinic setting or even in operating suites. However, radiotherapy treatment requires facilities that are unique and limited. Therefore, there is not the excess capacity to have a linac, simulator or mould room specifically set aside for 'at risk' patients. Concerns that viral particles might remain viable for 3–6 h have implications for subsequent patient and staff activity in that room.

Fever is the key initial indicator of SARS; however, it is not an uncommon symptom in patients, particularly oncology patients. Most lung cancer patients have respiratory symptoms of some description. Surveillance for low-grade fever might place stress on resources as well as potentially exposing these immunosuppressed non-SARS patients to possible exposure during Emergency Department screening. Raising the threshold increases the risk of a case being missed.

Unlike medical or surgical therapies, radiotherapy patients have a daily requirement for attendance and the nature of the treatment is such that an interruption of therapy is clinically unacceptable. So, unlike a surgical unit, we cannot cancel theatre lists for the following week. Even if no new cases are started, the patients currently on treatment must continue. The lag in workload reduction after a decision to wind down is much greater than in other disciplines. At least our Australasian experience in waiting list management might become a useful skill when normal activity is recommenced.

POTENTIAL OUTBREAK INTERVENTIONS IN A RADIATION ONCOLOGY UNIT

Service protection

It is essential to: (i) rationalize patient contact to essential activity; (ii) restrict staff movement within and between hospitals; (iii) develop staff teams and minimize contact between teams; and (iv) review interventions and be prepared for policy changes.

Staff monitoring for SARS

Twice daily temperature monitoring is required. The supervisor is accountable for surveillance, any sick leave has to be reported daily, and clusters of staff sick leave have to be investigated.

Patient and visitor screening

All patients and relatives coming into the department every day with questions and temperature have to be screened, and patients with fevers over 37.5°C are sent for assessment.

Barrier protection

Staff are required to: (i) wear an N95 mask during all patient contact; (ii) wash hands after each patient contact; and (ii) write medical notes after hand washing.

Early quarantine

There can be no heroes. Every staff member, including the boss, leaves the department if they develop a temperature.

IMPLICATIONS FOR FUTURE HEALTH CARE IN SINGAPORE

Eventual containment of the outbreak is anticipated; however, sporadic episodes arising from travelers are likely to be a source of potential future outbreaks. The lesson that this outbreak has taught is that health-care workers are portals of infection in an outbreak. A new medical service paradigm emphasizing the importance of temperature surveillance of both health-care workers and consumers is likely to persist. Doctors recording temperature before clinic commencement or before a Continuing Medical Education meeting is likely to be enforced. Patient trust in hospitals has also been damaged as a result of the crisis, and might have significant effects on early management of illness such as malignancy. Movement towards non-conventional therapies such as traditional Chinese medicine will occur, especially as these already have a viable presence in the community. The role of surveillance testing when a reliable inexpensive diagnostic kit becomes available is yet to be established.

POTENTIAL FOR SARS OUTBREAK IN AUSTRALASIA

There are no unique features of the Australasian health-care system over the Singaporian system that will protect it from a SARS outbreak. The hope of geographical isolation is diminished by aircraft accessibility and the evidence in Singapore that only one individual is required for an outbreak. Health care in Australasia is dispersed among various hospital levels while in Singapore it is centralized to major sites. The sprawling nature of the Australasian system might provide protection against a crippling large outbreak, but containment might be more difficult. Singapore did benefit by its government's ability to implement major interventions quickly, and whether an Australian model of government can achieve that same level of control is uncertain. For radiation oncology services, Singapore fortunately has no significant waiting list, thus a limited interruption to service might be absorbed more readily than the stretched Australasian systems.

History of the South-East Asian experience will undoubtedly provide lessons for control of future outbreaks. From our bunkers in Singapore, it appears that early precaution, staff monitoring and a low index of suspicion appear to be crucial in the containment of this quite unusual threat.

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