Sickle Cell Disease

Executive Summary

Approximately 122,000 Americans live with Sickle Cell Disease (SCD), which is a heritable disease that can have severely debilitating effects. While there is no cure, many of the symptoms can be mitigated, and research on treatments are ongoing. Six bills have been introduced in the 2022 legislative session in Missouri related to SCD (SB 1145, SB 1147, SCR 35, HB 2559, HB 2653, and HB 2658). The proposed legislation seeks to designate awareness weeks, as well as require MO HealthNet to conduct an annual review of the medications and treatments, including novel therapies and educational programs, most effective for MO HealthNet beneficiaries with SCD.

Highlights

- Roughly 2,500 Missourians live with SCD, which can cause stroke, kidney problems, heart problems, acute chest pain, and overall debilitating pain.
    - Patients with SCD often report life disruptions in education and employment due to the need for medical attention, leading to depression, anxiety, despair, insomnia, helplessness, and greater dependency on medications.
- Treatment regimens to maintain overall health include acute and chronic symptom management, and regular prescription use of hydroxyurea.
    - Newer treatments are under continued study and may allow children born since the mid-2000s to have a higher chance of reaching their 40s and 50s.
- Federal laws have been passed to improve research, treatments, and approved projects to test and improve patient outcomes.
- Several states have historically passed anti-discrimination laws against healthcare coverage determinations or employment and added support measures for patients and families.

Limitations

- Funding for SCD from both public and private sectors is generally lower than other comparable diseases, and newer treatments still need extensive study.

Research Background

Statistics and Epidemiology of Sickle Cell Anemia

It is estimated that approximately 2,500 Missourians (and over 122,000 Americans overall) live with Sickle Cell Disease (SCD; **Figure 1a**). SCD (inclusive of Sickle Cell Anemia) is a collection of diseases that manifests due to a genetic mutation of a protein (*hemoglobin*) in the red blood cells and results in crescent or "sickle shaped" cells (**Figure 1b**). This non-circular shape leads to

impeded blood and oxygen flow, and painful episodes of blood blockages.[1,2] Over the life of an SCD patient, individuals can suffer from stroke, kidney problems, heart problems, acute chest pain, and overall debilitating pain.

