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Case Report: Caring for Suspected Severe Acute Respiratory Syndrome (SARS) Patients

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The rapid onset and widespread distribution of severe acute respiratory syndrome (SARS) has created worldwide concern and scientific cooperation. It also has presented challenges to every health care provider to be informed and prepared to handle potential cases.

SARS is recognized as a contagious respiratory illness and is believed to be associated with a coronavirus (SARS-associated coronavirus - SARS-CoV). The rate that it has spread internationally is noteworthy. SARS first manifested in China in November 2002. The World Health Organization (WHO) alerted the world at the end of February 2003. Dr. Carlo Urbani, an epidemiologist working with WHO, investigated an atypical respiratory disease at a hospital in Hanoi, Vietnam. On March 10, 2003, 22 hospital workers at the same hospital developed a similar respiratory illness and on March 29, 2003, Dr. Urbani died of SARS. Within 1 month of recognition, SARS has become a global threat to health. Practitioners worldwide are working to prevent an epidemic of an unknown and potentially fatal infectious disease. Since February 2003 the number of SARS cases and the countries affected has continued to increase.

CASE REPORTS

Santa Clara Valley Medical Center (SCVMC) is a 528-bed public hospital for the county of Santa Clara, California. SCVMC is the only county facility for an area with a population of 1.8 million. During March 2003, the staff was challenged to work with potential SARS cases during a time when very little was known about the disease. The following discussion presents this experience plus observations for improving future responses to unknown biologic threats.

Situation #1

On March 17, 2003, the health officer of Santa Clara County, California, issued a public health alert to all area physicians, hospitals, and health care agencies. The alert described how to recognize potential SARS patients and what precautions to take to prevent the spread of the syndrome.

Within days of receiving the alert, a potential SARS patient was seen at SCVMC in San Jose, California. A 38-year-old man who recently had traveled to Hong Kong presented ambulatory to the emergency department (ED). The patient was complaining of body aches, generalized weakness, and cough with flulike symptoms. The triage nurse immediately placed the patient in a room with negative air pressure, and airborne/contact precautions were instituted. The staff caring for the patient wore personal protective equipment (ie, N95 respirators, gloves, gowns, eye protection) when in direct, face-to-face contact with the patient.

The patient’s chest x-ray examination results revealed right upper lobe pneumonia.

Additional diagnostic studies were completed, the Infectious Disease Attending was consulted, and the patient was admitted. The patient was discharged 2 days later with instructions to maintain a self-quarantine until 10 days post symptoms.

Serum samples from the patient were submitted to the Santa Clara County Public Health Laboratory from which they were transported to the California Department of Health Services Viral and Rickettsial Diseases Laboratory and the Centers for Disease Control and Prevention. All samples were negative for known pathogens of respiratory disease including influenza A and B, human metapneumovirus, and respiratory syncitial virus. Although PCR for SARS associated coronavirus was negative, serum was found to be positive for SARS-CoV confirming the diagnosis of SARS. This patient’s case allowed the ED to put into effect the recommendations received from the hospital Infection Control department and the County Public Health Department.

Situation #2

On April 1, 2003, an airline pilot en route from Tokyo contacted air traffic control at the Mineta San Jose International airport to report potential SARS patients on board the
Boeing 770. Air traffic control personnel contacted the Santa Clara County Fire Department who, in turn, contacted the Public Health Department. At the request of the pilot, upon landing, the plane was quarantined away from the terminal areas. In accordance with the County’s mass casualty incident plan, officials from the Airport, Fire Department and Public Health Department responded to the plane and assessed the situation.

At the airport, the on-call Health Officer determined that it was not possible to fully assess the suspect passengers on site. Thus, 3 potential SARS patients were transported via ambulance to the SCVMC Emergency Department. The ambulance crews wore full personal protective equipment, and the patients were masked for transport. The remaining passengers were provided with verbal instructions regarding health monitoring and a copy of the CDC Health Advisory for persons returning from areas with SARS.

