Costs of Hospitalizations due to Respiratory Syncytial Virus (RSV) Illness Among Children and Adolescents in Ontario, Canada

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INTRODUCTION

- The burden of RSV illness among children and adolescents is high and has increased due to pandemic-related factors, imposing a substantial cost to the healthcare system[1,2].
- A recent study in Ontario found that children under 2 years old who were hospitalized with RSV incurred a median cost of $6,760 per patient in the year following their discharge, which was more than 10-fold higher than the median cost of a matched control[3].
- The specific economic burden of RSV hospitalizations, especially in older children, has not been documented.

OBJECTIVE

The aim of this study is to understand the economic burden of hospitalizations due to RSV infections in children and adolescents ≤17 years old in Ontario.

METHODS

Study Design

- This is a retrospective, observational study using provincial administrative data on hospitalizations due to RSV infections in children and adolescents ≤17 years of age in Ontario.
- Ontario's provincial administrative healthcare data from ICES (Institute for Clinical Evaluative Sciences) was used for this study, which captures all healthcare encounters in the publicly funded healthcare system.
- The study period encompassed July 1, 2010 to March 31, 2023. Annual outcomes were reported from July 1 to June 30 of the next year. Due to data availability, the final study year concluded on March 31.
- Participants with an RSV-specific hospitalization were identified using the following definition: an overnight stay at a hospital with any ICD-10-CA code specific for RSV (B97.4, J12.1, J20.5, or J21.0).
- Subsequent RSV-specific hospitalizations occurring within 30 days were considered as a single hospitalization and only acute hospitalizations were considered (i.e., planned hospitalizations were not included).
- Participants were included if they were aged ≤17 years at the hospital admission date and had a valid Ontario Health Insurance Plan (OHIP) card number during the hospitalization.

Variables

- Variables describing hospitalization were analyzed, stratified by year, RSV seasonality (RSV-season: November – April; non-RSV season: May – October), age, weeks' gestational age (wGA) at birth, birthweight, sex, geographic region, neighborhood income quintile, and risk status^.

Analysis

- All analyses were descriptive, with continuous data summarized as mean (standard deviation) or median (interquartile range) and categorical data summarized as frequencies and percentages
- The total costs incurred for RSV-specific hospitalizations occurring within 30 days were summed, estimated using resource-intensity weighting (RIW) methodology[4]. All costs were standardized to 2021 Canadian dollars (CAD$).

DISCUSSION

- Median hospitalization costs of children and adolescents hospitalized with RSV (~$5,000) are relatively high compared to the general pediatric population. Among the median costs of the top 50 most expensive conditions requiring inpatient care, RSV ranks at the 60th percentile[5].
- A study found that the third most costly condition among patients ≤17 years old with inpatient encounters in Ontario between 2014 – 2019 had a total cost of $78.3 million over five years[5]. This amount is just more than twice the hospitalization costs for RSV hospitalizations in 2022/2023 alone, and slightly more than the total costs of RSV hospitalizations over the same five-year period.

LIMITATIONS

- A validated algorithm (97.9% sensitivity and 96.9% positive predictive value) was used to identify RSV hospitalizations[3]; therefore, the captured RSV hospitalizations may be an underestimate.
- The study did not include RSV cases identified in an ambulatory setting and/or via laboratory testing; therefore, the total costs attributable to RSV would be higher.

CONCLUSION

Hospitalizations of young children and adolescents due to RSV pose a substantial burden to the healthcare system, with costs comparable to those of the most expensive medical conditions or patient groups. These findings underscore the importance of preventative measures to mitigate this burden.

REFERENCES

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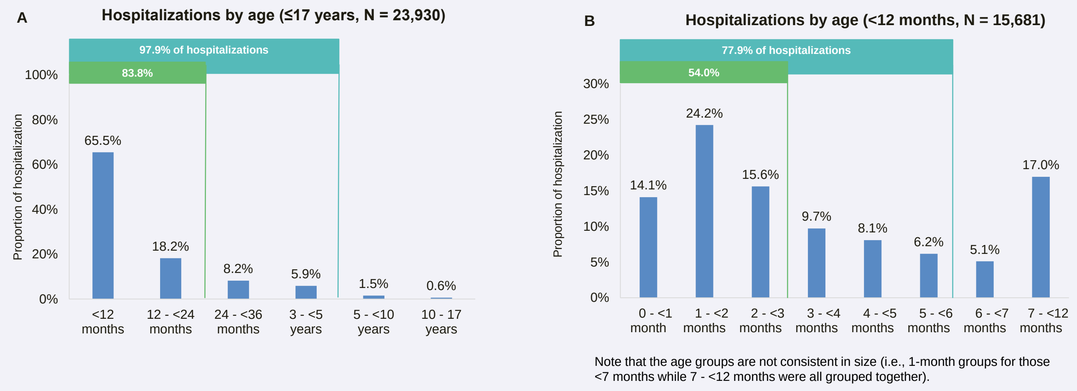
DISCLOSURES

