Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Comorbidity Risk Factors and Mortality in Patients Hospitalized with Respiratory Syncytial Virus and Influenza A: a Retrospective Observational Cohort Study

Christoffer Vigen
chrisvigen@hotmail.com
Aarhus University Hospital
Alexander Dutschke
Aarhus University Hospital
Jacob Redder
Central Denmark Region
Thomas Greve
Aarhus University Hospital
Lars Skov Dalgaard
Gødstrup Hospital
Anita Rath Sørensen
Horsens Regional Hospital
Lotte Ebdrup
Randers Regional Hospital
Rajesh Mohey
Viborg Regional Hospital
Britta Tarp
Silkeborg Regional Hospital
Lars Østergaard
Aarhus University Hospital
Merete Storgaard
Aarhus University Hospital
Bo Langhoff Hønge
Aarhus University Hospital

Research Article

Keywords: Respiratory syncytial virus, Influenza A, Mortality, Comorbidity, Risk factors, Hospitalization

Posted Date: August 25th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9700987/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License

Additional Declarations: No competing interests reported.

Abstract

Purpose: To compare mortality in adults hospitalized with laboratory-confirmed respiratory syncytial virus (RSV) with influenza A and identify comorbidity as risk factors for death.

Methods: We performed a retrospective cohort study including adults admitted to a hospital in the Central Denmark Region from February 2019 to February 2024 with a positive RSV or influenza A test. Outcomes were in-hospital, 30-, 90- and 180-day mortality. A cox regression including age, sex and comorbidities was used.

Results: The cohort comprised 4,416 patients: 1,366 with RSV and 3,050 with influenza A. Patients with RSV were older (median age 74 vs 67) and more often had at least one comorbidity (76% vs 61%). Mortality was higher for RSV than influenza A across all follow-up periods. Adjusted hazard ratios (aHRs) for mortality were also higher for RSV for all follow up periods. In adjusted 90-day models, shared risk factors for death were chronic obstructive pulmonary disease (COPD) (aHR RSV 1.59, 1.10–2.28; influenza A aHR 1.69, 1.18–2.42) and chronic liver disease (RSV 4.21, 1.54–11.49; influenza A 2.81, 1.23–6.40). In patients with RSV chronic heart disease (aHR 1.46, 1.02–2.09) was also associated with increased risk of death. Asthma showed inverse associations in both models, significant only for RSV (aHR 0.43, 0.19–0.98). Diabetes was not associated with increased risk for any of the patient groups.

Conclusions: Among hospitalized adults, RSV was associated with higher mortality than influenza A. Mortality risk factor findings support targeted prevention in older adults and patients with comorbidity.

Background

Respiratory viral infections, with influenza A as a major contributor, have long been recognized as a major cause of global health burden [1, 2]. In recent years respiratory syncytial virus (RSV) has emerged as an important disease linked to significant economic and societal burden [3]. However, less is known about the impact on hospitalized adult patients [4, 5]. Since COVID-19 restrictions were lifted, there has been an increase in both influenza and RSV cases [6]. Considering the expanding availability of effective RSV vaccines, accurately characterizing the severity of the disease and identifying high-risk groups has become a priority [7–9]. In-hospital mortality of RSV infected patients has been shown in several countries to be as high as 7% [4, 10] and with infection numbers sometimes reaching the levels of influenza virus this makes up a major concern [11]. A recent Danish study suggested higher mortality rates among patients infected with RSV compared with those infected with Influenza A virus and explore risk factors associated with death among these patients. However, the study lacked the statistical power to show differences for in-hospital and 90-day mortality between the two viruses [4]. Moreover, only age and sex alongside very few and specific comorbidities have been shown as significant risk factors for mortality in RSV patients [4, 12].

In this study we aim to investigate mortality in infections with RSV versus influenza A virus as well as evaluate comorbidities as risk factors for death in a large cohort of hospitalized patients. This may help clinicians caring for hospitalized patients to identify those at risk and adds evidence to the scope of patients eligible for vaccination.

MATERIALS AND METHODS

The methodological approach of this study follows the STROBE reporting guidelines [13].

Study design

Retrospective observational cohort study.

Setting

The study was conducted across all public hospitals in the Central Denmark Region. This region serves approximately 23% of the Danish population, corresponding to around 1.3 million residents, providing tax-funded healthcare services [14]. Patients admitted to any of these hospitals between February 3, 2019, and February 3, 2024, were eligible for inclusion.

