Changes in Hydroxyurea Adherence During the COVID 19 Pandemic among Children and Young Adults with Sickle Cell Disease

Melinda Rushing, PhD, LMSW; Melissa Plegue, MA; Kevin J. Dombkowski, DrPH, MS; Krista Latta, MPH; Susan Woolford, MD, MPH; Sarah L. Reeves, PhD, MPH
Susan B Meister Child Health Evaluation and Research (CHEAR) Center, University of Michigan

SUSAN B. MEISTER CHILD HEALTH EVALUATION AND RESEARCH CENTER
MICHIGAN MEDICINE

SCDC Sickle Cell Data Collection

Background

- The Michigan Sickle Cell Data Collection Program (MiSCDC) is a Centers for Disease Control and Prevention (CDC) funded program that uses multiple data sources to identify individuals with SCD, as well as longitudinally follow and evaluate the receipt of health services and health outcomes within Michigan.
- Hydroxyurea, a daily medication, is recommended for children and young adults with sickle cell disease (SCD) to reduce the risk of pain crises and acute chest syndrome, complications exacerbated by COVID 19 infections.
- The impact of the COVID 19 pandemic on adherence to hydroxyurea among people with SCD is unknown.

Objective

Evaluate changes in hydroxyurea adherence among children and young adults with SCD during the pandemic.

Methods

- **Data Source:** Data were acquired from the Michigan Sickle Cell Data Collection Program, which combines multiple data sources to identify and follow healthcare utilization and outcomes for those with SCD in Michigan. Enrollment and prescription data was obtained from Medicaid.
- **Study Population:** The inclusion criteria were continuous Medicaid enrollment during the study, ≤25 yrs. of age, and SCD based on validated case definitions developed under the Michigan Sickle Cell Data Collection Program. The observation period was 1/1/2019-12/31/2021.
- **Outcome:** Among individuals with at least one hydroxyurea prescription, monthly hydroxyurea adherence was assessed using medication possession ratios (MPR), accounting for inpatient admissions and overlapping prescriptions.

$$\text{Monthly Hydroxyurea Possession Ratio} = \frac{\text{Total Drug Days in Month} - \text{Number of Inpatient Days}}{\text{Total Days in Month} - \text{Number of Inpatient Days}}$$

- **Covariates:** Covariates included in the model were sex, age, and race.
- **Statistical Analysis:**
  - Changes in monthly MPR during the pandemic was evaluated using a mixed linear model with random intercepts to account for multiple observations per person.
  - We included a binary 0/1 indicator for during the pandemic (≥ 4/2020) or before the pandemic
  - Models were adjusted for sex, age, and race.
  - Interactions were evaluated between 1) age and time (months), and 2) the start of the pandemic and time.

Results

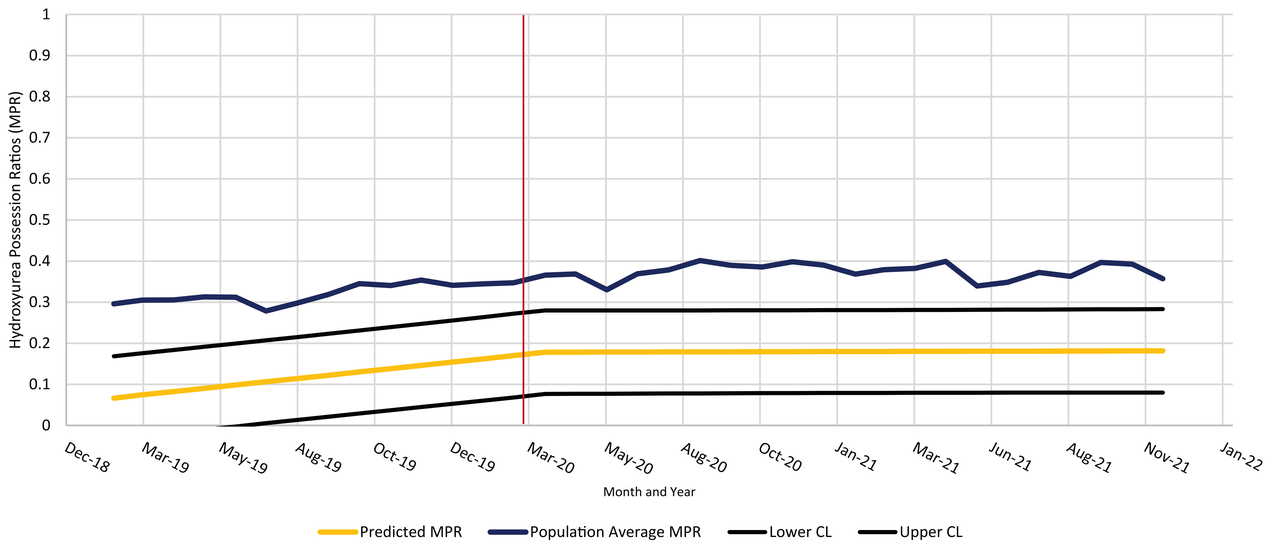
- There were 2,234 individuals with SCD in the study population
  - 1,940 (86%) identified as Black
  - 1,146 (51%) were female
  - Mean age was 11 yrs. (SD=8.53)
  - The final sample consisted of 293 (13%) individuals that met the inclusion criteria
- At the start of the pandemic, children and young adults increased their hydroxyurea adherence (MPR increase: .125 p<.01, ~3.75 days per month) (Table 1)
- As the pandemic persisted, adherence declined for all ages (interaction between the start of the pandemic and time effect on MPR: -.0078 p<.001) (Table 1) (Figure 1)
- Older individuals had the greatest decline (interaction between age and time effect on MPR: -.0003 p<.01) (Table 1)

Table 1. Linear Mixed Model using Generalized Estimating Equations of Hydroxyurea Medication Possession Ratios, Ages 0-25 with SCD Before and During the COVID 19 Pandemic (N=293)

Parameter	Days Change in Hydroxyurea MPR	95% CI	
Sex	0.0508	-0.0112	0.1128
Age	-0.0018	-0.0061	0.0025
COVID 19*	0.1249	0.0851	0.1646
Marginal Effect of Time Pre COVID*	0.0079	0.0058	0.0101
Age x Time*	-0.0003	-0.0003	-0.0002
COVID 19 x Time*	-0.0078	-0.0103	-0.0053
Marginal Effect Time Post COVID	0.0001	--	--

*$p<.05$

Figure 1. Predicted Monthly Hydroxyurea Possession Rations from January 2019 to December 2021 for an 11-Year Old Male with SCD



Discussion

- The initial average hydroxyurea adherence increase at the start of the pandemic did not persist.
- Future research should focus on identifying drivers of the initial increase and the characteristics of those individuals with sustained adherence to identify impactful intervention targets to reduce negative health outcomes among this population.

Contact Information

Scan Me

Funding for this project (CDC-RFA-DD20-2003; CDC-RFA-DD23-0002) was provided by the Centers for Disease Control and Prevention