Meanwhile, in a separate incident that occurred while the SCVMC was awaiting patients from the airplane, 3 patients arrived at the medical center’s ED triage desk wearing makeshift facemasks stating, “We have SARS.” The 3 new patients were concerned because of exposure they had had to someone who recently may have traveled to China. All 3 had respiratory complaints. The patients were immediately taken into the ED.

Three patients arrived at the medical center’s ED triage desk wearing makeshift face masks and stating, ‘We have SARS.’

On the basis of advice from public health authorities, the goals of hospital care were the following: (1) prevent further transmission of suspected SARS; (2) provide diagnostic services to identify or rule out patients in respiratory distress and/or with SARS; (3) treat patient symptoms; and (4) counsel/educate patients treated and released.

Prevent transmission. A large 5-bed room was prepared for the incoming patients and 2 HEPA filters were placed in the room. The 3 existing negative airflow rooms in the department were in use. Two nurses were assigned to the room, and all nonessential equipment was removed to decrease the amount of terminal cleaning. All 6 patients were seen and treated in the large patient care room.

Diagnostic studies. Diagnostic imaging was arranged to take place in the patient care room, and any blood samples were gathered by the nurses assigned to the room. Health care providers were instructed to adhere to hospital guidelines and precautions for airborne/ contact transmission. SCVMC policy on precautions is even more rigid than CDC recommendations. No visitors were allowed in the treatment room, and additional staff members were limited to decrease the chance of exposure.

Screening tests for viral respiratory pathogens, including Influenza A and B, Respiratory Syncytial Virus along with sputum and blood cultures. A chest x-ray was done to identify infiltrates. Samples for definitive testings for SARS CoV must be submitted to the Public Health Laboratory. In the case of the patients referred from the airplane, no diagnostic testing was needed. By taking a thorough history, the ED physician was able to rule out SARS. Two of the patients had no symptoms, and the other had a cough that began before her trip overseas.

The history was not so clear-cut with the patients who arrived ambulatory to the triage desk. Two of the patients were complaining of fever and cough, and the other patient complained of a long history of cough associated with an existing condition. Only 1 of the patients had been exposed to someone who recently may have traveled to China, but they were concerned that they may have exposed each other from the 1 contact. Baseline testing for influenza A and B was done on the patients with respiratory complaints.

Treatment. There is no known effective pharmacologic regimen for SARS. Treatment includes usual care for patients with atypical, community acquired pneumonia, supportive care and is dependent on the patient’s individual clinical status.

Counsel/education. All 6 patients were discharged home with instructions to monitor their health status for 10 days. They were advised to contact their health care provider if additional symptoms developed.

DISCUSSION

The Syndrome

SARS is an infectious illness that appears to spread by close person-to-person contact. The majority of SARS cases involve people who were in close personal contact with someone with SARS (eg, cared for or lived with that person) or their respiratory secretions. It is possible that people become infected with SARS by touching skin or objects that are contaminated with infectious droplets then touching their own mucous membranes (eg, eye, nose, or mouth) or via methods that currently are not known.

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Initially, patients with SARS may present with mild respiratory symptoms, headache, malaise, and overall body aches (Table 1). The subtlety of the early stages of SARS is reflected in the Toronto experience. Researchers noted
that one third of the patients who eventually were admitted with SARS had been seen by a physician and sent home. After 2 to 7 days, the infection produces a dry cough and trouble breathing. The causative agent for SARS currently is unknown; however, a type of coronavirus is suspected.5

WHO has developed case definitions for SARS.7 SARS should be suspected in persons who have a history of exposure (eg, traveled to parts of the world with active SARS cases; close contact with persons who have SARS or their family members; and clinical symptoms such as fever greater than 100.4°F [>38.0°C], cough, and dyspnea). A probable SARS patient is a person who has met the aforementioned criteria and has clinical evidence of infection (eg, radiographic changes consistent with pneumonia, respiratory distress syndrome, or death without an identifiable cause). In Canada, 25% of the patients had normal chest radiograph results on admission to the hospital.1

Clinical Observations at SCVMC

On the basis of the information from the international, national, and state health authorities, the Infection Control Department at SCVMC developed a plan that would identify potential SARS patients, prevent further transmission of the disease, and streamline a process to obtain pertinent diagnostic studies.

