

Prevention of Respiratory Virus Infections

Presented by:

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Objectives

- Review the etiology and epidemiology of common agents responsible for viral respiratory infections
- Highlight how viral respiratory infections may be complicated by lower respiratory tract infections
- Discuss the impact of respiratory viral infections in the healthcare setting
 - > HCWs
 - Patients
- Enumerate strategies to prevent and control respiratory infections in healthcare settings
- Leveraging your local health department in respiratory viral infection prevention



URI is reportedly the most common acute illness in United States, with the average adult estimated to have about 2-4 cold episodes/year

 coinfection with > 1 virus (such as rhinovirus and enterovirus) is possible in patients with upper respiratory infections

The most common viruses causing acute respiratory infections in children are rhinoviruses, respiratory syncytial virus (RSV), and influenza.

In adults, rhinoviruses, influenza, and coronaviruses, including SARS-CoV-2 (the virus responsible for COVID-19), are major culprits.



Upper respiratory infections (URI), or "common colds" are acute, generally viral infections of the upper respiratory tract causing symptoms such as nasal congestion, sneezing, low grade fever, malaise and/or throat pain.

Month	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
		Influenza virus										
Winter virus							HCoV					
						RSV						
All-year virus	Adenov	irus/HBo\	/									
Type-specific	PIV3		PIV1									
Spring	hMPV											
Spring/Fall	Rhinovirus											
Summer virus	Non-rhinovirus enteroviruses											

Seasonality of respiratory virus infection in temperate regions



Respiratory viral infections have a wide spectrum of presentations and disease severity.

In children, these infections frequently manifest as mild symptoms such as cough, runny nose, and fever, but they can also lead to severe complications like bronchiolitis and pneumonia, especially in infants and those with underlying health conditions.

These complications can require hospitalization and intensive care, imposing a considerable burden on pediatric healthcare resources.

In older adults and persons with chronic medical conditions including immunocompromised individuals, acute respiratory viral infections may progress or be complicated with bacterial co-infection



Virus exposure, attachment and entry into upper respiratory tract host cells

Virus replication, spread and inflammatory response

Tissue damage and progressive pathology in respiratory tract

Lower respiratory tract infection with virus +/- co-infection with bacteria

The severity and outcome of microbial infections are determined by **host**, **pathogen**, and **environmental factors**.

As the pathogen colonizes the host, it encounters members of the resident microbiota and/or other pathogens.

These interactions can influence microbial pathogenesis, including increased bacterial adhesion, enhanced virion stability, and modulation of the immune response by one microbe that benefits the other.

Particularly relevant in anatomical sites that have complex microbial communities, including the respiratory tract

Spaeder MC, Fackler JC. Hospital-acquired viral infection increases mortality in children with severe viral respiratory infection. Pediatr Crit Care Med 2011; 12:e317–21

Manchai et al. Hospital acquired viral respiratory tract infections: An underrecognized nosocomial infection. Infection, Disease and Health. 2020;25:175-180

Sender V, Hentrich K, Hentriques-Normark B. Virus-Induced Changes of the Respiratory Tract Environment Promote Secondary Infections With Streptococcus pneumoniae. Front Cell Infect Microbiol. 2021 Mar 22;11:643326.

Manna S, McAuley J, Jacobson J, Nguyen CD, Ullah MA, Sebina I, Williamson V, Mulholland EK, Wijburg O, Phipps S, Satzke C. Synergism and Antagonism of Bacterial-Viral Coinfection in the Upper Respiratory Tract. mSphere. 2022 Feb 23;7(1):e0098421 7



Virus exposure, attachment and entry into upper respiratory tract host cells

Virus replication, spread and inflammatory response

Tissue damage and progressive pathology in respiratory tract

Lower respiratory tract infection with virus +/- co-infection with bacteria

Younger age group

Older hospitalized patient with

- immunosuppression or
- multiple co-morbidities including heart and lung disease

Benign course of an upper respiratory viral infection may progress to severe disease

