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Nursing care of patients with severe acute respiratory syndrome in the intensive care unit: case reports in Hong Kong

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This paper is dedicated to the frontline healthcare professionals who risked their lives to care for patients with SARS and who have died in Hong Kong

Abstract

Severe acute respiratory syndrome (SARS) was diagnosed in more than 8437 patients in 25 countries between February and July 2003. During this period the World Health Organisation issued a global alert about SARS and together with the Centre for Disease Control have coordinated their efforts to investigate its pathogenesis and treatment. The outbreak in Hong Kong has been dramatic due to its geographical proximity with Guangdong province, China where the first case of SARS was reported. SARS has been described as a rapidly progressive, sometimes fatal pneumonia with a case fatality rate of 7.6% requiring intensive care. The four case reports illustrate a number of important points concerning the recognition, treatment, management and prevention of SARS, and highlights the importance of considering vigilant assessment and monitoring of patients with SARS. The purpose of this paper is to share our experiences in caring for critically ill patients with SARS in the intensive care unit to nurses globally in order to reduce SARS’ morbidity and mortality as well as to protect nurses and other healthcare workers from this disease that is so far threatening the community at large.

Keywords: Severe acute respiratory syndrome (SARS); Coronavirus; Intensive care; Infection control; Hong Kong

1. Introduction

March 2003 was the beginning of an outbreak of atypical pneumonia in Hong Kong, later known as severe acute respiratory syndrome (SARS). The disease has spread rapidly throughout the region within the hospitals and into the community threatening the lives of thousands of people. As a result of this spread, schools were suspended and wearing of facemask especially in public crowded places was enforced. As of July 18, there were 8437 cases reported worldwide (WHO, 2003b). In Hong Kong, there were 1755 reported cases (including 386 healthcare workers and medical students), and 299 deaths (including eight healthcare professionals) in Hong Kong (Department of Health, 2003a). The case fatality rate of 7.6% was reported based on the number of deaths per 100 cases which was consistent with the World Health Organisation (WHO) case fatality rate calculation (Department of Health, 2003b).

The Executive Director of Communicable Diseases, WHO reported in April 2003 that SARS needs to be regarded as a particularly serious global threat if the SARS virus maintains its present pathogenicity and transmissibility (Heyman, 2003). The global spread of SARS was suspected to be by person-to-person...
transmission in unsuspected, undetected and asymptomatic air travelers (Drazen, 2003). However, outbreaks in hotels and housing estates in Hong Kong indicated that SARS was showing an unusual pattern or presentation probably involving some environmental components (Department of Health, 2003c).

2. Epidemiology of SARS

The outbreak of SARS in Hong Kong began when the index patient (first case), a Chinese physician from Guangdong Province, China who cared for patients with pneumonia and had himself infected traveled to Hong Kong to visit his relatives. He stayed in a hotel and a week later was admitted to the hospital with complaints of fever and respiratory symptoms and subsequently died. He infected his family members, 12 other hotel guests who were on holidays in Hong Kong, and healthcare workers and patients who were in the same ward where he was admitted. The 12 hotel guests went back to their respective countries (Canada, Vietnam, Singapore) who then infected their family members and other close contacts (Center for Disease Control and Prevention (CDC), 2003a; Wong and Hui, 2003).

One man who visited the hotel was admitted to one hospital in Hong Kong with febrile illness and was diagnosed with right upper lobe pneumonia. He was treated with antibiotics and nebulised salbutamol and recovered. Six days after his treatment, 18 healthcare workers from the same ward reported having the same symptoms. The infection subsequently spread to other 69 healthcare workers and 16 medical students (Lee et al., 2003).

In the community, the major outbreak in Hong Kong was caused by a patient with chronic renal failure who was admitted to the index ward and was later discharged. He visited relatives at Amoy Garden apartment complex where over 300 residents were infected. He also infected two nurses who attended to him in hospital (Department of Health, 2003c).

From tracking the spread of SARS, only one individual started the outbreak. Thereafter, the most often cause of transmission seems to be due to highly infectious individuals termed “super-spreaders.” Super-spreaders are known to carry a high viral load because of defects in their immune system (Tomlinson and Cockram, 2003). Only one individual is required to start the outbreak and the rapid intercontinental spread was related to travel of unsuspected, asymptomatic individuals who have had contact with a person with SARS (Donnelly et al., 2003). Transmission within hospitals and confined areas was by direct contact with contaminated droplets, while preliminary investigations as to the likelihood of transmission within an apartment complex (Amoy Garden) in Hong Kong was through leaky sewage pipes allowing an aerosol of faeces and urine into the narrow light well between buildings (Cyranoski and Abbott, 2002; Wong and Hui, 2003).

