

Life Expectancy in Spinal Cord Injury: The Importance of High-Quality Care

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ABSTRACT

Spinal Cord Injury (SCI) injuries most commonly occur in the young, and there is a significant need to understand how long SCI patients will live for the purposes of planning and financing their care. The calculators that are used to estimate life expectancy in those with SCI are flawed and tend to underestimate survival time. Thanks to medical advancements, SCI patients are living longer than ever before and thus require more care over a longer duration. This care is costly and must be financed if SCI patients are to remain healthy and have an adequate quality of life.

Keywords: Spinal Cord Injury (SCI); Pain; Life expectancy; Chronic pain

INTRODUCTION

Nearly 300,000 people are currently living with Spinal Cord Injury (SCI) in the United States, and each year, between 250,000 and 500,000 more people around the globe will suffer this devastating injury [1]. Most SCIs result from accidents, sports-related injuries, and violence [1,2]. In the United States, motor vehicle collisions account for 38% of SCI, with falls accounting for another 30% [1].

Males between the ages of 16 and 30 represent the highest risk group for this condition [1,3]. Given that SCI often occurs in young people and causes long-term health-related consequences, healthcare planning is critically important in the context of SCI to ensure that those living with SCI have the care and resources they need to optimize health outcomes.

LITERATURE REVIEW

There is an unmet need to accurately estimate survival in SCI patients

Determining future medical care, support services, and durable medical products for those with SCI requires life expectancy estimation and identification of the factors affecting survival [4].

Unfortunately for SCI patients and their families, there does not exist a highly reliable way to predict how long an individual patient will survive. Though SCI life expectancy calculators have been generated based on population data, these calculators are not sensitive enough to adequately capture clinically meaningful contextual factors that affect longevity in individual SCI patients.

While life expectancy calculators may in some circumstances provide a valuable baseline from which to begin an assessment of how long an SCI patient will survive, the estimates from the calculators are almost always inferior to estimates provided by experts who can improve upon the baseline prediction by incorporating crucial circumstantial information that will impact the patient's outcomes. Though models and experts agree that healthcare funding is a modifiable predictor of longevity in those with SCI and that those who cannot finance high-quality care are likely to live significantly shorter lives than those who can afford better care, experts are needed to evaluate life expectancy in each individual case and to provide a more precise estimate of survival than can be attained with algorithms alone [5].

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SCI life expectancy calculators suffer several limitations

How long any given individual will live results from a plethora of factors. Life expectancy calculators, which are based on the status of a discrete number of factors at a snapshot in time, are highly rigid in their analyses of longevity. They are incredibly limited in the data they incorporate into their assessments. For example, the life expectancy calculated provided by the Life Expectancy Project accounts only for a patient's name, sex, age, smoking habits, and whether one's health classifies as 'excellent,' 'good,' or 'average' [6]. In the case of SCI, medical schools disclaim that for any given individual, life expectancy calculators will not provide an accurate estimate of the number of years that an individual will survive [7]. In addition to the inherent limitations of all life expectancy calculators, SCI-specific life expectancy calculators are further plagued by weak data on the relevant patient population. Historically, studies in SCI life expectancy have suffered from small sample sizes and statistical designs that prevent robust estimates of survival from the time of injury [8]. Nonetheless, it has become clear that some factors can help in the prediction of how long SCI patients will live. For instance, some of the important clinical factors to consider are the severity of the injury, degree of impairment, and ventilator dependency, whereas some of the demographic predictors of longevity include gender, ethnicity, and age at the time of injury [4,9].

Critical in the evaluation of life expectancy models is the recognition that longevity in SCI results not only from nonmodifiable risk factors but also from modifiable ones. These factors include overall health, economic status, social support, and community integration [9,10]. That aspects of an individual's life can be modified to affect their longevity highlights the complexity of predicting how long a patient will live and demonstrates why a life expectancy calculator-which is used at a given moment in time-cannot adequately integrate the dynamic information that will ultimately determine how long a given SCI patient survives.

Life expectancy models likely under predict how long SCI patients will survive

Though data on life expectancy in those with SCI are scant and suffer from a high degree of variability in the estimates they provide, there is significant evidence that overall survival in SCI patients has improved dramatically since World War II, likely owing to advancements in understanding and management of the condition [3,10,11]. The current medicines and medical services, including surgical and rehabilitation services, all enhance longevity in those with SCI [12]. However, current models to predict life expectancy in SCI often incorporate old data and do not give current scientific advancements enough weight.