Spaeder MC, Fackler JC. Hospital-acquired viral infection increases mortality in children with severe viral respiratory infection. *Pediatr* Crit Care Med 2011; 12:e317–21

Manchai et al. Hospital acquired viral respiratory tract infections: An underrecognized nosocomial infection. Infection, Disease and Health. 2020;25:175-180

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- Healthcare workers may be affected by respiratory viral infections. Incidence mirrors community transmission rates
 - > Absenteeism and presenteeism in healthcare workers due to respiratory illness
 - > 89% of 152 HCWs reported 1 influenza or respiratory symptom over study period
 - 68% of HCWs worked with symptoms of influenza on some 8.8% of study days*
 - In a prospective study of 170 HCWs, positive viral shedding noted in symptomatic HCWs of which 46% reported working while ill.
 - Respiratory viral infections in HCWs may impact staffing

- Patients may either present with a respiratory viral infection (RVI) from the community or develop nosocomial infection
 - In a single center study over an 8 yr period there were 436 hospital –onset RVIs. Most occurred during the fall-winter months of October to March (315/436, 72.2%)
 - Influenza (124/436, 28.4%),
 - ▶ RSV (84/436, 19.3%),
 - Rhinovirus (114/436, 26.1%)

- > HMPV (40/436, 9.2%),
- > Parainfluenza (52/436, 11.9%),
- Adenovirus (22/436, 5.0%)
- Hospital-acquired respiratory viral infections are associated with increased length-of-stay and high mortality rates, particularly in patients who are elderly, have compromised immune systems, or underlying heart and lung disease

 > 283 patients met definition of hospital acquired viral respiratory infection over the study period (2012-2018). Single center retrospective study in Northern Australia



- The rate of hospital acquired respiratory viral infections increased over study period with younger patients more likely to be admitted to intensive care and need mechanical ventilation.
- A higher mortality was found with individuals in the older age category. The morbidity and mortality did not differ based on the virus type.



In one study, 1 in 5 children admitted to a pediatric intensive care unit (ICU) due to a respiratory viral infection had acquired the infection in the hospital.



These children had an approximately 6-fold increased likelihood of mortality compared with those who had community-acquired respiratory viral infections





SARS-CoV-2 and other respiratory viral infections can be transmitted in the healthcare setting between HCWs and patients in a complex pattern

Cluster map depicting locations, role groups, medical teams, and interconnections among SARS-CoV-2 infected staff members and patients

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Prevent or minimize introduction of respiratory viruses into the healthcare setting





Prevent or minimize transmission of respiratory viruses within the healthcare setting





Prevent or minimize introduction of respiratory viruses into the healthcare setting



Prevent or minimize transmission of respiratory viruses in the healthcare setting



Monitor and Manage III Healthcare Personnel



Healthcare workers should have a simple and clear process that they follow when ill

Facility sick leave policies should be non-punitive and flexible to prevent presenteeism



Vaccination Protects the Workforce and the Patient

nature communications				
Article	https://doi.org/10.1038/s41467-023-41109-9			
Effect of SAR mRNA vaccin susceptibility	S-CoV-2 prior infection and ation on contagiousness and to infection			
Received: 3 February 2023	Denis Mongin @1⊠, Nils Bürgisser @12, Gustavo Laurie³, Guillaume Schimmel³,			
Accepted: 21 August 2023	Diem-Lan Vu ^{1,3,4,9} , Stephane Cullati ⁽¹⁾ ^{6,7} , Covid-SMC Study Group* & Delphine Sophie Courvoisier ^{1,6}			
Published online: 06 September 2023				

50,000+ SARS-CoV-2 positive cases and over 100,000 contacts studied to understand the impact of immune status on the secondary attack rate (SAR)

A vaccinated index case-patient was associated with a lower SAR, when the last dose of vaccination was less than 6 months before the index-contact date

The immunity granted by mRNA vaccines played a significant role in reducing the infectiousness and contributed to decreasing the transmission of SARS-CoV-2.