3. Pathophysiology of SARS

SARS is a new infectious disease. In March, preliminary data on two causative agents of SARS, metapneumovirus and coronavirus, have been implicated by the medical staff of the two universities in Hong Kong. However, the WHO and CDC scientists around the world have been searching for the causative agent of SARS. Clinical specimens from patients with SARS were analysed to detect the unknown virus. Drosten et al. (2003) conducted virologic testing from respiratory and blood samples of SARS patients in Frankfurt, Germany and detected a novel coronavirus. They concluded that the extremely high concentration of the virus particles in sputum specimen were consistent with high level of contagiousness, its presence in the serum suggested a long viremic phase, and during the convalescent period, presence of the virus in feces could increase its period of infectivity which compared to the typically short infectivity of acute viral respiratory infections. Kiszek et al. (2003) and Peiris et al. (2003) also used virus isolation technique and also isolated a novel coronavirus from patients who met the case definition of SARS. As of April 19, WHO (2003a) reported that the agent that causes SARS has now been conclusively identified as a new coronavirus unlike any other known human or animal virus in the coronavirus family.

In Hong Kong, the incubation period of SARS is typically 2–10 days (average 2–7 days). Clinical manifestations of SARS observed in patients admitted in Hong Kong hospitals included fever of more than 38°C ranging from 2 to 16 days accompanied by chills and rigors, myalgia, headache and dizziness. Some patients complained of sore throat, coryza, nausea and vomiting, purulent sputum and diarrhoea. Severe respiratory symptoms manifest on the 3rd–7th day and in some patients could progress to severe hypoxaemia mimicking acute respiratory distress syndrome (RDS) requiring intubation and mechanical ventilation (Lee et al., 2003). Pathological studies of patients who died showed alveolar damage in the pulmonary tree.

The initial diagnostic testing of SARS includes chest X-ray, blood and sputum cultures. Chest X-ray offers an important diagnostic tool as patients initially present with focal unilateral interstitial infiltrates of the lung, progressing to more generalised patchy interstitial infiltrates (Center for Disease Control and Prevention (CDC), 2003b) to bilateral patchy consolidation of the lungs within a week (Lee et al., 2003). The Director of ICU at the Prince of Wales Hospital also reported that during the course of the disease, patients were also
found to have lymphopenia, thrombocytopenia, elevated lactate dehydrogenase and creatinine kinase levels; however, the significance of these abnormalities in patients with SARS is still unclear (Joynt, 2003).

However, from the accumulated clinical experiences in Hong Kong, Sung (2003) from the Chinese University of Hong Kong and Peiris et al. (2003) from the Hong Kong University reported that the clinical course of SARS can be divided into three phases: (1) viral replicative phase, (2) immune replicative phase, and (3) lung destructive phase. From the clinical picture of patients who died in Hong Kong hospitals, the four most important factors related to the fatality were old age, comorbid chronic illness, delay in presentation for treatment and severity of pneumonia (Sung, 2003).

Due to the absence of reliable and rapid laboratory tests, the diagnosis of SARS is still based on clinical features. The case definition provided by the WHO is updated periodically in order to categorise “suspect” and “probable” cases WHO, 2003a).

4. Case definition

The following case definitions are based on available clinical and epidemiological data to assist clinicians in their diagnosis of suspected and probable cases of SARS (WHO, 2003a):

A suspect case is a person presenting with

1. High fever (> 38°C) and cough or difficulty of breathing. The person is also a suspect case if one or more of the following exposures are present 10 days prior to onset of symptoms such as close contact with a person who is a suspect or probable case of SARS, history of travel to an area with recent local transmission of SARS, and/or residing in an area with recent local transmission of SARS.

2. Unexplained acute respiratory illness resulting in death after 1 November 2003 whose autopsy has not been performed and one or more of the same exposures as above 10 days prior to onset of symptoms.

