The economic impact of respiratory syncytial virus (RSV) in young children in the United States: systematic literature review

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BACKGROUND

- Respiratory syncytial virus (RSV) is a common illness of children and older adults with an estimated 587,000 infections annually among children in United States.
- RSV is the leading cause of lower respiratory tract infections (LRTI) in infants.[1]
- RSV is associated with considerable health care utilization and health care costs in children under 5 years of age.
- Information about the overall cost of RSV illness is critical to pharmaceutical firms and payers for development and funding of RSV-related products.

OBJECTIVE

- To conduct a Systematic Literature Review (SLR), using PRISMA methodology, of the current evidence on the cost per RSV episode in all children under 60 months of age (not just those at high risk) by setting and other characteristics in the US.

METHODS

Data extraction

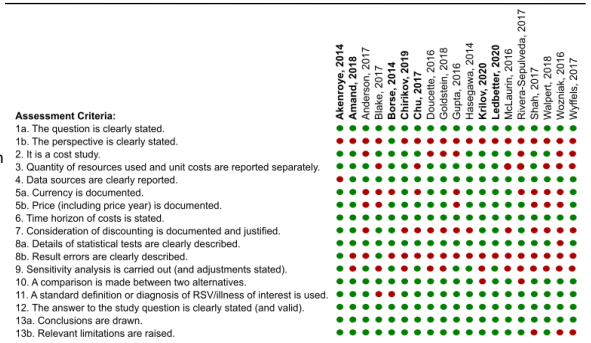
- After submitting our protocol to PROSPERO, we searched EconLit, Health Technology Assessment Database, PubMed, Paediatric Economic Database Evaluation, and Scopus databases.
- We included studies in English published between 2014-2020 which reported RSV-related costs in children < 5 years of age in the US.
- We classified cost, where possible, by gestational age (GA) – full term (≥37 wGA), late preterm (35-36 wGA), early preterm (29-34 wGA), extremely preterm (≤28 wGA), unspecified GA – and by special populations (CHD, major health problems).
- We extracted cost data by healthcare setting, GA at birth, payer type, and chronological age at RSV episode.

Data analysis

- We calculated within- and across-study average cost by pooling subgroups into larger groupings (GA and high-risk populations) and weighting according to subgroup sample sizes (StatsToDo).
- We used normal distributions to calculate the 95% confidence interval (CI) for each mean.
- We used national data[2] (RSV hospitalization rates) to weight categories by GA to calculate the overall average cost per hospitalization as well as the proportion of RSV-related discharges and costs by GA.

Figure 1 shows the results of the quality assessment using a modified version of the Drummond checklist.[3] The studies marked in bold satisfied the most quality criteria.

Figure 1: Quality Assessment



RESULTS

- 17 articles met SLR eligibility criteria and quality thresholds for inclusion in the SLR and meta-analysis shown in the PRISMA diagram (**Figure 2**).
- Cost (mean, CI) per hospitalized infant with RSV was 10.2% higher than those with unspecified bronchiolitis.
- Few studies (4/17, 23.5%) reported non-hospital costs.
- Average RSV-related non-inpatient cost per year was $1,446 ($1,354 - $1,538).
- No studies since 2014 reported indirect costs.
- Reported costs related to RSV were largely confined to infants with a history of prematurity or other comorbid conditions in inpatient settings, with extremely preterm infants having a mean inpatient cost more than 6 times that of a full-term infant (**Figure 3**).
- The average cost of per inpatient hospitalization for commercially insured children, $15,804 ($15,094 - $16,515) was 1.6 times the cost of those with Medicaid coverage, $10,149 ($9,747 - $10,551) (**Figure 4**).
- Despite high average costs for extremely preterm infants, RSV-related hospitalizations for full-term infants constituted 82.0% of annual RSV discharges (N=39,407) and 69.9% of their aggregate costs ($461.4 million) **(Figure 5).**

Figure 2: PRISMA diagram

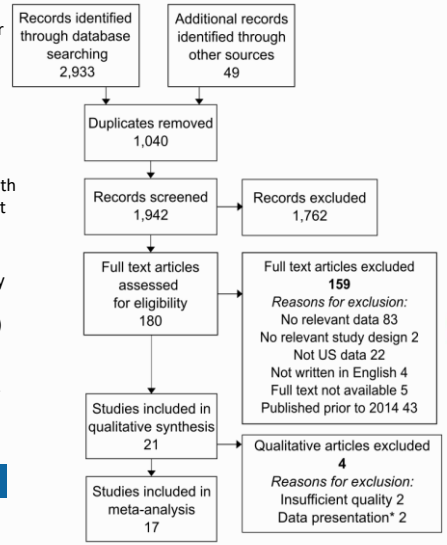


Figure 3: Cost per RSV hospitalization by wGA group, in children <60 months, †denotes within study weighted average.