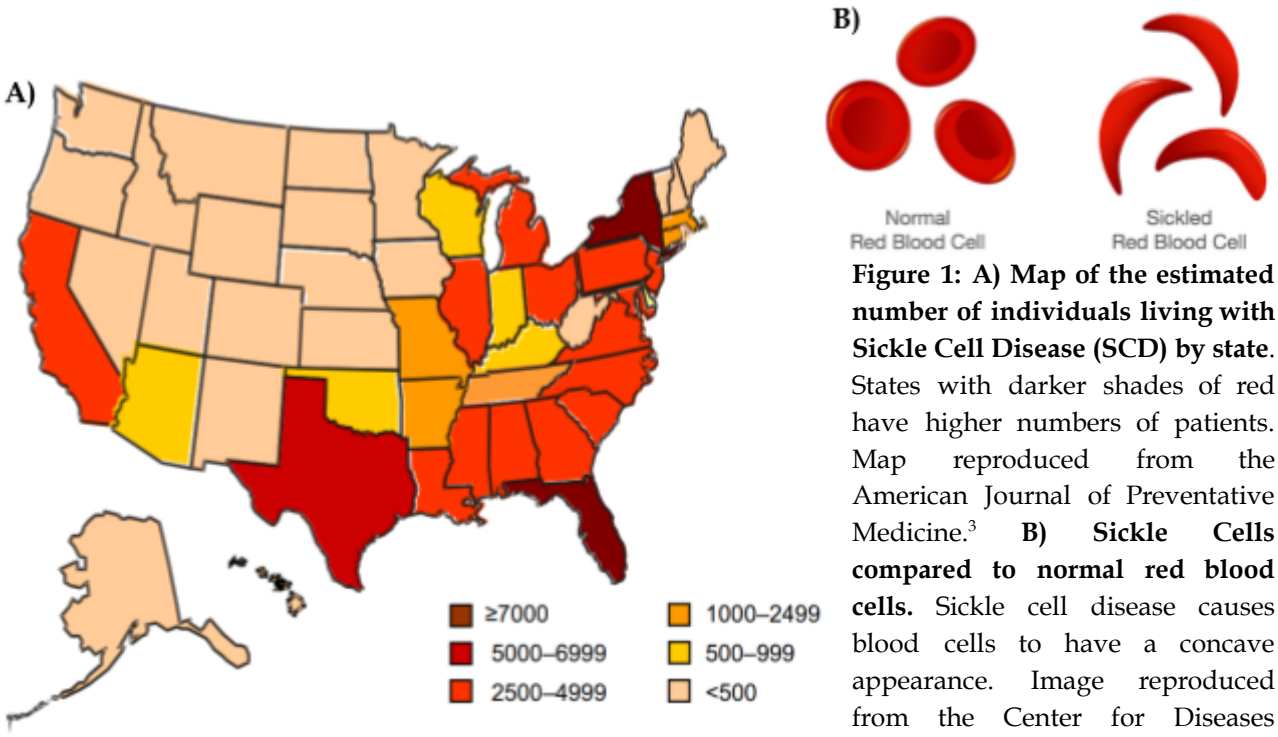

Figure 1: A) Map of the estimated number of individuals living with Sickle Cell Disease (SCD) by state. States with darker shades of red have higher numbers of patients. Map reproduced from the American Journal of Preventative Medicine.[3] **B) Sickle Cells compared to normal red blood cells.** Sickle cell disease causes blood cells to have a concave appearance. Image reproduced from the Center for Diseases Control and Prevention (CDC).[2]

Theorized to initially have evolved in African populations as a survival advantage against malaria, one in every 365 African Americans and 1 in every 16,300 Hispanic Americans are born with the disease. Meanwhile, roughly 1 in 64 people are born carrying the genetic mutation.[1] While the average age of death for individuals born with SCD before 1999 was under the age of 34, biomedical advances for children born since the mid-2000s are estimated to push the average age into the 40-50 age range.[3]

Missouri screens for several inherited genetic diseases at birth. For information on other inherited diseases and how Missouri screens and provides care, please see the Science Note: Coverage of Phenylketonuria (PKU) Dietary Products.

Patients with SCD often report life disruptions in education and employment due to the need for medical attention, and stigmas around the need for pain relief and healthcare, leading to social discrimination, loneliness, and isolation. Many report depression, anxiety, despair, insomnia, helplessness, and greater dependency on medications. Lifetime estimates of depression in SCD range from 40-50%, an 8% suicide attempt rate, and a 6% suicide death rate.[4]

For more information on suicide preventions, please see the Science Note: Suicide Education and Prevention Programs.

Treatments and Medical Coverage Gaps

Several treatment protocols and regimens exist for the treatment of SCD (**Table 1**).

Topic	Specific Actions
Health Maintenance	*Prophylactic antibiotics through age 5, vaccinations against bacterial pneumonia, cranial screening through age 16 for stroke risk, protein/creatinine screening starting at age 10, access to non-estrogen-based birth control for women*
Management of Acute Complications	*Monitoring of pain & establishing an action protocol, rapid initiation of analgesic medications, evaluation for fevers & antibiotic treatment, avoiding transfusions for certain indications, evaluating for acute chest syndrome & respiratory difficulty (may include x-ray and hospitalization for low oxygen)*
Management of Chronic Complications	*Guided use of pain relievers (with special attention to opioids), treatment of dying bone tissue with analgesics, perform echocardiograms for identifying pulmonary hypertension, treatment for abnormal protein/creatinine levels.*
Hydroxyurea & Transfusion Therapies	*Treatment with hydroxyurea (increases hemoglobin levels and aids in shaping blood cells to semi-normal) when prone to pain or acute chest syndrome, patient education and monitoring for drug use, treatment of all children if SCD progresses to sickle cell anemia, red blood transfusions (with careful matching) to boost hemoglobin counts.*

Table 1: Best Practice Recommendations from the National Heart, Lung, and Blood Institute for Treating Patients with Sickle Cell Disease. Adapted from the National Academies of Sciences, Engineering, and Medicine.[1]

Further, more targeted therapies exist such as:

Endari is an anti-inflammatory approved for patients 5 years and older which targets blood vessels to improve tone and decrease blockage events. One study showed a 30% decrease in hospitalizations. However, the drug is not well tolerated in individuals with kidney or liver dysfunction, which is common in SCD.

