Quality of Care in US Children With Sickle Cell Anemia

#601

Julie Kanter, MD[1]; Carlton Dampier, MD[2]; Irene Agodoa, MD[3]; Robin Howard[3]; Sally Wade[4]; Virginia Noxon, PhD[5]; Samir K. Ballas, MD[6]

[1]Lifespan Comprehensive Sickle Cell Center, Medical University of South Carolina, Charleston, SC; [2]Emory University, Atlanta, GA; [3]Global Blood Therapeutics, Inc., South San Francisco, CA; [4]Wade Outcomes Research and Consulting, Salt Lake City, UT; [5]Truven Health Analytics, an IBM company, Ann Arbor, MI; [6]Department of Medicine/Hematology, Thomas Jefferson University, Philadelphia, PA

INTRODUCTION

- Sickle cell disease (SCD) is a genetic disorder in which sickle hemoglobin (HbS) triggers multiple downstream effects, including red cell sickling, hemolysis, vaso-occlusion, and inflammation[1]
- SCD, a lifelong disease occurring from birth with injury that accumulates over time, causes significant end-organ damage and clinical complications that are undertreated and associated with early death[1]
- Patients of all ages are at risk for infection (highest risk <2 years), stroke, and retinopathy[1]
- Hemoglobin SS (HbSS) and HbS β^0-thalassemia (HbS β^0-thal) patients experience the most severe effects of sickling
- Clinical guidelines for pediatric SCD patients recommend[2]
  - All genotypes
    - Prophylactic penicillin use (age birth-5 years)
    - Immunization with the 13-valent pneumococcal conjugate and 23-valent pneumococcal polysaccharide vaccines
    - Annual anti-influenza vaccine
    - Annual ophthalmology examination to assess for retinopathy (age ≥10)
  - HbSS and HbS β^0-thal: annual screening for stroke with transcranial Doppler (TCD) imaging (age 2-16 years)
- There is limited real-world evidence describing the implementation of these clinical guidelines in pediatric patients with SCD

OBJECTIVE

- To describe the use of vaccines, penicillin, TCD screening, and ophthalmology care in a large cohort of children with HbSS disease

METHODS

Study Design and Data Sources

- This is a retrospective administrative claims database analysis among a sample of commercially and Medicaid-insured populations in the United States
- These databases provide detailed outcomes measures, including outpatient pharmacy claims, resource utilization, and associated costs for health care services performed in both inpatient and outpatient settings for over 41 million individuals
- De-identified US administrative claims data from January 1, 2009, through December 31, 2014, were extracted from the Truven Health MarketScan® Commercial Claims Database and Medicaid Database
- Only regional geographic data are available for commercially insured patients in this dataset

Patient Selection

- For each year (2009-2014), the following inclusion/exclusion criteria* were applied:
  - Pediatric HbSS
  - Either 1 inpatient or 2 outpatient (different days) nondiagnostic claims with HbSS (*ICD-9* code 282.62 or 282.63 [HbSS with and without crisis])
  - 1 to 16 years of age at identification of HbSS in dataset
  - 1 year of continuous enrollment in medical and pharmacy benefits prior to HbSS identification in dataset
  - Patients with chronic transfusions (defined as ≥9 transfusions during year; 10% of pediatric HbSS population) were excluded

*Note that patients could qualify in multiple years if they met all criteria in each year (ie, a patient could qualify in 2010, 2011, and 2012).

Outcomes

- The following utilization measures were captured by procedure codes during the year prior to HbSS identification:
  - Vaccines: influenza, pneumococcal (13-valent conjugate and 23-valent polysaccharide)
  - Penicillin
  - TCD procedures (age 3-16 years)
  - Ophthalmologist visits (proxy for retinopathy screening)
- Averages of descriptive results across all years were reported to provide a comprehensive overview of prior year utilization among identified HbSS patients
- All results were reported by payer (commercial, Medicaid) and age group (TCD only [3-5, 6-11, 12-16, 3-16 years]; all others [1-5, 6-11, 12-16, 1-16 years])

RESULTS

Table 1. Annual Cohorts[a]

	2009	2010	2011	2012	2013	2014
Commercial	348	400	387	438	347	355
Medicaid	1024	1225	1239	1254	1557	1526

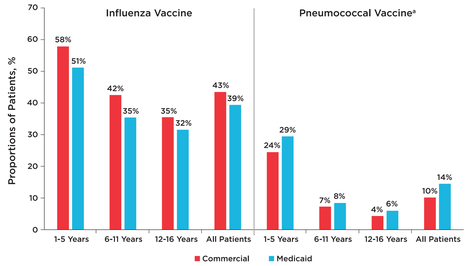
[a]Truven Health MarketScan Medicaid databases had an underlying increase in enrollees compared to commercial databases during this time frame; states contributing Medicaid data may vary over time.

