

Respiratory Syncytial Virus Outbreak in a Veterans Affairs Long-term Care Facility

Nancy Barrett, RN, MS, CIC,* Lisa Bailey, RN, BSN, MS, CIC,* Florence Ford, RN, BSN, MSN,*
Monique Thorne, EdD, MS, RN-BC,* Nancy Azab, MBCCH,† Beth LeMaitre, MT,‡
Zeena Lobo, MD,§, and George Psevdos, MD§

Background: Respiratory syncytial virus (RSV) is increasingly becoming an important cause of respiratory infections in adults, especially those living in long-term care facilities (LTCFs). Seasonal outbreaks peaking from October to April are common. We report an outbreak of RSV involving 2 LTCFs with total capacity of 80 beds in 2019.

Methods: Retrospective chart review of cases identified with positive RSV infection via DNA polymerase chain reaction (PCR) from January 24 to February 24, 2019, at 2 LTCF units, in close proximity to each other, at Northport Veterans Affairs Medical Center.

Results: Twenty veterans (18 men and 2 women) tested positive for RSV by rapid PCR. The median age was 73 (47–89) years, 85% are Caucasian, and 5 patients had temperature of greater than 100°F (100°F–102.4°F). All had rhinorrhea and 65% had cough. Medical history shows 45% with dementia, 30% with stroke, and 35% with diabetes; 2 patients on hemodialysis; and 2 patients with chronic obstructive pulmonary disease (COPD). Four patients required hospitalization, and 2 of them required admission to intensive care unit. Length of stay ranged from 1 to 9 days. One patient with COPD required mechanical ventilation. One patient with computed tomography finding of airway impaction had antibiotics stopped by infectious diseases consult, yet he developed *Clostridium difficile* diarrhea. No deaths were observed, and all patients recovered. Aggressive infection control measures were implemented.

Conclusions: Respiratory syncytial virus is highly infectious and can easily cause an outbreak in an LTCF. Polymerase chain reaction testing was contributory to identify cases rapidly. Rapid PCR results and intensified infection control measures were instrumental to halt the outbreak.

Key Words: respiratory syncytial virus, veterans, long-term care facility, polymerase chain reaction testing

(*Infect Dis Clin Pract* 2020;00: 00–00)

Respiratory syncytial virus (RSV) is an RNA virus commonly active in the winter time affecting persons of all ages.¹ It can cause serious lower respiratory tract infections in older adults with comorbidities or immunosuppressed status, leading to an increasing number of hospitalizations.² In fact, RSV is the culprit for nearly 10,000 deaths annually in persons older than 65 years in the United States.^{3,4} Infectious outbreaks in long-term care facilities (LTCFs) are frequent (estimated in the thousands per year) with respiratory and gastrointestinal infections being the most common.^{5,6} Respiratory syncytial virus was first recognized as a cause of outbreaks in nursing homes in the late 1970s and mid-1980s.^{1,7} With the advent of new diagnostic modalities, such as reverse transcriptase polymerase chain reaction (PCR), accurate

and rapid diagnosis of RSV outbreaks in LTCFs can be achieved, allowing for appropriate infection control measures and antimicrobial stewardship.⁸ We describe an outbreak of RSV in an LTCF occurring in the month of February 2019.

METHODS

Northport Veterans Affairs Medical Center provides a hospital-based acute care facility for US veterans, as well as long-term/extended nursing home care. Our nursing homes are currently structured as community living centers (CLCs), a 139 total bed capacity. Community living center is divided in 4 areas, CLC1 to 4, which includes mental health and hospice care. The RSV outbreak involved CLC1 and CLC2, both totaling 80 beds. Veterans are eligible to live in CLC 1 and 2 for nursing home care if they have service-connected disability (70% or more)—a disability compensation assigned to veterans by the Department of Veterans Affairs based on injury or illness that incurred or was aggravated during active military service.

The RSV outbreak occurred from January 24 to February 24, 2019, in CLC1 and CLC2. A case of RSV infection was defined as a CLC resident who developed upper respiratory symptoms (rhinorrhea, cough) and tested positive for RSV. Health care worker cases were defined as probable RSV cases if they developed upper respiratory symptoms at any time during the outbreak period. Respiratory syncytial virus infection was diagnosed with rapid real-time PCR respiratory virus panels. Patients with symptoms had a nasopharyngeal swab performed at the bedside, and PCR (Cepheid, Sunnyvale, CA; which detects influenza A, influenza B, and RSV) was run in our microbiology laboratory with a usual turnaround time being 2 hours. The geriatric team had the discretion to obtain nasal swabs on patients without symptoms (usually in close proximity to ones with positive results) to possibly identify asymptomatic carriage and cohort patients accordingly.

