

Management of SARS relies on supportive measures and preventing the spread of infection

Severe acute respiratory syndrome (SARS) is caused by the SARS-associated coronavirus (SARS-CoV) and has a mortality rate of $\approx 10\%$. SARS-CoV is very contagious and the majority of cases have been among healthcare workers and family members of patients with the illness. As there is as yet no specific treatment for SARS, management focuses on supportive measures and infection control strategies.

SARS virus new to humans ...

Severe acute respiratory syndrome (SARS), a recently emerged severe respiratory infection, is caused by a previously unrecognised virus, now called the SARS-associated coronavirus (SARS-CoV).^[1] The condition was first recognised in late 2002 in the Guangdong Province in Southeast China. From there it spread rapidly to the rest of the world during the early months of 2003.^[1] As of July 2003, the total number of people infected with SARS worldwide was 8437 with a mortality rate of 9.6%.^[2] The vast majority of cases have been from Asia.^[2] The SARS-CoV is evident in a number of animals and appears to have undergone interspecies transmission to infect humans.^[1]

SARS primarily infects adults aged 25–70 years, but the mortality rate is higher in older individuals (aged >60 years) and in those with comorbidities.^[1]

Infection spreads via close contact ...

Transmission of SARS appears to occur most commonly via close face-to-face contact with infected individuals, and the greatest risk is probably from droplet transmission of respiratory secretions.^[3] In some settings, airborne or faecal transmission may also play a role in the spread of the disease. Although most cases have been in healthcare workers and family members of patients with SARS, there is evidence that community spread also occurs.^[3]

Patients do not appear to be infective before they develop symptoms, and preliminary data suggests that they are at their most contagious during the second week of the illness.^[4]

Starts with a fever ...

In patients that require hospitalisation, SARS is often reported as a bi- or tri-phasic illness.^[1] Importantly, although the disease may follow this pattern, these phases may not present in all patients.

The mean incubation period of SARS is thought to be about 6 days, with a usual range of up to ≈ 10 days after exposure.^[1] The illness usually begins with an acute febrile stage, often accompanied by chills, rigours, myalgia, headache, severe malaise and, in some patients, diarrhoea.^[1]

... followed by respiratory phase

After about 3–7 days, lower respiratory symptoms commence, including a non-productive cough and progressive pneumonia.^[1] In about 20–30% of patients, SARS will progress to an acute respiratory distress syndrome requiring ventilator support.^[1] Some patients may experience less severe symptoms, whereas others experience hyperacute progression.^[1] Epidemiological data suggest that asymptomatic infection is very uncommon.^[3]

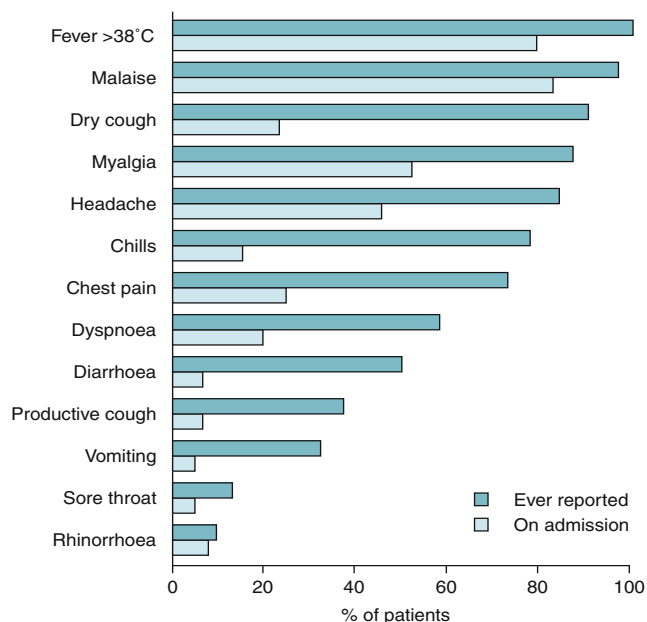


Fig. 1. Symptoms reported in patients with severe acute respiratory syndrome (SARS) from beginning of outbreak until declaration of containment in Vietnam (2003 Feb–May). SARS symptoms at the time of admission to hospital and during the course of the illness of 62 patients who required hospitalisation.

Progress is rapid

In a report of a complete SARS outbreak in Vietnam, which evaluated 62 hospitalised patients, only a minority had symptoms of respiratory tract infection on admission; most developed these symptoms during their stay in hospital.^[5] Figure 1 summarises the symptoms that were evident at admission or reported later in the course of the illness.^[5] The mean times from the onset of illness until the evolution of various endpoints of the disease were:^[5]

- onset of fever 0.3 days
- admission to hospital 4.3 days
- onset of radiographic change 4.4 days
- onset of respiratory symptoms 4.5 days
- maximal radiographic change 10 days
- intubation 10.5 days
- end of fever 12.7 days
- death 18.8 days.