Research now shows that for those who have suffered SCI but can walk without assistance and do not need an indwelling catheter to manage their bladder, life expectancy is reduced by less than 10% [13]. Further, for those in the youngest age groups, life expectancy is nearly normal. In addition, life

expectancies should continue to improve with advances in methods to prevent and manage complications such as pneumonia, pulmonary embolism, and sepsis [8]. Though our medical teams are getting better and better at keeping SCI patients alive, translating those improvements into updated life expectancy algorithms in a quantifiable way is challenging, and thus life expectancy calculators are always behind the curve.

Longer life expectancies in those with SCI means SCI patients require longer-term care

Despite improvements in longevity, fewer than 1 in 100 SCI patients have fully recovered functionally by the time they leave the hospital, pointing to the significant need to effectively manage this population of patients as they continue to suffer from their injuries beyond hospital discharge [1]. In addition to failing to recover fully, SCI patients are now enduring chronic health conditions such as coronary artery disease, cardiovascular disease, and maturity-onset diabetes, which had not before been recognized in this population because these patients did not tend to live as long as they do now [12].

While approximately 90% of SCI patients return to their homes following their injuries today, these patients are at high risk for secondary complications [14]. The typical SCI patient experiences between 8 and 14 complications each year, with common complications being: Pain, spasticity, urinary tract infections, bowel problems, osteoporosis, respiratory difficulties, autonomic dysreflexia, and pressure ulcers [15].

With the appropriate care, however, secondary complications could be prevented or quickly managed before they escalate to the point where patients require readmission to the hospital [15]. There is an urgent unmet need to provide ongoing rehabilitative care to SCI patients after they are discharged from the hospital to reduce the level of long-term disability. Indeed, research shows that the best outcomes in SCI occur with intense rehabilitation directed by a collaborative healthcare team of physiatrists, physical therapists, and occupational therapists [1].

A leading cause of death amongst SCI patients is suicide, pointing to the significant need for better care

Urinary tract disease was once a major cause of mortality in SCI patients but has dropped dramatically as a cause for death in this population over the past several decades [13].

Similarly, renal failure, which was the leading cause of death in SCI patients who survived their initial injury, is no longer a top driver of death in this population. Instead, suicide has become a leading cause of death in those with SCI and the number one cause of death in those with complete paraplegia [14].

Suicide risk is potentially even more modifiable than other secondary complications related to SCI that may lead to death, and thus effective strategies for preventing suicide could therefore significantly increase life expectancy in SCI patients.

Suicide risk can depend in part on the quality of life, and quality of life in those with SCI is directly linked to continued and well-

coordinated care. The type and quality of care predict life expectancy in those with SCI by reducing secondary complications but also by improving patients' function and perception of support, which contribute to how patients feel about their quality of life. Psychiatrists and pain management specialists can also more directly address SCI complications that may enhance suicide risk, such as depression and pain [1].

Ultimately, financial means have a huge impact on survival in SCI

It is generally agreed that financial realities impact health outcomes and that health disparities result largely from income gaps, and it is well established that wealthier people tend to be healthier and experience lower mortality rates than less wealthy people [10]. The trend for people with SCI is no exception. Data show that financial means are predictive of how long SCI patients will live and how many comorbidities they will suffer [10]. Research shows, for instance, that those SCI patients near the poverty line likely live shorter lives than those with access to more resources [9].

While life expectancy calculators cannot provide accurate or precise estimates for how long individual SCI patients will survive, they do tend to consider factors that are known to contribute to patients' longevity, including those related to economic status. Tellingly, the life expectancies that are generated by these calculators vary widely depending on information linked to financial status.

Take, for example, the gold standard for life expectancy estimation in those with SCI: The University of Alabama's Life Expectancy Calculator. This calculator accounts for just 10 factors: Age, injury date, sex, ethnicity, the highest level of education, type of insurance, whether a patient has used a ventilator, the cause of their injury, their current level of SCI, and current completeness of SCI.

