MAJOR ARTICLE

Medically Attended Respiratory Syncytial Virus Infections in Adults Aged ≥50 Years: Clinical Characteristics and Outcomes

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Background. Few studies have examined respiratory syncytial virus (RSV) infections in adults. We assessed the characteristics and outcomes of RSV relative to other viral infections.

Methods. Patients ≥50 years old with acute respiratory illness were recruited for studies of influenza vaccine effectiveness from 2004 through 2010. Nasopharyngeal swabs from enrollees were analyzed for the presence of RSV and other respiratory viruses by multiplex reverse transcription polymerase chain reaction. Clinical data were obtained from interview and medical records.

Results. A total of 2225 samples were tested across all seasons. The mean age was 64.2 (SD, 10.7) years; the mean interval from illness onset to sample collection was 4 (SD, 2.2) days. One or more viruses were detected in 1202 (54%) participants. In a multivariable logistic regression model, RSV was associated with ages 65–79 years (vs 50–64 years), symptoms of cough, nasal congestion and wheezing, and longer interval from illness onset to clinical encounter. RSV was not associated with the presence of chronic obstructive pulmonary disease or congestive heart failure in univariate analyses. Hospital admission within 30 days after illness onset was less common among patients with RSV compared to those with influenza (unadjusted odds ratio = 0.54 [95% confidence interval, .29–1.01], $P = .06$).

Conclusions. RSV is a common cause of acute respiratory illness in adults aged ≥50 years; the risk of infection increases with age. Delays in healthcare seeking and reduced risk of hospital admission in patients with RSV suggest a milder course of illness relative to influenza.

Keywords. respiratory syncytial virus; acute respiratory infection; adults.

Respiratory syncytial virus (RSV) is a significant cause of acute respiratory illness in young children as well as in older adults [1]. Limited evidence suggests that RSV may infect between 3% and 7% of healthy, community-dwelling older adults annually [2] and cause approximately 10% of winter hospital admissions for older adults [3]. In one study, RSV and influenza were identified in similar proportions among adults who were hospitalized with acute respiratory illness, but patients with RSV were older and more likely to be immunocompromised [4]. Time-series models that account for periods of virus circulation suggest that the number of deaths attributable to RSV may be almost as high as those due to influenza A, although year-to-year variability is greater for influenza [5].

Few studies have described RSV infections and coinfections with other respiratory viruses among adults in the outpatient setting [2, 6, 7]. Diagnostic testing for RSV is not routinely performed in adult outpatients, and highly sensitive and specific molecular methods for detecting multiple virus targets have not been widely used. The objective of this study was to describe the occurrence, clinical features, and outcomes of RSV infection among adults aged ≥50 years who provided a nasal swab for influenza testing during 6 influenza seasons and the 2009 influenza pandemic period.

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METHODS

Setting and Participants

We analyzed respiratory swab samples from patients with acute respiratory illness who participated in previous studies of influenza vaccine effectiveness from 2004–2005 through 2009–2010. The details of these studies have been previously published [8–10]. In brief, patients with medically attended acute respiratory illness (MAARI) were enrolled each season from a cohort of community-dwelling individuals living in or near Marshfield, Wisconsin [11]. All individuals aged ≥50 years were eligible to be enrolled with MAARI during every season except the 2004–2005 season. During that season, all individuals aged ≥65 years were eligible for enrollment, and individuals aged 50–64 years were eligible if they had at least 1 high-risk chronic medical condition according to Advisory Committee on Immunization Practices criteria [12].

Each season, enrollment occurred during periods of local influenza circulation. This generally corresponded to the months of January through March, but the onset of the 2005–2006 season was delayed and all enrollments for that season occurred in March and April. In response to the 2009 influenza pandemic, limited enrollment continued during the spring, summer, and early fall months of 2009. Maximum recruitment efforts resumed during the pandemic wave in October and November 2009. For every season, the study enrollment period included the peak week of RSV infection in Wisconsin (defined by diagnostic testing at the Wisconsin State Laboratory of Hygiene) [13].

