SARS/ MERS
Topic Collection
10/2/2015
Topic Collection: SARS/MERS

Healthcare facilities and emergency medical professionals need to be able to recognize and treat disease caused by novel respiratory pathogens, such as Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS). This Topic Collection contains resources that can help medical emergency planners and health care professionals: learn more about managing patients experiencing illness from novel respiratory pathogens; understand related infection control principles in healthcare and community settings; and benefit from lessons learned from past outbreaks.

Each resource in this Topic Collection is placed into one or more of the following categories (click on the category name to be taken directly to that set of resources). Resources marked with an asterisk (*) appear in more than one category.

**Must Reads**

- Clinical Management and Research
- Education and Training
- Event-Specific Lessons Learned
- Health Care Worker Safety
- Nosocomial Transmission
- Plans, Tool, and Templates
- Agencies and Organizations

**Must Reads**


Ten years after the World Health Organization (WHO) issued their first global alert for severe acute respiratory syndrome (SARS), the authors reviewed the critical gaps that remain in the global surveillance and response capacity for similar public health threats. Of 194 WHO member states that signed on to the International Health Regulations (2005), fewer than 20% had achieved compliance with the core capacities required by the deadline in June 2012. The authors emphasize the lessons learned from the global SARS outbreak (e.g., avoid complacency, use all available 21st century tools to strengthen capacity building efforts, and support research).


This article includes guidelines for the care of patients with highly infectious diseases, with an emphasis on droplet precautions, isolation units, and need for healthcare worker
training. The author advocates that protective measures for isolation units be modeled after those for biosafety level laboratories. Pediatric considerations are also included.


This web page contains links to information on MERS for the public, healthcare providers and laboratory professionals including a frequently asked questions resource. Preparedness checklists for providers and healthcare facilities are included.


This web page contains links to information on SARS for healthcare providers and laboratory professionals. Preparedness checklists for providers and healthcare facilities are included.


The authors review the 2003 SARS outbreak and discuss lessons learned, particularly with regard to treatment and containment activities. Summaries of studies conducted to identify risk factors and infection control measures, as well as to describe nosocomial outbreaks for affected countries, are included.


The authors summarize the eight “national and international policy, operational, and systems needs identified by public health officials and emphasize the value of having a national public health institute in the preparedness and response phases of a public health emergency.


The authors provide a review of the knowledge base pertaining to the current MERS-CoV outbreak, including detection, clinical features, and interventions.


This document from the UK public health service summarizes a literature review (based on SARS experience) for evidence-based treatment guidelines for MERS-CO-V patients in the United Kingdom.

The authors use data from prior infectious disease outbreaks, including SARS in 2003, to emphasize how important it is for emergency departments to have effective screening and isolation protocols in place for febrile respiratory illness. Such protocols are critical to avoid possible disease transmission by infected patients in the waiting room to others also waiting to be seen.


This document discusses gaps in preparedness for responding to emerging infectious diseases, and provides recommendations for health care facilities to prepare to identify and care for patients with MERS-CoV or other novel respiratory infections.


This document provides recommendations, best practices and principles for infection prevention and control for acute respiratory infections in health care, particularly those that present as epidemics or pandemics. It includes information on PPE and aerosol-generating procedures. There are also summaries of literature and research reviews on physical interventions for infection control; risk of transmission from aerosol-generating procedures; and effectiveness of vaccination of health care workers to protect patients.

Clinical Management and Research


The authors reviewed the therapeutic schedule and outcomes for five MERS patients who received ribavirin and interferon combination therapy an average of 19 days post-admission. None of the patients responded to therapy and all died, suggesting that this therapy is ineffective in patients with co-morbidities who start treatment late in the course of their illness.


The Saudi Arabian Ministry of Health provided an analysis of 47 individuals with laboratory-confirmed MERS-CoV disease. Data suggest that the clinical presentation of MERS-CoV infection ranges from asymptomatic to severe pneumonia with the acute
respiratory distress syndrome, septic shock and multi-organ failure resulting in death. At least two cases had a consumptive coagulopathy during the course of their illness.