The life expectancy generated from the University of Alabama Spinal Cord Injury Calculator changes significantly, depending on whether the patient has Workers' Compensation or private insurance versus Medicare, Medicaid, or other. In our example, a 70-year old black male (date of birth 11/16/50, date of injuries 10/31/19), who was a high school graduate and had been on a ventilator, was diagnosed as a C5 ASIA B spinal cord injury. Using the University of Alabama calculator, his life expectancy would be 8.68 years if his funding came from Workers' Compensation or private insurance. However, if his funding came from Medicare, Medicaid, or other, the University of Alabama calculator provides a life expectancy of 6.81 years. Thus, whether this patient has insurance indicative of higher versus lower economic status and corresponding quality of care alters life expectancy by 22%. When patient information is used, the impact of insurance type is sometimes even more drastic. It is thus clear that not only clinical experts but also those who developed the Spinal Cord Injury Life Expectancy Calculator algorithms, recognized that SCI patients who have optimal funding will have a significantly longer life expectancy. On the other hand, patients who do not receive optimal funding are not afforded early detection of and early intervention to the

secondary effects of immobility and SCI, which carry increased morbidity and mortality. These complications include but are not limited to deep vein thrombosis, pulmonary embolus, pneumonia, sepsis, urinary tract infection, cellulitis, osteomyelitis, and autonomic dysreflexia. Thus, according to the University of Alabama Spinal Cord Injury Calculator, patients who do not receive optimal funding are unlikely to receive optimal care and will have a significant reduction in life expectancy.

CONCLUSION

SCI carries a significant burden to patients, families, and the healthcare system. These injuries tend to occur relatively early in life, and thus the care for those who survive requires a great deal of planning for and spending on healthcare, the quality of which substantially impacts longevity. SCI life expectancy calculators are employed to aid in financial and future medical care planning, but they are extremely limited in the value they offer to individual patients because they fail to capture meaningful clinical and non-clinical factors that affect how long each patient will survive. Nonetheless, these calculators do account for the critical role of finances and high-quality care as well as other important contributors to patient survival. These calculators may thus provide a valuable jumping-off point from which clinical experts familiar with the details of individual patients can base their more accurate and precise estimates for how long a given patient will survive and what can be done to increase longevity and improve quality of life for those patients.

REFERENCES

1. Bennett J, Das JM, Emmady PD. T Spinal cord injuries. StatPearls. 2022.
2. Aikman K, Oliffe JL, Kelly MT, McCuaig F. Sexual health in men with traumatic spinal cord injuries: A review and recommendations for primary health-care providers. *Am J Mens Health*. 2018;12(6):2044.
3. Frontera JE, Mollett P. Aging with spinal cord injury: An update. *Phys Med Rehabil Clin N Am*. 2017;28(4):821-828.
4. Middleton JW, Dayton A, Walsh J, Rutkowski SB, Leong G, Duong S. Life expectancy after spinal cord injury: A 50-year study. *Spinal cord*. 2012;50(11):803-811.
5. NSCISC National Spinal Cord Injury Statistical Center: Life Expectancy Calculator. 2021.
6. Life Expectancy for CP, VS, TBI and SCI. 2021.
7. Health Professions. SCI Life Expectancy Calculator. MUSC Health University Medical Center. 2021.
8. deVivo MJ, Ivie CS. Life expectancy of ventilator-dependent persons with spinal cord injuries. *Chest*. 1995;108(1):226-232.
9. Strauss D, deVivo M, Shavelle R, Brooks J, Paculdo D. Economic factors and longevity in spinal cord injury: A reappraisal. *Arch Phys Med Rehabil*. 2008;89(3):572-574.
10. Oña A, Strøm V, Lee BS, Fort ML, Middleton J, Gutenbrunner C. Health inequalities and income for people with spinal cord injury. A comparison between and within countries. *SSM Popul Health*. 2021;15:100854.
11. Strauss DJ, deVivo MJ, Paculdo DR, Shavelle RM. Trends in life expectancy after spinal cord injury. *Arch Phys Med Rehabil*. 2006;87(8):1079-1085.

12. Thietje R, Pouw MH, Schulz AP, Kienast B, Hirschfeld S. Mortality in patients with traumatic spinal cord injury: Descriptive analysis of 62 deceased subjects. *J Spinal Cord Med.* 2011;34(5):482.
13. Shavelle RM, Paculdo DR, Tran LM, Strauss DJ, Brooks JC, de Vivo MJ. Mobility, continence, and life expectancy in persons with Asia Impairment Scale Grade D spinal cord injuries. *Am J Phys Med Rehabil.* 2015;94(3):180-191.
14. Chin L. *Spinal Cord Injuries: Practice Essentials, Background, Anatomy.* 2021.
15. Kang N, Woollard AC. Targeted muscle reinnervation: Advances and opportunities. *J Plast Reconstr Aesthet Surg.* 2018;71(6):920-921.