Participants

The overall cohort has previously been described [15, 16]. The sampled population for this study included adult patients (≥ 18 years) hospitalized with a confirmed positive polymerase-chain-reaction (PCR) result for influenza A virus or RSV. Participants were censored at their first hospital admission during the study period, ensuring that individuals were included only once in the dataset. Participants with positive results for multiple viruses within the test window were not included.

Ethics

The project was approved by the administrative authorities of the participating hospitals and categorized as a quality assurance initiative. Data extraction and management were carried out by the regional business intelligence unit (Department of Data and Data Utilization), with all personal identifiers replaced by pseudonymized civil registration numbers before analysis. According to Danish regulations, registry-based quality assurance studies do not require further ethics committee approval.

Variables

For this study, follow-up began at the time of hospital admission. The primary outcomes were in-hospital mortality and mortality within 30, 90, and 180 days after admission.

The primary exposure variable was virus type (RSV vs. influenza A virus), with influenza A virus used as the reference category. We used laboratory test results for influenza A virus and RSV, to define virus infections and not ICD-codes. Age was modeled using restricted cubic splines with predefined knots at 50, 65, and 80 years to allow for non-linear associations. The knots were predefined before running any models based on previous age grouping within this field of study [10, 12, 16]. Also guidelines indicate that precision of knots is not crucial to the analysis [17, 18]. Sex was included as a categorical variable. Comorbidities were included as binary variables and comprised chronic neurodegenerative disease, chronic heart disease, chronic liver disease, kidney disease, diabetes, immune disease, malignancy, hypertension, chronic obstructive pulmonary disease (COPD), emphysema, and asthma. Comorbidities were only considered present if the diagnosis was recorded prior to the date of the positive PCR result. See Supplementary Table 1 for further characterization of the comorbidities.

Data sources/measurements

All hospitals in the Central Denmark Region use a shared electronic health record system (Elektronisk Patientjournal (EPJ), Systematic A/S, Aarhus, Denmark) for clinical documentation. The regional business intelligence unit (Department of Data and Data Utilization) located in Aarhus, centralizes data, where information on laboratory results, medication records, and other clinical data is securely stored. Data extraction was performed in accordance with predefined study objectives.

Study size

No formal a priori power calculation was performed before the study was initiated. Instead, we included all hospitalized patients in the Central Denmark Region who met the eligibility criteria during the study period.

Statistical methods

Baseline characteristics were summarized using counts and percentages for categorical variables and means with interquartile ranges (IQRs) for continuous variables. Comparisons between patients with RSV infection and influenza A infection were performed using the chi-squared test for categorical variables and the Wilcoxon rank-sum test for continuous variables due to age not following a normal distribution.

Time-to-event analyses were performed using Cox proportional hazards regression models, with follow-up starting at the time of hospital admission. Separate models were constructed for in-hospital mortality and for mortality within 30, 90, and 180 days after

admission. For each outcome, patients were followed until death or censored at discharge (for in-hospital analyses) or at the end of the respective follow-up period (30, 90, or 180 days). Events occurring on the day of admission were assigned a follow-up time of 0.5 days to avoid zero-time observations.

Hazard ratios (HRs) with 95% confidence intervals (CIs) were estimated using univariable, semi-adjusted, and adjusted models. Semi-adjusted models included age and sex, while adjusted models additionally included comorbidities.

All analyses were performed using Stata version 18.5 (StataCorp, College Station, TX, USA).

RESULTS

Descriptive data

During the study period more patients were admitted with influenza A infection (3,867) than with RSV infection (1,366) – in total 4,416 (Table 1). Median age for patients with RSV infection was higher (74 vs 67 years, P < 0.01). Patients with RSV infection more often had two or more comorbidity (76% vs. 61%; P < 0.01). Most frequent comorbidities for both groups were chronic heart disease followed by COPD. Proportion of female sex was higher for RSV (57% vs 51%, P < 0.01).

Outcomes

Median length of stay (LOS) (Table 2) was longer among patients with RSV infection than among those with influenza A infection, at 2.2 days (IQR 0.6–5.0) versus 1.4 days (IQR 0.4–3.9). Equal proportions of hospitalized patients were admitted to the ICU (Intensive Care Unit) for RSV infection (2.2%) and influenza A infection (2.1%). In-hospital mortality was higher among patients with RSV infection than among those with influenza A infection (4.2% vs. 2.2%; P < 0.01). This finding was consistent in longer term outcomes (Figure 1), with 30-day mortality rates of 7.2% versus 3.7% (P < 0.01), 90-day mortality rates of 10.0% versus 5.5% (P < 0.01), and 180-day mortality rates of 13.3% versus 7.2% (P < 0.01).