Ten years after the World Health Organization (WHO) issued their first global alert for severe acute respiratory syndrome (SARS), the authors reviewed the critical gaps that remain in the global surveillance and response capacity for similar public health threats. Of 194 WHO member states that signed on to the International Health Regulations (2005), fewer than 20% had achieved compliance with the core capacities required by the deadline in June 2012. The authors emphasize the lessons learned from the global SARS outbreak (e.g., avoid complacency, use all available 21st century tools to strengthen capacity building efforts, and support research).


This article includes guidelines for the care of patients with highly infectious diseases, with an emphasis on droplet precautions, isolation units, and need for healthcare worker training. The author advocates that protective measures for isolation units be modeled after those for biosafety level laboratories. Pediatric considerations are also included.


This page provides guidance for evaluating and diagnosing SARS-CoV infections.


This web page contains links to guidance on SARS infection control in various settings.


This web page contains links to information on MERS for healthcare providers and laboratory professionals. Preparedness checklists for providers and healthcare facilities are included.
Centers for Disease Control and Prevention. (2015). **Severe Acute Respiratory Syndrome (SARS).**

This web page contains links to information on SARS for healthcare providers and laboratory professionals. Preparedness checklists for providers and healthcare facilities are included.


This page links to a recording and transcript of a COCA call for clinicians held June 11, 2015 to provide an update on the current outbreak of MERS-CoV and guidance on who should be tested for the disease. Infection control measures are also discussed.


The authors looked at factors contributing to SARS transmission in 98 index cases (22 with transmission; 76 without). They found several factors that seemed to contribute to transmission, including delay to isolation; admission to a non-isolation facility; and higher lactate dehydrogenase levels of greater than 650 IU/L.


The authors review the 2003 SARS outbreak and discuss lessons learned, particularly with regard to treatment and containment activities. Summaries of studies conducted to identify risk factors and infection control measures, as well as to describe nosocomial outbreaks for affected countries, are included.


This document provides guidance on the identification and treatment of patients with severe acute respiratory infection in the intensive care unit (ICU).


The authors summarize the epidemiology of the ongoing MERS-CoV outbreak, noting its sporadic nature and unclear transmission routes. They call for additional research to answer unanswered questions about the disease so that effective interventions to control its spread may be implemented.

This Medline encyclopedia article on SARS includes information on symptoms, tests, treatments, and prevention methods.


The authors conducted this study to determine the effects of mechanical ventilation on pneumothorax and if pneumothorax in SARS patients increased mortality. They did not find any increase in mortality from pneumothorax. They found that patients who developed pneumothorax presented with significant respiratory involvement upon admission, and that these individuals required "meticulous" respiratory therapy and monitoring.


The authors examined viral load in plasma over time in SARS patients and the effect of corticosteroids on viral load. They found that relatively early corticosteroid treatment was related to a higher subsequent plasma viral load.


The authors describe clinical and epidemiologic data for 199 patients hospitalized with SARS. Nineteen of 24 ICU deaths occurred a week or later after ICU admission (and were linked to other complications, including acute respiratory distress syndrome (ARDS). The authors hypothesize that differences in the virulence of varied strains and viral load may be related to the likelihood of developing a severe ARDS and suggest aggressive early intervention.


This article describes an assay kit that was approved by the U.S. Food and Drug Administration in 2013 for the detection of MERS-CoV. The authors discuss the accuracy of the assay, as well as selection of samples for testing, timing of collection after disease onset, and collection methods.
The authors provide a review of the knowledge base pertaining to the current MERS-CoV outbreak, including detection, clinical features, and interventions.

The authors share a timeline of the SARS outbreak and include tables that highlight clinical components of the disease, laboratory abnormalities associated with the disease, radiographic results of patients with SARS, and other information that can help healthcare providers understand the 2003 outbreak and prepare for future outbreaks.

This algorithm assists clinicians and public health workers in the management of potential cases of MERS-CoV infection in the United Kingdom.