All data during this outbreak were collected as part of health care epidemiology from our infection control/infectious diseases specialists, in effort to stop the outbreak. Our institutional review board determined that the description of the outbreak did not involve human subjects' research and required no further institutional review board review or approval.

The outbreak was started on February 9. The infection control nurse recognized a cluster of veterans (5 in total) who tested positive for RSV over the weekend after February 9. The unit nurse managers and geriatricians were promptly notified by February 11 and educated on RSV by the infection control nurse manager. No new cases were identified until February 16. Three new cases occurred over the President's days holiday weekend. The infection control team initiated an intensified infection prevention program right after the holiday: the team began investigating any epidemiologic link between residents, their activities in the units, and their health care providers. Strict infection control measures were implemented, which included daily environmental rounds (the infection control nurses visited the units daily), enforcing strict hand hygiene and universal mask precautions (droplet precautions) and contact

From the *Division of Nursing, Infection Control, Veterans Affairs Medical Center, Northport; †Infectious Diseases, Stony Brook University Hospital, Stony Brook; ‡Department of Microbiology, and §Division of Infectious Diseases, Veterans Affairs Medical Center, Northport, NY.

Correspondence to: George Psevdos, MD, Division of Infectious Diseases, Veterans Affairs Medical Center, 79 Middleville Rd, Northport, NY 11768. E-mail: george.psevdos@va.gov.

The authors have no funding or conflicts of interest to disclose. Copyright © 2020 Wolters Kluwer Health, Inc. All rights reserved. ISSN: 1056-9103

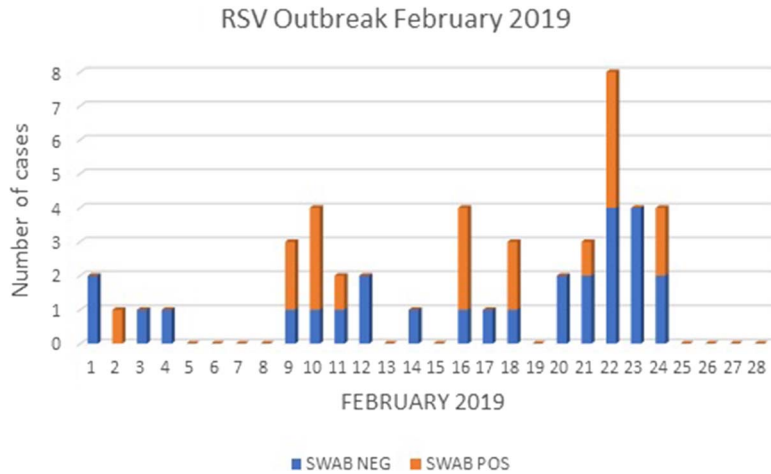


FIGURE 1. Dates of positive and negative RSV tests in February 2019.

precautions (use of gloves/gowns) for all health care personnel assigned to each suspected or confirmed RSV case. A geographic and staff cohort was enforced, where RSV-infected patients were relocated to either private rooms or grouped in double occupancy rooms. Floating of staff was discouraged, and ill employees were requested to stay home. New admissions to CLC1/2 and group activities were temporarily halted. Visitors were required to wear masks, and infection control nurses provided education to patients and

family members regarding this outbreak to ensure compliance with infection control measures.

RESULTS

Between January 24 and February 24, 2019, 20 veterans (18 men and 2 women) tested positive for RSV, and 22 tested negative. Figure 1 shows the positive and negative RSV tests in February. Figure 2 depicts the bed outline of CLC 1 and CLC2 and the