- Sazini Nzula is an employee of Pfizer. Alexandra Goyette, Deshayne Fell, and Ana Gabriela Grajales are employees and shareholders of Pfizer. Ceryl Tan, Natalie Nightingale, Sophia Rodopoulou, Maria Esther Perez Trejo, and Calum S. Neish are employees of IQVIA.
- Ethics: Approvals received from the Institutional Review Board services (Advarra IRB# 00000971, Approval #Pro00074411) and the ICES Privacy and Compliance Office.
- Analyses were conducted using Statistical Analysis System (SAS) version 9.3 or higher and as per ICES SOPs, any cell sizes smaller than six were suppressed to prevent back-calculation.

RESULTS

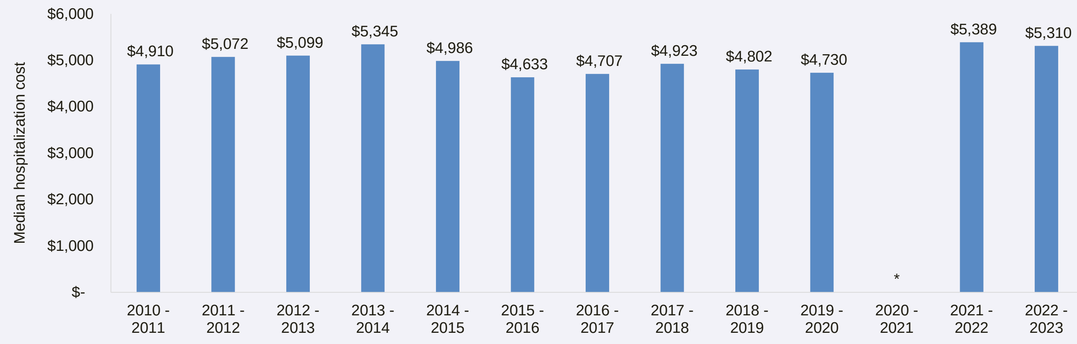
- Throughout the study period, 23,930 RSV hospitalizations were reported (annual range: 1,356 – 4,298). Children <12 months accounted for 66% of all hospitalizations, of which >75% occurred in those <6 months (**Figure 1**).
- Overall, the total annual cost of RSV hospitalizations was $12 - 16 million during 2010/2011 to 2021/2022, and more than doubled to $38 million in 2022/2023 due to the rise in hospitalized cases. Annual costs were consistent over the study period, with a median (IQR) of $5,070 ($4,486 - $6,742) per hospitalization (**Figure 2**).
- Those hospitalized at 10 – 17 years old incurred the highest costs, with a median (IQR) of $9,653 ($5,296 – $22,502), followed by those hospitalized at <1 month old (median [IQR]: $6,931 [$6,088 – $11,408]) (**Figure 3**).
- For children hospitalized at <12 months, median costs increased with prematurity, with those born at wGA <32 weeks incurring the highest costs. Children hospitalized at <1 month incurred higher median costs at $11,059 (wGA 32 – <37 weeks) and $6,854 (wGA ≥37 weeks), compared to those hospitalized between 1 – <12 months old, whose median costs remained consistent at $5,000 (wGA ≥32 weeks).
- Overall, 12% of patients were admitted to the intensive care unit (ICU) for a median duration of 87 hours. The hospitalization costs for patients with an ICU stay (median [IQR]: $12,042 ($6,836 –$24,685)) were more than twice those of patients who were not admitted to the ICU (median [IQR]: $4,945 [$4,429 – $6,091]) (**Figure 4**).

Figure 1. RSV hospitalizations among Ontario children <12 months old (2010 – 2023).



Note that the age groups are not consistent in size (i.e., 1-month groups for those <7 months while 7 - <12 months were all grouped together).

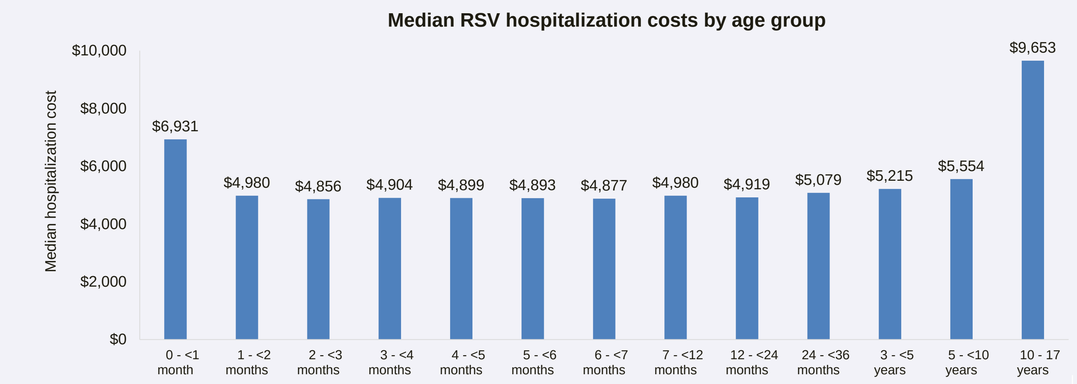
Figure 2. Median (IQR) costs of RSV hospitalizations by year.