Patients were actively screened and recruited by research staff during or after an outpatient or inpatient encounter for acute respiratory illness. During the first 3 seasons (2004–2005 through 2006–2007), patients with any acute respiratory illness were eligible for enrollment, including those who did not have fever or influenza-like illness. During subsequent seasons, enrollment and testing were restricted to those patients with a respiratory illness and at least 1 of the following symptoms: feverishness, chills, or cough. Potential participants with illness duration ≥7 days (or >10 days in 2004–2005 through 2006–2007) were excluded to minimize false-negative test results. Research coordinators used an electronic appointment system to screen chief complaints and identify potential participants in primary care departments at the Marshfield Clinic main campus and a satellite clinic. Eligible patients were also recruited from the emergency department and at the time of admission to the only acute care hospital serving the study population (St Joseph's Hospital). Many patients who were not approached during the clinical encounter were contacted by phone on the following day if they received an *International Classification of Diseases, Ninth Revision* diagnosis code indicating acute respiratory illness; a swab was obtained from those who were eligible and consented.

Each adult participant was interviewed at the time of enrollment to determine illness onset date and symptoms. Nasopharyngeal swabs were obtained and placed in M4-RT viral transport media for reverse transcription polymerase chain reaction (RT-PCR) testing. After influenza testing was complete, sample aliquots were stored at −70°C until the current study was initiated to identify other respiratory viruses.

Laboratory

Archived samples were batch-tested for the presence of respiratory virus nucleic acid using a multiplex respiratory virus panel (eSensor Respiratory Viral Panel, GenMark Diagnostics, Carlsbad, California). This multiplex panel tested for RSV A and B, human rhinovirus, human metapneumovirus, parainfluenza viruses 1–4, influenza A and B (including H3N2, seasonal H1N1, and pandemic H1N1 subtypes of influenza A), coronaviruses OC43, NL63, HKU1, and 229E, and adenoviruses B and E. Nucleic acid was extracted from the swabs using the Roche MagnaPure 2.0 system and was then amplified using RT-PCR with target-specific primers. Target-specific signals were determined by voltammetry, a process which generates electrical signals from ferrocene-labeled signal probes.

We validated the GenMark multiplex assay for influenza and RSV A and B against singleplex assays approved by the Centers for Disease Control and Prevention, and sensitivity of the multiplex assay was 97%, 93%, and 98%, respectively, for detection of influenza A, influenza B, and RSV (unpublished data). Specificity of the multiplex assay relative to singleplex was 97%, 99%, and 99%, respectively. Other investigators have reported 99% overall agreement between the GenMark multiplex assay and corresponding singleplex real-time PCR for respiratory viruses in children [14].

Statistical Analysis

We analyzed factors associated with RSV-positive illness using 2 different comparison groups: all RSV-negative individuals and all influenza-positive individuals. Individuals with influenza and RSV coinfection were excluded from the latter analysis. For each analysis, clinical features of illness and host characteristics were evaluated. Univariate comparisons were performed using χ^2 or Fisher exact tests (for categorical variables) or *t* tests (for continuous variables) as appropriate. For the analysis of RSV-positive and RSV-negative illnesses, a multivariable logistic regression model was created with RSV result (positive–negative) as the dependent variable. For the comparison of RSV and influenza, the dependent variable was RSV positive vs influenza positive. Covariates in the regression models included age group (50–64, 64–79, or ≥80 years), sex, presence of specific acute respiratory illness symptoms (cough, wheezing, and/or nasal congestion), presence of chronic lung disease, and the interval (days) between symptom onset and date of swab. Grouping of

age categories was based on clinical relevance as well as sample size in each group. Smoking status was not available for most seasons and was not included in the analysis. Hospital admissions within 30 days after illness onset were compared for patients with RSV infection and influenza, but the number of hospital admissions was insufficient for multivariable analysis; analysis of variance (ANOVA) was used to compare the age distributions among hospitalized patients. All statistical analyses were conducted using SAS software, version 9.2 (SAS Institute, Cary, North Carolina).