Mortality in RSV infection compared to influenza A infection

In unadjusted analyses using influenza A infection as the reference group, RSV infection was associated with a higher risk of death at all follow-up time points (Table 3). While the increase in in-hospital mortality did not reach statistical significance after adjustment (aHR 1.31, 95% CI: 0.91-1.88), RSV infection was associated with significantly higher mortality at 30 days (aHR 1.48, 95% CI 1.12–1.95), 90 days (aHR 1.39, 95% CI 1.10–1.74), and 180 days (aHR 1.39, 95% CI 1.14–1.70).

Risk factors for 90-day mortality rates

In the fully adjusted models (Table 4), COPD and chronic liver disease were associated with a higher hazard of death in both RSV infection and influenza A infection. Asthma showed an inverse association in both models, although this was only statistically significant in RSV infection. In patients infected with RSV, COPD (aHR 1.59, 95% CI 1.10–2.28) and chronic liver disease (aHR 4.21, 95% CI 1.54–11.49) were associated with a higher hazard of death, whereas asthma was associated with a lower hazard of death (aHR 0.43, 95% CI 0.19–0.98). In influenza A infection, COPD (aHR 1.69, 95% CI 1.18–2.42) and chronic liver disease (aHR 2.81, 95% CI 1.23–6.40) were also associated with increased mortality, and a similar, though non-significant, tendency towards a lower hazard of death was observed for asthma (aHR 0.66, 95% CI 0.34–1.28).

Beyond these shared patterns, additional significant associations were observed only in one of the two models. In RSV infection chronic heart disease (aHR 1.46, 95% CI 1.02–2.09) was associated with higher mortality. In influenza A infection, chronic neurological disease (aHR 2.42, 95% CI 1.55–3.79) and malignancy (aHR 1.52, 95% CI 1.10–2.11) were associated with increased mortality.

Diabetes was not associated with increased risk of death in any of the patient groups.

DISCUSSION

During the 5-year study period, more than double the number of patients were hospitalized with infection caused by influenza A virus compared to RSV, but patients with RSV infection had longer LOS and almost twice the mortality rates. The mortality rates for RSV infection versus influenza A infection are similar to what other studies have previously found, with in-hospital mortality rates ranging from 5% to 7.3% for RSV infection and 1.5% to 4% for influenza A infection [4, 12, 19]. Also, the aHR is coherent with the results found in a recent Danish study where the 90-day mortality risk for RSV infection compared to influenza A infection was found to be 1.38 [4].

Our findings confirm that advanced age and comorbidity burden are associated with poor outcomes in RSV infection. Increasing age was strongly associated with mortality. This is in line with previous studies demonstrating substantially higher mortality among elderly patients, particularly those above 80 years [12]. Similarly, comorbid conditions such as cardiovascular disease, and malignancy have consistently been identified as key predictors of severe disease and mortality [12].

These findings are broadly in agreement with studies describing the clinical manifestations of RSV infection in adults. However, an important methodological difference should be highlighted. Several previous studies have included clinical presentation variables such as pneumonia, respiratory failure, or need for ventilatory support as predictors in their multivariable models [4, 12]. While these factors are strongly associated with mortality, they may represent mediators in the causal pathway of viral infection and death. Including such variables may introduce overadjustment or obscure the role of underlying comorbidities. In contrast, our analysis was restricted to pre-existing comorbidities and baseline characteristics, providing a stringent assessment of independent risk factors present prior to hospitalization.

A key strength of the present study is the use of time-to-event analysis with Cox proportional hazards models, which accounts for differences in follow-up time and censoring. In contrast, previous studies in this field have relied on logistic regression models [4, 12]. While logistic regression provides estimates of overall risk, it does not account for the timing of events and may therefore underestimate the relationship between exposure and outcome [20]. By using Cox regression, our study provides a statistically more accurate and clinically relevant assessment of mortality risk over time [20, 21].

A particularly noteworthy and somewhat unexpected finding was the protective association observed for asthma. This contrasts with the traditional view of chronic lung disease as a risk factor for severe respiratory infections but is in line with findings from a large Spanish cohort, where asthma appeared protective [12]. Possible explanations include earlier healthcare contact, use of inhaled corticosteroids, larger muscle mass, vaccinations and/or residual confounding. This could also be explained by asthmatic patients being hospitalized for an easily treatable exacerbation triggered by the infection, without subsequent adverse clinical outcomes. Another plausible confounder is smoking, which we were unable to adjust for. Smoking is strongly associated with adverse outcomes in respiratory infections, and the lack of smoking data may therefore have influenced the observed associations.