Voxelotor is a drug approved for patients aged 12 years and older which increases the amount of hemoglobin and is also known as an anti-sickling agent for allowing sickle cells to carry oxygen. While studies have shown the ability to increase hemoglobin, further post-approval studies are confirming if the drug can safely be administered for SCD patients with comparatively low oxygen levels.

Adakveo is an immunotherapy approved for patients aged 16 years and older that helps block the adhesion of sickle cells together to prevent blockages, has shown nearly two-fold reductions in yearly adverse pain events compared to untreated patients. Post-approval studies are confirming the long-term adverse effects on blood platelets and reactions to infusions.[5]

Bone marrow transplants may cure SCD in patients, but the procedure has serious risks, and not all individuals are eligible for the extensive and invasive procedure.[6]

While established guidelines exist for the treatment of SCD, it is well documented that the disease receives less in federal and private funding than other diseases. Annually, funding from the National Institutes of Health per person is roughly four-times less than comparable diseases such as cystic fibrosis, despite the disease affecting fewer people overall. Private funding is even more disparate, with foundations contributing $342 million for cystic fibrosis between 2008 and 2012, versus $6.4 million for SCD.[1] Further barriers for effective SCD patient outcomes may include lack of education after diagnosis, lack of providers, lack of routine care, lack of medication adherence, and lack of social support networks.[1]

Expert recommendations from researchers and clinicians with the National Academies of Science, Engineering, and Medicine on strategic planning to improve outcomes for SCD patients include: 1) establish a national database of patients to collect information on disease burden and treatment outcomes; 2) establish coordinated clinical and non-clinical care systems; 3) strengthen evidence on best interventions; 4) increase the number of SCD-care professionals; 5) increase SCD awareness; 6) address barriers to accessing SCD therapies; 7) advance the understanding of genetic carriers of sickle cell genes; and 8) establish research programs aimed at informed interventions and policies across the lifespan of the SCD population.[1]

While Georgia is the only state to specify sickle cell disease as a qualification for medical cannabis access, most comprehensive medical cannabis programs may also include the pain associated with sickle cell disease among the reasons for qualification.[7] For more information on cannabis legalization measures in the U.S., please see the Science Note: Cannabis Legalization. For more information on opioids and their potential for abuse, see the Science Note: Substance Abuse & Naltrexone Hydrochloride.

Legislative Policies

Missouri law (RSMo § 191.365 and 191.370) states that the Department of Health and Senior Services is responsible for the Missouri Sickle Cell Anemia Program (MSCAP), including identifying, counseling, providing treatment, and providing financial assistance after all other health provider sources are exhausted. The program further provides newborn screening, parental education, healthcare professional education, and inpatient and outpatient resource centers for patients.

In the 2022 Missouri Legislative session, six bills have been introduced (SB 1145, SB 1147, SCR 35, HB 2559, HB 2653, and HB 2658) that seek to designate SCD awareness weeks, as well as requiring MO HealthNet to conduct an annual publicly available review of the medications and treatments most effective for SCD-MO HealthNet Beneficiaries, study information on novel therapies, and highlight provider and patient education on the disproportionate impact of SCD on minorities.

While federal laws such as Genetic Information Nondiscrimination Act of 2008 and the Affordable Care Act of 2010 largely eliminated coverage and ineligibility determinations for chronic diseases in healthcare,[8] 42 states have historically had laws that prevented

discrimination for insurance eligibility or risk assessments based on genetics.[9] A further 35 states have had laws that prevented genetic discrimination for hiring, firing, or conditional employment.[10] Three states (FL, LA, and NC) specified sickle cell genetics as explicitly prohibited factors from discrimination.[11] Maryland added counseling and education support for families as required coverage under health plans after a newborn tests positive for SCD.[12]

At the federal level, the National Sickle Cell Anemia Control Act of 1972 allocated initial government funding for SCD treatment, screening, and research. The American Jobs Creation Act of 2004 further amended Medicaid to require preventative strategies, treatment, and genetic testing and counseling services for those with SCD. Finally, the Sickle Cell Disease & Other Heritable Blood Disorders Research, Surveillance, and Treatment Act of 2018 reauthorized the SCD demonstration program through the Health Resources & Services Administration to provide further project funding for surveillance, research, and treatment strategies to select universities and centers.[1,13] Introduced in the U.S. House of Representatives in 2012, HR 6216, the Sickle Cell Disease Comprehensive Care Act, seeks to further demonstration projects for improving outpatient clinical care for SCD patients.

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