This study was reviewed and approved by the Marshfield Clinic Institutional Review Board (IRB). During each season, all study participants provided informed consent for influenza testing. Multiplex RT-PCR testing to detect additional viruses was subsequently approved by the IRB with a waiver of informed consent.

RESULTS

Residual swab samples were available for 2225 study participants aged ≥50 years from the 2004–2005 through 2009–2010 influenza seasons. The number of samples per season ranged from 195 in the 2005–2006 season to 455 in the 2009–2010 season. The mean age was 64.2 (SD, 10.7) years and 792 (40%) were male. A single respiratory virus was detected in approximately 50% of participants, and multiple viruses were uncommon (Table 1). The most commonly detected single virus was influenza (17% of participants), followed by human rhinovirus (10%), RSV (8%), and human metapneumovirus (7%). The RSV-positive samples were equally divided between RSV A (n = 102) and RSV B (n = 102). The most common combinations of multiple virus detection were influenza/coronavirus (n = 8 [0.4%]) and RSV/coronavirus (n = 9 [0.4%]). Two individuals had 3 viruses detected; 5 study participants had simultaneous RSV and influenza infection.

Table 1. Virus Targets Detected by Reverse Transcription Polymerase Chain Reaction in Respiratory Swabs From Study Participants

Infection Type	No.	%
Single respiratory virus infection		
Adenovirus	2	0.1
Coronavirus	134	6.0
Influenza	377	16.9
Human metapneumovirus	144	6.5
Parainfluenza virus	93	4.2
Respiratory syncytial virus	184	8.3
Human rhinovirus	218	9.8
Multiple viruses detected	50	2.3
No virus detected	1023	46.0
Total	2225	100.0

Factors Associated With RSV-Positive Illness

Participants with and without RSV did not significantly differ by age group, sex, or presence of specific chronic diseases in univariate comparisons (Table 2). The interval from illness onset to clinical encounter (enrollment) was significantly longer for those who were RSV positive vs RSV negative, consistent with a delay in seeking healthcare among those who were RSV-positive. Cough was present in 93% of all study participants, and RSV-positive individuals were significantly more likely to report cough, wheezing, and nasal congestion compared to those without RSV. Other symptoms did not vary significantly according to RSV status. RSV positivity varied significantly by season, and the proportion with RSV was highest in 2009–2010 (26%) and lowest in the 2009 pandemic period, which included the summer and fall of 2009 (0%).

In multivariate analyses excluding coinfections with RSV and influenza, age group and symptoms of cough, nasal congestion, and wheezing were all significantly associated with RSV-positive illness (Table 3). RSV-positive illness was not significantly associated with sex or presence of chronic obstructive pulmonary disease (COPD) or congestive heart failure. A longer interval from symptom onset to clinical encounter (and swab collection) was significantly associated with RSV infection in the multivariable model.

Illnesses caused by RSV group A and RSV group B were similar with the exception of wheezing (Table 4). This symptom was reported by 74% of those with RSV A illness and 60% of those with RSV B illness ($P = .03$). The distribution of age, sex, and host characteristics was similar for those with RSV group A and group B infections.

RSV-Positive vs Influenza-Positive Illness

The characteristics of patients with RSV and influenza were compared in a multivariable logistic regression model. RSV was significantly associated with older age and longer interval from illness onset to clinical encounter (Table 5). The only symptom that distinguished RSV from influenza was nasal congestion, which was present in 90% of patients with RSV and 80% of those with influenza. The proportion with wheezing was similar in patients with RSV and those with influenza.

Hospital Admissions

Two hundred sixty-four patients (12%) were hospitalized within 30 days after illness onset. Of those, 137 (51%) were female; 48 (18%) had chronic lung disease, and 54 (20%) had congestive heart failure. The risk of hospital admission was compared for patients with influenza and RSV after excluding 5 individuals who were infected with both viruses. Hospital admission occurred within 30 days after illness onset in 14 of 199 (7%) patients with RSV, 48 of 391 (12%) with influenza, and 202 of 1630 (12%) with neither virus; these comparisons

Table 2. Characteristics of Study Participants According to Respiratory Syncytial Virus Infection Status