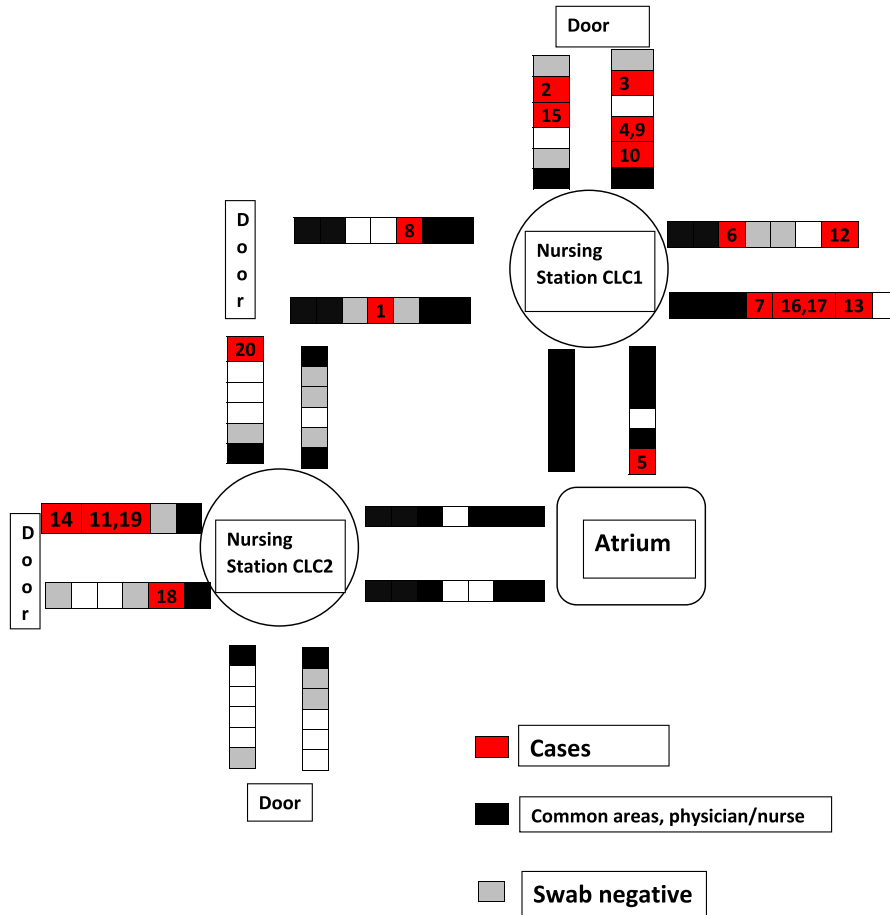


FIGURE 2. Distribution of RSV cases in the CLC 1 and CLC 2 during the outbreak.

TABLE 1. Clinical Characteristics of RSV-Positive and RSV-Negative Patients

Characteristic	RSV Positive (n = 20)	RSV Negative (n = 22)
Age, median (range), y	73 (47–89)	72 (61–89)
Men	18	21
Women	2	1
Caucasian, %	85	95
Fever >100°F (range)	5 Patients (100°F–102.4°F)	3 Patients (100.1°F–102.9°F)
Rhinorrhea, %	100	9
Cough, %	65	14
Dementia, %	45	36
History of stroke, %	30	14
Diabetes, %	35	32
Hemodialysis, %	10	5
COPD, %	10	9
Heart failure %	15	5
Hospitalization	4	4
ICU stay	2	0

ICU indicates intensive care unit.

location of positive cases in numerical sequence (15 cases in CLC1, 5 cases in CLC2). Table 1 shows the characteristics for the RSV-positive and RSV-negative patients. Four patients with RSV were hospitalized. Their length of stay ranged from 1 to 9 days. One patient with history of emphysema required mechanical ventilation; his chest x-ray showed a retrocardiac opacity and was treated with antibiotics. Five patients had chest x-rays, and 1 had a computed tomography scan that showed no pneumonia. No specific antiviral therapy was given, and all cases recovered. There were no deaths associated with this outbreak. The antimicrobial stewardship program requested antibiotics to be stopped in 2 cases, but 1 patient still developed diarrhea due to *Clostridium difficile*. Four patients who were RSV negative required hospitalization. All 4 patients had additional testing for respiratory viruses, with multiplex PCR (Biofire Filmarray; bioMérieux, Cambridge, MA) and were found to be negative. One patient was diagnosed with heart failure, 1 with metastatic cancer, and 1 with exacerbation of chronic obstructive pulmonary disease (COPD). No health care workers were identified with upper respiratory symptoms in CLC1; 2 workers from CLC2 were asked to stay home. No health care worker underwent testing for RSV.

DISCUSSION

We investigated an outbreak of RSV respiratory viral infections in veterans living in 2 CLCs that exist in close proximity to each other. The first case of RSV was noted in January 24. New cases of RSV were detected on Saturday, February 9, with 5 new cases seen over the weekend. The incubation period for naturally occurring RSV infection is typically 2 to 8 days. By closely reviewing Figure 2, the epidemiologic analysis of this outbreak likely suggests propagated spread of RSV between patients and health care workers via exposure to symptomatic individuals and possibly to those who were asymptomatic carriers. Birger et al⁹ demonstrated in a large study of 2685 individuals in New York city, over half of the adult participants had asymptomatic shedding of respiratory viruses. Transmission between patients was likely aided in the beginning of the outbreak due to sharing of double occupancy rooms and due to participation in group activities. No