Most develop lymphopenia

SARS is often associated with absolute lymphopenia, mild neutropenia and thrombocytopenia.^[1] In about 30–80% of patients, mild to moderately elevated plasma levels of creatine phosphokinase, lactate dehydrogenase, and transaminases were also evident.^[1]

Rule out other diseases ...

The initial symptoms of SARS can not be easily distinguished from those of other respiratory tract infections.^[1] If SARS is suspected in a patient, thorough diagnostic testing is recommended to rule out other diseases.^[1]

... using chest x-rays ...

Chest x-ray abnormalities usually develop after the initial phase of the illness and often progress to bilateral lung disease from about day 3. Therefore, repeated chest x-rays during the initial phase of the disease, sometimes twice daily, may be helpful in establishing disease progression.^[1] Blood and sputum cultures, and testing for viral respiratory pathogens should also be performed to identify specific organisms associated with pneumonia.^[1]

... and other methods

Several methods are now available for identifying the SARS-CoV, including culture methods, polymerase chain reaction-based methods and serological tests.^[6] Analysing multiple specimens (e.g. stool, serum, sputum) may increase the likelihood of confirming a diagnosis of SARS.^[1]

No specific treatment yet

No specific treatment for SARS is currently recommended.^[1] Although a number of therapies have been used, they have not been evaluated in a controlled manner.^[1] Treatment for most patients has included broad-spectrum antibacterials, supplemental oxygen, intravenous fluid and other supportive measures.^[1]

Weigh risks and benefits

Some clinicians recommend ribavirin and corticosteroids, but neither therapy is recommended alone.^[1] The benefits of ribavirin therapy may not be sufficient to outweigh the risk of adverse events.^[7] In a study of 110 patients with suspected or probable SARS, ribavirin was associated with haemolytic anaemia, hypocalcaemia and hypomagnesaemia in 61%, 58% and 46% of patients, respectively.^[7] The use of systemic corticosteroids in the treatment of SARS is also controversial, as they can be hazardous in patients with viral infections unless accompanied by an effective antiviral agent.^[8]

Interferon- α , glycyrrhizin and protease inhibitors have also been suggested for the treatment of SARS.^[3] In uncontrolled data in a 21 patients, interferon 9 $\mu\text{g}/\text{day}$ for 2 days, increased to 15 $\mu\text{g}/\text{day}$ for 10 days, plus corticosteroids was associated with reduced impaired oxygen saturation and hastened the resolution of radiographic lung abnormalities.^[9]

Prevention is key

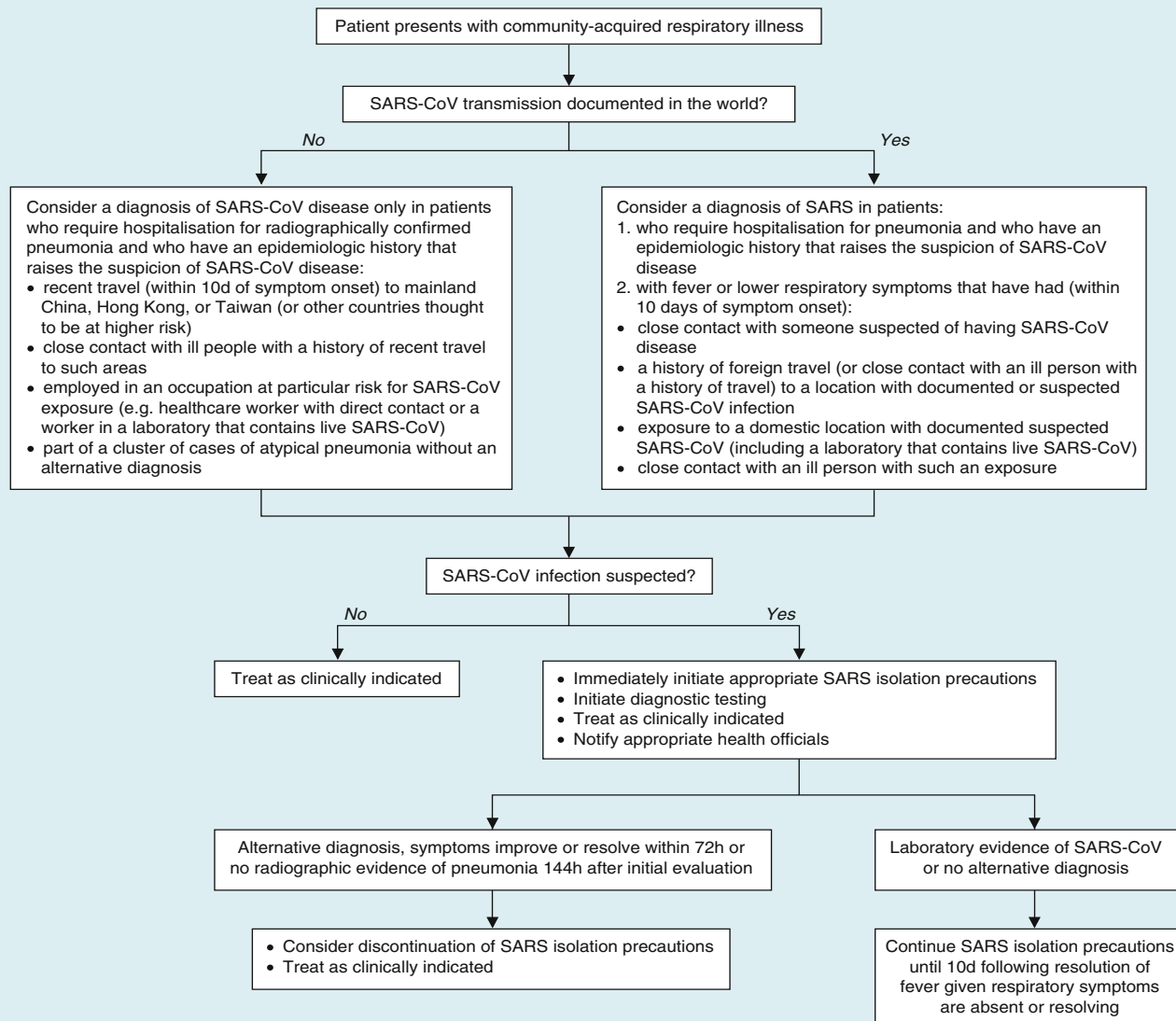
Preventative measures against contracting the very contagious SARS-CoV are extremely important, particularly in the absence of effective drugs or vaccines.^[1]