Characteristic	Total (N = 2225)	RSV Positive (n = 204)	RSV Negative (n = 2021)	*P* Value[a]
Age, mean ± SD	64.3 ± 10.7	65.8 ± 11.0	64.1 ± 10.6	.04
Age group, No. (%)				
50–64 y	1233 (55.4)	101 (49.5)	1132 (56.0)	.20
65–79 y	749 (33.7)	77 (37.8)	672 (33.3)	
≥80 y	243 (10.9)	26 (12.8)	217 (10.7)	
Female sex, No. (%)	1353 (60.8)	124 (60.8)	1229 (60.8)	.99
Time from symptom onset to swab, d, mean ± SD	4.0 ± 2.2	4.5 ± 1.9	4.0 ± 2.2	<.01
Influenza season, No. (%)				<.0001
2004–2005	326 (14.7)	15 (7.4)	311 (15.4)	
2005–2006	195 (8.8)	24 (11.8)	171 (8.5)	
2006–2007	271 (12.2)	26 (12.8)	245 (12.1)	
2007–2008	342 (15.4)	41 (20.1)	301 (14.9)	
2008–2009	316 (14.2)	46 (22.6)	270 (13.4)	
2009 pandemic	320 (14.4)	0 (0)	320 (15.8)	
2009–2010	455 (20.5)	52 (25.5)	403 (19.9)	
ARI symptoms. No. (%)				
Cough[b]	2059 (92.6)	202 (99.0)	1857 (91.9)	<.001
Wheezing[c]	1132 (51.0)	135 (66.8)	997 (49.4)	<.0001
Nasal congestion[d]	1752 (78.8)	182 (89.7)	1570 (77.7)	<.0001
Fever[e]	1427 (64.5)	124 (61.1)	1303 (64.8)	.29
Fatigue	2008 (90.3)	184 (90.2)	1824 (90.3)	.98
Headache[f]	1537 (69.1)	134 (65.7)	1403 (69.5)	.27
Muscle aches[g]	1399 (63.1)	116 (56.9)	1283 (63.7)	.05
Ear pain[h]	778 (35.0)	69 (33.8)	709 (35.1)	.72
Sore throat	1430 (64.3)	131 (64.2)	1299 (64.3)	.99
High-risk health conditions, No. (%)				
COPD[i]	138 (6.2)	9 (4.4)	129 (6.4)	.27
CHF[j]	124 (5.6)	8 (3.9)	116 (5.7)	.28
Liver disease	27 (1.4)	1 (0.5)	26 (1.5)	.24
Renal disease	162 (8.5)	18 (8.8)	144 (8.5)	.86
Hospitalized (%)	267 (12.0)	17 (8.3)	250 (12.4)	.09

Abbreviations: ARI, acute respiratory illness; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; RSV, respiratory syncytial virus; SD, standard deviation.

[a] χ^2 or Fisher exact test, as appropriate.

[b] One individual was missing information for cough symptoms.

[c] Five individuals were missing information for wheezing symptoms.

[d] One individual was missing information for nasal congestion symptoms.

[e] Eleven individuals were missing information for fever symptoms.

[f] One individual was missing information for headache symptoms.

[g] Seven individuals were missing information for muscle ache symptoms.

[h] One individual was missing information for ear pain symptoms.

[i] Defined having an *International Classification of Diseases, Ninth Revision* (*ICD-9*) code within the range of 491.001–492.999 in the year prior to the study season.

[j] Defined as having an *ICD-9* code within the range of 428.001–428.9 in the year prior to the study season.

excluded participants who were coinfected with both RSV and influenza. The unadjusted odds ratio for hospital admission among patients with RSV vs influenza was 0.54 (95% CI, 0.29–1.01; $P = .06$). The mean age of hospitalized patients was 74.0 (SD, 11.0) years for RSV, 69.5 (SD, 9.5) years for influenza, and 70.4 (SD, 11.5) years for those with neither influenza nor RSV ($P = .42$, ANOVA).

