Severe Acute Respiratory Syndrome (SARS) and Preparedness for Biological Emergencies

27 April 2004

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SARS Presentation Overview

The presentation has five sections:

1. Chronology and Clinical Features
2. Command and Control
3. Surveillance & Case and Contact Investigations
4. Infection Control & Roles of Healthcare System
5. Isolation and Quarantine
Severe Acute Respiratory Syndrome

2002-’03 SARS Outbreak

November 2002 - July 2003: 8098 cases (774 deaths) reported from 29 countries; ~10% case fatality rate, range 0 to >50%

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<th>Deaths</th>
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FIGURE 1. Chain of transmission among guests at Hotel M — Hong Kong, 2003

*Health-care workers.

All guests except G and K stayed on the 9th floor of the hotel. Guest G stayed on the 14th floor, and Guest K stayed on the 11th floor.

Guests L and M (spouses) were not at Hotel M during the same time as index Guest A but were at the hotel during the same times as Guests G, H, and I, who were ill during this period.
Severe Acute Respiratory Syndrome

Chronology

• SEPT 2003: Lab-acquired case in Singapore, no transmission
• DEC 2003: Lab-acquired case in Taiwan, no transmission
• Since DEC 16, 2003: 4 SARS cases (three confirmed, one probable) reported in China
  – All four patients have recovered from their illness and have been discharged from the hospital.
  – To date, none of the contacts of these cases has developed a SARS-like illness.
  – The source of infection in these individuals has not been determined.
Severe Acute Respiratory Syndrome

Chronology – Most Recent

- April 2004: China reports 8 SARS cases linked to lab-acquired case with multiple potential healthcare exposures
  - 1000 contacts under observation

China Quarantines Hundreds

Eight Possible SARS Cases Reported in China
Severe Acute Respiratory Syndrome

Clinical Features

• Incubation period: 2-10 days (median 4-6 days)
• Febrile prodrome
  • >100.4°F (38°C), often “high”, +/- chills/rigors
• May be accompanied by:
  – chills/rigors, headache, malaise, myalgia
  – diarrhea prominent early in illness in some cases
Severe Acute Respiratory Syndrome

Clinical Features

• After 3-7 days: lower respiratory phase
• Peak in 2nd week; 30% have respiratory symptoms at onset
  • dry nonproductive cough or dyspnea
  • may be accompanied by or progress to hypoxemia
  • 10-20% progress to require intubation and mechanical ventilation
• Chest x-ray may be normal at presentation
• Severity of illness highly variable
• Patients developing SARS may present with fever OR respiratory symptoms
Severe Acute Respiratory Syndrome

Transmission

• Spreads primarily to close contacts by direct contact
  • Respiratory droplets and secretions
  • Other infectious body fluids, secretions, and substances
  • Indirect contact: contaminated objects/environment
• Hand hygiene and attention to contact transmission is critical
• Possible airborne transmission
• To date, no evidence to suggest that SARS is transmitted from asymptomatic individuals
Severe Acute Respiratory Syndrome
Transmission: Superspreaders, Singapore
172 Probable SARS Cases by reported source of infection
FEB 25 - APR 30, 2003

Source: MMWR May 9, 2003 / 52(18);405-411
Severe Acute Respiratory Syndrome

Diagnostic Testing

- No “rapid test” available to diagnose SARS
- Routinely available clinical lab tests are neither sensitive nor specific for SARS
- Initial management should be based on clinical and epidemiological features
- Coronavirus testing by CDC: serology, PCR, culture
- Absence of antibody to SARS-CoV in serum obtained <28 days after illness onset, a negative PCR test, or negative viral culture do not exclude coronavirus infection.
- Negative tests do not mean isolation precautions can be discontinued
2003-4 Outbreak of Highly Pathogenic Avian (HPAI) Influenza A (H5N1) in Asia

- Widespread epidemic of influenza A (H5N1) HPAI in at least 9 countries in Asia
- To-date, 35 human cases with 23 deaths from Vietnam (n=23) and Thailand (n=12)
- No conclusive person-to-person transmission
- Potential pandemic precursor: all 20th century influenza pandemic viruses arose from avian viruses.
- Must be considered in in addition to SARS for persons with respiratory disease returning from Asia
Severe Acute Respiratory Syndrome (SARS) Treatment

