Infection Control & Hospital Epidemiology (2025), 1–2
doi:10.1017/ice.2025.43

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Letter to the Editor

Nosocomial or community-acquired? A comparison of healthcare-associated infection definitions and maximum incubation periods of common respiratory viral infections at a large academic hospital

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Introduction

Healthcare-associated infections (HAI) represent a public health risk among patients who receive care at healthcare facilities and are categorized as a public health emergency in North Carolina.[1] To prevent these infections, great strides have been made to conduct surveillance of HAI and to guide the development of preventive measures. According to the standardized definitions of HAI, as provided by the National Healthcare Safety Network (NHSN), a healthcare-associated infection is defined as an infection that occurs at least 2 calendar days after admission to a healthcare facility.[2] However, the incubation periods of several epidemiologically important pathogens exceed this 2-calendar day infection window period. This definition could result in several community-acquired respiratory viral infections (CA-RVIs) being misclassified as healthcare-associated RVIs (HA-RVIs), potentially confounding analysis and subsequent intervention steps.

This evaluation will describe pathogens most commonly associated with HA-RVI, compare documented incubation periods to duration of patient stay, and discuss the implications for timing used in the current HAI case definition.

Methods

At a large academic hospital (>950 beds), we compared data on healthcare-associated infections caused by respiratory viral pathogens by fiscal year 2019–2024 (July 2018 through June 2024).

Patients were included in the study if they met the National Healthcare Safety Network surveillance definition for a healthcare-associated infection with positive tests for these respiratory viruses: influenza A (subtypes H3, H1, H1N1pdm), influenza B, rhinovirus and/or enterovirus, respiratory syncytial virus (RSV), human coronavirus, and SARS-CoV-2. Laboratory testing was performed using a polymerase chain reaction-based Food and Drug Administration BioFire FilmArray Respiratory Panel 2.1 assay. Analysis was performed by isolate, that is patients with multiple pathogens identified on viral testing had each unique virus included. We reviewed the following descriptive variables for each case from our electronic infection prevention database: pathogens responsible for infection and duration of stay before symptomatic infection onset. Maximum incubation periods for each evaluated pathogen were also used for this analysis.

SAS 9.4 was used to analyze de-identified HA-RVI case data. HA-RVI incidence and duration of hospitalization prior to HA-RVI onset were calculated.

Results

There were 452 HA-RVIs that occurred between July 2018 and June 2024. Five pathogens were responsible for 92% of these infections: SARS-CoV-2 (34.1%), rhinovirus/enterovirus (32.5%), influenza viruses (8.4%), respiratory syncytial virus (8.0%), and human coronavirus (8.6%). Among all HA-RVI caused by these pathogens, 66.4% occurred within the first 3 weeks of admission.

Table 1 provides an overview of the incubation periods for each of these pathogens as well as the percentage of these pathogens that occurred within the maximum range of their respective incubation periods. Because current testing methods cannot differentiate between rhinovirus and enterovirus, the incubation periods for both pathogens were included in this analysis.

As seen in Table 1, as much as a third to half of the HA-RVI cases with rhinovirus/enterovirus and human coronavirus occurred within the maximum incubation period. However, several viruses – influenza, SARS-CoV2 and RSV had only a minority (<15%) of the HA-RVI cases occurring within the maximum incubation period.

Discussion

Our evaluation demonstrates that the majority of HA-RVI occur in the first 3 weeks after hospital admission. The first week (3–7 days) after hospital admission represents the time window with the highest proportion for HA–RVI caused by influenza, SARS-CoV-2, rhinovirus/enterovirus, or human coronavirus. This trend could be reflective of national length of stay distributions in United States Hospitals, with an average duration of 5.5 days as of 2018.[8] Regardless, when comparing this data to the incubation periods for these pathogens, the short length of time used in the current HAI case definition may not always differentiate between viral infections that are healthcare-associated compared to infections that are present or incubating on admission. This intermingling of infections attributed to healthcare and community is especially true for viruses