A probable case is a suspect case with

1. a chest radiographic evidence of infiltrates consistent with pneumonia or RDS,
2. positive for SARS coronavirus by one or more assays,
3. autopsy findings consistent with the pathology of RDS without an identifiable cause.

In Hong Kong, when patients are admitted to the hospital, cases of pneumonia will be screened according to the Hospital Authority (HA) surveillance case definition of SARS (HA, 2003a–c). The case definition was somewhat different from that outlined by the WHO as Rainer et al. (2002) found that it was only 85% accurate in detecting suspected cases of SARS. The authors claimed that the best predictor of SARS was radiological evidence of pneumonia preceded by fever. The HA case definitions are more in line with the CDC (2003a) case definitions which included:

1. presence of new radiological infiltrates of the lungs compatible with pneumonia, and
2. fever > 38°C, or history of fever any time in the last 2 days, and
3. at least two of the following:
   3.1. chills any time in the last 2 days,
   3.2. new or increased cough,
   3.3. general malaise,
   3.4. typical physical signs of consolidation of the lungs,
   3.5. known history of exposure.

If there was no history of exposure, exclusion is then considered if:

1. chest X-ray shows lobar consolidation, and
2. the pathogen is already identified.

5. Case reports

Table 1 presents a summary of the four case reports based on the HA case definitions for SARS. All patients presented with fever plus three–four other symptoms. They were found to have positive results to coronavirus from the blood and stool specimens as well as from nasopharyngeal aspirate samples. All probable cases were first admitted to the Index Ward with isolation facilities and were administered antiviral drug ribavirin and corticosteroid as first line of treatment (Tsang et al., 2003). However, because the diagnosis of SARS is still dependent on clinical presentations and exposure, broad spectrum antibiotics were also administered to provide prophylactic therapy for community acquired pneumonia (Lee et al., 2003). Patients with hypoxiaemia received oxygen via the nasal cannula and were closely monitored. However, within 1–8 days after admission, these patients were transferred to the Intensive Care Unit (ICU) due to severe respiratory failure that required intubation and mechanical pressure controlled ventilation with high positive end expiratory pressure (PEEP) and a fraction of inspired oxygen (FiO2) of 1.0 (Tsang et al., 2003). The decision to transfer patients was based on oxygen desaturation of less than 90% while receiving 50% supplemental oxygen and a respiratory rate exceeding 35 respirations per minute (Lee et al., 2003).

The case reports presented in this paper were chosen to illustrate the difficulty in exactly mapping the course of the disease and that the management depended largely on the clinical presentations of the patients and
the day-to-day evaluation of their condition. The increasing number of patients requiring intensive care meant that the present ICU had to be expanded to almost double its capacity by converting other ward areas to accommodate non-SARS intensive care patients. This resulted in having to use all available resources such as old and new ventilator models as well as deploy nurses working in other clinical areas even those without ICU training or experience to work in the ICU. The management of each patient also varied as there was no specific treatment currently available for SARS and treatment regimen depended on new knowledge as it arises.

5.1. Case one

Mrs. H, aged 30, a saleswoman, was admitted to the Index Ward with fever (39°C), chills, rigors, myalgia, and productive cough. Chest X-ray revealed right lung opacities. She had no previous medical history, had no contact with people with suspected SARS nor traveled outside Hong Kong but resided in Amoy Garden residential block in Hong Kong. (Table 1) On admission, she was treated with ribavirin and corticosteroids. She responded to the drug therapy but on the 7th day, her condition deteriorated requiring admission to the ICU. She had severe lymphopenia, poor oxygen...
satisfaction and bilateral consolidation of the lungs. She was intubated and ventilated on controlled mechanical ventilation (CMV) mode with 90% oxygen. During CMV, a pre-set tidal volume and frequency of breaths were delivered to the patient and since the patient was fully dependent on the ventilator, continuous sedation and muscle relaxant were administered. Her arterial blood gas results continued to be poor. While in ICU, she continued to receive ribavirin and corticosteroids as well as a broad spectrum antibiotic. Continuous standard enteral feeding 500ml/day was commenced. She also required blood transfusion due to decreased haemoglobin level. She remained in the critical list.