Vaccination Protects the Workforce and the Patient



The influenza vaccination rate of all employees significantly increased from 56% (8,762/15,693) in 2006-2007 to 94% in 2013-2014 (P < .0001).

The proportion of nosocomial influenza infections significantly decreased (P = .045) during the study period and was significantly associated with increased HCW vaccination rates in the nursing staff (P = .043) and in personnel working in high-risk areas (P = .0497).

Increased HCW vaccination rates were associated with a reduction in the proportion of nosocomial influenza infections in immunocompromised cancer patients.



Respiratory Hygiene and Cough Etiquette

Visible reminders about the need for these practices at entrances and triage or waiting areas

Use CDC Project FirstLine Tools

https://blogs.cdc.gov/safehealthcare/actions-forrespiratory-virus-season/

Provide facemasks, hand sanitizers and tissue disposal receptacles



VCU Virginia Infection Prevention Training Center

Infection Control Actions to stop the spread of viral respiratory infections like influenza, RSV, and COVID-19.



Infection Control Actions to stop the spread of viral respiratory infections like influenza, RSV, and COVID-19.



VCU Virginia Infection Prevention Training Center https://www.cdc.gov/infectioncontrol/projectfirstline/healthcare/print.html#an chor_1646671363779

Broad Communication About Infection Control Practices

		Travel Scree	ning	
ommunicable D	isease Screening			
Have you been in co	intact with someone who	was sick?		
Yes	No / Unsure Una	able to assess 📑		
Do you have any of	the following symptoms?			
None of these	Unable to assess	Abdominal pain	Bruising or ble	D
Cough	Diarrhea	E Fever	Joint pain	
Muscle pain	Rash	Red eye	Severe headac	
Vomiting	U Weakness			
Have you traveled in Yes	ternationally in the last m	nonth? able to assess 🔯		
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Symptom screening should be done with all patient scheduling and at initial point of contact to the health care system (triage or registration



STOP!

If you are experiencing:

- Fever or Chills
- Cough
- Shortness of breath
- Fatigue
- Muscle or body aches
- Headache

- · New loss of taste or smell
- Sore throat
- Congestion or runny nose
- Nausea or vomiting
- Diarrhea

Please REPORT immediately to the registration desk!

Simple, clear and broad messaging to patients seeking care and accompanying visitors to aid in triaging

Administrative and Engineering Controls

Protection of healthcare workers and patients in a congregate setting through physical barriers at the reception, separate triage areas and distancing with seating

Limiting time spent in triage areas and waiting rooms by proactive and creative scheduling processes especially during periods when community spread of respiratory viruses is high

Single patient rooms or cohorting if needed

Working with facility engineers to improve ventilation delivery (eg. ensure air vents are not blocked) and indoor air quality in patient rooms and shared spaces



Source control refers to use of respirators or well-fitting facemasks to cover a person's mouth and nose to prevent spread of respiratory secretions when they are breathing, talking, sneezing, or coughing.

Healthcare workers, patients and visitors

May be considered during:

- Respiratory virus season (e.g., October April)
- Local increases in ED and outpatient visits for influenza-like illness and COVID-19
- Local outbreaks on specific units in a facility



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JAMA Network

JAMA[®]

Clinical Infectious Diseases MAJOR ARTICLE



Universal Mask Usage for Reduction of Respiratory Viral Infections After Stem Cell Transplant: A Prospective Trial

Anthony D. Sung,^{1,a} Julia A. M. Sung,^{2,a} Samantha Thomas,² Terry Hyslop,³ Cristina Gasparetto,¹ Gwynn Long,¹ David Rizzieri,¹ Keith M. Sullivan,¹ Kelly Corbet,¹ Gloria Broadwater,³ Nelson J. Chao,¹ and Mitchell E. Horwitz¹