Among 17 patients who were hospitalized after onset of RSV illness (including 3 with RSV and influenza), the mean interval from onset to hospital admission was 4.1 (SD, 2.2) days (range, 0–8 days). The RSV-positive hospital admissions included 7 patients with RSV group A and 10 with group B; these admissions included 4 individuals enrolled on the same day as hospital admission. The primary discharge diagnosis indicated an

Table 3. Factors Associated With Respiratory Syncytial Virus Infection in Multivariable Logistic Regression Model

Characteristic	Unadjusted OR	95% CI	Adjusted OR[a]	95% CI
Age group				
50–64 y	Ref	. . .	Ref	. . .
65–79 y	1.29	.95–1.77	1.50	1.07–2.10
≥80 y	1.27	.79–2.02	1.54	.93–2.56
Sex				
Female	1.00	.74–1.35	0.96	.71–1.32
ARI symptoms				
Cough	8.65	2.13–35.13	4.37	1.05–18.19
Nasal congestion	2.56	1.59–4.11	2.15	1.32–3.52
Wheezing	2.03	1.49–2.77	1.81	1.31–2.50
Comorbid conditions				
COPD	0.70	.35–1.39	0.67	.33–1.38
CHF	0.69	.33–1.43	0.76	.35–1.64
Time elapsed from symptom onset to swab date				
0–1 d	Ref	. . .	Ref	. . .
2–3 d	2.45	1.19–5.03	2.16	1.03–4.50
4–5 d	4.60	2.27–9.31	3.65	1.77–7.51
≥6 d	3.62	1.77–7.41	2.71	1.30–5.65

The comparison group included all individuals with a negative reverse transcription polymerase chain reaction for respiratory syncytial virus.

Abbreviations: ARI, acute respiratory illness; CHF, congestive heart failure; CI, confidence interval; COPD, chronic obstructive pulmonary disease;OR, odds ratio.

[a] The model covariates included age, sex, cough, nasal congestion, wheezing, presence of COPD and/or CHF, interval from onset to sample collection (days), and study year. The model excludes 5 individuals coinfected with respiratory syncytial virus and influenza.

acute respiratory tract infection (eg, pneumonia, bronchitis, exacerbation of COPD) in 13 of 17 admissions. Among the 4 RSV-positive hospitalized patients without a respiratory illness diagnosis, the primary discharge diagnoses were viral gastroenteritis (2 patients), paroxysmal atrial fibrillation (1 patient), and ischemic cardiomyopathy (1 patient). Cough was present at the time of hospital admission in 3 of these 4 patients. Only 1 of the 17 hospitalized patients was diagnosed with RSV during the hospital admission based on clinical testing.

DISCUSSION

Few studies have systematically assessed RSV infections in older adults in the outpatient setting. Over a period of 6 influenza seasons, we found that RSV was the third most common cause of MAARI in a community cohort of adults aged ≥50 years. RSV was detected in 8% compared to 17% with influenza. This is similar to the proportion of respiratory illnesses caused by RSV (9%) in a prospective cohort study of healthy adults aged ≥65 years during 4 consecutive winters in Rochester, New York [2]. In the United Kingdom, a general practice sentinel surveillance system identified RSV in 19% of adults aged 45–64 years and 15% of those aged ≥65 years with medically attended influenza-like illness during 3 consecutive seasons [15]. However, comparisons between countries are difficult to interpret due to differences in healthcare delivery systems and healthcare seeking behavior. We found that RSV was absent during the spring, summer, and early fall months of 2009. This was the only season when we enrolled patients during the summer and fall months (due to the pandemic), but it is consistent with the known seasonality of RSV.

In this study we found a significant association between medically attended RSV infection and older age. This association was present when RSV illnesses were compared to all RSV-negative illnesses, and when RSV was compared to influenza. In other studies, RSV detection in hospitalized patients with acute respiratory illness has been associated with older age [4, 16], and with increased excess incidence of acute bronchitis due to RSV [7]. Immunosenescence may contribute to more frequent or more severe infection with RSV in older age groups, but further work is needed to understand factors influencing RSV susceptibility in older adults.