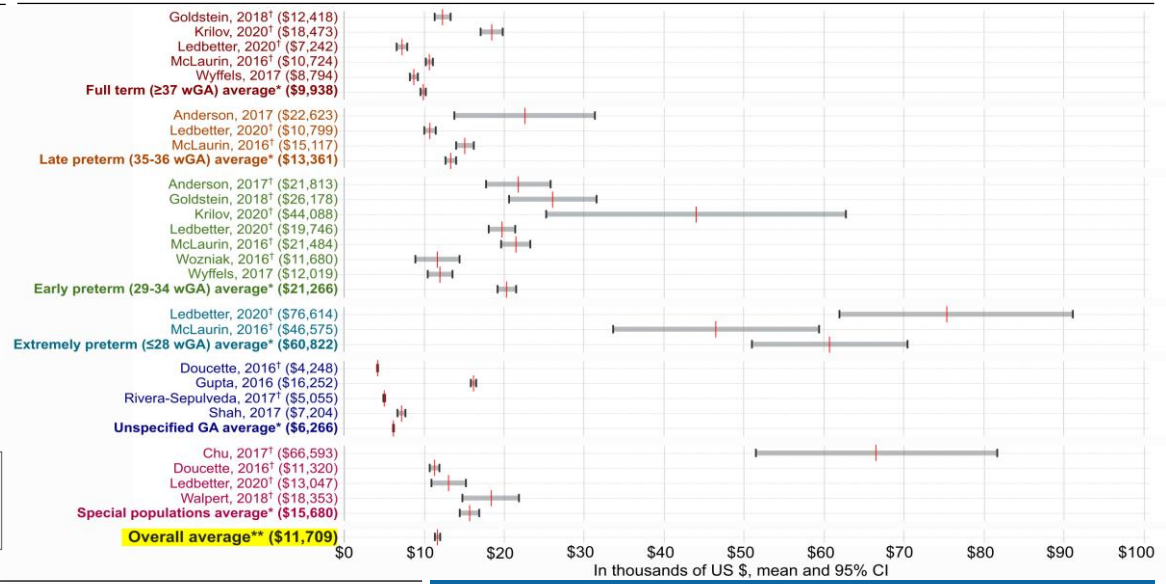


Figure 4: Cost per RSV hospitalization by payer, in children <60 months,
†denotes within study weighted average. *denotes across study weighted average.

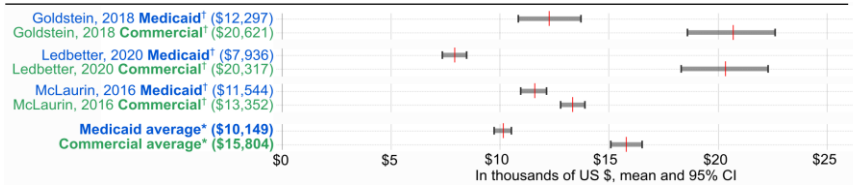
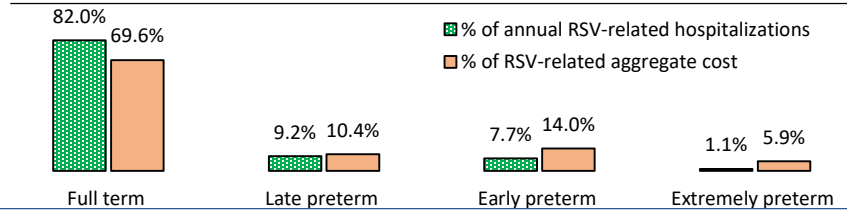


Figure 5: RSV hospitalizations in children 0-11 months: Percentage of RSV-related discharges (N=39,407) vs. percentage of RSV-related aggregate costs ($461.4 million)



DISCUSSION / CONCLUSIONS

- Our average cost per inpatient RSV hospitalization ($11,709) was similar to the national healthcare spending per capita in 2018 ($11,172) and reflects the high economic burden of RSV hospitalizations in young children in the U.S.[4]
- Outpatient cost per episode was substantially lower than inpatient cost per episode. Additional epidemiological data are needed to assess the aggregate cost of outpatient episodes.
- The dearth of literature on ambulatory and indirect costs highlights the need for more research on these topics to fully understand the societal cost of RSV.

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Christopher Rizzo and Christopher B. Nelson are employees of Sanofi Pasteur.