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Health Care–Acquired Viral Respiratory Diseases

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KEYWORDS

• Influenza • SARS-CoV-2 • COVID-19 • Coronavirus • Respiratory virus
• Infection prevention • Nosocomial infection • Health care–acquired infection

KEY POINTS

- Health care–acquired viral respiratory infections are common, with increased patient morbidity and mortality.
- Multicomponent infection control measures consisting of education, hand washing, isolation, consistent use of personal protective equipment, cohorting patients, and cohort nursing reduces transmission of respiratory infections.
- Health care worker influenza vaccination is recommended, with mandatory vaccination policies becoming more common.

INTRODUCTION

Although the threat of viral respiratory infection has been underscored by the current coronavirus disease 2019 (COVID-19) pandemic, respiratory viruses have a significant impact in health care settings even under normal circumstances. It is estimated that approximately 19,000 nosocomial respiratory virus infections occur in US hospitals each year, resulting in increased patient morbidity, mortality, and health care costs.[1] Approximately 20% of patients with health care–associated pneumonia have viral respiratory infections, with an incidence that typically reflects the level of virus activity within the community.[2,3] Respiratory viruses can be transmitted through multiple pathways, including contact, droplet, and airborne routes, with the relative contributions of each route depending on the viral species and environmental factors. Controlled laboratory studies to determine which transmission routes are possible and epidemiologic studies to determine which routes most contribute to real-world transmission are both needed to inform prevention and control. This article describes the current

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understanding of the epidemiology, transmission, and control of health care–associated respiratory viral infections.

SEVERE ACUTE RESPIRATORY SYNDROME CORONAVIRUS-2 AND OTHER HUMAN CORONAVIRUSES

Epidemiology

Among the human coronaviruses (HCoVs), there are 4 seasonal viruses (229E, OC43, NL63, and HKU1) that cause annual epidemics of primarily mild respiratory infections. In addition, several novel coronaviruses have emerged from zoonotic reservoirs in recent decades causing severe lower respiratory disease, most notably the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) virus responsible for the recent COVID-19 pandemic.

As of March 1, 2021, the COVID-19 pandemic caused by SARS-CoV-2 resulted in 113,467,303 confirmed cases and 2,520,550 deaths worldwide, with the United States accounting for approximately 25% of the cases and 20% of the deaths.[4,5] A large study performed in the United States and United Kingdom found that health care personnel (HCP) were more than 3 times more likely to be infected with SARS-CoV-2 compared with the general community after adjusting for likelihood of testing.[6] These infections strained health care capacity and put patient safety at risk. Characterizations of nosocomial outbreaks early in the pandemic noted that mortality among patients with health care–acquired COVID-19 was much higher than in the general population, potentially reflecting older age and poorer health.[7–9] Residents of long-term care facilities have accounted for more than a quarter of all US COVID-19 deaths as of mid-February 2021.[10]

Although the COVID-19 pandemic is the first documented pandemic caused by an HCoV, there are other recent examples of novel HCoV emergence causing epidemics. In 2002 to 2003, the novel SARS-CoV caused an epidemic of severe respiratory illness (coined severe acute respiratory syndrome [SARS]) resulting in 8096 cases globally and 774 deaths (9.6% case fatality ratio) with notable nosocomial outbreaks in Singapore and Toronto.[11,12] Middle East Respiratory Syndrome Coronavirus (MERS-CoV) was identified in the Arabian Peninsula in 2012.[13] As of January 2021, 2566 cases in 27 countries have been reported, with 882 deaths (34.4% case fatality ratio).[14,15] Although direct contact with dromedary camels has remained a major risk factor for MERS, there have been multiple MERS nosocomial outbreaks and 13% to 70% of nosocomial MERS infections were among HCP.[15–19]

Nosocomial infection with seasonal coronaviruses has also been described,[1,20,21] including large outbreaks among patients and HCP in pediatric and neonatal intensive care units.[22]

Transmission

The median incubation period of SARS-CoV-2 is 4 to 5 days, with symptoms developing within 12 days in 95% of symptomatic infections.[23,24] Between 1 in 3 and 1 in 6 SARS-CoV-2 infections remain asymptomatic.[25,26] Asymptomatic patients may have viral loads higher or comparable with symptomatic patients, but shorter durations of shedding.[27,28] Among symptomatic individuals, viral shedding peaks on or just before the day of symptom onset.[28] In uncomplicated infections, shedding of virus capable of replication lasts less than 10 days,[28] but individuals with severe COVID-19[29] or who are immunocompromised[30] may be infectious for much longer. Taken together, the long incubation period, high proportion of asymptomatic infections, presymptomatic shedding, and long duration of shedding contribute to a high proportion of unobserved transmission.