This document summarizes a literature review (based on SARS experience) for evidence-based treatment guidelines for MERS-CoV patients in the United Kingdom.

The authors use data from prior infectious disease outbreaks, including SARS in 2003, to emphasize how important it is for emergency departments to have effective screening and isolation protocols in place for febrile respiratory illness. Such protocols are critical to avoid possible disease transmission by infected patients in the waiting room to others also waiting to be seen.

The authors discuss what is known about the current MERS-CoV outbreak. They emphasize the importance of rapid identification and isolation of cases in the absence of effective treatments and clear understanding of how the virus is primarily being transmitted (i.e., human-to-human, or animal-to-human spread).

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The authors discuss what is known about the current MERS-CoV outbreak. They emphasize the importance of rapid identification and isolation of cases in the absence of effective treatments and clear understanding of how the virus is primarily being transmitted (i.e., human-to-human, or animal-to-human spread).
The author reviews the agents that could necessitate the need for mass critical care of patients with severe febrile respiratory illness, as well as associated infection control protocols and personal protective equipment requirements, including those for procedures that could result in a high rate of disease transmission. Planning considerations are included, as are general treatment principles and research supporting lung ventilation protocols.


The authors conducted experiments with different types of doors to assess which allowed the most air into and out of rooms to determine the type of door(s) that hospitals should use for isolation rooms. The effect of human movement on air flow when operating the doors was also examined. The authors contend that sliding doors are the most effective.


This Medline encyclopedia article on MERS includes information on geographic extent, transmission, symptoms tests, and prevention methods.


The authors review treatment options for coronavirus, with an emphasis on that for SARS, based on reports from the 2003 outbreak.


This web page contains links to information on MERS for healthcare providers and laboratory professionals. It also provides updates on the various outbreaks occurring around the world.


The authors describe a previously unknown coronavirus (later known as MERS-CoV) isolated from the sputum of a 60-year-old man who presented with acute pneumonia with a fatal outcome in Saudi Arabia, remarkably similar to that of the severe acute respiratory syndrome (SARS) outbreak in 2003.

The authors discuss novel and emerging viral agents that cause respiratory illness, and development and use of new antimicrobial agents and immune-based and host-directed therapies to treat them.

**Education and Training**


The authors trained 275 health care workers in two weeks on how to don personal protective equipment and perform resuscitation procedures for a patient in cardiac arrest using a high-fidelity simulator. Lessons learned from this initiative have implications for health care worker training, as well as care of patients with infectious respiratory diseases.


Pediatric emergency department staff completed a questionnaire to assess their perceptions of infection control measures against SARS. The authors found that perception of an agent as a significant public health threat improved compliance with infection control measures. Perception of effectiveness of infection control measures did not improve compliance.

**Event-Specific Lessons Learned**


The authors trained 275 health care workers in two weeks on how to don personal protective equipment and perform resuscitation procedures for a patient in cardiac arrest using a high-fidelity simulator. Lessons learned from this initiative have implications for health care worker training, as well as care of patients with infectious respiratory diseases.


The authors provide an analysis of SARS-related decision making along with recommendations for use of the "accountability for reasonableness" principles and ideas for future situations where information about the pathogen is rapidly evolving and decisions may be open to interpretation.

This executive summary of the 3rd part of the Government of Ontario’s report on SARS focuses on the workforce issues related to SARS, the psychological impact on the nursing staff in particular, and the issues with the lack of guidance on appropriate infection control. Unfortunate and difficult lessons that echo today with MERS and Ebola.

*Centers for Disease Control and Prevention. (2003).* Cluster of Severe Acute Respiratory Syndrome Cases Among Protected Health-Care Workers-Toronto, Canada. Morbidity and Mortality Weekly, 52(19);433-436.

Despite apparent compliance with recommended infection-control precautions, a cluster of healthcare workers became ill with SARS during the 2003 outbreak. One table shows how these workers were exposed, by their occupation and type of exposure.


The authors describe the SARS outbreaks in the various wards of a hospital in Singapore, and discuss lessons learned from their experiences. Namely, that early detection and proper infection control procedures are critical to limiting or stopping transmission.