- No specific treatment recommendations: role of antiviral treatment and steroids unclear
- No preventive treatment or vaccine
- Antibiotic coverage for community-acquired pneumonia
- **AVOID AREOSOL GENERATING PROCEDURES** unless medically necessary
Severe Acute Respiratory Syndrome

Questions/Discussion: Chronology and Clinical Features
Severe Acute Respiratory Syndrome (SARS) and Preparedness for Biological Emergencies

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SARS & Preparedness for Biological Emergencies

Key Points

• SARS disproportionately affected hospital staff compounding its impact on the health care system
  – Hospitals served as settings for amplification of transmission leading to community spread

• Hospital and community-based infection control measures are the most important way to interrupt SARS transmission

• Knowledge and skills needed by health care providers and public health professionals to respond to SARS are applicable to a broad range of public health emergencies

• SARS is a good model for communicable disease and BT emergency response capacity
SARS & Preparedness for Biological Emergencies

Components of SARS Response Capacity*

- Command and control
- Surveillance
- Case and contact investigation and management
- Preparedness and response in healthcare facilities
- Community containment measures including isolation and quarantine
- Managing travel-associated risk
- Laboratory diagnosis
- Communication

*Based on CDC’s Public Health Guidance for Community Level Preparedness and Response to SARS (version 2)
SARS & Preparedness for Biological Emergencies

Command and Control

• Incident command structure that works for outbreak response
  – Collecting & organizing real time information on the outbreak: epidemiological investigation, analysis & interpretation of data
  – Managing staffing needs & requirements: disease investigation, epidemiology response, administrative support, clinical, legal, emergency management
  – Monitoring and supplying persons in isolation & quarantine
  – Material resources: PPE & other necessary equipment/supplies
  – Operating special/temporary facilities
  – Administrative & financial needs
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Command and Control

- Legal authority & legal preparedness plan
- Communication between and among response agencies
- Ensure roles and responsibilities within and among response agencies are clearly described and understood
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Questions/Discussion: Command and Control
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Surveillance
SARS & Preparedness for Biological Emergencies

Surveillance

• Ensure prompt recognition and reporting of SARS, BT or other outbreak of public health significance

• Healthcare providers/facilities must be aware of evolving SARS screening criteria and case definitions and guidelines

• Need methods for rapidly communicating urgent information from public health authorities to health care providers and facilities

• Need specialized databases
Severe Acute Respiratory Syndrome
Case and Contact Investigations

• Labor/time intensive investigations
• Monitoring and management of cases and contacts
  – Case and contact monitoring teams
  – Prioritization of cases and contacts for investigation and management
  – Healthcare worker exposures
  – Tracking diagnostic laboratory test results
  – Provision of supplies and other needs for persons in isolation
• Need standardized approach/training for “surge capacity” staff
• Isolation and quarantine - legal, political, social considerations
  Special databases
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Washington Administrative Code (WAC) 246-101

Notifiable Conditions and the Health Care Provider

• Who is required to report notifiable conditions?
  – Principal health care providers, and
  – Other physicians in attendance unless notification has already been made, and
  – Health care facilities

• Laboratory reporting does not relieve the health care provider of his/her reporting obligation
  – Different timeline and content of notifications, not duplicate system
SARS & Preparedness for Biological Emergencies

Washington Administrative Code (WAC) 246-101 Notifiable Conditions and the Health Care Provider

- WAC specifies what diseases are notifiable and within what time frame, and means and content of notifications
- Report outbreaks and suspected outbreaks
- Cooperate with public health authorities during investigations of cases and suspected cases of notifiable diseases
- Provide adequate and understandable instruction in disease control measures to each patient who has been diagnosed with a communicable disease and to contacts who may have been exposed the disease
Severe Acute Respiratory Syndrome

CDC Case Definition*

- Clinical criteria - compatible illness
- Epidemiological criteria - relevant exposure history
- Laboratory criteria - confirmation
- Exclusion criteria