SARS-CoV-2 is predominantly transmitted through close contact via the large droplet and direct contact routes.[31,32] However, there is evidence that SARS-CoV-2 may be transmitted over longer distances and periods of time via smaller droplets or aerosols in certain circumstances.[32–34] Aerosol transmission may be of particular concern in health care settings where procedures are performed that can generate infectious respiratory droplets and aerosols (aerosol-generating procedures) such as endotracheal intubation and extubation, nebulizer administration, and airway suctioning.[35] Studies have also shown frequent contamination of surfaces, with prolonged infectivity up to 96 hours on nonporous surfaces and up to 72 hours on cardboard.[34,36] However, instances of indirect fomite transmission have not been conclusively documented.

In contrast with SARS-CoV-2, MERS-CoV has low human-to-human transmission potential. However, inadequate or inconsistent infection control measures have been cited as factors in MERS-CoV transmission during nosocomial outbreaks.[16,17] MERS-CoV may transmit by large droplets, contact, and aerosols following aerosol-generating procedures.[37]

The seasonal HCoVs, unlike their higher-severity counterparts, seem to be largely spread by droplet transmission.[38] Performing aerosol-generating procedures and contact with pediatric patients have been identified as risk factors for HCP infection with seasonal HCoV.[39]

Prevention and Control

Patients with suspected or confirmed SARS-CoV-2 infection, or those who would otherwise be required to quarantine, should be placed in single rooms with a closed door and dedicated bathroom.[40] Patients undergoing aerosol-generating procedures should be placed in airborne infection isolation rooms if possible. Limiting patients with SARS-CoV-2 to specific units should be considered, and their movement should be limited. In addition to standard precautions, HCP entering the rooms of patients with SARS-CoV-2 should use an N-95-equivalent or higher-level respirator, eye protection, gloves, and a gown. These best practices have not always been feasible given limited personal protective equipment (PPE) resources, and the US Centers for Disease Control and Prevention (CDC) has outlined contingencies and strategies to preserve PPE.[41] The World Health Organization (WHO) and several US state health departments have issued more lenient guidance permitting use of medical masks rather than respirators in the absence of aerosol-generating procedures.[42] Although the SARS-CoV-2 research base has developed in an extraordinarily short time, these differing recommendations highlight remaining gaps in the knowledge of SARS-CoV-2 epidemiology, transmission, and infection control best practices.[43]

CDC has also recommended general measures to reduce health care–associated transmission.[40] These measures have been extremely effective for reducing risk of health care–associated SARS-CoV-2 infection and could be considered for use during nonpandemic respiratory virus seasons.[44,45]

- Telehealth strategies should be used to reduce in-person medical visits where possible.
- Visitors to the health care facility should be limited, especially during times of high community transmission.
- All patients, visitors, and HCP should be screened for symptoms of COVID-19 or contact with a suspected or confirmed case in the past 14 days.
- Patients, visitors, and HCP should wear a well-fitting cloth mask,[46] surgical mask, or respirator at all times as a method of universal source control.

- Physical distancing should be encouraged to maintain at least 2 m (6 feet) between individuals when possible.

Both the Infectious Diseases Society of America (IDSA) and CDC recommend nucleic acid amplification testing for all individuals, hospitalized or in the community, with either symptoms of COVID-19 or who have been exposed to a suspected or confirmed patient with SARS-CoV-2 infection.[47,48] Negative results in symptomatic hospitalized patients should be treated with suspicion with repeated testing, including specimens from the lower respiratory tract if possible. Testing of asymptomatic patients on hospital admission is also recommended by IDSA and CDC during periods of high community transmission.[40,48] Periodic testing of asymptomatic HCP without known exposure is recommended for those working in long-term care facilities, and may be considered in hospital settings if resources are available.[49]

As of March 2021, 3 vaccines for the prevention of COVID-19 have received emergency use authorizations from the US Food and Drug Administration (FDA), and all have shown substantial efficacy, particularly against severe disease.[50–52] Frontline HCP are among those designated as highest priority for vaccination by the CDC's Advisory Committee for Immunization Practices (ACIP).[53,54] High HCP vaccination coverage is critical to protecting both HCP and patients. It remains to be seen whether requirements for HCP COVID vaccination will emerge as has occurred with influenza vaccination. As the experience and comfort with these new vaccines increases and full FDA approval is issued, such requirements may be justified, especially if an impact on transmission is confirmed.

