Medically Attended Respiratory Syncytial Virus Hospitalizations (RSVH) and All-Cause Bronchiolitis Hospitalizations (BH) Among Children Aged ≤24 Months at RSV Season Start With Higher-Risk Congenital Heart Disease (CHD) Before and After the 2014 American Academy of Pediatrics (AAP) Policy

Jaime Fergie, MD[1]; Tara Gonzales, MD[2]; Mina Suh, MPH[3]; Xiaohui Jiang, MS[3]; Jon P. Fryzek, PhD, MPH[3]; Ashley Howard, DO[4]; Adam Bloomfield, MD[2]

[1]Driscoll Children's Hospital, Corpus Christi, TX, USA; [2]Sobi Inc., Waltham, MA, USA; [3]EpidStrategies, Rockville, MD, USA; [4]Yale School of Medicine, New Haven, CT, USA.

Background

- Respiratory syncytial virus (RSV) disease is a leading cause of hospitalization due to lower respiratory tract infections. However, current treatment options for RSV are primarily supportive[1,2]
- Palivizumab is the only available immunoprophylaxis (IP) for the prevention of severe RSV infection in high-risk populations, including infants born at ≤35 weeks' gestational age and children with hemodynamically significant congenital heart disease (CHD)[1,2]
- In 2014, the American Academy of Pediatrics (AAP) stopped recommending palivizumab for use in children with hemodynamically significant CHD aged 12 to 24 months at the RSV season start[1]

Objective

- To evaluate the impact of the 2014 AAP policy change on RSV hospitalizations (RSVH) and all-cause bronchiolitis hospitalizations (BH) in children aged ≤24 months with higher-risk CHD

Methods

Study Design

- This was a historical, observational cohort study using hospital discharge records from 51 US children's hospitals affiliated with the Pediatric Health Information System (PHIS) database

Patient Selection

- Children with higher-risk CHD were eligible if they were aged ≤24 months at the RSV season start and hospitalized for RSV or bronchiolitis during the 2010-2011 to 2016-2017 RSV seasons (Nov-Mar)
- RSVH was defined by International Classification of Diseases, Ninth and Tenth Revisions, Clinical Modification (ICD-9-CM; ICD-10-CM) codes (ICD-9: 079.6, ICD-10: B97.4), pneumonia due to RSV (ICD-9: 480.1, ICD-10: J12.1) or acute bronchiolitis due to RSV (ICD-9: 466.11, ICD-10: J21.0). BH was defined as RSV hospitalizations plus unspecified bronchiolitis hospitalizations (ICD-9: 466.1, 466.19, ICD-10: J21, J21.1, J21.8, J21.9)
- As there are no ICD codes for hemodynamically significant CHD, the effect of the AAP policy change on infants with higher-risk CHD as defined by ICD codes was evaluated[3]

Data Collection and Analysis

- SAS version 9.4 was used for statistical analysis of these data, with chi-squared test or Wilcoxon rank-sum test used to determine statistical significance

Results

- Over the 7 RSV seasons studied (2010-2011 through 2016-2017), a total of 104,687 RSVH and 164,055 BH were identified in the PHIS database. Among RSVH, 3.6% (3790 of 104,687) were identified as higher-risk CHD. Among BH, 3.9% (6480 of 164,055) were identified as higher-risk CHD
- Among children aged ≤24 months with higher-risk CHD, RSVH and BH significantly increased after the 2014 policy change with hospitalizations of 3.4% before vs 4.0% after for RSV and 3.7% before vs 4.3% after for bronchiolitis **(Figure 1)**
- RSVH rose after the policy change vs before among the subgroup of children with higher-risk CHD aged 12 to 24 months at the start of the RSV season (0.5% before the guidance and 0.8% after; $P<0.0001$) **(Figure 1)**
- RSV disease severity as measured by intensive care unit (ICU) admissions significantly increased after the 2014 policy (0.2% before the policy and 0.3% after; $P<0.0001$) in the 12 to 24 months subgroup. However, mechanical ventilation (MV) receipt was not statistically increased after the 2014 policy ($P=0.188$) **(Figure 2)**. Similarly, ICU admissions associated with BH significantly increased in the 12 to 24 months subgroup (0.2% before the policy vs 0.3% after; $P<0.0001$), and MV receipt also increased ($P=0.0422$)

Figure 1. Proportions of RSV and All-Cause Bronchiolitis Hospitalizations Among Children with Higher-Risk CHD (hr-CHD) Aged ≤24 Months or 12-24 Months Before and After the 2014 AAP Policy Change
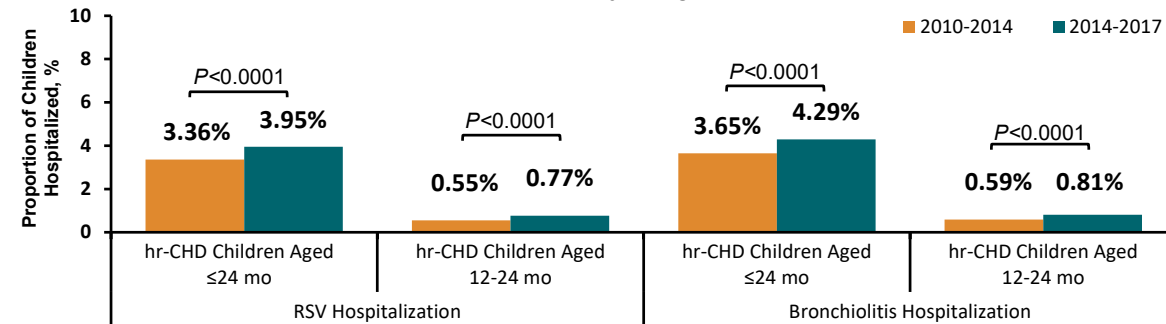

Figure 2. RSV and All-Cause Bronchiolitis Hospitalization Disease Severity (ICU Admission and MV Receipt) Among Children With Higher-Risk CHD Aged 12-24 Months Before and After the 2014 AAP Policy Change

Limitations

- As with any observational retrospective cohort, causal associations cannot be established and the results may not be generalizable to the overall population
- Higher-risk CHD was evaluated because no specific ICD codes for hemodynamically significant CHD exist, therefore misclassification of patients into the higher-risk CHD subset is possible
- Potential coding errors and inconsistencies may underestimate or overestimate severe RSV disease

Conclusions

RSVH, BH, and associated disease severity significantly increased among children with higher-risk CHD aged 12 to 24 months within the PHIS in the 3 RSV seasons following the 2014 AAP RSV IP recommendations

Future Directions

Further study of long-term complications associated with RSVH and BH in these children is warranted in addition to continued examinations of the impacts from the 2014 AAP policy recommendations on RSV IP

References

1. American Academy of Pediatrics Committee on Infectious Diseases; American Academy of Pediatrics Bronchiolitis Guidelines Committee. *Pediatrics.* 2014;134(2):e620-e638.
2. Kong AM, et al. *Am J Perinatol.* 2018;35(2): 192-200.
3. Doucette A, et al. *PLoS One.* 2016;11(4):e0152208. doi: 10.1371/journal.pone.0152208.