Another strength of our study is the high validity of exposure data, as all infections were laboratory-confirmed. This is particularly relevant, as RSV infection is frequently underdiagnosed in adults due to limited routine testing and non-specific clinical presentation, leading to substantial underestimation of disease burden [5]. Studies relying on administrative coding alone may underestimate RSV infection incidence and misclassify cases.

We chose not to include obesity as a covariate. Although frequently used in epidemiological studies, body mass index (BMI) is an imprecise measure of adiposity and metabolic risk, with substantial risk of misclassification, even in large population studies [22]. Furthermore, the well-described “obesity paradox,” where higher BMI is associated with improved outcomes in certain conditions, highlights the limitations of BMI as a risk marker and suggests that its inclusion may introduce bias rather than improve model validity [23, 24].

Nevertheless, there are also limitations. Comorbidities were defined based on clinician-recorded diagnoses, which introduce a risk of misclassification and residual confounding. In addition, we did not have access to data on smoking status, which is a relevant limitation given its strong association with both chronic lung disease and adverse outcomes in respiratory infections [25, 26]. The absence of smoking data may have influenced some of the observed associations [27]. The dataset also lagged information on pregnancy, which is known in influenza to increase severity, as well as data on vaccination prior to hospitalization [28].

In Denmark routine vaccination against RSV is currently not recommended, but RSV vaccination has been evaluated in a large scale trial among people > 60 years during the 2024–2025 winter season [29]. Danish health authorities recommend vaccination against seasonal influenza for individuals with comorbidities including people with diabetes and people with chronic lung disease (without further sub-classification) [30]. For both RSV infection and influenza A infection, we found that diabetes was not associated with a poorer outcome. And for chronic lung diseases we found a highly relevant distinction between COPD and asthma. Our study does not address comorbidities as risk factors of hospitalization, an important factor when designing a vaccination program [31]. We suggest future research to evaluate comorbidities as risk factors for hospitalization.

Finally, our study adds to the growing body of evidence that RSV infection constitutes a substantial risk in adult populations, particularly among older and comorbid individuals. Most of our identified risk factors are consistent with existing literature while adding novel significant findings such as chronic liver disease and heart disease. RSV is increasingly recognized as a major cause of hospitalization and mortality in older adults, with disease burden often underestimated due to diagnostic limitations. These findings underscore the importance of improved surveillance, risk stratification, and preventive strategies, including vaccination.

Funding sources

BLH was supported by a grant from the Danish Independent Research Fund (Case number 2034-00120B). The study was supported with a grant from Fonden til Lægevidenskabens Fremme (AP Møller) (Case number 2024 – 00839)

Declarations

Author Contribution

Christoffer Vigen wrote the main manuscript text.Bo Hønge and Alexander Dutschke provided significant guidance regarding data management, statistical software usage, and contributed to the writing of smaller sections of the manuscript.All other authors contributed data from their respective hospitals/departments and participated in a thorough review process, providing substantial feedback.

Data Availability

All hospitals in the Central Denmark Region use a shared electronic health record system (Elektronisk Patientjournal (EPJ), Systematic A/S, Aarhus, Denmark) for clinical documentation. The regional business intelligence unit (Department of Data and Data Utilization) located in Aarhus, centralizes data, where information on laboratory results, medication records, and other clinical data is securely stored. Data extraction was performed in accordance with predefined study objectives.

References

1. Rolfes MA et al (2018) Annual estimates of the burden of seasonal influenza in the United States: A tool for strengthening influenza surveillance and preparedness. Influenza Other Respir Viruses 12(1):132–137
2. Sirota SB et al (2026) Global burden of lower respiratory infections and aetiologies, 1990–2023: a systematic analysis for the Global Burden of Disease Study 2023. Lancet Infect Dis 26(4):343–361
3. Fonseca, M.J., et al., *Burden of respiratory syncytial virus and influenza in adults – a Danish nationwide cohort study.* Clinical Microbiology and Infection
4. Clausen CL et al (2024) Clinical Manifestations and Outcomes in Adults Hospitalized With Respiratory Syncytial Virus and Influenza a/B: A Multicenter Observational Cohort Study. Open Forum Infect Dis 11(10):ofae513
5. Davido B, Loubet P (2025) The silent surge: the under-recognised burden of respiratory syncytial virus, human metapneumovirus, and parainfluenza viruses in adults. Int J Infect Dis 159:108006
6. WHO. Respiratory infectious diseases on the rise across WHO European Region (2023) [cited 2026 26 – 03]; Available from: https://www.who.int/europe/news/item/15-12-2023-respiratory-infectious-diseases-on-the-rise-across-who-european-region