Hospitalized patients with MERS-CoV should be placed in contact and airborne precautions with the use of eye protection.[55]

Although seasonal HCoV are not specifically mentioned in CDC infection prevention guidelines, droplet and contact precautions may be considered based on likely routes of transmission.[38]

SEASONAL INFLUENZA

Epidemiology

Influenza infects approximately 2% to 10% of the US population annually, resulting in 140,000 to 810,000 hospitalizations and 12,000 to 61,000 deaths.[56,57] Transmission of influenza has been reported in a variety of health care settings, and HCP are often implicated as index cases for nosocomial outbreaks.[58] A recent study found that nearly 90% of influenza-infected HCP were asymptomatic or mildly symptomatic with no fever or cough.[59] Although asymptomatic and mildly symptomatic individuals shed less virus for shorter duration than those who are symptomatic,[60] there is still potential for transmitting infection to patients or other HCP. Even when symptomatic, HCP often work while acutely ill for a variety of reasons.[61,62] High levels of patient and HCP infection can also disrupt hospital operations during seasonal influenza epidemics.[63,64]

Transmission

The average incubation period for influenza is approximately 3 days, but can range from 1 to 4 days.[65] Viral shedding begins before the appearance of symptoms and within the first 24 hours following infection, peaks on the second day following infection, and usually declines rapidly thereafter.[65,66] Virus is typically no longer detectable after 6 to 10 days after inoculation. Prolonged viral shedding has been documented in children,[67] those hospitalized for severe influenza,[68] and immunocompromised adults.[69]

The possibility for influenza transmission to occur through direct contact,[70,71] indirect contact with fomites,[72,73] large droplet,[74,75] and aerosol[76,77] routes has been shown in

both laboratory and field studies. However, in both the community and health care settings, large droplet and direct contact transmission predominates.[78] Although possible, indirect fomite transmission and aerosol transmission across long distances and time periods have not been conclusively shown and are unlikely. Consistent with this, several randomized controlled trials have found that no significant advantage of N95 respirators compared with surgical masks has been shown for standard clinical care.[79–81] The exception may be for aerosol-generating procedures, which can increase risk of transmission to health care workers involved in or in close proximity to the procedure.[82,83]

Prevention and Control

In addition to standard precautions, the CDC recommends implementation of droplet precautions to prevent health care–associated influenza (**Tables 1** and **2**).[3,84,85] Droplet precautions should continue for 7 days after illness onset or until 24 hours after the resolution of fever and respiratory symptoms, whichever is longer, but may be extended for immunocompromised or other patients who may have prolonged viral shedding. HCP should wear respiratory protection equivalent to a fitted N95 filtering respirator mask if patients with influenza undergo aerosol-generating procedures.[85]

Annual influenza vaccination is recommended for HCP by the ACIP.[86] Although influenza vaccine effectiveness can vary annually, it is the best available tool for the prevention of influenza infection (**Fig. 1**).[87] Vaccinated HCP are less likely to miss work because of respiratory illness and miss fewer days when they are ill.[88,89] Improved HCP vaccination coverage has also been linked with decreased health care–associated influenza among patients and personnel,[90,91] and reduced mortality among nursing home patients.[92–96] Since 2013, multiple professional societies and safety advocacy organizations have endorsed policies for mandatory influenza vaccination for HCP (**Box 1**). As a result, the proportion of hospitals with mandatory influenza vaccination programs increased from 37% in 2013 to 61% in 2017.[97] During the 2019 to 2020 influenza season, HCP vaccination coverage was 81% overall; 52% in settings where vaccines were not required, promoted, or offered on site; and 94% where vaccination was required.[98]

Data from observational studies and controlled trials support recommendations to provide antiviral chemoprophylaxis to residents in long-term care facilities, regardless of vaccination status, during an institutional influenza outbreak.[99,100] In this setting, chemoprophylaxis should be continued for 14 days or for at least 7 days after the onset of symptoms in the last person infected, whichever is longer.[99,100] Effectiveness of employee chemoprophylaxis in the acute care setting is unclear, but may be considered for unvaccinated or high-risk HCP during an institutional outbreak.[99,100]