The article describes a retrospective study of health care workers infected with SARS during the 2003 outbreak in China that sought to identify measures that might have protected them from becoming ill. Measures found to be preventive included the use of double gloves; high-air flow ventilation on the wards; and avoidance of face-to-face contact with SARS patients.


The authors review the 2003 SARS outbreak and discuss lessons learned, particularly with regard to treatment and containment activities. Summaries of studies conducted to identify risk factors and infection control measures, as well as to describe nosocomial outbreaks for affected countries, are included.


The authors review their experience during the 2003 SARS outbreak and present lessons learned to assist health care facilities plan for future infectious disease outbreak.

This comprehensive analysis of Canada's experience with the 2003 SARS outbreak includes after-action issues and recommendations.


The authors report findings from a literature review on physical interventions to reduce or interrupt the spread of respiratory viruses, such as isolation, quarantine, social distancing, barriers, personal protection, and hygiene. They found that handwashing more than 10 times daily; wearing gowns, gloves, masks, and/or N-95 masks were effective. They also found that hygiene measures directed at children helped contain viral spread in the community.


The authors summarize the eight “national and international policy, operational, and systems needs identified by public health officials and emphasize the value of having a national public health institute in the preparedness and response phases of a public health emergency.


Authors described possible cause of MERS-CoV transmission in South Korea resulting in 185 secondary infections as of July 14, 2015. These secondary infections were attributed to three overlapping generations of cases who have contracted the virus almost exclusively in the healthcare environment. Fomite transmission may explain a significant proportion of the infections occurring in the absence of direct contact with infected cases. The analysis of publicly available data collected from multiple sources, including the media, is useful for describing the epidemic history of an infectious disease outbreak.


The authors investigated alternative measurement methodology for infrared body thermometry to increase accuracy for outdoor fever screening during the 2003 SARS epidemic. They found that temperature by ear was a more accurate measurement than forehead body surface temperature. This has implications for fever screening interventions for emerging infectious diseases.

The authors discuss the first 2 cases of MERS-CoV in France in 2013, and how they were handled to demonstrate the need for stringent infection control measures when caring for suspected or confirmed cases. They also note the atypical presentation of the index case, who did not originally present with respiratory symptoms.


The authors share a timeline of the SARS outbreak and include tables that highlight clinical components of the disease, laboratory abnormalities associated with the disease, radiographic results of patients with SARS, and other information that can help healthcare providers understand the 2003 outbreak and prepare for future outbreaks.


The authors use data from prior infectious disease outbreaks, including SARS in 2003, to emphasize how important it is for emergency departments to have effective screening and isolation protocols in place for febrile respiratory illness. Such protocols are critical to avoid possible disease transmission by infected patients in the waiting room to others also waiting to be seen.


The authors described a contact investigation to identify possible person-to-person transmission and assess infection control measures following an imported, confirmed case of MERS-CoV in Germany. They identified 83 identified contacts and followed up with 81. Ten contacts reported experiencing mild symptoms, but test results for respiratory and serum samples were negative for MERS-CoV. Serologic testing was done for 53 (75%) of 71 nonsymptomatic contacts; all results were negative.


The authors conducted a small cohort study to determine factors for nosocomial transmission of SARS among health care workers, and which job categories had the highest rates of infection. Nurses working on general wards and who cared for SARS
patients had the highest attack rates. Non-clinical staff experienced a 19% attack rate. These findings have implications for hospital infection control plans.


This article describes a study of attitudes towards use of the Internet to provide services during an outbreak of infectious disease. Patients at 3 Toronto hospitals were interviewed during the second SARS outbreak of 2003. The authors recommend that hospitals develop plans to use the Internet to maintain communication and continuity of care with patients during a large-scale infectious disease outbreak.


The authors examined the effects of restrictions on non-urgent use of hospital services during the SARS outbreak in Toronto and found substantial decreases in elective use and also some decreases in emergency use, suggesting that some patients may have forgone care for urgent conditions.


