Research Article

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Journal of Health & Medical Economics

2025
Vol.11 No.1:150

Overall Cost of Medical Care Compared to Physical Therapy for People with Sickle Cell Disease

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Citation: Marchese V, Duggal A, Shelawala N, Sun K, Rolla KJ, et al. (2025) Overall Cost of Medical Care Compared to Physical Therapy for People with Sickle Cell Disease. J Health Med Econ Vol. 11 No. 1:150

Received: 26 June, 2025, Manuscript No. ipjhme-25-20372; **Editor assigned:** 28 June, 2025, PreQC No. P-20372; **Reviewed:** 12 July, 2025, QC No. Q-20372; **Revised:** 18 July, 2025, Manuscript No. R-20372; **Published:** 26 July, 2025, DOI: DOI: 10.5281/zenodo.17150913

Abstract

Objective: People with Sickle Cell Disease require extensive medical care throughout their life in the acute care and outpatient settings. Physical therapy is a known service that has demonstrated a positive impact on improving quality of life in this specific patient population. However, the cost of physical therapy as compared to the overall cost of medical care for people with Sickle Cell Disease has yet to be comprehensively explored.

Design: A retrospective analysis of medical records for people with Sickle Cell Disease was performed and descriptive statistics were used to evaluate the cost associated with physical therapy.

Results: We identified 30,569 episodes of care. Of the 30,569 episodes of care, 413 included physical therapy. Of the 413 episodes, the difference between total charges and physical therapy charges was an average of $44,887.00; thus, physical therapy made up only 3.2% of total medical costs.

Conclusion: Our study identified physical therapy services are minimally utilized for people with Sickle Cell Disease. As physical therapy is known to provide positive benefits and cost is low compared to overall medical expenses; we suggest further study is warranted to explore if physical therapy can help lower medical acute care length of stay and reduce readmissions.

What is known: It is known that physical therapy provides positive benefits, across body systems, for people with Sickle Cell Disease.

What is new: Physical therapy is being underutilized, despite being cost effective, for people with Sickle Cell Disease.

Keywords: Sickle cell disease; Physical therapy; Medical costs; Economic outcome

Introduction

Sickle Cell Disease (SCD) is a genetic blood disorder distinguished by the production of abnormal sickle-shaped red blood cells which cause a cascade of symptoms associated with high medical and non-medical costs [1]. Globally, the World Health Organization estimates that approximately 300,000 infants are born with SCD each year [2]. SCD may lead to physiological complications including vaso-occlusive crises, acute chest crises, and increased risk of strokes. Individuals with SCD can live into adulthood; however, they face chronic health issues and reduced quality of life. Beyond acute manifestations, individuals with SCD may experience chronic complications, such as pulmonary hypertension, kidney and liver damage, and splenic injury leading to an increased risk of infection [3]. Additionally, people with SCD have strength impairments, increased fatigue and decreased endurance, which can negatively affect physical activity and quality of life [4,5]. Given these associated health conditions, the Centers for Disease Control and Prevention reports the average yearly cost for medical care for people living with SCD in the United States to be approximately 1.1 billion dollars [6].

While SCD impacts multiple body systems, the complications observed when the neurologic system is impacted is high. In the United States alone, 11% of people with SCD experience clinically apparent strokes by age 20 and up to 39% of children under 18 experience silent strokes [7]. A retrospective review of 65 patients with SCD found that 27% experienced strokes and another 13% had silent infarcts. Of the people who experienced a stroke, 59% of the injuries impacted the frontal lobe, an area associated with cognitive and motor functioning [8]. In the United States, the cost of overall stroke related medical care was approximately 56.2 billion dollars between the years of 2019-2020 [9]. Given the high risk of stroke, as well as the complications of living with SCD, physical therapy rehabilitation must be considered for people with SCD.

In the United States, only one third of individuals with SCD have private health insurance. The remainder either have no form of health insurance or rely solely on federally provided health insurance. Those 64 years and younger with private health insurance pay around $44,000 in out-of-pocket medical expenses across their lifetime, spending an average of $1,300 each year [10]. Total lifetime costs for women with SCD averages around $1.6 million dollars and for men around $1.7 million dollars [11]. The Resource-Based Relative Value Scale aids in the determination of reimbursement rate for medical services in the United States [12]. The equation for the calculation of payment requires three separate components: Relative Value Units (RVUs), Geographic Practice Cost Indices (GPCIs), and a conversion factor. RVUs and GPCIs are further divided into separate groups: work, practice expense, and malpractice [13]. Work RVUs encompass the physical work of a service, such as the time spent, technical skills, and mental and physical effort required. Practice expense RVUs considers the cost of supplies, equipment, utilities, and staff necessary to provide a service. Malpractice RVUs reflect the cost of acquiring malpractice insurance. Together work, practice expense, and malpractice RVUs comprise the total RVU number. The GPCIs determine the regional differences in the cost of work, different practice expenses, and acquiring malpractice insurance [14]. The conversion factor is the standard dollar amount assigned to the RVUs, measuring the volume and complexity of the service [15,16].

While RVUs are used to calculate the cost of clinician services, the Value of a Statistical Life Year (VSLY) estimates the dollar amount willing to be spent each year to reduce the risk of mortality. Similarly, the Value of a Statistical Life (VSL) estimates healthcare costs across an entire lifetime. The VSL gauges the willingness to accept risk *vs.* reward across a lifetime. This information is often utilized by regulatory bodies when making healthcare decisions. The approximate VSL for an average American is 7.2 million dollars. There is no universally accepted VSL; therefore, it is purely an estimation and is subject to change based on data from a specific region or data relating to the cost of healthcare [17]. The VSL and VSLY are used to determine healthcare costs for people with varying health concerns, for example, people with SDC in the United States [17].