*12 December 2003
Severe Acute Respiratory Syndrome
CDC Case Definition (DEC 2003):
Clinical Criteria

• **Early illness:** 2 or more of the following:
  - Fever; chills; rigors; myalgia; headache; diarrhea; sore throat; rhinorrhea

• **Moderate respiratory illness**
  - Temperature >100.4°F (>38°C) **AND**
  - One or more clinical findings of lower respiratory illness (e.g. cough, shortness of breath, difficulty breathing,)

• **Severe respiratory illness**
  - Meets clinical criteria for mild-moderate respiratory illness, and
  - Radiographic evidence of pneumonia or ARDS, **OR**
  - Autopsy findings consistent with ARDS or pneumonia in the absence of an identifiable cause
Severe Acute Respiratory Syndrome

CDC Case Definition: Epidemiological Criteria

Possible exposure to SARS-CoV

In the 10 days before onset of symptoms:

• **Travel** to a foreign or domestic location with documented or suspected recent transmission of SARS-CoV (No areas with current documented or suspected community transmission of SARS).

OR

• **Close contact** with a person with mild-to-moderate or severe respiratory illness and a history of travel *within 10 days of onset of symptoms* to a foreign or domestic location with documented or suspected recent transmission of SARS-CoV.
Severe Acute Respiratory Syndrome

CDC Case Definition: Epidemiological Criteria

**Likely exposure to SARS Co-V**

In the 10 days before onset of symptoms:

- **Close contact** with a person with *confirmed* SARS-CoV disease

  OR

- **Close contact** with a person with mild-to-moderate or severe respiratory illness for whom a chain of transmission can be *linked to a confirmed case of SARS-CoV disease* in the 10 days before onset of symptoms
Severe Acute Respiratory Syndrome

CDC Case Definition: Laboratory Criteria

Laboratory confirmed:

– Detection of serum antibody to SARS-CoV by a test validated by CDC

OR

– Detection of SARS-CoV RNA by RT-PCR test validated by CDC with subsequent confirmation by CDC

OR

– Isolation in cell culture of SARS-CoV from a clinical specimen
Severe Acute Respiratory Syndrome

CDC Case Definition: Exclusion Criteria

• An alternative diagnosis can fully explain the illness
• Antibody to SARS-CoV is undetectable in a serum specimen obtained >28 days after onset of illness
• Case was reported on the basis of a contact with a person subsequently excluded as a case of SARS (provided other epidemiological or laboratory criteria are not present)
Severe Acute Respiratory Syndrome

CDC Case Definition: Case Classification

• Classified based on combination of clinical, epidemiological and laboratory data

• SARS Reports Under Investigation - Reports in persons from areas where SARS is not known to be active
  • SARS RUI-1: Cases compatible with SARS in groups likely to be first affected by SARS-CoV if SARS-CoV is introduced from a person without clear epidemiologic links to known cases of SARS-CoV disease or places with known ongoing transmission of SARS-CoV
Severe Acute Respiratory Syndrome

CDC Case Definition: Case Classification

SARS Reports Under Investigation - Reports in persons from areas where SARS activity is occurring

- SARS RUI-2: Cases meeting the clinical criteria for mild-to-moderate illness and the epidemiologic criteria for possible exposure (spring 2003 CDC definition for suspect cases)

- SARS RUI-3: Cases meeting the clinical criteria for severe illness and the epidemiologic criteria for possible exposure (spring 2003 CDC definition for probable cases)

- SARS RUI-4: Cases meeting the clinical criteria for early or mild-to-moderate illness and the epidemiologic criteria for likely exposure to SARS-CoV
Severe Acute Respiratory Syndrome
CDC Case Definition: Case Classification

SARS-CoV disease

• Probable case of SARS-CoV disease: meets the *clinical criteria for severe respiratory illness* and the epidemiologic criteria for *likely exposure* to SARS-CoV

• Confirmed case of SARS-CoV disease: clinically compatible illness (i.e., early, mild-to-moderate, or severe) that is laboratory confirmed
Approach to Fever and/or Respiratory Symptoms in The Absence of SARS Activity Worldwide

