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Effect of Free Dental Services on Individuals with Sickle Cell Disease

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Abstract

Objectives—Poor oral health can have a negative impact on overall health. This is especially concerning for individuals with sickle cell disease (SCD), an inherited blood disorder that affects hemoglobin and can lead to an increased risk of infection and hyperalgesia. Because the majority of individuals with SCD have Medicaid insurance and no dental coverage, we provided free basic dental care to individuals with SCD to determine whether it decreased overall healthcare utilization.

Methods—Through a contract with a private dental office, we provided free basic dental care (eg, cleanings, fillings, x-rays) to individuals with SCD. We reviewed medical records for the 12 months before and after their initial dental visit to determine whether there were any changes in acute care visits (defined as a visit to the emergency department, sickle cell infusion center, or visits to both in the same day), hospitalizations, and total days hospitalized. We conducted a negative binomial regression to determine any differences in the pre–post periods.

Results—In our multivariable analysis, there was a statistically significant decrease in hospital admissions. In addition, there was a significant decrease in total days hospitalized if dental work was completed, but an increase in days hospitalized in men.

Conclusions—Providing dental care to individuals with SCD who did not have dental insurance did not greatly alter acute care visits. A larger sample size may be necessary to observe an effect.

Keywords

sickle cell disease; dental care; preventable utilization

Poor oral health, defined as periodontal disease, missing teeth, caries, and marginal bone loss, is associated with an increased risk of mortality from cardiovascular disease and all-cause mortality.^{1,2} These relations are likely causal because poor oral health can limit nutritional intake, increase inflammatory mediators, and lead to severe infections and

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increased pain. Sickle cell disease (SCD) is an inherited red blood cell disorder that affects approximately 100,000 individuals in the United States.³ SCD causes hemoglobin to polymerize when it is deoxygenated, leading to sickle-shaped red blood cells, hemolytic anemia, and vaso-occlusions. This causes a host of complications, the most common being acute painful episodes, known as crises. The consequences of poor oral health are particularly concerning for individuals with SCD because they are at higher risk for infection and more sensitive to pain, and inflammation can lead to crises.^{4,5} SCD is an inflammatory state and gingival inflammation surprisingly was associated with increased levels of interleukin-10, an anti-inflammatory cytokine, in children with SCD.⁶

Like most areas of health, oral health is subject to racial and socioeconomic disparities. Non-Hispanic black adults are more likely than non-Hispanic white or Asian adults to have poor oral health.⁷ Individuals with Medicaid insurance are twice as likely as all other adults to have not seen a dentist in 5 years and are five times as likely to have poor oral health compared with those with private health insurance.⁷ Cost is the primary reason that individuals do not seek dental care.⁷ In the United States, the majority of individuals with SCD are non-Hispanic blacks and have Medicaid insurance, increasing their likelihood of poor oral health.⁷ Low socioeconomic status is associated with an increased number of decayed, missing, and filled teeth in children with SCD.⁸

People with SCD have an increased frequency of self-reported oral pain, dental caries, and an increased number of missing teeth compared with the general population.^{4,5} In addition, there are a wide array of orofacial manifestations of SCD, which include midfacial overgrowth, anesthesia of the mandibular nerve, asymptomatic pulpal necrosis, gingival enlargement, and osteomyelitis of the mandible.⁹ Dental complications may correlate with other complications of SCD because individuals with SCD are more likely to be admitted to a hospital if they have a dental infection.¹⁰ We hypothesized that better access to dental care would improve oral health and decrease healthcare utilization in adults with SCD.

Methods

Dental Services

The Improving Health Outcomes and Medical Education for Sickle Cell Disease (iHOMES) Network provided dental care through a contract with a private dental office supported by a Health Resources and Services Administration Sickle Cell Treatment Demonstration Project grant. The iHOMES Network paid for 1 hour of dental services for adult patients without dental insurance to provide basic prevention and treatment including cleanings, x-rays, extractions, and simple restorations of carious teeth. Services such as crowns or dentures were not provided. Patients could schedule as many appointments as required to complete oral treatments.

Data Collection

We performed a retrospective cohort study (preintervention–postintervention) of patients who received dental services. We reviewed each patient's electronic medical records at Johns Hopkins Hospital for 12 months preinitial and 12 months postinitial dental appointment and

determined the number of acute care visits. We defined an acute care visit as treatment in the Hopkins Sickle Cell Infusion Center (SCIC) and/or the emergency department (ED), hospitalizations, and days hospitalized. If a patient was transferred between the ED and the SCIC, it was counted as a transfer between the SCIC and ED and as a single acute care visit. We also recorded the number of hospitalizations and days hospitalized.

Data Analysis

We modeled pre–post differences in total visits of each type by negative binomial regression. In the multivariable analysis we controlled for age, sex, number of dental visits, and completion of dental treatments. Dental treatment was categorized as completed, not completed, or required treatment was not available through this program.

Results

Between August 2012 and January 2014, 55 patients completed 155 dental appointments, with a mean of 2.8 visits per patient (median 2, interquartile range 3). Five patients were excluded from analysis for the following reasons: he or she was a new patient at the time of the dental appointment and not seen during the 1-year preintervention period (3), was deceased during the follow-up period (1), and was discharged from care from the Johns Hopkins sickle cell program during the follow-up period (1). The mean age of the remaining 50 patients was 34.6 years (range 19–59 years), and 74% were women. Seventy-eight percent of patients had sickle cell anemia, 16% had hemoglobin SCD, and 6% had sickle beta plus thalassemia.