¹Division of Hematologic Malignancies and Callular Therapy, Duka University Medical Canter, Dunham, ²Division of Infectious Diseases, University of North Carolina at Chepel Hill, and ²Duke Cancer Institute Biostatistics, Duke University Medical Canter, Dunham, North Carolina July 14, 2020

Association Between Universal Masking in a Health Care System and SARS-CoV-2 Positivity Among Health Care Workers

Xiaowen Wang, MD¹; Enrico G. Ferro, MD²; Guohai Zhou, PhD³; et al

» Author Affiliations | Article Information JAMA. 2020;324(7):703-704. doi:10.1001/jama.2020.12897

Pre- pandemic era, prospective study

Nosocomial transmission of respiratory viral infections decreased by 50-60% in a high-risk population when masking compliance rates were high. During the intervention period, the positivity rate decreased linearly from 14.65% to 11.46%

Universal masking was associated with a significantly lower rate of SARS-CoV-2 positivity among HCWs



Sung AD et al. Clin Infect Dis. 2016 Oct 15;63(8):999-1006 Wang et al. JAMA. 2020;324(7):703-704

Strategies	Description	Advantages of the strategy	Disadvantages of the strategy
Symptom-based precautions	Wearing a surgical mask in addition to standard precautions by patients with respiratory symptoms	 Better compliance with policy Lower utilization of supplies Better HCP-patient relationship 	 Does not prevent asymptomatic and presymptomatic transmission Requires high levels of vaccine and infection-induced immunity
Targeted masking	Wearing of a face mask in direct patient contact (either all patients or immunocompromised patients only)	 Better compliance with policy Protection of (vulnerable) patients 	 Does not prevent staff-to-staff transmission Interferes with HCP-patient relationship
Epidemiology- based universal masking	Wearing surgical masks by all staff (clinical and nonclinical), patients, and visitors during high level of community transmission	 Adjustment to the risk of transmission, more acceptable by HCPs Increased adherence and compliance with policy Responsible utilization of supplies 	 Difficult to implement in regions without sentinel data or wastewater surveillance Challenge of back-and-force institution of a radical intervention in a complex environment



Strategies	Description	Advantages of the strategy	Disadvantages of the strategy
Season-based universal masking	Wearing a surgical mask by all staff (clinical and nonclinical), patients, and visitors during seasonal respiratory viral periods	 Adjustment to the theoretical risk of transmission of all respiratory viruses with a seasonal pattern Takes into account the risk of asymptomatic and presymptomatic respiratory infections Prevents hospital functioning 	 Decreased adherence from HCPs during low level of community transmission Not covering non-seasonal respiratory infections Utilization of supplies
Targeted continuous masking	Wearing of a face mask by all HCPs during their entire shifts in areas with patient care	 Prevents HCP-patient and patient- patient asymptomatic and presymptomatic transmission Increased adherence due to consistency of the strategy Prevents presenteeism or absenteeism in clinical areas Mitigates presenteeism in clinical areas Preserves patient safety Maintains clinical activity 	 Utilization of supplies Not preventing staff-to-staff transmission in nonclinical areas Interferes with HCP-patient relationship
Permanent universal masking	Wearing a surgical mask by all staff (clinical and nonclinical), patients, and visitors at any time	 Prevents asymptomatic and presymptomatic transmission in the hospital Prevents absenteeism - Mitigates presenteeism Preserves patient safety Maintains hospital activity 	 Lack of adherence and compliance related to fatigue, discomfort and tolerability Large utilization of supplies

Personal Protective Equipment (PPE)

Droplet Precautions are intended to prevent transmission of pathogens spread through close respiratory or mucous membrane contact with respiratory secretions

The use of the mask is in addition to standard precautions, which includes use of a face shield or goggles as well as gown and gloves if contact with blood/body fluids is possible.

https://www.vdh.virginia.gov/content/uploads/sites/13/2016 /03/LTC_DropletPrecautionsForCareProviders_FAQ.pdf





Infectious agents for which droplet precautions are indicated include B. pertussis, influenza virus, adenovirus, rhinovirus, N. meningitides, and group A streptococcus (for the first 24 hours of antimicrobial therapy).