5.2. Case two

Mr. F, aged 47, single, an air conditioner technician that required him to travel to China frequently. He was admitted to the Index Ward with fever (40°C), shortness of breathing, chills, rigor, myalgia, and headache. On admission, chest X-ray revealed multiple infiltrates and the blood and sputum specimens revealed positive results for coronavirus. (Table 1) He was administered intravenous ribavirin and corticosteroid. He was transferred to ICU 3 days later with severe lymphopenia, thrombocytopenia, elevated lactate dehydrogenase and creatinine kinase levels and poor oxygen saturation. He was intubated and mechanically ventilated on pressure control volume (PCV) with 80% oxygen. The PCV mode of ventilatory support delivers respiratory rate to the patient at a pre-set pressure with tidal volume varying with lung compliance. The patients received continuous total parenteral nutrition (500mls/day) because of intolerance to standard enteral feeding. The patient also had diarrhoea, a common complication of broad spectrum antibiotics. Diarrhoea was managed with anti-diarrhoeal drugs. On day 9, his haemoglobin dropped and two units of packed cells were transfused. His blood pressure also dropped to 80/40mmHg, and two units of packed cells were transfused. He remained on the critical list.

5.3. Case three

Mr. H, aged 28, a computer programmer, was admitted to the Index Ward with shortness of breathing, fever (40°C), chills, rigor and myalgia (Table 1). He was transferred to ICU on Day 2 with tachypnoea and tachycardia and very poor arterial blood gas results. He was intubated and ventilated on pressure release volume control (PRVC) on 100% oxygen. PRVC is a form of assist control ventilation in which a constant pressure is applied throughout inspiration. This is the preferred mode of ventilation because it reduces the risk of barotraumas associated with high oxygen concentration and PEEP required to treat the severe respiratory failure. His medications included ribavirin and corticosteroid, Morphine and Midazolam. The patient developed diarrhoea on Day 2 and a rectal tube was inserted. His enteral feeding was changed to parenteral feeding. On Day 6, his chest X-ray revealed bilateral pneumothorax, chest tubes were inserted. On Day 7, his blood pressure deteriorated, Adrenaline was administered intravenously at 4ml/h and titrated accordingly. On Day 8, he developed hyperkalaemia, acidosis and poor urine output. He was ordered continuous veno-venous haemofiltration and dialysis (CVVHD), a method of renal replacement therapy used for ICU patients who are haemodynamically unstable. On Day 9, his haemoglobin dropped, three units of packed cells were transfused. He remained on the critical list.

5.4. Case four

Mr. L, aged 40, a physiotherapist, was admitted to the Index Ward with fever (39°C), chills, myalgia, rigors and sore throat. He had no history of being in contact with persons with probable SARS but had visited mainland China a week before his admission. His wife, parents and niece were also admitted with the same signs and symptoms of SARS. On admission, chest X-ray revealed multiple patchy infiltrates, ribavirin and corticosteroid were administered. Nasopharyngeal aspiration, stool culture and viral titre showed positive results for coronavirus. He was admitted to ICU 10 days later with severe hypoxaemia and ventilation/perfusion mismatch. His lymphocytes remained low and both creatinine and blood urea nitrogen levels were high. He was then intubated and ventilated on PRVC. Five days after admission to ICU, his condition remained critical. Nine days later, he developed right side pneumothorax and a chest drain was inserted. His condition continued to deteriorate and he died on the 15th day of hospitalisation.

6. Nursing management of SARS patients in ICU

As SARS is a new disease, our management of the patients will continue to change as new information becomes available. We also had to learn from the experiences of ICU nurses and doctors in other hospitals in Hong Kong. From the case reports, the course of the disease varied and often prolonged. Radiological changes were observed to progress from unilateral (first week of admission) to bilateral opacities (2 weeks after). The main reasons for ICU admission of these patients were progressing dyspnoea and hypoxaemia requiring mechanical ventilation. All patients admitted to ICU were mechanically ventilated, have more than two
intravenous catheters, an arterial line, nasogastric tube (NGT) and indwelling catheter. Some patients required chest drain for pneumothorax. Care of patients in ICU were focused not only towards providing respiratory, cardiovascular, renal, gastrointestinal support and monitoring, but most importantly, patient and family support.

