

Symptom Severity and Functional Impact of Medically-Attended Influenza, SARS-CoV-2 and RSV Illness among Children in Central Wisconsin

Oluwakemi D. Alonge, MPH¹; Huong Q. Nguyen, PhD¹; Zhe Zheng, PhD²; Jennifer P. King, MPH¹; Wen-Hsing Wu, MS²; Meng Wang, PhD²; Emma Viscidi, PhD²; Catherine A. Panozzo, PhD²; Chelsea Canan, PhD², Shivani S. Nagapurkar, MPH¹; Jennifer K. Meece, PhD¹; Evan J. Anderson, MD²; Joshua G. Petrie, PhD¹

¹Marshfield Clinic Research Institute, Marshfield, WI, USA;

²ModernaTX, Inc., Cambridge, Massachusetts, USA

Contact: Oluwakemi Alonge, 1000 N Oak Ave, ML2, Marshfield, WI 54449; alonge.oluwakemi@marshfieldresearch.org; 1-715-221-7392



Introduction

- Respiratory illnesses resulting from influenza, respiratory syncytial virus (RSV) and SARS-CoV-2 share overlapping symptoms and pose a significant public health burden, particularly in young children

Objective

- Assess symptom severity and functional impact of medically-attended influenza, RSV and SARS-CoV-2 acute respiratory illness (ARI) among children

Methods

Study Design

- Prospective surveillance of medically-attended ARI enrolled from inpatient and outpatient settings in a US health system

Study Period

- June 2024 – June 2025

Inclusion criteria

- Marshfield Clinic Health System (Wisconsin) patients aged <18 years with an ARI of <10 days with ≥1 of the following symptoms: cough, sputum production, nasal congestion, runny nose, sore throat, wheezing, or shortness of breath
- Fever was additionally a qualifying symptom for patients <3 years of age

Study Activities

- Parents of participants provided informed consent
- Respiratory swabs were collected by research staff for molecular respiratory pathogen panel testing
- Enrollment surveys were completed to assess symptom severity

Analysis

- Laboratory-confirmed influenza, RSV and SARS-CoV-2
- Symptom severity, functional impact and overall illness severity assessed using a modified Wisconsin Upper Respiratory Symptom Survey for Kids (WURSS-K) instrument (Table 1)
- WURSS-K scores were compared across each virus in multiple linear regression models adjusted for age group, presence of ≥1 chronic condition, and days from illness onset to enrollment

Methods Cont.

Table 1. Overview of Modified Wisconsin Upper Respiratory Symptom Survey – Kids (WURSS-K)

Modified WURSS-K Component	Items
Overall Illness Severity	On a 0 to 7 scale, how sick does your child feel today? 0 means not sick, 1 means very mildly sick, and 7 means severely sick. Not sick Very mild Mild Moderate Severe 0 1 2 3 4 5 6 7

Symptom Severity Score (sum of ratings divided by number of questions answered)

In this section, please rate the average severity of your child’s symptoms over the last 24 hours. For each symptom, choose a number between 0 and 7. 0 means they do not have the symptom, 1 means the symptom is very mild, and 7 means the symptom is severe.

- Runny Nose
- Stuffy Nose (not asked <3 years)
- Sneezing
- Sore Throat (not asked <3 years)
- Cough
- Feeling Tired

Functional Impact Score (sum of ratings divided by number of questions answered)

Over the last 24 hours, how much has your child’s illness interfered with their ability to perform their usual activities? For each activity, choose a number between 0 and 7. 0 means their illness did not interfere with their ability to do that activity at all, 1 means their illness mildly interfered, and 7 means their illness severely interfered.

- Think Clearly (not asked <3 years)
- Sleep Well
- Breathe Easily
- Walk, Climb Stairs, or Exercise (not asked <3 years)
- Go to School
- Interact with Others (not asked <13 years)
- Play with Friends (not asked <5 years or ≥13 years)

Schmit KM, et al. Pediatric Research 2021; 90:1207–1214.

- Overall illness severity = Rated on a scale of 0 to 7
- Symptom and functionality scores = $\frac{\text{Sum of ratings}}{\text{Number of questions answered}}$