SARS Screening by Healthcare Providers: Key Points

- Patients developing SARS may present with fever OR respiratory symptoms
- To prevent exposure of healthcare workers and patients to SARS, need to identify potential cases at point of first contact with health care system using screening criteria
- Presence of current epidemiological criteria (exposure history) is the only way to identify potential SARS cases among persons with a compatible clinical syndrome
- Specific screening criteria and corresponding recommendations for management of possible SARS cases will vary according to the level of SARS worldwide and locally
Approach to Fever and/or Respiratory Symptoms in The Absence of SARS Activity Worldwide

Questions/Discussion:
Surveillance &
Case and Contact Investigations

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Severe Acute Respiratory Syndrome
Infection Control
Severe Acute Respiratory Syndrome

Infection Control

• Most important component of SARS management & prevention
• Requires familiarity with infection control precautions and proper use of PPE
• Need new approach to patients with fever & respiratory symptoms
  • Rapid, targeted screening & triage to identify potential cases at point of first contact with health care system
  • Early use of infection control measures
Total SARS Cases and Proportion of Cases Among Healthcare Workers by Country

- China: Total No. SARS cases
- Hong Kong: % HCW
- Taiwan: Total No. SARS cases
- Canada: % HCW
- Singapore: Total No. SARS cases
- Vietnam: % HCW

The chart shows the total number of SARS cases and the proportion of cases among healthcare workers by country.
Severe Acute Respiratory Syndrome

Infection Control

- **A surgical mask** should be placed on potential SARS patients early during the triage process until other recommended infection control precautions can be instituted.

- **Standard and contact precautions**: hand washing, gown, gloves, eye protection or face shield for contact with the patient or their environment.

- **Airborne precautions**

**REF**: Guidelines for Isolation Precautions in Hospitals
www.cdc.gov/ncidod/hip/ISOLAT/Isolat.htm
Severe Acute Respiratory Syndrome
Infection Control

Airborne precautions

• An isolation room with negative pressure relative to the surrounding area and use of an N-95 filtering disposable respirator for persons entering the room

• Use of a higher level of respiratory protection may be considered for certain aerosol-generating procedures

• Where respirators are not available, healthcare personnel evaluating and caring for suspect SARS patients should wear a surgical mask
SARS &
Preparedness for Biological Emergencies

Infection Control

- Other communicable disease requiring **airborne precautions**
  - Tuberculosis
  - Measles
  - Varicella (including disseminated zoster)
  - Smallpox
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**Infection Control**

- Other communicable diseases requiring *droplet precautions*
  - Invasive meningococcal disease
  - *Mycoplasma pneumonia*
  - Pertussis
  - Certain Group A streptococcal infections
  - Adenovirus
  - Influenza
  - Mumps
  - Rubella
  - Parvovirus B19
  - Pneumonic plague
  - Smallpox
SARS & Preparedness for Biological Emergencies

Infection Control

- Other communicable disease requiring **contact precautions**
  - Multi-drug resistant bacterial infections
  - Certain enteric infections
  - Zoster and other skin infections
  - Hemorrhagic fever viruses
  - Smallpox
Infection Control - Disposition

- Patients should **not be hospitalized** solely for the purpose of infection control **unless** they cannot be discharged directly to their home (e.g. travelers, homeless persons) or if infection control precautions recommended for the home or residential setting are not feasible in their home environment.

- Discharge of SARS cases and suspects should be coordinated with public health:
  - Assess suitability of home environment for isolation of patient
  - Provide information for patient and family members on infection control
  - Issue isolation order & assure needs of patient while in isolation are met
  - Follow-up monitoring
Infection Control - Exposure Management

- Health care workers (and others) with exposures to suspect SARS cases should be monitored for 10 days for respiratory symptoms or fever.
- Health care workers with unprotected high-risk exposures to SARS should be excluded from duty for 10 days.
- Public health authorities must conduct (or assure) appropriate monitoring of exposed healthcare workers.
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Roles of Healthcare System/Providers in Public Health Emergencies

• Recognize suspected cases of public health significance
  • Know how to access and use current screening criteria
  • Exclude others without the disease (“worried well”)
• Report cases and other relevant information to public health in a timely fashion
  • Know legal obligations in your state
• Clinical management (treatment, testing, infection control/isolation) and follow-up of affected individuals
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Roles of Healthcare System/Providers in Public Health Emergencies