Sickle Cell Disease places an economic hardship on patients, caregivers, and society. A systematic review by Baldwin, reported that patients with SCD have a cost difference range of $6,636-$63,436 in annual medical care needs as compared to their non-SCD counterparts [1]. In addition to the high costs of medical care, SCD limits physical activity due to impairments in muscle and motor performance, overall mobility, and quality of life in individuals living with this health condition [4,5,18]. However, physical therapy can positively impact impairments associated with SCD [19-23]. Unfortunately, did not include physical therapy in their systematic review. Thus, Baldwin et al our aim was to compare the costs associated with utilizing physical therapy services to the costs of traditional medical care for people with SCD. We hypothesize that physical therapy is cost effective and has the potential to decrease SCD's financial hardships.

Methods

Costs associated with physical therapy for patients with SCD were retrospectively retrieved from electronic medical records of a large urban hospital system, including emergency room visits, acute care hospitalizations, inpatient rehabilitation visits, and outpatient sessions. Data was maintained and analyzed according to the Institutional Review Board protocol (IRB) in a Secure Research Environment (SRE) IRB #HP-00111699.

Participants were included if they had a primary diagnosis of SCD and received medical care between 1/1/2016 and 3/31/2024. As SCD occurs throughout the lifespan, no age restrictions were placed. Given the retrospective nature of the study design, the IRB gave exempt approval and consent was not required. Data elements retrieved included primary diagnosis, physical therapy referral, physical therapy evaluation, physical therapy treatments and associated RVUs, total medical costs. Total medical costs included all costs associated within an episode of care. Episode sample size was calculated using prior literature comparing economic outcomes for episodes of care. These studies used a timespan of one-two years to determine an intervention's economic value; [17] however, as we had access to a six-year timespan from the start of our electronic medical record database, we opted to include all episodes of care during that timeframe. Descriptive statistics of the sample characteristics were performed to examine how medical costs compared to the costs of physical therapy services. The difference between means was assessed *via* T-Test.

Results

Retrospective observational analysis

A retrospective analysis of electronic medical records of people with SCD showed a total of 30,569 episodes of care. Of those, 413 episodes received physical therapy, while 30,156 episodes did not receive physical therapy. Thus,1.35% of total episodes received rehabilitation services. The average cost of physical therapy per episode was $1,469.38 (minimum $1.00, maximum $85,297.53); whereas, on average $4,733.57 was spent on total costs of care (minimum $0.00, maximum $398,408.64). There was a significant difference between the physical therapy costs and total costs of care, per episode, ($t=14.24$, $p<0.0001$). Of the 413 episodes that did receive physical therapy, the difference between total charges and total physical therapy charges was an average of $44,887.00. Thus, physical therapy made up only 3.2% of total medical costs.

Discussion

To better understand the economics of physical therapy, we performed a retrospective observational analysis of the actual costs of physical therapy compared to total medical costs for people with SCD. The methods utilized electronic medical records of individuals who received medical care within a larger urban hospital system during a six-year timespan. The results identified that physical therapy was a minimal cost as compared to total medical care cost. Our study identified 30,569 episodes of care over the 6-year timespan. The average total cost of medical care for all individuals with SCD within the measured six-year timeframe was $4,733.57. Of the 30,569 episodes of care, only 413 episodes received treatment from physical therapy services. It was identified that for the episodes that received physical therapy services, the cost of physical therapy was on average $1,469.38, compared to the difference between total charges and total physical therapy charges, an average of $44,887.00. Thus, physical therapy made up only 3.2% of total medical costs. In 2023, the American Physical Therapy Association showed that physical therapy was cost-effective for other health conditions such as cancer, falls, osteoarthritis, acute low back pain, carpal tunnel syndrome, stress urinary incontinence, vascular claudication and lateral epicondylitis. For example, the net economic benefit for opting to use physical therapy services over other medical care was $13,981 for osteoarthritis of the knee, and $39,533 for carpal tunnel syndrome [17]. These findings align with the reduced costs associated with physical therapy as compared to total medical care for people with SCD.

Physical therapy services are beneficial for people with SCD and have been shown to improve functional impairments [20]. It has also been recognized that physical therapy has a positive impact on pain and is useful for pain management in individuals with SCD [20,22,24]. Therefore, given the high costs associated with medical care ($44,887.00) and the minimal costs of physical therapy services ($1,469.38), combined with the known benefits of physical therapy on functional mobility and pain management for people with SCD, it is highly recommended that physical therapy be included as a healthcare option to individuals living with SCD.

Conclusion

To the authors' knowledge no articles have addressed the financial impact of physical therapy associated with people living with SCD. Our results show that physical therapy is a minimal cost compared to total medical care and has the potential to reduce economic burden. Future studies are needed to continue to provide economic information to be utilized by clinicians and regulatory bodies who make healthcare and financial decisions for people living with SCD.

Limitations

The current study utilized electronic medical records from a single large urban hospital system in one state of the United States. Therefore, this information is representative of the area deprivation indices and socioeconomic status of the state of Maryland only and may not be generalizable to other states with differing area of deprivation indices. Future studies would benefit from expanding the electronic medical record retrieval to include states with similar and differing area deprivation scales to assess consistency and generalizability. Future studies would also benefit from evaluating the relationship between physical therapy services and hospital readmission rates as increased readmissions increase overall medical costs for everyone. Thus, it is with hope that future research will continue to expand on the results of the current study to promote increased awareness to the costs associated with SCD and the impact physical therapy may have on the value of statistical life (VSL) and the costs of healthcare across the lifespan, for people with SCD.

Acknowledgment

This work was funded by The Dr. Gladys E. Wadsworth Physical Therapy Research Fund

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