Individuals with RSV infection were more likely to experience cough, nasal congestion, and wheezing than individuals with other respiratory illnesses, but the only symptom that distinguished RSV from influenza was nasal congestion. The latter finding has also been reported in older adults hospitalized with acute respiratory infections [17]. However, the difference in proportion with nasal congestion was only 10%, and this is unlikely to be clinically useful. We also found that wheezing was significantly more common in participants infected with RSV A compared to RSV B. Wheezing has been associated with RSV in other studies of adults with respiratory illness [18], but the clinical features of RSV A and RSV B infections have not been reported in adults aged ≥50 years. However, RSV A has been associated with more severe symptoms compared to RSV B infection in infants [19, 20].

Other studies have identified congestive heart failure and chronic pulmonary disease as risk factors for severe RSV illness in older adults [2, 21]. These conditions were not associated with RSV in our community cohort of adults aged ≥50 years with mostly outpatient illness. This is not surprising, as the prevalence of chronic pulmonary and cardiac disease is expected to be lower in the community compared to hospitalized patients or residents of chronic care facilities. The proportion of RSV-positive individuals with congestive heart failure in this analysis was similar to estimates from other studies of medically attended RSV infection in healthy, community-dwelling adults [2]. It is possible that chronic pulmonary disease and congestive heart failure do not increase the risk of RSV infection overall,

Table 4. Demographic and Clinical Features of Respiratory Syncytial Virus (RSV) A vs RSV B

Characteristic	Total (N = 204)	RSV A Positive (n = 102)	RSV B Positive (n = 102)	*P* Value
Age, mean ± SD	65.8 ± 11.0	66.3 ± 11.3	65.4 ± 10.7	.57
Age group, No. (%)				
50–64 y	101 (49.5)	51 (50.0)	50 (49.0)	.36
65–79 y	77 (37.8)	35 (34.3)	42 (41.2)	
≥80 y	26 (12.8)	16 (15.7)	10 (9.8)	
Female sex, No. (%)	124 (60.8)	61 (59.8)	63 (61.8)	.77
Days from symptom onset to swab, mean ± SD	4.5 ± 1.9	4.6 ± 1.8	4.3 ± 1.9	.23
Influenza season, No. (%)				<.0001
2004–2005	15 (7.4)	13 (12.8)	2 (2.0)	
2005–2006	24 (11.8)	5 (4.9)	19 (18.6)	
2006–2007	26 (12.8)	16 (15.7)	10 (9.8)	
2007–2008	41 (20.1)	18 (17.7)	23 (22.6)	
2008–2009	46 (22.6)	8 (7.8)	38 (37.3)	
2009 pandemic	0 (0)	0 (0)	0 (0)	
2009–2010	52 (25.5)	42 (41.2)	10 (9.8)	
ARI symptoms, No. (%)				
Cough	202 (99.0)	102 (100.0)	100 (98.0)	.16
Wheezing[a]	135 (66.8)	74 (74.0)	61 (59.8)	.03
Nasal congestion[b]	182 (89.7)	91 (90.1)	91 (89.2)	.84
Fever[c]	124 (61.1)	65 (63.7)	59 (58.4)	.44
Fatigue	184 (90.2)	90 (88.2)	94 (92.2)	.35
Headache	134 (65.7)	70 (68.6)	64 (62.8)	.38
Muscle aches	116 (56.9)	59 (57.8)	57 (55.9)	.78
Ear pain	69 (33.8)	35 (34.3)	34 (33.3)	.88
Sore throat	131 (64.2)	70 (68.6)	61 (59.8)	.19
High-risk health conditions, No. (%)				
COPD[d]	9 (4.4)	4 (3.9)	5 (4.9)	.73
CHF[e]	8 (3.9)	3 (2.9)	5 (4.9)	.47
Liver disease	1 (0.5)	0 (0)	1 (1.0)	.32
Renal disease	18 (8.8)	7 (6.9)	11 (10.8)	.32
Hospitalized, No. (%)	17 (8.3)	7 (6.9)	10 (9.8)	.45

Abbreviations: ARI, acute respiratory illness; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; RSV, respiratory syncytial virus; SD, standard deviation.