7. Riccò MC, Corrado A, Bottazzoli S, Marchesi M, Gili F, Giuri R, Gori PG, Manzoni D (2025) P., Efficacy of Respiratory Syncytial Virus Vaccination to Prevent Lower Respiratory Tract Illness in Older Adults: A Systematic Review and Meta Analysis of Randomized Controlled Trials. Vaccines, 12
8. Zeng B et al (2024) Efficacy and safety of vaccines to prevent respiratory syncytial virus infection in infants and older adults: A systematic review and meta-analysis. Int J Infect Dis 146:107118
9. Morimoto T et al (2026) Prevalence and clinical outcomes of respiratory syncytial virus, COVID-19, and influenza among older hospitalized adults: the EVERY prospective cohort study. Clin Microbiol Infect 32(5):845–852
10. Prono RS (2023) V.s.g.o.t.c.d.w.o.G.P.U.H., *Prognosis of hospitalised adult patients with respiratory syncytial virus infection: a multicentre retrospective cohort study.* Clinical Microbiology and Infection, 29(7): p. 943.e1–943.e8
11. Institut SS (2026) *Overvågning af influenza, covid-19, RS-virus og andre luftvejssygdomme*. 22nd of March ; Available from: https://www.ssi.dk/sygdomme-beredskab-og-forskning/overvaagning-af-luftvejssygdomme
12. Ramos-Rincón J-M et al (2026) Adult RSV hospitalizations in Spain: clinical characteristics and risk factors for ICU admission, prolonged stay, and mortality across six seasons (2016–2017 to 2021–2022). Front Public Health, Volume 14–2026
13. STROBE. STROBE. Accessed 22nd of (2026) March ; Available from: https://www.strobe-statement.org/
14. Midtjylland R (2025) *Central Denmark Region (Region Midtjylland)*. 29 Jan ; Available from: https://www.rm.dk/om-os/English/english/
15. Hønge BL et al (2026) Procalcitonin compared to C-reactive protein and leukocyte count. A comparative analysis of baseline markers of bacterial co-infection in patients admitted with a viral respiratory tract infection. A retrospective observational cohort study. Infect Dis (Lond), : p. 1–10
16. Hønge BL et al (2026) Implications of empirical testing and treatment for atypical bacteria in patients hospitalized with COVID, influenza, or RSV: a retrospective observational cohort study. Eur J Clin Microbiol Infect Dis
17. Harrell FE (2001) *Regression Modeling Strategies: With Applications to Linear Models, Logistic Regression, and Survival Analysis*. 1st ed. Springer Series in Statistics. 2001, New York, NY: Springer New York
18. Stone CJ (1986) [Generalized Additive Models]: Comment. Stat Sci, 1(3)
19. Kanecki K et al (2025) Hospitalizations and In-Hospital Fatality Among Influenza Patients in the Pre-Pandemic and COVID-19 Pandemic Periods. J Clin Med, 14(6)
20. Kleinbaum DG, Klein M (2005) *Survival analysis: a self-learning text*. Second Edition ed. Statistics for Biology and Health. New York, NY: Springer
21. Hosmer DW, Lemeshow S, May S (2008) *Applied survival analysis: regression modeling of time-to-event data*. 2nd Edition ed. Wiley Series in Probability and Statistics. Vol. 618. Hoboken, N.J: Wiley-Interscience
22. Tomiyama AJ et al (2016) Misclassification of cardiometabolic health when using body mass index categories in NHANES 2005–2012. Int J Obes (Lond) 40(5):883–886
23. Amundson DE, Djurkovic S, Matwiyoff GN (2010) The obesity paradox. Crit Care Clin 26(4):583–596
24. Kalantar-Zadeh K, Rhee CM, Amin AN (2014) To legitimize the contentious obesity paradox. Mayo Clin Proc 89(8):1033–1035
25. Arcavi L, Benowitz NL (2004) Cigarette smoking and infection. Arch Intern Med 164(20):2206–2216
26. Feldman C, Anderson R (2013) Cigarette smoking and mechanisms of susceptibility to infections of the respiratory tract and other organ systems. J Infect 67(3):169–184
27. Fewell Z, Davey Smith G, Sterne JA (2007) The impact of residual and unmeasured confounding in epidemiologic studies: a simulation study. Am J Epidemiol 166(6):646–655
28. Mertz D et al (2019) Pregnancy as a risk factor for severe influenza infection: an individual participant data meta-analysis. BMC Infect Dis 19(1):683
29. Lassen MCH, Johansen ND, Christensen SH (2026) RSV Prefusion F Vaccine for Prevention of Hospitalization in Older Adults. N Engl J Med 394:138–151
30. Sundhedsstyrelsen (2026) *Vaccination against influenza and COVID-19*. [cited 2026 09-04-2026]; Available from: https://www.sst.dk/en/vaccination