new cases were identified until the weekend of February 16. Stringent infection control measures were implemented after the President's day holiday, with daily environmental rounds, with higher audits for hand hygiene, relocating positive patients either to single rooms or grouping to double occupancy rooms, halting new admissions, and, the most unpopular, halting group activities. The success of our measures would not have been possible without the early detection and prompt identification of the cases. The results of our rapid influenza A/B/RSV tests were available within 2 hours. Rapid detection of cases was instrumental to halt the RSV outbreak in an adult stem-cell transplant unit involving 14 patients and 5 health care workers.¹⁰ Clinical pneumonia in our cohort was recognized only in 1 case with positive RSV. Sorvillo et al⁷ described an outbreak of RSV in a nursing home where pneumonia occurred in 55% of the affected patient, whereas Osterweil and Norman¹¹ reported only 5% of pneumonia in their outbreak. Pneumonia, nevertheless, is the second most common cause of infection among nursing home residents, especially those with COPD and heart failure.¹² In our cohort of RSV cases, COPD and heart failure were present in 10% and 15%, respectively; the case of pneumonia was observed in a patient with COPD who required mechanical ventilation. One limitation of our investigation is that no nasopharyngeal swabs were performed for health care workers with mild symptoms or no symptoms and without fever. Such workers could have chosen to continue working, thus spreading the infection in the units. Russell et al¹³ provided a thorough review on the human immune response to RSV infection: natural infection to RSV results in incomplete immunity allowing for recurrent infections in adults especially the elderly; however, RSV immunoglobulin G and immunoglobulin A antibodies, if they persist, are protective. It is possible that some of our residents had immunity, so they did not acquire the virus; however, we did not obtain RSV antibodies in our cohort.

In conclusion, RSV is currently considered an important respiratory pathogen in older adults and has the potential to cause serious outbreaks in nursing homes. When RSV outbreaks occur in LTCFs, swift detection by rapid PCR from nasopharyngeal swabs and implementation of strict infection control measures are pivotal for their elimination. Indeed, infection control nurses are the unsung heroes of the first line of defense, not only in the protection of vulnerable nursing home residents from RSV but also in providing valuable education of infection control measures for staff and patients' families, thus relieving stress and anxieties that can encompass such respiratory outbreaks.

ACKNOWLEDGMENT

The authors would like to thank Dr Asrat Tesfa for reviewing our article.

REFERENCES

1. Falsey AR. Respiratory syncytial virus infection in adults. *Semin Respir Crit Care Med.* 2007;28:171–181.
2. Talbot HK, Belongia EA, Wash EE, et al. Respiratory syncytial virus in older adults a hidden annual epidemic. *Infect Dis Clin Pract.* 2016;24:295–302.
3. Pastula ST, Hackett J, Coalson J, et al. Hospitalizations for respiratory syncytial virus among adults in the United States, 1997–2012. *Open Forum Infect Dis.* 2017;4:ofw270.
4. Thompson WW, Shay DK, Weintraub E, et al. Mortality associated with influenza and respiratory syncytial virus in the United States. *JAMA.* 2003;289:179–186.
5. Strausbaugh LJ, Sukumar SR, Joseph CL. Infectious disease outbreaks in nursing homes: an unappreciated hazard for frail elderly persons. *Clin Infect Dis.* 2003;36:870–876.

6. Utsumi M, Makimoto K, Quroshi N, et al. Types of infectious outbreaks and their impact in elderly care facilities: a review of the literature. *Age Ageing*. 2010;39:299–305.
7. Sorvillo FJ, Huie SF, Strassburg MA, et al. An outbreak of respiratory syncytial virus pneumonia in a nursing home for the elderly. *J Infect*. 1984;9:252–256.
8. Caram LB, Chen J, Taggart W, et al. Respiratory syncytial virus outbreak in a long-term care facility detected using reverse transcriptase polymerase chain reaction: an argument for real-time detection methods. *J Am Geriatr Soc*. 2009;57:482–485.
9. Birger R, Morita H, Comito D, et al. Asymptomatic shedding of respiratory virus among an ambulatory population across seasons. *mSphere*. 2018;3:e00249–e00218.
10. Kelly SG, Metzger K, Bolon MK, et al. Respiratory syncytial virus outbreak on an adult stem cell transplant unit. *Am J Infection Control*. 2016;44:1022–1026.
11. Osterweil D, Norman D. An outbreak of an influenza-like illness in a nursing home. *J Am Geriatr Soc*. 1990;38:659–662.
12. Smith PW, Bennett G, Bradley S, et al, Society for Healthcare Epidemiology of America (SHEA); Association for Professionals in Infection Control and Epidemiology (APIC). SHEA/APIC guideline: infection prevention and control in the long-term care facility. *Am J infect control*. 2008;36:504–535.
13. Russell CD, Unger SA, Walton M, et al. The human immune response to respiratory syncytial virus infection. *Clin Microbiol Rev*. 2017;30:481–502.