[a] Two individuals were missing information for wheezing symptoms.

[b] One individual was missing information for nasal congestion symptoms.

[c] One individual was missing information for fever symptoms.

[d] Defined having an *International Classification of Diseases, Ninth Revision* (*ICD-9*) code within the range of 491.001–492.999 in the year prior to the study season.

[e] Defined as having an *ICD-9* code within the range of 428.001–428.9 in the year prior to the study season.

or RSV infection leading to outpatient care, but the severity of RSV illness is likely to be higher among high-risk groups.

This study was not sufficiently powered to address risk factors for hospital admission or other complications with adjustment for age and other potential confounders. However, the unadjusted analysis indicated that influenza was associated with an increased odds of hospital admission compared to RSV. Increased age is unlikely to explain this association, as individuals with influenza were significantly younger than those with RSV. These findings suggest that influenza infection may cause more frequent or serious complications compared to RSV in this age group, a finding which has been reported elsewhere [22]. The longer interval from illness onset to healthcare encounter in patients with RSV vs influenza is also consistent with milder illness.

This study had some limitations. Participants originally consented to participate in a study of influenza vaccine effectiveness, and recruitment was restricted to periods of influenza circulation except during the 2009–2010 pandemic when study recruitment was extended beyond the normal influenza season.

Table 5. Factors Associated With Respiratory Syncytial Virus Infection Compared to Influenza Infection in a Multivariable Logistic Regression Model

Characteristic	RSV Positive (n = 199)	Influenza Positive (n = 391)	Adjusted OR[a]	95% CI
Age group				
50–64 y	99 (49.8)	220 (56.3)	Ref	. . .
65–79 y	76 (38.2)	138 (35.3)	2.14	1.27–3.60
≥80 y	24 (12.1)	33 (8.4)	5.44	2.30–12.87
Sex				
Female	121 (60.8)	230 (58.8)	0.99	.62–1.57
ARI symptoms				
Cough	197 (99.0)	384 (98.2)	1.77	.21–14.84
Nasal congestion	178 (89.9)	315 (80.6)	2.92	1.40–6.08
Wheezing	131 (66.5)	213 (54.8)	1.26	.79–2.01
Chronic pulmonary disease				
COPD	9 (4.5)	16 (4.1)	1.01	.31–3.25
CHF	8 (4.0)	15 (3.8)	1.46	.43–4.95
Interval from symptom onset to swab date				
0–1 d	9 (4.5)	67 (17.1)	Ref	. . .
2–3 d	52 (26.1)	153 (39.1)	1.59	.65–3.84
4–5 d	77 (38.7)	106 (27.1)	2.55	1.08–6.05
≥6 d	61 (30.7)	65 (16.6)	4.77	1.93–11.77

Abbreviations: ARI, acute respiratory illness; CHF, congestive heart failure; CI, confidence interval; COPD, chronic obstructive pulmonary disease;OR, odds ratio; RSV, respiratory syncytial virus.

[a] Model covariates included age (categorical), sex, cough, nasal congestion, wheezing, presence of COPD and/or CHF, interval from symptom onset to sample collection (categorical), study year, and presence of another virus besides RSV or influenza. Five individuals coinfected with both RSV and influenza were excluded from the analysis.

Patients with RSV infection before or after our enrollment period were not included, although we would not expect any bias in terms of clinical characteristics or outcomes. An additional limitation is the small number of hospital admissions among patients with RSV, which limited our ability to identify risk factors for hospitalization. Additionally, this study was restricted to medically attended respiratory illnesses, and it does not represent the entire spectrum of RSV infections in the community, including those occurring in people who did not seek medical care.

In conclusion, the findings from this study indicate that RSV is an important cause of medically attended respiratory illness in healthy, community-dwelling adults aged ≥50 years. In general, RSV appears to cause milder illness than influenza in this population, although RSV disproportionately affected the oldest age groups compared to influenza. A greater understanding of factors triggering severe RSV disease in older populations will require further study of immunosenescence and other host factors.

Notes

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All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

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