Table 2. Average Patient Characteristics (all years)

	Commercially Insured Patients	Medicaid Patients
Average age (mean), years	9.5 (4.4)	8.3 (4.3)
Age group, n (%)		
1-5 years	89 (23%)	414 (32%)
6-11 years	146 (38%)	530 (41%)
12-16 years	145 (38%)	360 (28%)
Females, n (%)	195 (52%)	625 (48%)
Geographic location, n (%)		
Northeast	48 (13%)	
North Central	62 (16%)	
South	242 (64%)	
West	21 (6%)	
Unknown	6 (2%)	Unavailable
Urban status, n (%)		
Urban	351 (93%)	1064 (82%)
Rural	22 (6%)	239 (18%)
Unknown	7 (2%)	1 (0%)
Top 2 comorbid conditions, n (%)		
Acute chest syndrome	30 (8%)	192 (15%)
Asthma	76 (20%)	396 (30%)

- Patients were slightly younger in the Medicaid population (mean age 8.3 years) compared with the commercial population (mean age 9.5 years; **Table 2**)
- Across payers and age groups (**Table 2**)
  - Relatively balanced between male and female
  - Majority resided in urban area

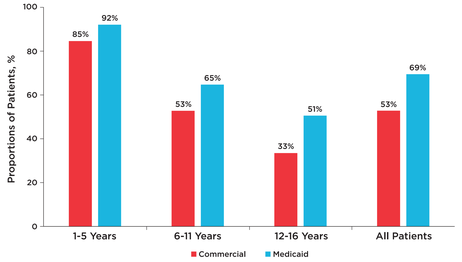
Figure 1. Average prior year vaccinations



*13-valent conjugate and 23-valent polysaccharide vaccines.

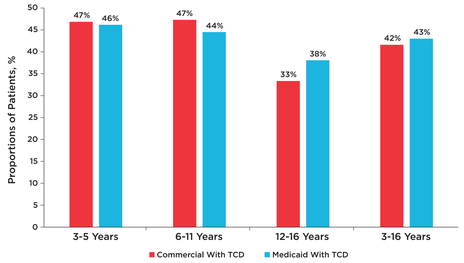
- Patients aged 1 to 5 years had the highest use of influenza and pneumococcal vaccines in both payers (**Figure 1**)
- Across age groups, influenza vaccines were more common among commercially insured patients than Medicaid patients. This trend was reversed for use of pneumococcal vaccine (**Figure 1**)
- Across payers and age groups, no marked differences were observed when results were stratified by urban/rural status

Figure 2. Average prior year penicillin use



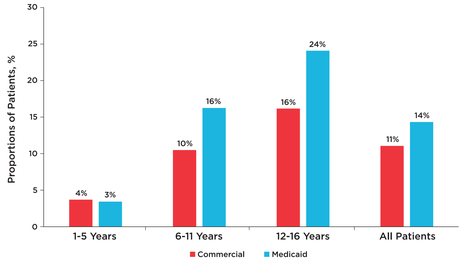
- The proportion of patients who used penicillin was consistently greater among Medicaid patients than among commercially insured patients (**Figure 2**)
- For both payer populations, over 80% of patients aged 1 to 5 years used penicillin (**Figure 2**)
- No marked differences in results across payers and age groups were observed when stratified by urban/rural status

Figure 3. Average prior year TCD screen



- Each year only 33% to 47% of patients had a TCD screen (**Figure 3**)
- TCD utilization was highest among patients aged 3 to 11 years, dropped at age 12 to 16, and was consistent across payers (**Figure 3**)
- No marked differences were observed when results were stratified by urban/rural status, regardless of payer or age group