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Cite this article: Butcher DR, DiBiase L, Sickbert-Bennett E. Nosocomial or community-acquired? A comparison of healthcare-associated infection definitions and maximum incubation periods of common respiratory viral infections at a large academic hospital. *Infect Control Hosp Epidemiol* 2025. doi: 10.1017/ice.2025.43

Table 1. Percentage of HA-RVI's that occurred within the incubation period for a CA-RVI[a]

Virus	Incubation period	Percentage
Rhinovirus/ Enterovirus	2–10 days[3]	39.5%
	2–14 days[3]	55.1%
Human Coronavirus	2–10 days[4]	35.9%
Respiratory Syncytial Virus	2–8 days[5]	13.9%
SARS–CoV-2	7 days[6]	13.6%
Influenza	1–4 days[7]	0%

[a]CA-RVI: community-acquired respiratory viral infection, HA-RVI: healthcare-associated respiratory viral infections.

with longer incubation times, such as human coronavirus or rhinovirus/enterovirus.

Incorporating HA-RVI into surveillance programs for healthcare facilities is critically important for facilities to understand the impact and need for respiratory viral prevention strategies. However, current Centers for Disease Control and Prevention NHSN case definitions for surveillance of healthcare-associated respiratory infections may be overly sensitive for viral infections with relatively long incubation periods. The high sensitivity of current definitions may lead to misclassification bias with a higher degree of community-associated infections being designated as healthcare-associated. This misclassification may confound epidemiologic analysis and may over-emphasize the role of in-hospital prevention strategies. No studies to date have thoroughly described the epidemiology of HA-RVI that compares timing of infection to documented incubation periods. More studies may be beneficial to fully explore the implications of current NHSN definitions on the designation of infections as community-associated or healthcare-associated. A more clinically relevant standardized HA-RVI definition is essential for understanding HA-RVI impact and opportunities for prevention across healthcare settings.

Acknowledgments. The authors state no conflict of interest. No outside funding was provided for this evaluation.

References

1. North Carolina Department of Health and Human Services. *Diseases & Topics: Healthcare-Associated Infections (HAIs)*. Raleigh, NC: NCDHHS; North Carolina Department of Health and Human Services; 2024.
2. National Healthcare Safety Network. *Identifying Healthcare-associated Infections (HAI) for NHSN Surveillance*. Atlanta, GA: NHSN: National Healthcare Safety Network; Centers for Disease Control and Prevention; 2024.
3. American Academy of Pediatrics. Section 3: summary on infectious diseases. In: Pickering LK, Baker CJ, Kimberlin DW, Long SS, (eds.), *Red Book: 2012 Report of the Committee on Infectious Diseases*. Elk Grove Village, IL: American Academy of Pediatrics; 2012.
4. American Academy of Pediatrics. Section 3: summary on infectious diseases. In: Pickering LK, Baker CJ, Kimberlin DW, Long SS, (eds.), *Red Book: 2012 Report of the Committee on Infectious Diseases*. Elk Grove Village, IL: American Academy of Pediatrics; 2012.
5. American Academy of Pediatrics. Section 3: summary on infectious diseases. In: Pickering LK, Baker CJ, Kimberlin DW, Long SS, (eds.), *Red Book: 2012 Report of the Committee on Infectious Diseases*. Elk Grove Village, IL: American Academy of Pediatrics; 2012.
6. Wu Y, Kang L, Guo Z, Liu J, Liu M, Liang W. Incubation period of COVID-19 caused by unique SARS-CoV-2 strains: a systematic review and meta-analysis. *JAMA Network Open* 2022;5:e2228008.
7. American Academy of Pediatrics. Section 3: summary on infectious diseases. In: Pickering LK, Baker CJ, Kimberlin DW, Long SS, (eds.), *Red Book: 2012 Report of the Committee on Infectious Diseases*. Elk Grove Village, IL: American Academy of Pediatrics; 2012.
8. Tipton K, Leas BF, Mull NK, *et al. Interventions to Decrease Hospital Length of Stay*. Rockville (MD): Agency for Healthcare Research and Quality (US); 2021.

https://doi.org/10.1017/ice.2025.43 Published online by Cambridge University Press