6.1. Surveillance

Several forms were developed by the HA, Hong Kong to be used by all hospitals admitting suspected and probable cases of SARS. The SARS Reporting Form issued by the HA documents full details about the patient’s biographical and medical history as well as a history of travel outside Hong Kong within 30 days of onset of symptoms. The Initial Screening Form records whether the patient had any of the symptoms associated with SARS including the results of blood tests and chest X-ray. The Reassessment Form records patient’s day-to-day progress and provides a summary of the patient’s medical treatment. Vigilant completion of these forms is important in order to gather important information about the progress of the patients’ responses to treatment and provide a complete registry of new cases of SARS, discharges and deaths. These records could also, in the future, serve as a database to understand more about the forms of transmissibility and also to monitor the virus response to therapy.

6.2. Infection control measures

During the outbreak, our infection control protocol had to be re-visited and revised in accordance with the guidelines for infection control measures revised and released by WHO (2003c). In our hospital, we also instituted the infection control guidelines issued by the HA (2003b) which included:

1. barrier nursing with personal protection equipment (N-95 respirator, hair covering, shoe covers, goggles, latex gloves and long-sleeve disposable gown),
2. environmental cleaning 4-hourly by disinfection of the ICU environment with sodium hypochlorite solution 1 in 49 dilution for non-metallic items and 70% alcohol for metallic items,
3. strict handwashing with chlorhexidine gluconate (Hexol) and strict avoidance of touching the eyes, nose and mouth,
4. patients were nursed in a room with other SARS patients but maintaining at least three feet from each other,
5. treatment with nebuliser or non-invasive ventilation was strictly avoided as the virus mode of transmission is by droplet,
6. for patients requiring mechanical ventilation, disposable ventilator tubings with expired gas scavenging system were used. Reusable respiratory equipment had to undergo high-level disinfection in the Central Supply Division. Disposable ventilator tubings were discarded as clinical wastes,
7. patients’ daily hygiene was performed using disposable wetpacks for body wash,
8. environmental splashes arising from emptying body fluids are minimised by careful emptying of urine bags, use of disposable underwater-sealed drainage system, and disposable suction containers,
9. heavily soiled linens with vomitus, body secretions, blood and excreta were discarded as clinical waste.

The importance of infection control is vital in controlling the spread of the disease as the virus is highly contagious. Many health workers have also been affected and already eight healthcare workers have died.

We have followed the Centre for Disease Control (CDC, 2003b) guideline for the management of healthcare exposures released in April 2003 (available in http://www.cdc.gov/ncidod/sars/exposureguidance.htm). On 17 April 2003, the HA also released a copy of the Infection Control Measures at Home for Staff Caring for SARS patients. Examples of the infection control measures included in the guideline are: frequent handwashing with liquid soap, avoid sharing food, eating utensils and towels with family members, avoid close contact with family members (e.g. kissing, hugging), shower immediately after work (change rooms with shower facilities in the hospital for staff use), wearing of surgical mask, and daily environmental cleaning at home with diluted domestic bleach (1 part of bleach to 49 parts of water). Healthcare workers were also told to be vigilant for any fever by daily temperature monitoring and respiratory symptoms. However, since the SARS outbreak, some healthcare workers and nurses, for fear of infecting their family, opted to stay in the hospital staff quarters.

6.3. Care of patients on mechanical ventilation

About 60% of patients admitted to our ICU required mechanical ventilation until they can be weaned off from the ventilator. Non-invasive ventilation was avoided because of fear that the high gas flow could leak out of the mask and increase the spread of the virus by aerosol.

The care of patients on mechanical ventilation described in this paper was what was practiced in our ICU and reflected only our own experiences and available resources. Patients admitted to the SARS-ICU were monitored very closely including hourly blood pressure, heart rate, respiratory rate, arterial blood gases, urine output and oxygen saturation using the
pulse oximeter. Temperature was measured using a skin probe. Patients also receive full sedation (Morphine or Midazolam) and a muscle relaxant (Pavulon). Chest auscultation was also done to monitor breath sounds as crackles and dullness on percussion were detected in most patients and also to assess the need for endotracheal suctioning.

Nutritional support was provided through the NGT using a standard feeding regimen of 500 ml/day or 1–1.5 ml/kg/h. However, patients often developed diarrhoea (Cases 2 and 3) that was mostly attributed to antibiotic therapy (Tsang et al., 2003). Patients who developed diarrhoea received alternative enteral feeding prescribed by the hospital dietician and in worst cases of malabsorption, patients received total parenteral nutrition. Anti-diarrhoeal agent was given to patients and a rectal catheter was inserted in patients with severe watery diarrhoea to contain the faeces in the drainage bag. Stool specimen was collected for culture as there was some microbiological evidence that the virus can also be transmitted through contact with the faeces. To reduce the incidence of nosocomial pneumonia, especially in patients on enteral feeding, patients were nursed supine with the head elevated at 45° angle and broad spectrum antibiotics were administered as a prophylaxis until other causative agents of chest infection can be ruled out.