Figure 4. Average prior year ophthalmologist visits



- Less than 25% of patients had an ophthalmologist visit annually across payers (**Figure 4**)
- Compared with commercially insured patients, Medicaid patients were more likely to have ophthalmologist visits (**Figure 4**)
- Patients aged 12 to 16 years had the highest proportion with an ophthalmologist visit across payers (**Figure 4**)
- No marked differences in results across payers and age groups were observed when stratified by urban/rural status

LIMITATIONS

- The MarketScan® Research Databases represent a sample of individuals with employer- and Medicaid-sponsored health insurance; thus, findings from this study may not be generalizable to populations with other forms of insurance or the uninsured
- Data are limited to those captured in claims, and identification of a diagnosis that utilized *ICD-9-CM* diagnosis codes only reflects the claims submitted by the physicians for reimbursement
- Potential for misclassification of SCD and HbSS was present as patients were identified through administrative claims data as opposed to medical records
- The proportion of patients aged 1 to 5 years who received a pneumococcal vaccine might be underestimated, as this age group includes patients for whom capture of booster vaccinations may be incomplete in the study period
- Influenza and pneumococcal vaccines may be underreported as vaccines provided by state/local agencies are not captured in these databases
- Medication data indicate drugs administered in a physician's office or filled through an outpatient pharmacy, but the data do not represent whether the patient used the medication as prescribed; in addition, over-the-counter medications and medications administered in the inpatient setting are not captured
- Results are limited in scope and generalizability to healthier HbSS pediatric patients due to the exclusion of patients with chronic transfusions

SUMMARY

- The high penicillin utilization among patients aged 1 to 5 years was consistent with guideline recommendations and offered a partial validation of the dataset
- Immunization against pneumococcus was surprisingly poor in this cohort
- Underutilization of guideline-recommended TCD screening and retinopathy screening (ophthalmology visits) was observed

CONCLUSIONS

- Appropriate use of TCD screening for stroke prevention is especially warranted as chronic transfusion therapy is a proven method of prevention against this potentially devastating complication
- Additional evaluation is needed to validate the algorithm used for assessment of pneumococcal vaccination
- Further research is needed to better understand potential barriers to proper screening in addition to evaluating strategies to improve awareness, adherence, and implementation of recommended screening in children with SCD

References

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2. NHLBI. Evidence-based management of sickle cell disease: expert panel report, 2014. Accessed April 5, 2018. https://www.nhlbi.nih.gov/sites/default/files/media/docs/sickle-cell-disease-report%20020816_0.pdf.

Disclosures

- **Julie Kanter:** Novartis: membership on an entity's board of directors or advisory committees, research funding; Apopharma: research funding; Global Blood Therapeutics: research funding; AstraZeneca: membership on an entity's board of directors or advisory committees; Bluebird Bio: membership on an entity's board of directors or advisory committees, research funding; MUSC: other: the site PI for sponsored research conducted at MUSC who receives funds from Novartis, Bluebird Bio, Global Blood Therapeutics, Sancilio, Apopharma, Pfizer; Sancilio: research funding; NHLBI (sickle cell disease research advisory committee): membership on an entity's board of directors or advisory committees, research funding; American Society of Hematology (Sickle Cell Disease Guideline Panel): membership on an entity's board of directors or advisory committees; Pfizer: research funding. **Carlton Dampier:** Pfizer, Lilly, Novartis, Sancilio: consultancy, membership on an entity's board of directors or advisory committees, research funding. **Irene Agodoa:** Global Blood Therapeutics: employment, equity ownership. **Robin Howard:** Global Blood Therapeutics: employment, equity ownership. **Sally Wade:** Truven Health Analytics, an IBM company which received project funding from Global Blood Therapeutics: consultancy. **Virginia Noxon:** Truven Health Analytics, an IBM company which received project funding from Global Blood Therapeutics: employment. **Samir K. Ballas:** Novartis: honoraria, speakers bureau
- Medical writing and editorial assistance were provided by ApotheCom (San Francisco, CA) and supported by Global Blood Therapeutics
- This study was sponsored by Global Blood Therapeutics

http://bit.ly/2HwVWoN

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