The authors formed a working group and developed a list of SARS-related ethical issues and values by a consensus process. They also developed a framework for looking at the ethical implications of the SARS outbreak, including 10 key ethical values, and five major ethical issues faced by medical decision makers.


The authors share an overview of patterns of transmission to help health officials prepare for future outbreaks.


Using lessons learned from the 2003 SARS outbreak, the author provides planning recommendations for future outbreaks, and notes that this planning is valuable for bioterrorism or pandemic influenza response, even if SARS does not reemerge.

This article reviews lessons learned from the SARS outbreak in Singapore in 2003, and focuses on the containment and monitoring measures utilized. Large-scale home quarantine and telephone surveillance helped identify probable cases quickly, but required a significant effort to find a small number of cases comparatively. Daily temperature monitoring of health care workers led to early identification of SARS cases, but monitoring of children and travelers at the airports did not.


The authors share the lessons learned from the SARS outbreak, including how hospitals "amplified" the disease by performing specific procedures (e.g., endotracheal intubation and airway suctioning) that can aerosolize respiratory droplets. The authors then highlight successes (e.g., the use of "respiratory etiquette") that have come about as a result of implementing the lessons learned.


The article describes a cohort study conducted in 2003 to develop a predictive score for SARS infection in patients presenting to emergency departments at several hospitals in Taiwan with fever. The score is based on 10 evaluation items that include symptoms; travel history; contact history; blood count data; and chest X-ray findings. The authors contend that the scoring system was more sensitive and specific than the World Health Organization case definition criteria.


The author provides comment on the public health measures taken during the 2003 SARS outbreak in Toronto.


The authors review treatment options for coronavirus, with an emphasis on that for SARS, based on reports from the 2003 outbreak.

This article described the incident of Middle East Respiratory Syndrome coronavirus infection in South Korea on May 2015. Patients included were a man who had recently visited the Middle East, his wife, and a male patient who shared a hospital room with the index patient. The authors emphasize that rapid laboratory confirmation can facilitate subsequent prevention and control for imported cases.

**Health Care Worker Safety**


The authors review the data behind current theories of respiratory virus transmission, and discuss critical aspects of respiratory illness prevention, taking into account influences such as the relative cost-effectiveness of different protection strategies.


This article includes guidelines for the care of patients with highly infectious diseases, with an emphasis on droplet precautions, isolation units, and need for healthcare worker training. The author advocates that protective measures for isolation units be modeled after those for biosafety level laboratories. Pediatric considerations are also included.

*Centers for Disease Control and Prevention. (2003). *Cluster of Severe Acute Respiratory Syndrome Cases Among Protected Health-Care Workers-Toronto, Canada.* Morbidity and Mortality Weekly, 52(19);433-436.

Despite apparent compliance with recommended infection-control precautions, a cluster of healthcare workers became ill with SARS during the 2003 outbreak. One table shows how these workers were exposed, by their occupation and type of exposure.


The article describes a retrospective study of health care workers infected with SARS during the 2003 outbreak in China that sought to identify measures that might have protected them from becoming ill. Measures found to be preventive included the use of double gloves; high-air flow ventilation on the wards; and avoidance of face-to-face contact with SARS patients.

The authors review the 2003 SARS outbreak and discuss lessons learned, particularly with regard to treatment and containment activities. Summaries of studies conducted to identify risk factors and infection control measures, as well as to describe nosocomial outbreaks for affected countries, are included.


The authors summarize a debate among infectious disease practitioners in Singapore regarding whether surgical masks or N-95 respirators should be recommended for health care workers caring for patients with MERS-CoV. They conclude that the evidence supports MERS-CoV being transmitted through droplets, except for aerosol-generating procedures, and so surgical masks are sufficient. They contend that it is more protective for health care workers to consistently wear surgical masks, than inconsistently wear N-95s. N-95 masks have previously been found to be uncomfortable and cause headaches and impaired mental function in health care workers after prolonged use. (Note that the CDC recommends N95s be used for suspect MERS-CoV in the U.S.)