Patients were also fitted with graded elastic stockings to prevent deep venous thrombosis in addition to receiving prophylactic dose of low molecular weight heparin intravenously.

It was also our experience that an increasing number of patients’ indwelling urinary catheters become blocked due to the development of sediments, a recognised side effect of ribavirin. Therefore, flushing the urinary catheter with normal saline 4-hourly was required. Creatinine kinase levels were also closely monitored to assess renal integrity. Some patients (e.g. Case 3) required CVVHHD. A local protocol for the management of patients on CVVHHD was followed and included careful monitoring of electrolyte levels and for complications such as hypovolaemia, hypotension/hypertension and dysrhythmias.

Suctioning of the endotracheal tube was done as needed. To prevent droplet transmission of the coronavirus, closed-system type suctioning technique was used. The endotracheal suction catheter was left connected to the suction apparatus to minimise break in the system. When not in use, the suction apparatus is turned off. Patients are hyperoxygenated by setting the ventilator oxygen to 100% prior to suctioning instead of disconnecting the patient from the ventilator and hand bagging the patient.

Routine care including eye care with artificial tears, protective gel or taping the eyelids close, positioning and pressure area care were provided to the patients.

6.4. Family/public support

During the SARS outbreak, relatives were prohibited from visiting and entering the unit. As a result, patients as well as families became very anxious and isolated. Therefore, we have devised ways to alleviate their feeling of isolation. A form was developed where patients’ significant others, their telephone number, appropriate time for telephone interview, and information provided were documented. This strategy facilitated communication between the doctors or nurses with one family member who receives information about the progress of the patient on a daily basis and who is then responsible for informing other relatives or friends of the patient’s progress.

Contact with a person with SARS, especially family members resulted in various psychological reactions to SARS. In a study conducted by Tang and Wong (2003), 80% of the public were worried about the spread of this disease to the community, 40% felt helpless and scared and 20% would delay going to hospitals for fear of contracting the disease themselves. A survey of college students, some of them have friends and classmates who contracted SARS found that fear of SARS was induced by high mortality rate, the infectious nature of the disease, uncertainties about the incubation period, the effects of treatment and complications (Min, 2003).

The family and the public in general need to be educated about the principles for controlling the spread of infection and symptoms of SARS. The Department of Health in Hong Kong developed a website (available at http://www.info.gov.hk/ap.htm) and a pre-recorded health education online for the public. However, nurses also have the responsibility to educate the patients’ relatives and make sure that they have understood the government guidelines. Since Hong Kong is a highly dense community, the government also emphasised the importance of avoiding: (1) places and restaurants that are too crowded, (2) traveling to areas considered as “hot spots” (places and building were SARS infections have been confirmed), (3) children’s outings while schools are suspended, (4) kissing and shaking hands in social encounters, and (5) the importance of hand hygiene. Family members of infected victims were also asked to record their activities in the past 10 days and to keep a list of close contacts before and after the onset of the patient’s symptoms.

Supportive and counseling services were also provided to the public to reduce stress and the negative psychological reactions to SARS by different government and non-government agencies in Hong Kong as well as within the hospital itself. For example, the University of Hong Kong Mood Disorder Centre launched a campaign to heighten public awareness of mood disorders in the wake of SARS to dispel associated prejudices and myths. The School of Chinese
closely monitoring the need for ICU beds and preparing for the required manpower by deploying more healthcare workers to ICU, purchasing additional latest models of ventilators, and providing crash courses in intensive care nursing (HA, 2003c).

However, our experience showed that these nurses were very anxious and stressed not only from the fear of contracting the disease but mostly from feeling incompetent working in such a high-technology area. ICU nurses also expressed that they felt exhausted from having to work extra shifts and depressed because they cannot see any positive progress in most of their patients. In order to support the staff, the hospital has established a telephone counseling hot-line for staff as well as training and preceptorship program for new nurses working in ICU. The infection among healthcare providers was a sobering reminder of the importance of adhering to infection control measures. The Hong Kong Department of Health released a set of updated infection control measures at home for staff caring for patients with SARS available through the Hong Kong government website (http://www.info.gov.hk/dh). A 2-day infection control module was also developed and all medical, nursing and allied health professional students are required to attend and pass this module before they can be allowed to return to their clinical placements.