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Results

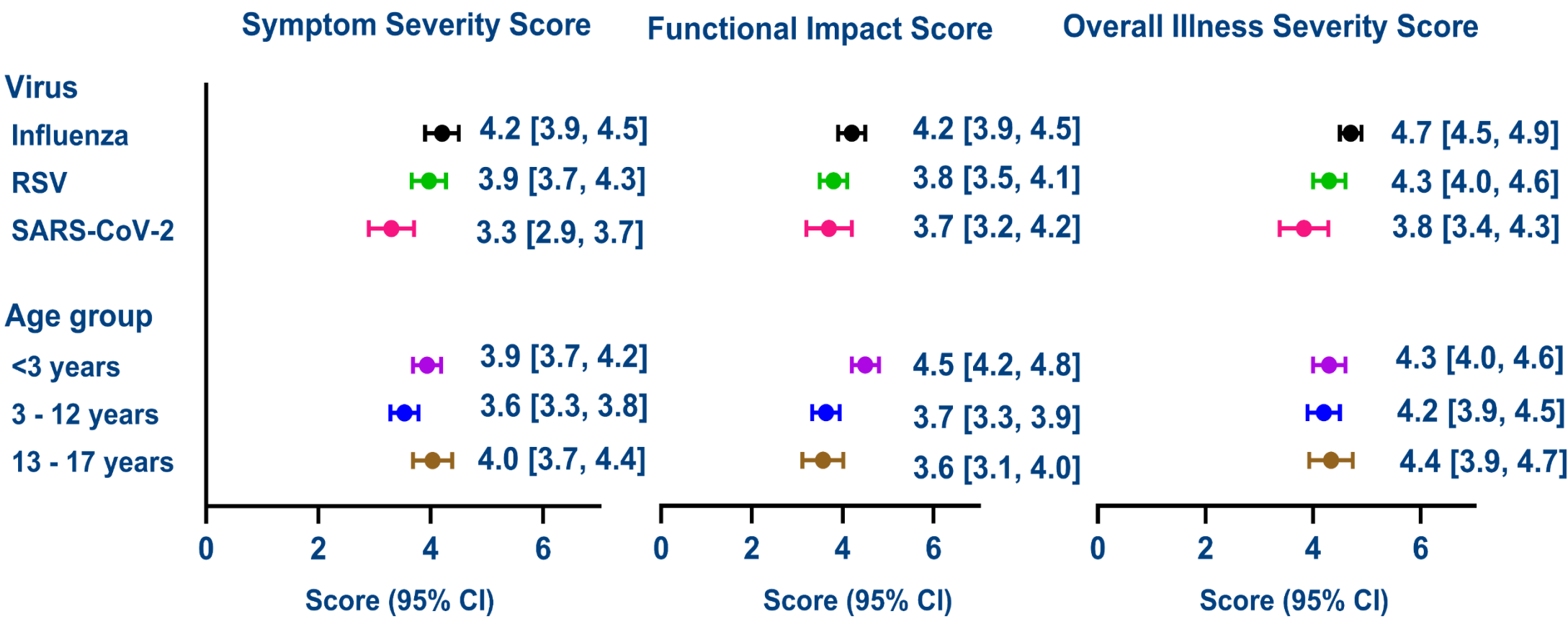
- 1465 patients (children) enrolled and tested: 294 (20.1%) tested positive
 - Influenza (134, 9.1%), RSV (112, 7.6%), SARS-CoV-2 (48, 3.3%) (Table 2)
- Among the 84 hospitalized children enrolled - 6 (7.1%) positive for influenza, 28 (33.3%) for RSV and 2 (2.4%) for SARS-CoV-2
- Among the 1381 children that were outpatients - 128 (9.3%) positive for influenza, 84 (6.1%) for RSV and 46 (3.3%) for SARS-CoV-2
- Influenza symptom severity higher than SARS-CoV-2 (p<0.001) but similar to RSV (p=0.19) (Figure 2)
- Influenza functional impact similar to SARS-CoV-2 (p=0.12) and RSV (p=0.09) (Figure 2)
- Influenza overall illness severity higher than SARS-CoV-2 and RSV (p<0.001) (Figure 2)

Table 2. Characteristics of the Study Population by Infection Status

Characteristics	Influenza	RSV	SARS-CoV-2	p value
	n (%)	n (%)	n (%)	
Number positive	134 (9.1)	112 (7.6)	48 (3.3)	
Age (years)				<0.0001
<3 years	21 (15.7)	67 (59.8)	23 (47.9)	
3-12 years	78 (58.2)	35 (31.3)	15 (31.3)	
13-17 years	35 (26.1)	10 (8.9)	10 (20.8)	
Age, median (Q1,Q3)	8 (4,13)	2 (1,5)	4 (0,12)	<0.0001
Sex				0.87
Female	70 (52.2)	62 (55.4)	25 (52.1)	
Male	64 (47.8)	50 (44.6)	23 (47.9)	
Race/ethnicity				0.73
Non-Hispanic White	104 (77.6)	93 (83.0)	37 (77.1)	
Hispanic	11 (8.2)	5 (4.5)	3 (6.3)	
Other	19 (14.2)	14 (12.5)	8 (16.7)	
Level of care				<0.001
Inpatient	6 (4.5)	28 (25.0)	2 (4.2)	
Outpatient	128 (95.5)	84 (75.0)	46 (95.8)	
Days between symptom onset and enrollment, median (Q1,Q3)	4 (2,5)	4 (2.5, 5)	2 (1,4)	<0.001
Immunization status†				0.24
Influenza vaccination	18 (1.3)	22 (1.6)	5 (0.4)	
COVID-19 vaccination	10 (0.7)	6 (0.4)	3 (0.2)	
RSV monoclonal antibody	7 (0.7)	14 (1.5)	7 (0.7)	
Presence of ≥1 chronic condition	39 (29.1)	45 (40.2)	8 (16.7)	0.01

†Percentages are among those eligible for immunization or vaccination; influenza and COVID-19 vaccination (age >6 months, n=1363), RSV monoclonal antibody (age <3 years, n=953)

Figure 2. Adjusted Mean WURSS-K Scores by Infection Status and Age group



Data are presented as least square means (95% CI) after adjustment for age group, presence of ≥1 chronic condition, and days from illness onset to enrollment

Conclusions

- In 2024-2025, among mostly outpatient children in a US health system, the highest WURSS-K score was noted for influenza; however, absolute differences between influenza, RSV and SARS-CoV-2 were relatively small
- WURSS-K overall illness severity score was mild to moderate among children of all ages

Limitations

- Data collected at a single time point limiting information on the progression of illness over time
- Parents of some participants completed surveys which can influence WURSS-K scores
- Although scores were normalized to number of items answered, the youngest children were not asked items not applicable to their developmental stage. Combined with patterns of virus-specific infection by age, this could be a potential alternative explanation for our findings.

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