31. Ruiz PLD et al (2020) Higher frequency of hospitalization but lower relative mortality for pandemic influenza in people with type 2 diabetes. J Intern Med 287(1):78–86

Tables

Tabel 1: Patient Characteristics

Variable	RSV+	Influenza A+	P-value*
N	1,366	3,050	
Male	592 (43%)	1486 (49%)	<0.01
Female	774 (57%)	1564 (51%)	<0.01
Age median (IQR)	74 (62–82)	67 (48–78)	<0.01
Age group. years			<0.01
18-49	158 (12%)	805 (26%)	
50-64	261 (19%)	627 (21%)	
65-79	498 (36%)	1000 (33%)	
>79	449 (33%)	618 (20%)	
Chronic Heart disease	481 (35%)	829 (27%)	<0.01
Chronic Kidney disease	102 (7%)	171 (6%)	0.02
COPD	336 (25%)	495 (16%)	<0.01
Asthma	156 (11%)	293 (10%)	0.07
Hypertension	374 (27%)	654 (21%)	<0.01
Neurodegenerative disease	77 (6%)	176 (6%)	0.86
Chronic liver disease	15 (1%)	38 (1%)	0.68
Diabetes	155 (11%)	340 (11%)	0.91
Immune disease	12 (1%)	35 (1%)	0.42
Obesity	18 (1%)	41 (1%)	0.94
Malignancy	359 (26%)	576 (19%)	<0.01
Number of comorbidities			<0.01
0	333 (24%)	1192 (39%)	
1	545 (40%)	1033 (34%)	
2	324 (24%)	585 (19%)	
≥3	164 (12%)	240 (8%)	

Table: General patient characteristics for RSV positive (+) patients and influenza A positive (+) patients
*Chi^2 and wilcoxons rank sum test

Table 2: Outcome characteristics

	Patients , No. (%)		
Outcome	RSV+ (n=1,366)	Influenza A+ (n=3,050)	P VALUE
Length of stay, median (IQR) , days	2.2 (0.6-5.0)	1.4 (0.4-3.9)	< 0.01
ICU admission	30 (2.2)	63 (2.1)	0.78
In-hospital death	57 (4.2)	68 (2.2)	< 0.01
Death within 30 days	98 (7.2)	112 (3.7)	< 0.01
Death within 90 days	137 (10.0)	168 (5.5)	< 0.01
Death within 180 days	181 (13.3)	221 (7.2)	< 0.01

Table: Outcome for hospitalized with positive test (+) for respiratory syncytial virus (RSV) patients and influenza A virus.
* Statistical significant at P < 0.05

Table 3: Mortality risk for RSV infection with influenza A infection as reference

Mortality Risk	Unadjusted HR (95% CI)	P-value	Semi-Adjusted sHR (95% CI)	P-value	Multivariable aHR (95% CI)	P-value
In-hospital mortality						
Influenza A+	Ref		Ref		Ref	
RSV+	1.47 (1.03 ; 2.10)	0.03	1.34 (0.94 ; 1.92)	0.11	1.31 (0.91 ; 1.88)	0.14
30-day mortality						
Influenza A+	Ref				Ref	
RSV+	1.99 (1.52 ; 2.61)	<0.01	1.52 (1.15 ; 2.00)	<0.01	1.48 (1.12 ; 1.95)	<0.01
90-day mortality						
Influenza A+	Ref				Ref	
RSV+	1.87 (1.49 ; 2.34)	<0.01	1.42 (1.13 ; 1.78)	<0.01	1.39 (1.10 ; 1.74)	<0.01
180-day mortality						
Influenza A+	Ref				Ref	
RSV+	1.89 (1.55 ; 2.30)	<0.01	1.44 (1.18; 1.76)	<0.01	1.39 (1.14 ; 1.70)	<0.01

Table: Cox regression model estimating mortality hazard ratio for respiratory syncytial virus (RSV) positive (+) patients with influenza A positive (+) patients as reference.

sHR: adjusted for sex, age(spline model). aHR: adjusted for sex, age (spline model), Chronic Neurological Disease, Chronic Heart Disease, Chronic Liver Disease, Chronic Kidney Disease, Diabetes, Immune Diseases, Malignancy, Hypertension, COPD, asthma .