Personal Protective Equipment (PPE)



Healthcare workers who enter the room of a patient with suspected or confirmed SARS-CoV-2 infection should adhere to

Standard Precautions and

- Use a NIOSH Approved particulate respirator with fit-tested N95 filters or higher
- Gown, gloves, and eye protection (i.e., goggles or a face shield that covers the front and sides of the face)

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Environmental Cleaning



Lobby areas, cafeterias, and waiting rooms are all hightraffic spaces where respiratory viruses can spread.

These areas should be cleaned regularly.

It's also important to disinfect reusable devices and not reuse disposable items.

https://blogs.cdc.gov/safehealthcare/actions-for-respiratory-virus-season/ https://www.cdc.gov/hai/pdfs/HowToReadALabel-Infographic-508.pdf

The Role of Your Public Health Department in Preventing Respiratory Viral Infections in Healthcare Settings

- Keep communication lines open to learn what may be going on in your community – they have surveillance data on multiple conditions including respiratory viral activity
- Education of staff about PPE use donning and doffing, fit-testing
- > Help with resources for outbreak prevention, management and mitigation



The Role of Your Public Health Department in Preventing Respiratory Infections in Healthcare Settings

VIRGINIA REPORTABLE DISEASE LIST

Reporting of the following diseases is required by state law (Sections 32.1-36 and 32.1-37 of the Code of Virginia and 12 VAC 5-90-80 of the Board of Health Regulations for Disease Reporting and Control). Report all conditions when suspected or confirmed to your local health department (LHD). Reports may be submitted by Confidential Morbidity Report Portal (Epi-1 form), computergenerated printout, CDC or VDH surveillance form, or upon agreement with VDH, by means of secure electronic submission.



REPORT IMMEDIATELY

Tuberculosis, active disease (Mycobacterium tuberculosis complex) 🕙 🍘 🏶 ²

Presumptive or Confirmed Tuberculosis (TB) Disease:

Pulmonary or extrapulmonary sites of TB (*Mycobacterium tuberculosis* complex), including **presumptive, laboratory confirmed**, or **clinically diagnosed** TB disease, must be reported to the Virginia Department of Health (VDH) within 24 hours.

How to report:

Presumptive or Confirmed Tuberculosis Disease:

Contact your local health department by phone: http://www.vdh.virginia.gov/local-health-districts/



https://www.vdh.virginia.gov/tuberculosis/

The Role of Your Public Health Department in Preventing Respiratory Infections in Healthcare Settings



Tuberculosis Disease and Latent Tuberculosis Infection Reporting Guidance in Virginia

What to report:

Presumptive or Confirmed Latent Tuberculosis Infection:

Latent tuberculosis infection should be reported to VDH within three days of diagnosis.

- Positive tuberculin skin test (TST) OR
- Positive interferon gamma release assay (IGRA) AND
- TB disease ruled-out (negative chest x-ray, no symptoms of active TB)

WCU Virginia Infection Prevention Training Center

https://www.vdh.virginia.gov/tuberculosis/

The Role of Your Public Health Department in Preventing Respiratory Infections in Healthcare Settings

