Vulnerable Patients More Likely to Use Telemedicine in Spine Surgery: A National Cohort Study

Muhammad Talal Ibrahim[1], Prajwal Guruprasad, Azeem Tariq Malik, Phillip Joseph Glivar, Elizabeth M Yu, Varun Kumar Singh, Venkat Chalapathi Kavuri
[1]Orthopaedics

INTRODUCTION:

Telemedicine is a virtual healthcare interaction between providers and patients, utilizing audio-video or audio-only formats. Use of telemedicine significantly increased during the COVID-19 pandemic, enabled by increased Medicare and insurance coverage of telehealth visits under the COVID-19 Public Health Emergency (PHE). However, this coverage is set to expire this year. Telemedicine mostly benefits patients with mobility limitations. However, patient characteristics associated with telemedicine use in the perioperative period in spine surgery have not been well-described. This study aims to analyze the patients characteristics associated with utilization of telemedicine in spine surgery.

METHODS:

This retrospective cohort study was conducted using the PearlDiver (M170) database, a nationally representative administrative dataset. Patients underdoing cervical and lumbar fusion between 2010 to 2023 in the US were identified and divided into two groups: telehealth and non-telehealth. Patients in telehealth cohort had at least one telehealth visit in one year before or after the surgery. Telehealth visits were identified using CPT-99441:43, CPT-G0425:27, and CPT-G0459.

Outcome measures included demographic, temporal, and geographical trends, as well as healthcare reimbursements. Moreover, telemedicine usage patterns was analyzed across the Social Vulnerability Index (SVI) and Rural-Urban Commuting Area Codes (RUCA) categories.

Statistical analysis was performed using RStudio, built-into PearlDiver. For the analysis of healthcare usage, patients were matched on age, elixhauser comorbidity index (ECI), sex, insurance plan, diabetes type 2, and hypertension. In the matched cohorts, three-month postoperative morphine milligram equivalents (MME), opioid usage, steroids usage, physical/occupational therapy (PT/OT) usage, readmission rate, and emergency department (ED) visit rate were compared using multivariable linear or logistic regression, adjusting for age, sex, and ECI. Non-telehealth cohort was the reference group in regression analyses.

RESULTS:

Out of 1.5 million spinal fusion patients covered in this study, 188,375 (12.7%) had at least one telehealth visit. The telehealth cohort was older (60.3 vs 58.5 years, $p < 0.001$), had a higher Elixhauser Comorbidity Index (ECI) score (5.6 vs 4.2, $p < 0.001$), and had higher proportion of Medicaid (5.5% vs 5.0%) and Medicare (25.5% vs 23.6%, $p < 0.001$) coverage. Its utilization steadily increased notably between 2018 and 2020 before plateauing.

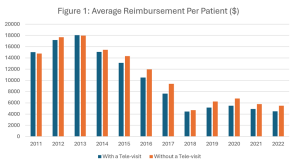
Telemedicine cohort also had a higher one-year total healthcare associated cost ($16k vs $11k, $p < 0.001$). Over the study period, per patient reimbursement for all spinal fusions dropped notably, although the telehealth cohort had a larger drop than non-telehealth cohort (Figure 1). Telemedicine was widely adopted across the U.S., with the highest prevalence in Delaware, Maine, and Ohio (Figure 2).

Although no trend was noticed in overall SVI rank, telemedicine use was significantly higher in areas with low access to vehicles and internet, and a higher percentage of African Americans (Figure 3). Percentage utilization was highest in urban areas (12.6%) followed by sub-urban (10.7%) and rural areas (10.6%, $p < 0.001$).

Telehealth cohort had higher utilization of MME, opioid, steroid, and PT/OT, along with increased readmission rate and ED visits. These differences maintained even after matching for baseline characteristics and adjusting for demographics. (Table 1)

DISCUSSION AND CONCLUSION:

In spine surgery, vulnerable patients had a slightly higher utilization of telemedicine, with the differences maintained in healthcare utilization even after matching. Legislative changes disincentivizing telemedicine will adversely affect these vulnerable patients the most.



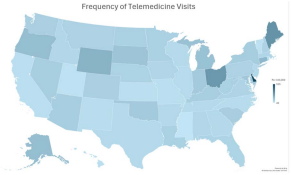


Figure 1: Telemedicine use Per 100,000 patients covered

Figure 3: Percentage of spine surgery patients utilizing telemedicine, stratified by the Social Vulnerability Index (SVI) of the provider's zip code.

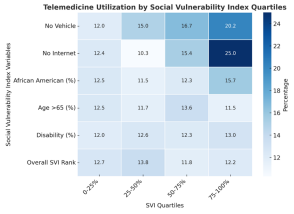


Table 1: Comparison of 3-Month Healthcare Utilization Between Telehealth and Non-Telehealth Cohorts, Matched for Baseline Characteristics.

	Telehealth	**Non Telehealth**	p-Value	**Regression***
N = 351,660	175,830 (50%)	175,830 (50%)		β or Odds Ratio (95%CI)
MME	2,689 ± 4,951	2,683 ± 4,899	< 0.001	26.21 (-11.16, 63.59)
Opioid	127,412 (73%)	126,087 (72%)	< 0.001	1.04 (1.02 – 1.05)
Steroids	30,552 (17%)	28,203 (16%)	< 0.001	1.10 (1.08 – 1.12)
PT/OT	37,768 (22%)	32,514 (19%)	< 0.001	1.21 (1.19 – 1.23)
Readmission	15,662 (9%)	14,751 (8%)	< 0.001	1.07 (1.04 – 1.10)
ED Visit	30,464 (17%)	27,204 (16%)	< 0.001	1.15 (1.13 – 1.17)

MME: morphine milligram equivalents (MME), PT/OT: physical/occupational therapy, ED: Emergency Department
* Non-telehealth cohort as reference