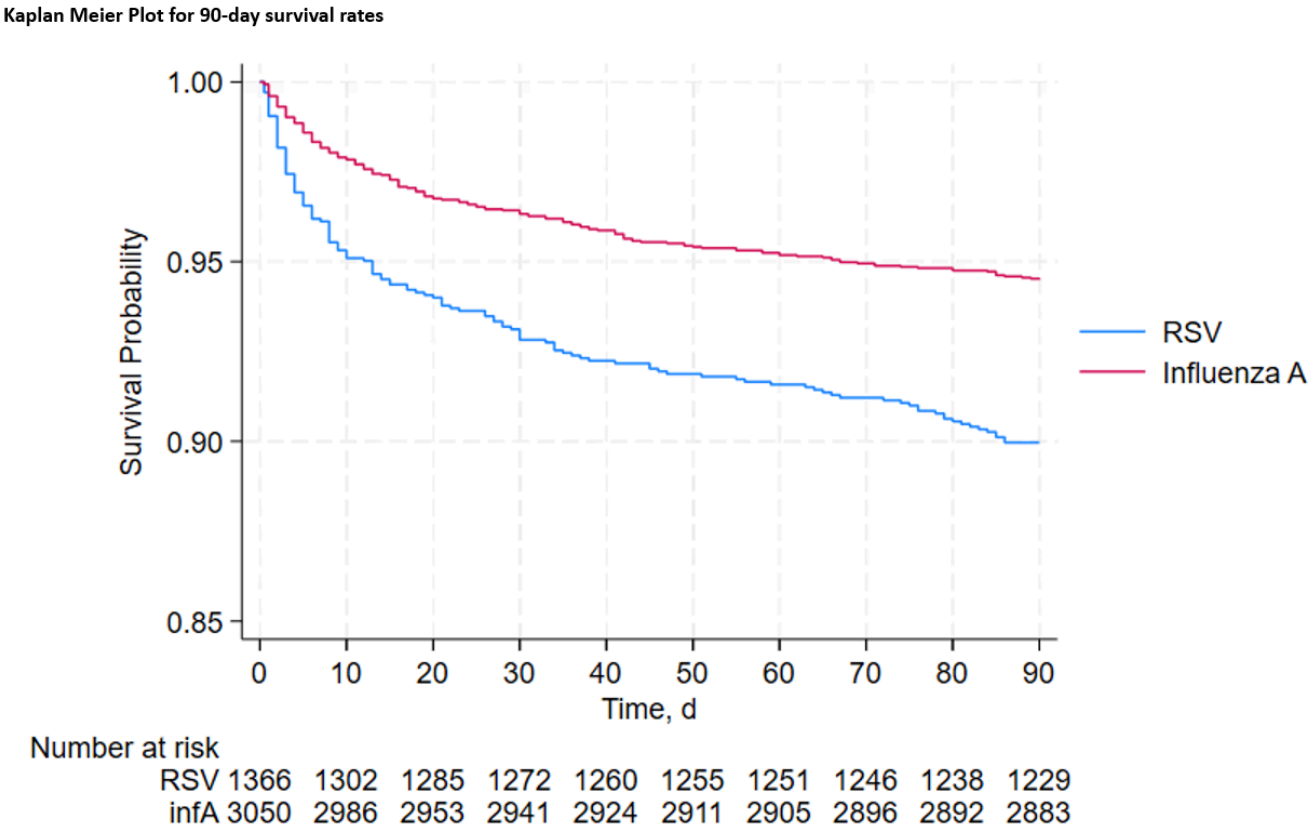
Table 4: Risk factors for 90-day mortality for RSV infection and influenza A infection in hospitalized patients