This article describes a series of three checklists developed to assess hospital capabilities in infection control and health care worker safety related to the treatment of patients with highly infectious diseases. Checklists focus on hospital resources, hospital procedures, and health care worker safety.


The authors summarize the available data on face mask use, noting how there is a lack of uniformity among the studies done to date, and a lack of data on the cost-effectiveness of face mask use. They discuss how the recommendations and language used varies across guidelines, and recommend areas for future research.


The article discusses a descriptive study wherein 5,065 individuals were screened for MERS-CoV, including suspected cases, health care worker contacts, and contacts of
laboratory-confirmed cases. The authors cite the data collected as part of this study, as well as data from studies undertaken in several countries, as proof that current infection control recommendations work. They state that the risk of transmission to health care workers is low.


The authors studied the psychosocial effects associated with working in a hospital environment during the SARS outbreak. They found significant negative effects on employees' families and lifestyles as a result of this experience.


The authors looked at risk factors for nosocomial SARS infections in Vietnam in 2003. Consistent mask use by health care workers was found to reduce transmission of SARS among those exposed to patients with the disease.


This article describes a study to determine factors affecting infections in health care workers from three hospitals. The authors found 19 protective factors (including double exposure suits, gloves, education, and room air ventilation) and three risk factors (including tracheal intubation).


The authors conducted a small cohort study to determine factors for nosocomial transmission of SARS among health care workers, and which job categories had the highest rates of infection. Nurses working on general wards and who cared for SARS patients had the highest attack rates. Non-clinical staff experienced a 19% attack rate. These findings have implications for hospital infection control plans.


The authors performed a literature review to assess evidence for the risk to health care workers of contracting an infectious disease from aerosol-generating procedures. They found the data to be limited, and describe the findings of each of the 10 included studies
in detail. They note that aerosol-generating procedures do seem to increase the risk of infection for health care workers, but that good infection control and proper training of workers can limit disease spread.

**Nosocomial Transmission**


The Saudi Arabian Ministry of Health provided an analysis of 47 individuals with laboratory-confirmed MERS-CoV disease. Data suggest that the clinical presentation of MERS-CoV infection ranges from asymptomatic to severe pneumonia with the acute respiratory distress syndrome, septic shock and multi-organ failure resulting in death. At least two cases had a consumptive coagulopathy during the course of their illness.


The authors calculated the rate of MERS CoV introductions into the population from outbreaks in Jordan and Al Hasa. They modeled two potential scenarios: one where there are many introductions, but only moderate transmissibility, and another with few introductions but higher transmissibility. Their analysis suggested that, at the time of the study, MERS-CoV did not yet have pandemic potential.


These authors analyzed epidemiological and genetic data to assess the extent of human infection, the performance of case detection, and the transmission potential of MERS-CoV with and without control measures.


Despite apparent compliance with recommended infection-control precautions, a cluster of healthcare workers became ill with SARS during the 2003 outbreak. One table shows how these workers were exposed, by their occupation and type of exposure.

The authors describe the SARS outbreaks in the various wards of a hospital in Singapore, and discuss lessons learned from their experiences. Namely, that early detection and proper infection control procedures are critical to limiting or stopping transmission.


The authors studied viral shedding of SARS coronavirus to improve diagnosis and infection control. They found that overall, peak viral loads were reached at 12-14 days of illness when patients were probably in hospital care, which would explain why hospital workers were prone to infection. Low rate of viral shedding in the first few days of illness meant that early isolation measures would probably be effective.


Full genome deep sequencing was done on nucleic acid extracted directly from PCR-confirmed clinical samples from patients with confirmed MERS-CoV demonstrated that transmission within Saudi Arabia is consistent with either movement of an animal reservoir, animal products, or movement of infected people.


The authors examined an outbreak of MERS in a hospital in Riyadh, Saudi Arabia in 2014, and found this outbreak was part of a larger outbreak that affected multiple health care facilities in Riyadh and possibly arose from a single zoonotic transmission event.


The authors summarize the available knowledge base regarding how well coronaviruses persist in the environment, and discuss the effectiveness of commonly used antiseptics-disinfectants to kill them. New antiseptic strategies are also discussed.