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		Сорона Санана Пара Санана С
	Latent Tuberculosis Infection (LTBI) Reporting	virginia Latent Tuberculosis Infection (LTBI) Reporting Form
	If you have any questions, please call the VDH Central Diffice 18 Team at 804-864-7089, or small <u>tuberculoside/with.vtPetria.stor</u> .	Please use this form to provide initial or follow-up information for persons with suspected or confirmed LTBL Provider name: Provider affliation: Provider a
DEPAKIMENT	To report a case of LTBI to VDH, please use either the	Provider releptione: ETBL resonance (Erknewn):
	LTRI Case Report Form OR the Confidential Monivolity Report.	🗆 Initial Report 👘 Follow-up Report
Please select your affiliation and what you would like to do from the drop drawn below. You will then be prompted to click a link to take you to the appropriate form.	The LTBI Case Report Form provides an easy way to report LTBI-specific information.	Lasd name First name Middle Date of birth (MM/DC/YYY?) Sea at birth
Please do not click the check mark at the bottom of this screen.	If you use the <u>Confidential Mechalism Record</u> , in the <u>Comments' section</u> , please include additional evaluation and treatment information, including the date and results of chest imaging, additional known risk factors (e.g., HU, TN-alphe endagonists), and treatment regimen and dates.	Address Unit ∉ City or Town State Zip code County of residence
Please choose your affiliation: Livel In Department. *rice precisionale kon-keach Denomination kon-keach Denomination	These forms and further LTBI resources can also be found on the <u>VDH TB molecular</u> ,	Putlent telephone number U.S. born: Country of hirth Month Year arrived in U.S. Occupation Draw Draw Draw Draw Draw Dra
What would you like to do? v Septer Latern TS Motion (LTB)	under the TB infection (LTBI) tab.	Response for the loss of opping in a characteristic strategy of the strat
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Click here to report Latent Tuberculosis infection (LTB).	Latent TB. Active Concern.	$\frac{3}{2} \sum_{i=1}^{n} Correctional facility Long-term care facility Contact investigation Normalize$
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Once you've made your selection, click the link above.		A Local health degr. Faderally qualified fealth center In Other United with the second se
n you nave ony questions, places call the VDP Central Office 15 Team at 894-504-7508, or email ruberculosis@wih.wiginla.gov		E g Risk factors (okań ali ikat apply)
2440	Please do not click the check mark below.	🚆 👼 🔄 Diabates 🗆 Henceless 🖃 Hency Alcohol Uso 🖃 Hencelitis 🗆 End Stage Renal Diseases 🖃 Injecting drug use 🖾 Noninjecting drug use
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In Virginia, latent TB reporting can be done by leveraging the VDH portal



INT

IGRA

Soutum Smax

Summary

Healthcare acquired respiratory viral infections occur frequently especially during the cold and flu season.

Healthcare workers and visitors are can spread respiratory viruses to patients seeking care for other conditions

The very young and elderly can have complications from healthcare acquired respiratory viral infections leading to increased morbidity and mortality

There are multiple proven strategies to mitigate the spread of respiratory viral illness in healthcare settings

The local health department is a partner in preventing respiratory infection outbreaks in healthcare settings.



Use the following infection control measures to prevent and slow the spread of respiratory infections in your facility.



Use of well-fitting masks or respirators, that cover a person's mouth and nose, can prevent the spread of germs when people are breathing, talking, sneezing, or coughing.



Encourage everyone in your facility to get recommended vaccinations. Vaccination is a safe and effective strategy for reducing disease spread and staff absenteeism.



Practice physical distancing, particularly in shared spaces such as waiting rooms, and implement screening and triage procedures. Use signs as visual reminders for patients, implement rapid screening, and separate symptomatic patients as soon as possible.



Practice respiratory hygiene and cough etiquette and encourage others to do the same. Provide masks, tissues, and no-touch receptacles for tissue disposal at facility entrances, triage areas, and waiting rooms.



Clean your hands regularly with an alcohol-based hand sanitizer or soap and water. Share key messages and reminders within in your facility by using CDC's <u>Clean Hands Count</u> resources.



Clean and disinfect regularly. Lobby areas, cafeterias, and waiting rooms are all high-traffic spaces where germs can spread. It's also important to disinfect reusable devices and not reuse disposable items.



Check that the air handling in your facility is functioning as it should. Make sure air vents aren't blocked, and consult with facilities management to ensure the heating, ventilation, and air conditioning, or HVAC, system is working efficiently for proper ventilation.

www.cdc.gov/ProjectFirstline

WE HAVE THE POWER TO STOP INFECTIONS. TOGETHER.



Thank You

Urginia Infection Prevention

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