Detect outbreaks early ...

International cooperation is needed to ensure that healthcare policies are in place in each region, and that systems are prepared to respond rapidly to any emerging infectious threat.^[1] New cases need to be detected as early as possible, all patient contacts identified, and updated recommendations for infection control procedures should be consulted.^[10]

The US Center for Disease Control and Prevention has released clinical guidelines for the identification and evaluation of possible SARS-CoV disease among patients presenting with community-acquired illness in the absence or presence of SARS-CoV transmission anywhere in the world (*Patient care guidelines*).^[10]

Patient care guidelines



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Suggested evaluation and management of patients with community-acquired respiratory illness in the presence or absence of severe acute respiratory syndrome-associated coronavirus (SARS-CoV) transmission in the world⁽¹⁰⁾

... and stop infection spreading

Strict adherence to infection control policies is important. In patients hospitalised with suspected/probable SARS, infection control measures include:^[1,11]

- placing patients in negative-pressure, vented rooms
- maintaining logs of everyone entering patients' rooms
- restricting visitors
- limiting the number of hospital personnel caring for patients
- using standard hand-hygiene (thorough washing with soap and water or use of an alcohol-based hand rub), contact (gowns, gloves, goggles) and airborne (high-efficiency masks) precautions in all healthcare workers entering the rooms
- minimising air turbulence when changing linen
- regular cleaning and disinfecting of environmental surfaces that come into contact with patients or their body fluids

- limiting cough-inducing procedures (sputum induction, administration of nebulised medications, suctioning, bronchoscopy)
- avoiding the use of noninvasive positive pressure ventilation
- using closed-suctioning devices and high-efficiency particulate air filtration on exhalation valve port in patients receiving mechanical ventilation
- educating personnel involved in the care of these patients to be vigilant for symptoms of SARS for 10 days after patient contact
- quarantining personnel who have had unprotected contact with SARS patients during aerosol-generating procedures.

Healthcare workers need to be careful

In recent SARS outbreaks, the disease has been transmitted to healthcare providers after patient care, usually after close, unprotected contact with symptomatic individuals.^[1] Healthcare workers who have had unprotected exposure and who develop fever or respiratory symptoms should not come to work, and should report their symptoms to the appropriate authorities. If unprotected SARS exposure occurs in a healthcare worker during procedures with high risk of aerosolisation (e.g. intubations, bronchoscopy), the individual should be quarantined for 10 days, since there is a high risk of infection transmission.

Infection control measures effective

The importance of infection control measures was demonstrated in a study of healthcare workers in five Hong Kong hospitals who had documented evidence of contact with SARS patients.^[12] All workers who wore gowns, gloves and surgical or high efficiency masks, and performed good hand-washing techniques did not develop SARS, whereas all 13 workers who became infected omitted at least one of the above measures ($p = 0.02$). High-efficiency masks, such as the N-95 or surgical masks, were more effective in reducing transmission than paper masks.^[12]

Hospitalisation not required for all

Patients with SARS who do not require hospitalisation can be managed at home.^[1] They should limit their interactions outside of the home, wear surgical masks when in contact with others, and wash their hands

frequently.^[1] After resolution of fever, the patient should stay away from work for 10 days. Other household members or close contacts should wear gloves and also practice careful hand hygiene. In the absence of fever or respiratory symptoms, they need not limit their activities.^[1]

Future impact of SARS uncertain

The future impact of SARS is difficult to predict.^[1] Although sporadic cases in China are cause for concern, the extent to which the disease will re-emerge in the future is unknown.^[1] It is possible that SARS may become an important cause of pneumonia in the future and the screening of outpatients at risk for SARS may become part of pneumonia evaluations.^[1]

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