In addition to vaccination and antiviral chemoprophylaxis, interventions to prevent health care–associated influenza include source control (ie, wearing a mask), cohort nursing, exclusion of ill HCP and visitors through comprehensive sick leave policies and entry screening, and early diagnostic testing of symptomatic patients.[85,99] Influenza testing is recommended on admission for all hospitalized patients with acute respiratory illness during the influenza season.[99]

NOVEL PANDEMIC INFLUENZA

Over the past century, there have been 4 major influenza pandemics caused by novel viruses resulting from reassortment of human influenza genes with those of avian or swine strains: 1918 to 1919 A (H1N1), 1957 to 1958 A (H2N2), 1968 to 1969 A (H3N2), and 2009 A (H1N1). Several zoonotic influenza viruses are currently being monitored for pandemic potential, including avian H5 and H7 viruses.

Table 1
Precautions for preventing transmission of respiratory infections

Precautions	Component	Recommendation
Standard	Hand hygiene	Wash hands with soap and water or use an alcohol-based hand rub: • Before and after contact with a patient • After contact with respiratory secretions, and • After contact with potentially contaminated items in the patient's vicinity, including equipment and environmental surfaces
	Respiratory hygiene	Instruct staff and visitors with signs and symptoms of a respiratory infection to: • Cover the mouth and nose when sneezing or coughing • Perform hand hygiene after soiling hands with respiratory secretions • Wear masks when tolerated, and • Maintain spatial separation from others (>1 m [3 feet]) when in common waiting areas, if possible
	Gloves	Wear when contact with respiratory secretions could occur
	Gowns	Wear during procedures and activities when contact of clothing or exposed skin with respiratory secretions is anticipated
	Masks and eye protection	Wear during procedures and activities likely to generate splashes or sprays of respiratory secretions
Contact[a]	Patient placement	Place patient in a single-patient room, if possible, or cohort with other patients infected with the same organism Limit patient movement to medically necessary purposes
	Gloves and gowns	Wear on room entry whenever contact is likely with the patient, patient's respiratory secretions, or potentially contaminated items in the patient's vicinity, including equipment and environmental surfaces
	Masks and eye protection	As per standard precautions
Droplet[a]	Patient placement	Place patient in a single-patient room, if possible, or cohort with other patients infected with the same organism Limit patient movement to medically necessary purposes, and patients should wear a mask and follow respiratory hygiene during transport
	Gloves, gowns, and eye protection	As per standard precautions
	Masks	Wear a surgical mask on room entry if close contact (eg, <1 m [3 feet]) with the patient is anticipated

(*continued on next page*)

Table 1 (*continued*)

Precautions	Component	Recommendation
Airborne[a]	Patient placement	Place infected patients in a single-patient airborne infection isolation room[b] Limit patient movement to medically necessary purposes, and patients should wear a mask and follow respiratory hygiene during transport
	Gloves, gowns, and eye protection	As per standard precautions
	Masks	Wear a fit-tested N95 respirator before room entry

[a] Contact, droplet, and airborne precautions include hand hygiene and respiratory hygiene as per standard precautions.
[b] Airborne infection isolation room consists of negative pressure relative to the surrounding area, 6 to 12 air changes per hour, and air is exhausted directly to the outside or recirculated through high-efficiency particulate air (HEPA) filtration before return.
From Siegel JD, Rhinehart E, Jackson M, et al; Health Care Infection Control Practices Advisory C. 2007 Guideline for isolation precautions: preventing transmission of infectious agents in health care settings. Am J Infect Control 2007;35:S65–164; with permission.

Highly pathogenic avian influenza A (H5N1) virus was first reported to cause human infections in 1997 in China; however, no other human infections were reported until the virus reemerged in Hong Kong in 2003.[101] Since that time, it has caused 862 infections worldwide, of whom 455 patients have died (case fatality ratio: 53%), although only 1 case was identified in 2020.[102] Human infection with avian influenza A (H7N9) was first reported 2013 in China, subsequently causing seasonal outbreaks of severe respiratory illness accounting for a total of 616 deaths from a total of 1568 cases (case fatality ratio: 39%).[103] However, only 4 human cases have been identified following mass immunization of Chinese poultry with a bivalent influenza A (H7N9) and A (H5N1) vaccine beginning in September 2017.[103,104]