This paper describes the epidemiological findings of retrospective investigation carried out in November 2012 for the earliest known healthcare associated outbreak of MERS-
CoV that occurred in April 2012. A total of 2 laboratory-confirmed and 11 probable cases were identified from this outbreak: 10 were HCWs and 2 were family members of cases. These findings highlight the likelihood of nosocomial transmission of nCoV infection in a health-care setting.


The authors assessed the survival of SARS-CoV from stool and respiratory specimens on different environmental surfaces and found that fecal and respiratory samples can remain infectious at room temperature for long periods of time (four days and more than seven days, respectively). The effectiveness of cleaning agents was also evaluated and the authors found that common disinfectants inactivated the virus.


The authors looked at risk factors for nosocomial SARS infections in Vietnam in 2003. Consistent mask use by health care workers was found to reduce transmission of SARS among those exposed to patients with the disease.


The authors found that rapid institution of infection control measures can prevent acquisition of MERS-CoV in healthcare settings. They share a case study and highlight that strict respiratory isolation was instituted with a severely ill patient. Ten days after last exposure, none of 64 close contacts had developed severe disease (13 of 64 reported mild respiratory symptoms). The novel coronavirus was not detected in 10 of 10 symptomatic contacts tested.


The authors conducted a retrospective cohort study to identify risk factors for transmission of SARS-CoV during intubation from confirmed SARS patients to healthcare workers. They found that close contact with the airway of severely ill patients and failure of infection control practices to prevent exposure to respiratory secretions were associated with transmission of SARS-CoV.

The authors conducted experiments with different types of doors to assess which allowed the most air into and out of rooms to determine the type of door(s) that hospitals should use for isolation rooms. The effect of human movement on air flow when operating the doors was also examined. The authors contend that sliding doors are the most effective.


The authors share the lessons learned from the SARS outbreak, including how hospitals "amplified" the disease by performing specific procedures (e.g., endotracheal intubation and airway suctioning) that can aerosolize respiratory droplets. The authors then highlight successes (e.g., the use of "respiratory etiquette") that have come about as a result of implementing the lessons learned.


This document provides recommendations, best practices and principles for infection prevention and control for acute respiratory infections in health care, particularly those that present as epidemics or pandemics. It includes information on PPE and aerosol-generating procedures. There are also summaries of literature and research reviews on physical interventions for infection control; risk of transmission from aerosol-generating procedures; and effectiveness of vaccination of health care workers to protect patients.

**Plans, Tools, and Templates**


This is an Incident Response Guide for hospitals to use in conjunction with their Incident Command System and emergency management plans. It describes actions by response role for identifying, triaging, isolating, treating, and tracking a surge of potentially infectious patients and staff.


This document provides recommendations on how to prepare for and respond to a case of SARS in a healthcare facility.

This web page contains links to guidance on SARS infection control in various settings.


This web page contains links to information on MERS for healthcare providers and laboratory professionals. Preparedness checklists for providers and health care facilities are included.


The authors used cost data from hospitals in Singapore in a model to assess cost-effectiveness of infection control protocols in response to a respiratory virus epidemic. The model was based on transmission from a single case in the hospital setting, and did not assume widespread community transmission. The authors concluded that it was most cost-effective to use a step-up approach to infection control measures, as necessary, based on how an outbreak evolves vs. applying very stringent measures at the start of the outbreak and then scaling them back when it becomes apparent they are too broadly applied.


This article describes a series of three checklists developed to assess hospital capabilities in infection control and health care worker safety related to the treatment of patients with highly infectious diseases. Checklists focus on hospital resources, hospital procedures, and health care worker safety.


The authors share a timeline of the SARS outbreak and include tables that highlight clinical components of the disease, laboratory abnormalities associated with the disease, radiographic results of patients with SARS, and other information that can help healthcare providers understand the 2003 outbreak and prepare for future outbreaks.


This algorithm assists clinicians and public health workers in the management of potential cases of MERS-CoV infection in the United Kingdom.