In the 12-month pre period there were a total of 562 acute care visits (individual patient range 0–31), 94 hospital admissions, (individual patient range 0–8), and 654 inpatient days of care (individual patient range 0–104). During the post period there were 591 acute care visits (individual patient range 0–57), 82 admissions (individual patient range 0–9), and 577 inpatient days of care (individual patient range 0–79). There were decreases in hospital admissions and total days of care and a small increase in acute care visits (Table 1) between the pre and posttreatment periods. The univariable analysis showed no statistically significant results (Table 2). Only the effect on admissions was statistically significant (Table 3).

Men had more than twice the rate of ED visits of women (incident rate ratio [IRR] 2.5; $P=0.04$), and the older the patients were, the lower the rate of ED visits (IRR 0.96; $P=0.032$). Men also had an 80% higher rate of acute care visits compared with women (IRR 1.8; $P=0.057$). Patients whose dental work was completed accounted for 78% fewer total days of care than those who did not complete their dental work or whose dental work was outside the scope of the iHOMES program (IRR 0.2; $P=0.03$; Table 3).

Discussion

We identified a clinically significant decrease in days hospitalized in adults with SCD who were provided access to basic dental evaluation and treatment. A lower incidence of ED visits in older patients is consistent with previous studies,¹¹ as is the higher acute healthcare

utilization rate for men.¹² There is an established relation between dental infections and an increased risk of hospital admissions for individuals with SCD.¹⁰ As such, our analysis, which demonstrates a decrease in hospitalizations for individuals who have received dental care, is consistent with the existing literature. The lack of effect of access to dental care on acute care visits may indicate a need for a larger sample size to adequately assess the impact of this intervention or the ready availability of the SCIC (using the SCIC for periodic visits as well as acute care visits).

Our study population predominantly included women (73%), so the measurement of the contribution of sex on utilization was less precise. It is unclear why more women used the free dental services provided through our grant.

Conclusions

Access to preventive and basic dental care may be an effective approach to decrease acute healthcare utilization and hospitalization while improving the health of people with SCD. Given the large variation in the number of acute care visits and admissions, a larger study is needed to definitely evaluate the effect of improved access leading to better dental care. We propose that better dental care may reduce acute care utilization by reducing inflammation as a trigger for sickle cell pain. Evaluating and overcoming barriers for access to dental services are essential next steps to improving the health of people with SCD.

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Key Points

- Poor dental care can have a severe impact on individuals with sickle cell disease (SCD).
- The majority of individuals with SCD do not have dental insurance.
- Access to dental care may decrease hospital admissions in people with SCD.

Table 1

Total visits by category

By sex	Pre	Post
Acute care visits	557	592
Male	181	201
Female	376	391
ED visits	223	267
Male	80	91
Female	143	176
SCIC visits	442	437
Male	138	154
Female	304	283
Hospitalizations	94	82
Male	30	24
Female	64	58
Days hospitalized	654	577
Male	244	186
Female	410	391

ED, emergency department; SCIC, Sickle Cell Infusion Center.

Table 2

Incidence rate ratios for acute healthcare utilization: univariable analysis

Variable	Acute care visits	Hospitalizations	Days hospitalized
Pre-post	1.01 ($P=0.9$; 95% CI 0.8–1.2)	0.8 ($P=0.2$; 95% CI 0.7–1.1)	0.9 ($P=0.2$; 95% CI 0.7–1.1)
Dental treatment completed	0.7 ($P=0.4$; 95% CI 0.4–1.6)	0.5 ($P=0.2$; 95% CI 0.2–1.3)	0.4 ($P=0.1$; 95% CI 0.1–1.1)
Male sex	1.6 ($P=0.1$; 95% CI 0.9–2.9)	1.4 ($P=0.3$; 95% CI 0.7–2.9)	1.7 ($P=0.2$; 95% CI 0.7–4.1)
Age/y	0.99 ($P=0.4$; 95% CI 0.95–1.0)	0.99 ($P=0.7$; 95% CI 0.95–1.0)	1.00 ($P=1.0$; 95% CI 0.9–1.1)

CI, confidence interval.

Table 3

Incidence rate ratios for acute healthcare utilization: multivariable model

	Acute care visits	Hospitalizations	Days hospitalized
Pre-post	1.0 ($P = 0.9$; 95% CI 0.9–1.2)	0.8 ($P = 0.05$; 95% CI 0.6–1.0)	0.9 ($P = 0.5$; 95% CI 0.7–1.1)
Dental treatment completed	0.6 ($P = 0.4$; 95% CI 0.2–1.8)	0.4 ($P = 0.1$; 95% CI 0.1–1.4)	0.2 ($P = 0.03$; 95% CI 0.06–0.9)
Male sex	1.9 ($P = 0.1$; 95% CI 0.9–1.0)	1.7 ($P = 0.2$; 95% CI 0.8–3.7)	2.4 ($P = 0.08$; 95% CI 0.9–6.7)
Age/y	1.0 ($P = 0.3$; 95% CI 0.9–1.0)	1.0 ($P = 0.9$; 95% CI 1.0–1.03)	1.0 ($P = 0.7$; 95% CI 1.0–1.1)

Boldface type indicates statistical significance. CI, confidence interval.