The CDC has issued interim guidelines for infection control for patients with suspected novel influenza A infection associated with severe disease, including H5N1, H7N9, and other emerging strains. Avian influenza should be suspected in patients presenting with a severe respiratory illness with recent contact with potentially infected birds or with travel to a country with avian influenza activity in the past 10 days.[105] Contact and airborne precautions should be used for patients with suspected novel influenza (see **Tables 1** and **2**). In addition, all HCP should wear eye protection when entering the patient's room. Transmission-based precautions for novel influenza should be continued throughout the duration of the patient's stay. Antiviral chemoprophylaxis for 5 days should also be considered for HCP with unprotected exposures if the exposure was not ongoing, or for 10 days if the exposure was ongoing.[106]

RESPIRATORY SYNCYTIAL VIRUS

Epidemiology

Respiratory syncytial virus (RSV) is the most common cause of pneumonia and bronchiolitis in infants[107] and a common cause of hospitalization in older and high-risk adults.[108] Rates of respiratory hospitalizations secondary to RSV infection are highest among infants, although older patients (≥75 years) have similar rates to children aged 1 to 4 years.[109] Outbreaks of RSV have occurred in a variety of health care settings.[110–113] Secondary infection risks between 19% and 45% among patients, and

Table 2
Infection prevention recommendations for viral respiratory pathogens

Common Measures for Reducing Transmission in the Health Care Setting
Hand hygiene
Respiratory hygiene/cough etiquette
Standard precautions
Restrict ill visitors[a]
Restrict ill personnel (prevent so-called presenteeism)
Cohort nursing
Prompt diagnosis of respiratory infections among patients by diagnostic tests[b]
Restrict elective admissions of patients during outbreaks in the community and/or facility
Surveillance for an increase in activity of viral infections within the community
Universal source control with well-fitting masks

Measures for Reducing Transmission of Specific Pathogens in the Health Care Setting

					Influenza		
Intervention	RSV	Adenovirus	Parainfluenza Virus/HMPV	Rhinovirus	Seasonal	Novel	Novel Coronavirus
Precautions	—	—	—	—	—	—	—
Contact	●	●	●	—	—	●	●
Droplet	—	●	—	●	●		●
Airborne	—	—	—	—	●[c]	●	○[d]
Eye protection	—	—	—	—	—	●	●
Vaccination of personnel	—	—	—	—	●	—	—
Chemoprophylaxis	○[e]	—	—	—	○[f]	○	—

Closed circles (●) denote recommended measures. Open circles (○) denote measures recommended in certain circumstances.

Abbreviations: HMPV, human metapneumovirus; RSV, respiratory syncytial virus.

[a] Institutions may restrict only young children and/or screen all visitors for illness by using a trained health care worker to assess for signs and symptoms or by using an educational patient information list to advise ill visitors.

[b] To control outbreaks, institutions may perform preadmission screening of patients for infection.

[c] The Centers for Disease Control and Prevention recommends an N95 respirator for HCP performing aerosol-generating procedures.

[d] The Centers for Disease Control and Prevention recommends use of a fit-tested N95 respirator. The WHO and some US state health departments recommend medical masks.

[e] In addition to other infection control measures, palivizumab prophylaxis of high-risk infants has been used to control outbreaks in the neonatal intensive care unit.

[f] During a facility outbreak of influenza, administer antiviral chemoprophylaxis to all patients in the involved unit, regardless of vaccination status, and to unvaccinated HCP working in the involved unit. If feasible, administer facility-wide chemoprophylaxis for all residents in long-term care facilities. Chemoprophylaxis may also be administered to personnel when the outbreak strain is not well matched by the vaccine.

between 34% and 56% among HCP, on infant wards have been reported when limited or no infection control measures are implemented.[110,114,115] Most infected HCP are symptomatic, but asymptomatic shedding of RSV occurs in 15% to 20%.[116] As with other viruses, symptomatic HCP who work while ill are a concern, and this is reported to occur with a high frequency (51%–75%) in some populations.[117,118]