Identification of potential patients. SARS is a diagnosis of exclusion. Febrile patients with respiratory symptoms (eg, cough, shortness of breath) who meet contact criteria must be evaluated to rule out SARS. Most of the patients described in the 2 situations at SCVMC demonstrated minimal signs and symptoms and did not have respiratory distress.

Phone advice or telephone appointment services staff should be trained to screen patients. Personnel of the SCVMC appointment and advice line have been instructed to gather information about callers with respiratory complaints. The advice staff will inquire about recent travel and the health status of close contacts.

Preventing transmission of the virus. The need to rapidly identify the potential SARS patient has led to a more focused triage process. Potential patients are alerted to the need to reduce risk to others via signs in the most “common” languages outside all entrances (Table 2). Legible and accessible signs instruct patients and visitors to be aware of SARS and to use masks before entering the hospital. If they fit the criteria. The triage nurse screens patients for recent travel or close contact with a SARS patient.

Health care workers must be aware of the risk of acquiring SARS after caring for infected patients. In most instances, transmission to health care workers appears to have occurred after close contact with symptomatic individuals (eg, persons with fever or respiratory symptoms) before recommended infection control precautions for SARS were implemented (ie, unprotected exposures). Personal protective equipment appropriate for standard, contact, and airborne precautions (eg, gown, gloves, eye splash shield, and N95 respirator) must be used.5 The N95 respirator mask is approved by the National Institute for Occupational Safety and Health (NIOSH) and must be fit-tested to each worker.

An unforeseen problem developed when the SCVMC hospital supply of N95 respirator masks was depleted during a 1-week period.

An unforeseen problem developed when the SCVMC hospital supply of N95 respirator masks was depleted during a 1-week period. Supply companies informed the hospital that the most commonly used masks were not available. Another N95 mask was available, but most staff members had not received respirator fit-testing on that particular model. Quick planning by the hospital Educational Services staff allowed for respirator fit-testing of more than 400 staff members over a 2-day period. The staff was issued the new masks and asked to maintain those masks until they worked with a potential SARS patient or the mask became soiled. The N95 mask supply has returned to near-normal levels, but now the

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Table 1. State of California Department of Health Services case definition for suspected SARS patients15

| Measured temperature $\geq 100.5\, ^\circ F$ ($>38^\circ C$) AND |
|---|
| ● One or more clinical findings of respiratory illness (eg, cough, shortness of breath, difficulty breathing, hypoxia, or radiographic finding of either pneumonia or acute respiratory distress syndrome) AND |
| ● Travel within 10 days of onset of symptoms to an area with documented or suspected community transmission of SARS OR |
| ● Close contact within 10 days of onset of symptoms with either a person with a respiratory illness who traveled to a SARS area or a person known to be suspected SARS patient |

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Table 2. Advice posted for all patients and visitors who enter Santa Clara Valley Medical Center, San Jose, California

| To all patients: |
|---|
| To prevent the transmission of severe acute respiratory syndrome to health care workers and other patients, please follow these instructions: |
| If you have a fever and a new cough and/or difficulty breathing |
| PLEASE |
| 1. Place a surgical mask over your nose and mouth before entering this health care facility |
| 2. Inform the staff at the desk of your symptoms |
| Thank you for protecting our patients and health care workers |

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An unforeseen problem developed when the SCVMC hospital supply of N95 respirator masks was depleted during a 1-week period.
masks are accounted for to prevent the loss of large numbers. It is believed that the masks were taken by staff and others because of a perceived need to protect themselves outside of the hospital setting.