This article focuses on three key business aspects of treating patients with highly infectious diseases: communication; human resources and staffing; and HIPAA concerns.


The authors use data from prior infectious disease outbreaks, including SARS in 2003, to emphasize how important it is for emergency departments to have effective screening and isolation protocols in place for febrile respiratory illness. Such protocols are critical to avoid possible disease transmission by infected patients in the waiting room to others also waiting to be seen.


The authors discuss a survey of isolation units in Europe and advocate for the application of biosecurity measures to specialized isolation units in health care facilities to limit exposure of health care workers and deter theft of infectious material. Such measures include the use of key card access; surveillance cameras; guards at the doors; and sign-in/sign-out for all personnel entering the isolation area.


The authors conducted a survey of health care workers at 47 health care facilities in New York City and the surrounding area to determine responsiveness and willingness to work during disasters. They found that 64% of respondents felt they would be able to report to work during a SARS outbreak, while 48% indicated they would be willing to report to work during a SARS outbreak.


The author conducted a literature search to develop a checklist for infection preventionists to use to assess their hospital's emergency management plans. Infectious disease response considerations are addressed.

This article describes a study of attitudes towards use of the Internet to provide services during an outbreak of infectious disease. Patients at 3 Toronto hospitals were interviewed during the second SARS outbreak of 2003. The authors recommend that hospitals develop plans to use the Internet to maintain communication and continuity of care with patients during a large-scale infectious disease outbreak.


This toolkit contains customizable templates and guidance documents to assist public health planners with developing a comprehensive infectious disease response plan that incorporates principles of communicable disease control and emergency management.


This plan contains the following sections: command, plans section (by unit), operations section, logistics, and finance. Four annexes that focus on different threats are included, as are sample forms and other appendices.


The author reviews the agents that could necessitate the need for mass critical care of patients with severe febrile respiratory illness, as well as associated infection control protocols and personal protective equipment requirements, including those for procedures that could result in a high rate of disease transmission. Planning considerations are included, as are general treatment principles and research supporting lung ventilation protocols.


The authors reviewed studies on facemask use in the community and framed their findings under the five principles of the Health Belief Model. They found that perceived susceptibility and perceived benefits of face mask use positively influenced compliance and recommend that a comprehensive approach to encouraging mask use during outbreaks of infectious disease in the community be utilized.

The authors reviewed 16 studies from nine countries to synthesize the data on public perception of non-pharmaceutical interventions to reduce transmission of respiratory infections. They found that hand and respiratory hygiene were viewed as socially responsible, and that concerns about stigma influence perceptions around social distancing and isolation. Barriers, including beliefs about infection transmission, are also discussed in this article.

The Kingdom of Saudi Arabia Ministry of Health. MERS Command and Control Center, Health Guideline. (Accessed 9/21/15.)

This website provides recommendations on how to identify and manage a case of MERS in a healthcare facility.


This document discusses gaps in preparedness for responding to emerging infectious diseases, and provides recommendations for health care facilities to prepare to identify and care for patients with MERS-CoV or other novel respiratory infections.


The authors present a framework for allocating scarce resources and implementing interventions to limit or stop transmission during an epidemic, using limited data. They state that interventions should be targeted at groups with the highest risk of infection per individual to have the greatest impact, and that adjustments may be made as more data becomes available during the course of the epidemic.


This web page contains links to information on MERS for healthcare providers and laboratory professionals. It also provides updates on the various outbreaks occurring around the world.

Agencies and Organizations

Note: The agencies and organizations listed in this section have a page, program, or specific research dedicated to this topic area.

Centers for Disease Control and Prevention. Middle East Respiratory Syndrome.

Centers for Disease Control and Prevention. Severe Acute Respiratory Syndrome.
The Kingdom of Saudi Arabia Ministry of Health. Middle East Respiratory Syndrome.

The Ontario Ministry of Health and Long Term Care. Severe Acute Respiratory Syndrome.

World Health Organization. Middle East Respiratory Syndrome Coronavirus.

World Health Organization. Severe Acute Respiratory Syndrome.

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