	2010 - 2011	2011 - 2012	2012 - 2013	2013 - 2014	2014 - 2015	2015 - 2016	2016 - 2017	2017 - 2018	2018 - 2019	2019 - 2020	2020 - 2021	2021 - 2022	2022 - 2023
1st quartile	$ 4,464	$ 4,544	$ 4,604	$ 4,871	$ 4,563	$ 4,185	$ 4,172	$ 4,478	$ 4,334	$ 4,334	N/A	$ 4,949	$ 4,715
3rd quartile	$ 5,771	$ 5,849	$ 6,278	$ 6,552	$ 6,547	$ 6,527	$ 6,740	$ 6,841	$ 6,663	$ 6,243	N/A	$ 7,205	$ 7,666

*There were only 1 – 5 RSV hospitalizations reported for 2020 – 2021 due to the COVD-19 restrictions. All costs were standardized to 2021 Canadian dollars.

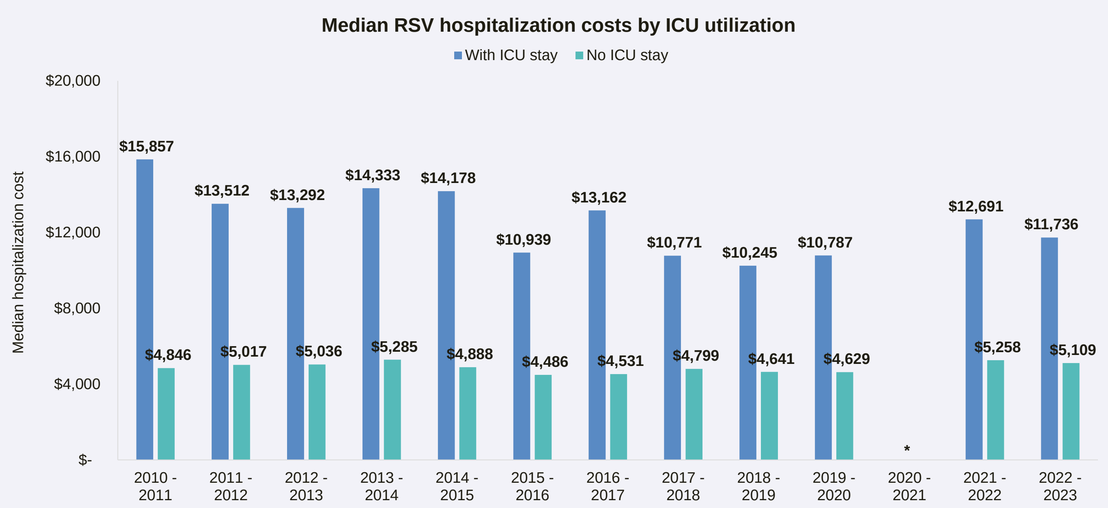
Figure 3. Median (IQR) costs of RSV hospitalizations by age group.



	0 - <1 month	1 - <2 months	2 - <3 months	3 - <4 months	4 - <5 months	5 - <6 months	6 - <7 months	7 - <12 months	12 - <24 months	24 - <36 months	3 - <5 years	5 - <10 years	10 - 17 years
1st quartile	$ 6,088	$ 4,448	$ 4,397	$ 4,439	$ 4,387	$ 4,429	$ 4,385	$ 4,462	$ 4,384	$ 4,506	$ 4,591	$ 4,767	$ 5,296
3rd quartile	$ 11,408	$ 6,593	$ 5,710	$ 5,812	$ 5,783	$ 5,691	$ 5,753	$ 6,354	$ 6,360	$ 6,728	$ 7,088	$ 8,754	$ 22,502

All costs were standardized to 2021 Canadian dollars.

Figure 4. Median cost of RSV hospitalizations by ICU utilization.



*There were only 1 – 5 RSV hospitalizations reported for 2020 – 2021 due to the COVD-19 restrictions. All costs were standardized to 2021 Canadian dollars.

^ wGA and birthweight information were only defined for children hospitalized at <2 years old. Risk status includes conditions such as congenital malformations, cystic fibrosis, chronic respiratory disease, trisomy 21, cardiovascular disorders, congenital kidney disease (in <2 years only), congenital neurological disorders (in <2 years only), cancer (in 2-17 years only), immunodeficiencies (in 2-17 years only), and neuromuscular diseases (in 2-17 years only).

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