Control of airborne transmission from spreading throughout a hospital appears to be a critical factor. An early report from Hong Kong theorized that the SARS outbreak at a public hospital could have been associated with the use of nebulized bronchodilator treatments in the index patient and transmission could have been increased by the use of diagnostic sputum induction, bronchoscopy, endotracheal intubation, and airway suction. SCVMC used HEPA filtration devices because negative airflow rooms were not available. The use of the HEPA filter does not take the place of putting the patient into a negative pressure room, but it can serve to cleanse some of the air in the room being used.

Diagnostic studies. Each state and territorial health department offers assistance in determining whether a patient meets the case definition for SARS. The CDC recommends that the state epidemiologist or health department be contacted before specimens are collected and shipped. The CDC provides online assistance for identifying the contact person for each state or territory.

If a patient is suspected of having SARS, a series of initial and delayed tests are recommended. The initial tests are used to obtain a clinical baseline (eg, chest radiograph, arterial oxygen saturation [pulse oximetry]) and to obtain cultures from the sputum and blood. The cultures can be used to recognize or rule out pathogens (eg, influenza A and B, respiratory syncytial virus). The CDC recommends that other testing be postponed until a specific diagnosis is made.

Bacterial and viral specimens may be obtained from the upper and lower respiratory tract, blood, and possibly tissues from deceased persons. Readers may refer to the SARS Laboratory and Specimen Information section of the CDC Web site for directions on how to obtain and transport specimens.

Respiratory tract. Specimens can be obtained via (1) nasopharyngeal wash/aspirate; (2) nasopharyngeal swabs; and (3) oropharyngeal swabs. Respiratory specimens should be obtained as soon as possible (ie, within 72 hours) after onset of symptoms. Specimens obtained after that tend to have less chance of recovering viruses. Only sterile Dacron or rayon swabs should be used to collect viral specimens because wooden sticks or swabs that contain calcium alginate may inactivate viruses.

Blood. The retrospective report from the greater Toronto area noted that 88% of the SARS patients treated had lymphopenia and 94% had elevated lactate dehydrogenase levels. Many other patients had low calcium, phosphorus, and potassium levels and elevated creatinine kinase levels on admission.

If a patient meets the SARS case definition, acute and convalescent (greater than 21 days after onset of symptoms) serum samples should be collected and forwarded through state and local health departments for testing at the CDC.

Many of the indicated tests used to rule out SARS are
infrequently ordered, and compliance with diagnostic testing orders may be difficult. The SCVMC laboratory had to be consulted for each patient. To solve this problem, an SCVMC laboratory technologist developed a SARS kit. The kit includes completed requisition forms, collection devices, and instructions discussing collection timing (Table 2-3).

Treatment. Treatment for SARS appears to be supportive at this time. Researchers in Toronto noted that 95% of the patients in their study received empirical antibiotics per guidelines for management of community-acquired pneumonia; 88% received ribavirin; and 40% received steroids. Of the patients who received ribavirin, a significant number experienced toxicity and 18% discontinued therapy prematurely.1 The CDC notes that the majority of US residents with SARS who had evidence of coronavirus recovered or their condition stabilized clinically without specific antiviral therapy. They further note that the efficacy of available antiviral therapies against coronavirus infection is unknown.12

Counseling and patient education. The patients from the airport and the 2 ambulatory patients were discharged with instructions to monitor their health status for 10 days. They were advised to contact their health care provider if additional symptoms developed.

The prospect of having SARS is alarming to patients and visitors. It is important to not only treat the patient’s symptoms but also to educate about how the syndrome is diagnosed, treated, and prevented. The CDC offers information on its Web site.13 If patients are to be isolated at home, they should be instructed to comply with strict measures to prevent the spread of the disease. This includes a self-quarantine for a minimum of 10 days after the disappearance of symptoms. Specific information about isolation and quarantine can be obtained from the CDC Web site.14

SUMMARY

SARS has created a great deal of concern and public attention. SCVMC was thrust into the national news spotlight when patients were removed from a flight and taken to the facility. The aforementioned case reports describe how the staff had less than 1 month to become aware of, prepare for, and treat a potential public health disaster. The resources, clinical trials, and lessons learned are shared with readers to help others to learn from this experience.

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