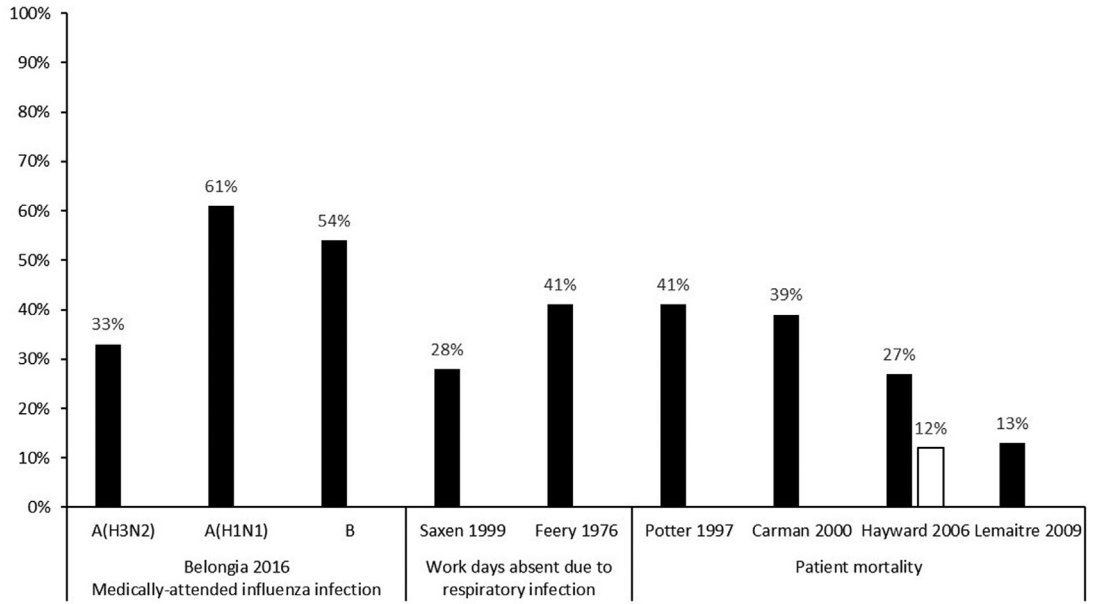

Fig. 1. Percentage reduction in noted outcomes in HCP receiving influenza vaccination. (*Data from* Refs.[58,94,95])

Box 1
Professional societies and safety advocacy organisms that recommend mandatory health care personnel influenza immunization

American Academy of Family Physicians (AAFP)

American Academy of Pediatrics (AAP)

American College of Physicians (ACP)

American Hospital Association (AHA)

American Medical Directors Association (AMDA)

American Nurses Association (ANA)

American Pharmacists Association

American Public Health Association (APHA)

Association for Professionals in Infection Control and Epidemiology (APIC)

IDSA

National Association of County and City Health Officials (NACCHO)

National Business Group on Health

National Patient Safety Foundation (NPSF)

Society for Healthcare Epidemiology of America (SHEA)

Veterans Health Administration (VHA) Department of Veterans Affairs

Transmission

Transmission of RSV occurs primarily through direct contact or by self-inoculation after touching contaminated fomites[119,120]; inoculation is most efficient via the eyes and nose.[121] RSV has been recovered on countertops for up to 6 hours, on rubber gloves for up to 2 hours, and on cloth gowns and hands for 15 to 60 minutes after contamination with infected nasal secretions.[122] The duration of viral shedding among hospitalized infants averages 6.7 days but can be as long as 21 days[123]; in a large Kenyan household cohort, shedding averaged 11 days, with approximately 13% shedding for more than 21 days.[124] Similar durations of viral shedding have also been shown for older adults.[125] Younger children, infants with lower respiratory disease, and those with a compromised immune status have more prolonged shedding and shed greater quantities of virus.[123,124]

Prevention and Control

Although several RSV vaccines are in development,[126] there is no licensed vaccine or specific treatment readily available for RSV. Therefore, effective infection control measures are paramount for minimizing transmission. In addition to standard precautions, the CDC recommends contact precautions to prevent health care–associated RSV (see **Tables 1** and **2**).[84] These precautions should continue for the duration of illness but may be extended for immunocompromised patients because of prolonged viral shedding. Some studies have suggested that eye protection may further reduce transmission given the importance of the eye as a portal of entry.[127,128]

Palivizumab is a humanized mouse immunoglobulin G monoclonal antibody that is effective in preventing hospitalizations caused by RSV infections,[129] and the use of palivizumab as prophylaxis for susceptible infants to control outbreaks in neonatal intensive care units has been described.[111,130] The American Academy of Pediatrics recommends that palivizumab be administered to the following groups of patients[131,132]:

- Infants younger than 12 months of age and born before 29 weeks' gestation at the beginning of RSV season
- Preterm infants with chronic lung disease of prematurity who are born before 32 weeks' gestation during the first year of life
- Infants younger than 12 months of age with hemodynamically significant heart disease

OTHER RESPIRATORY VIRUSES

Adenovirus

Health care–associated outbreaks of adenovirus have been reported from various settings with high secondary infection risks among patients (15%–56%).[133–135] Adenoviruses can result in severe or fatal disseminated disease among severely immunocompromised patients.[136] Adenoviruses are transmitted through large respiratory droplets but are also notable for their ability to survive on nonporous surfaces for up to 49 days.[137] As a result, transmission also occurs via self-inoculation after contact with contaminated fomites. In addition to standard precautions, the CDC recommends contact and droplet precautions to prevent health care–associated adenovirus infection (see **Tables 1** and **2**).[3,84]

Parainfluenza Virus

Transmission of parainfluenza has been documented in pediatric wards,[138] neonatal nurseries,[139] and adult transplant units.[140] Transmission of parainfluenza primarily occurs by direct person-to-person contact. Parainfluenza can survive up to 4 hours on porous surfaces and up to 10 hours on nonporous surfaces.[141] However, viral recovery from hands declines rapidly, with only 5% detected after 10 minutes.[142] The CDC recommends contact precautions for the prevention of health care–associated parainfluenza infection (see **Tables 1** and **2**).[3,84]

Rhinovirus

Among studies with broad molecular respiratory virus identification, rhinoviruses are typically the most common health care–associated respiratory viral infection among both children and adults.[1,20,21] Nosocomial rhinovirus infections have been linked with increased need for respiratory support and longer lengths of stay in high-risk neonates[143] and deaths in long-term care facilities.[144] However, the clinical significance of rhinovirus infections is debated because this virus is frequently detected in asymptomatic children.[145] The CDC recommends droplet precautions for the prevention of health care–associated rhinovirus infection (see **Tables 1** and **2**).[84]

Human Metapneumovirus

Nosocomial outbreaks of human metapneumovirus have been described in various settings with secondary infection risks ranging from 36% to 56%.[146–149] Human metapneumovirus survival on nonporous surfaces has been shown for up to 8 hours, but for much shorter durations on porous surfaces.[150] The CDC recommends contact precautions for the prevention of health care–associated human metapneumovirus infection (see **Tables 1** and **2**).[151]

EMPIRIC CLINICAL GUIDANCE FOR PATIENTS WITH SUSPECTED RESPIRATORY VIRAL INFECTIONS

For suspected respiratory virus infections, CDC recommends empiric contact plus droplet precautions until viruses specifically requiring droplet precautions can be ruled

out.[3,84] Empiric treatment with influenza antiviral medications is also recommended for any patient with suspected or confirmed influenza infection who is hospitalized, has severe illness, or is at high risk of complications.[100]

Diagnostic Testing

In many cases, diagnosing a respiratory virus infection can inform clinical management, improve infection prevention,[152,153] and may improve antibiotic stewardship.[154] In addition to virus-specific guidance previously discussed for SARS-CoV-2 and influenza, IDSA recommends respiratory virus panel testing of immunocompromised patients who are hospitalized with respiratory symptoms, and advises that panel testing can be used more broadly in hospitalized patients if it might influence clinical care or infection prevention.[99] The diagnostic landscape continues to rapidly evolve and more research is needed regarding best practices, clinical interpretation, and cost-effectiveness of respiratory virus testing.[155]

SUMMARY

Transmission of respiratory viruses occurs in a variety of health care settings, resulting in increased patient morbidity and health care costs. Different viruses have different modes of transmission, and prevention of transmission requires early recognition of symptomatic patients and prompt institution of appropriate transmission-based precautions, in addition to adherence to basic infection control practices such as hand hygiene. In addition to virus-specific infection control measures, vaccination of HCP is a priority for prevention of health care–associated SARS-CoV-2 and influenza infection.

CLINICS CARE POINTS

- Vaccination of health care personnel is a priority for the prevention of healthcare acquired influenza and SARS-CoV-2 infection.
- Recommended precautions preventing healthcare acquired viral respiratory diseases vary by viral species.
- droplet precautions until viruses specifically requiring droplet precautions can be ruled out.
- In many cases, diagnosing a respiratory virus infection can inform clinical management, improve infection prevention, and may improve antibiotic stewardship.

DISCLOSURE

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