At present, the speed of scientific discovery to the causative agent of SARS and the instantaneous communication and information exchange has supported every aspect of how to respond to this health problem (Gerberding, 2003). The questions now that we should all be mindful of are “Can we prevent the global pandemic of SARS? How can we best help our patients and their family? How can we best support our healthcare workers and our nurses cope with this health problem? To what extent does person-to-person spread occur in hospitals? From patients to hospital staff?” Today, numerous research projects are being conducted in Hong Kong with the special research grant provided by the government to combat SARS. The results of these studies will be reported in due course.

7. Evaluation of nursing care

On most days, our ICU had 22 patients with SARS. No two cases were exactly the same. Depending on the age and fitness of the patient, the course of the disease can vary from patient to patient as illustrated in the case reports. However, the medical management and nursing care provided for these patients basically followed the routine care received by the four case reports presented in this paper. The combination of ribavirin and corticosteroid in treating the cases in Hong Kong have stabilised and improved the outcome of most patients with most recovering from the disease after being in the critical list for nearly a month. Since the ICU was converted to SARS-ICU, strict adherence to infection control measures, and use of goggles, visors, and protective clothing, we were able to contain the spread of the disease to other areas of the hospital and to the healthcare providers. These practices were found effective and were supported from a case-control study in five Hong Kong hospital, Seto et al. (2003) found that staff who used N-95 masks, gowns, and handwashing were less likely to develop SARS than those who did not use them. On reflection, the nursing care provided to ICU patients has been effective in spite of limited resources in personnel and equipment.

8. Discussion

With SARS, death is often the result of complications arising from impaired ventilation. The advent of ICUs, sophisticated drugs and advanced nursing care has somewhat reduced the mortality of patients with SARS but it is not as great as it might otherwise have been. Our experiences showed that people infected with the SARS virus are not age or gender-specific. Initial diagnosis is according to clinical symptomatology which will be confirmed by virological studies. Thus, an early presentation of the disease can help in deciding the best course of action to provide for the patients with SARS and probably halt the physiological deterioration and the need for intensive care.

At present, hospital ICUs can no longer cope with the increasing number of patients being transferred from the Index Wards. Other areas of the hospital are being converted to ICU beds expanding to almost double its bed capacity. This resulted in deploying nurses from the general ward areas who have no intensive care training or experience to work in the ICU. The HA has been closely monitoring the need for ICU beds and preparing for the required manpower by deploying more healthcare workers to ICU, purchasing additional latest models of ventilators, and providing crash courses in intensive care nursing (HA, 2003c).

Since SARS is a new disease, management of patients was based according to each individual presentation and condition. The four case reports demonstrated the variety of ways patients with SARS were managed in a Hong Kong hospital. Collaboration, early detection and treatment, and rapid introduction of infectious control measures are vital to patient outcome. In emergency and ICUs, aggressive treatment of SARS victims is of utmost importance. All nursing and medical staff have made every effort to combat this disease. Although at present, there are no more new cases and deaths are decreasing,
the Hong Kong government continues to urge people to remain vigilant in maintaining good personal hygiene and environmental cleanliness. Continuous public education programmes are being provided to the public through the media, websites and community group activities.

In addition, all healthcare professionals, especially nurses who were constantly pressured to work in highly infected areas of the hospital were given adequate support, clinical supervision and briefing and debriefing sessions to alleviate potential burnout among nurses and other healthcare workers. The Institute of Chinese Medicine of the Chinese University of Hong Kong also manufactured anti-viral Traditional Chinese Medicine preparation for free distribution to frontline healthcare workers in the high-risk wards as a preventative option against SARS.

In July 2003, SARS appears to be under control as no more new cases of SARS have been detected in Hong Kong. However, it is predicted that this disease may reappear during the winter months as with other respiratory infection. There are still a lot of uncertainties as to the best way to treat the disease. Genetic, epidemiological studies, and the development of vaccines are continuing. Until there are definite answers to an ever-increasing question about the disease, nurses need to continue their efforts in providing the best care that they could offer to the patients and to themselves specially.

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