• Facilitate public health investigations and outbreak response
  • Understand and obtain information of public health relevance
  • Cooperate with investigations
  • Implement outbreak response activities and disease control measures in clinical settings
  • Management of exposed healthcare workers

• Interventions to prevent additional cases
  • Infection control and exposure management, recommendations for treatment, prophylaxis, isolation and quarantine
  • Provide thorough counseling to cases and contacts regarding disease control measures
SARS & Preparedness for Biological Emergencies

Roles of Healthcare System/Providers in Public Health Emergencies

- Implement appropriate discharge procedures for patients requiring isolation in collaboration with public health
- Be able to communicate with public health and other emergency contacts 24/7
  - Coordinate internal & external communications with public health
- Anticipate changes in guidelines and recommendations while outbreak/emergency evolving
SARS &
Other Public Health Emergencies

Questions/Discussion:
Isolation and the Roles of Healthcare System in Public Health Emergencies
Severe Acute Respiratory Syndrome (SARS) and Preparedness for Biological Emergencies

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Isolation & Quarantine
Usually voluntary, but can be mandatory.

Legal quarantine authority exists at federal, state and local levels and covers “isolation” and “quarantine”
Isolation & Quarantine

• **Isolation:**
  – Restriction of movement and/or separation of *sick infected* persons with contagious disease
  – Usually in a hospital setting, but can also be at home or in a dedicated isolation facility

• **Quarantine**
  – Restriction of movement and/or separation of *well persons presumed exposed* to a contagious disease
  – Usually at home, but can be in a dedicated quarantine facility
  – Individual(s) or community/population level
SARS & Preparedness for Biological Emergencies

SARS Isolation

- Persons with suspect SARS are to remain in isolation and adhere to infection control recommendations until 10 days after resolution of fever AND cough improving.
- Persons with SARS exposure and fever or respiratory symptoms should remain in isolation and adhere to infection control recommendations for 72 hours.
  - If progress to meet suspect SARS case definition, isolation as above.
  - If symptoms resolve, no restrictions.
  - If symptoms persist but still do not meet SARS case definition, additional 72-hour isolation followed by re-evaluation.
Rely on patients to comply with voluntary isolation request
Need official isolation requests/orders and accompanying instructions, guidelines, Q & A, etc., for patients, their families and other exposed persons
Critical importance of *patient education* by clinician regarding need for compliance with isolation and with infection control recommendations
Importance of public education regarding “modern quarantine”
Community-based quarantine measures
  – increase social distance
  – restrict movement of populations
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Isolation & Quarantine: Considerations

- Is quarantine likely to be effective in substantially decreasing disease transmission?
- Can the exposed population be defined?
- Are there other potentially effective disease control measures available (treatment, prophylaxis)?
- Is quarantine logistically feasible (are resources available to implement quarantine)?
- Is there a sound legal basis for isolation & quarantine authority?
- Will quarantine authority be recognized and enforced?
- What are the consequences for noncompliance?
- Effect of public perception (fear) on compliance with public health recommendations
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Isolation & Quarantine: Considerations

• Risks to persons under quarantine
• Can the needs of persons under quarantine (including those who become ill) be met?
• Who makes the decision to implement isolation or quarantine?
• Is there a process for delivering isolation and/or quarantine orders?
• Procedures for due process and legal challenge?
• Have the appropriate response partners been educated and prepared: judiciary, law enforcement, the public?
Severe Acute Respiratory Syndrome

SARS Resources

- CDC web site: www.cdc.gov (see Preparedness Planning webpage)
- Guidelines for Isolation Precautions in Hospitals
  - www.cdc.gov/ncidod/hip/ISOLAT/Isolat.htm
- Guidelines for Infection Control in Health Care Personnel, 1998
  - www.cdc.gov/ncidod/hip/GUIDE/infectcont98.htm
- Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health-Care Facilities, 1994
  - www.cdc.gov/mmwr/preview/mmwrhtml/00035909.htm
SARS & Other Public Health Emergencies

Questions?