Risk Factors by Infection Type	*Unadjusted HR (95% CI)*	*P-value*	*Semi-adjusted sHR (95% CI)*	*P-Value*	*Fully-adjusted aHR (95% CI)*	*P-value*
RSV+						
Age						
18-64	Ref		Ref			
65-80	2.60 (1.41 ; 4.74)	<0.01	2.51 (1.37 ; 4.61)	<0.01		
80+	5.88 (3.33 ; 10.36)	<0.01	5.81 (3.29 ; 10.24)	<0.01		
Chronic Liver Disease	3.33 (1.05 ; 10.60)	0.04	4.10 (1.51 ; 11.15)	<0.01	4.21 (1.54 ; 11.49)	<0.01
COPD	1.76 (1.21 ; 2.56)	<0.01	1.49 (1.04 ; 2.12)	0.03	1.59 (1.10 ; 2.28)	0.01
Chronic Heart Disease	2.37 (1.66 ; 3.39)	<0.01	1.50 (1.06 ; 2.11)	0.02	1.46 (1.02 ; 2.09)	0.04
Asthma	0.58 (0.30 ; 1.114)	0.10	0.47 (0.21 ; 1.07)	0.07	0.43 (0.19 ; 0.98)	0.04
Chronic Kidney Disease	2.04 (1.18 ; 3.50)	0.01	1.56 (0.95 ; 2.58)	0.08	1.67 (0.97 ; 2.88)	0.06
Male Sex	1.52 (1.09 ; 2.13)	<0.01	1.54 (1.10 ; 2.16)	0.01	1.41 (0.99 ; 1.98)	0.05
Diabetes	0.72 (0.39 ; 1.33)	0.29	0.67 (0.37 ; 1.22)	0.19	0.62 (0.34 ; 1.14)	0.12
Chronic Neurological Disease	1.72 (0.90 ; 3.27)	0.10	1.47 (0.81 ; 2.66)	0.20	1.50 (0.82 ; 2.74)	0.17
Immune disease	1.81 (0.39 ; 8.33)	0.45	3.25 (0.79 ; 13.30)	0.10	2.74 (0.65 ; 11.47)	0.17
Malignancy	1.37 (0.94 ; 2.00)	0.10	1.21 (0.84 ; 1.74)	0.31	1.25 (0.87 ; 1.80)	0.23
Hypertension	1.39 (0.95 ; 2.02)	0.09	0.92 (0.64 ; 1.33)	0.67	0.79 (0.54 ; 1.17)	0.24
Influenza A+						
Age						
18-64	Ref		Ref			
65-80	3.85 (2.41 ; 6.16)	<0.01	3.82 (2.38 ; 6.11)	<0.01		
80+	8.29 (5.26 ; 13.07)	<0.01	8.23 (5.21 ; 12.98)	<0.01		
COPD	1.38 (1.01 ; 1.90)	0.04	1.49 (1.06 ; 2.10)	0.02	1.69 (1.18 ; 2.42)	<0.01
Chronic Neurological Disease	1.52 (0.91 ; 2.54)	0.11	2.29 (1.47 ; 3.56)	0.00	2.42 (1.55 ; 3.79)	<0.01
Chronic Liver Disease	3.17 (1.17 ; 8.58)	0.02	2.87 (1.27 ; 6.50)	0.01	2.81 (1.23 ; 6.40)	0.01
Malignancy	1.29 (0.94 ; 1.76)	0.12	1.53 (1.11 ; 2.12)	0.01	1.52 (1.10 ; 2.11)	0.01
Chronic Kidney Disease	1.70 (1.11 ; 2.60)	0.02	1.49 (0.91 ; 2.43)	0.11	1.53 (0.92 ; 2.50)	0.10
Asthma	0.47 (0.23 ; 0.95)	0.04	0.79 (0.41 ; 1.49)	0.46	0.66 (0.34 ; 1.28)	0.22
Hypertension	0.97 (0.71 ; 1.32)	0.85	0.96 (0.68 ; 1.33)	0.79	0.83 (0.58 ; 1.18)	0.30
Chronic Heart Disease	1.45 (1.07 ; 1.95)	0.02	1.17 (0.85 ; 1.60)	0.33	1.13 (0.80 ; 1.57)	0.48
Male Sex	1.22 (0.90 ; 1.66)	0.19	1.17 (0.85 ; 1.57)	0.35	1.09 (0.80 ; 1.48)	0.59
Diabetes	0.82 (0.51 ; 1.32)	0.42	0.92 (0.58 ; 1.47)	0.73	0.90 (0.56 ; 1.45)	0.63
Immune disease	2.49 (0.61 ; 10.12)	0.20	0.94 (0.13 ; 6.78)	0.95	0.95 (0.13 ; 6.84)	0.96

Table: Cox regression model estimating mortality Hazard Ratios related to risk factors of Respiratory Syncytial Virus (RSV) positive (+) infection and influenza A positive(+) infection.

sHR: adjusted for sex, age(spline model). aHR: adjusted for sex, age (spline model), Chronic Neurological Disease, Chronic Heart Disease, Chronic Liver Disease, Chronic Kidney Disease, Diabetes, Immune Diseases, Malignancy, Hypertension, COPD, asthma .

Figures



Graph: Kaplan Meier plot illustrating the survival rate from 0 to 90 days from admission

Figure 1

See image above for figure legend.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- ComorbiditiesincludedintheCoxmodels.docx