

What is the Impact of Socioeconomic Status on the Mental and Physical Health, Functional Recovery, and Risk of Post-Operative Complication in Spine Surgery?

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INTRODUCTION: In May 2010, the American Academy of Orthopaedic Surgery (AAOS), the Orthopaedic Research Society (ORS), and the Association of Bone and Joint Surgeons (ABJS) sponsored a research symposium to better understand disparities in musculoskeletal healthcare. Despite this call to action, more than a decade later disparity persists. As medicine has worked to better understand the source of disparity, an interrelationship between mental and physical health has been established. Social health has further been recognized as a domain outside the individual's control that may influence other health domains. Socioeconomic status (SES) has been used as a metric of social health and low SES has been associated with a greater prevalence of disease including colorectal cancer, weight gain, perceived function, and mortality. Within the field of Orthopaedic Surgery, low SES is associated with decreased survival in sarcoma patients, increased musculoskeletal symptoms, increased rates of carpal tunnel syndrome and associated functional impairment along with decreased PROMIS physical function scores at presentation. Prior research has predominantly focused on individual-level factors such as income and education to explain the source of disparity as it related to SES, however these measures may not adequately capture the whole picture which is affected by local and neighborhood-level factors. The Area Deprivation Index (ADI) is a composite measure of income, education, employment, housing quality, and access to social services that more completely encompasses the impact of low SES. The impact of SES on patients undergoing spine surgery, however, is not completely understood and is understudied. Our research sought to evaluate this relationship. Our primary aim was to evaluate the association between ADI and patient-reported physical and mental health in patients undergoing thoracolumbar spine surgery involving greater than 3 levels. Our secondary aim was to evaluate the association between ADI and the risk for post-operative complication following spine surgery.

METHODS: A single-center retrospective cohort analysis using electronic medical record (EMR) data from patients undergoing spine surgery between Jan 1, 2019 and Dec 31, 2020. IRB approval was obtained including a waiver for informed consent. Patients aged 18 years and older who underwent thoracolumbar spine surgery with greater than 3 levels addressed were identified. Demographic information including age, sex, race, body mass index (BMI), primary residential address, smoking status, American Society of Anesthesiologists (ASA) classification were collected. Review of the medical record was completed to determine 90-day re-operation and post-operative medical complications. The Charlson Comorbidity Index (CCI) was calculated for each patient at the time of their surgery. Patient reported outcomes measures (PROM) scores used in our clinics, including Oswestry Disability Index (ODI), Modified Japanese Orthopaedic Association (mJOA), and Patient-Reported Outcomes Measurement (PROMIS) physical and mental health were assessed. Area Deprivation Index (ADI) was used to define SES. Participants were stratified into ADI tertiles with the highest tertile having the lowest SES and greatest amount of socioeconomic deprivation. Mean baseline, postoperative, and baseline to postoperative changes in PROM scores were compared among tertiles using generalized linear models. Logistic regression was used to model the association between ADI tertiles and odds of postoperative complication or 90-day reoperation.

RESULTS SECTION: 283 patients (mean age=61.3±14.3 years, 45% women) were included in analyses. Groups did not differ regarding age, sex, tobacco use, ASA or CCI. Patients in the highest ADI group had a higher BMI when compared to the middle group, but not when compared to the lowest group. Race approached significance with those in the highest ADI group having a higher proportion of non-white participants, however all groups were predominantly White. Preoperative PROMs did not significantly differ among tertiles ($p = 0.549$). 3-month and 12-month follow-up PROMs showed significant differences in 3-month ODI with the middle deprivation group having less disability than the lowest and highest deprivation groups ($p=0.03$ and $p = 0.04$). Change in PROMs from baseline was only significant in the 12-month post-operative ODI with the middle deprivation outperforming the highest deprivation group ($p=0.03$). There was no significant difference between groups regarding 90-day re-operations or post-operative complications.

DISCUSSION: Recently there has been an increased focus in the literature on understanding the impact of social factors such as SES on healthcare outcomes. Various individual measures of SES have been utilized however these fail to account for the full complexity and scope of SES. Only very recently has this topic been explored in the spine literature. As the US healthcare environment moves toward emphasizing pay for performance and bundled payment structures it is important to understand how patient reported outcomes, complications, and 90-day re-operation rates are affected. Furthermore, having a better understanding of the sources of disparity in our patient population is imperative. Prior research on the topic in spine surgery is limited and results have been mixed. Specifically there has been disagreement regarding presenting PROMIS scores and SES. Our results showed no difference in presenting PROMs when stratified by SES and limited impact on post-operative PROMs. There are several limitations that are pertinent to discuss. Our sample size may not be large enough to identify all potential outcomes. This was a retrospective study that involved inherent limitations and the possibility for inaccuracy secondary to documentation errors. There are also gaps in the data with limited completion of PROMIS physical and mental health questionnaires. Finally, our study population is homogenous with predominantly White race represented consistent with the state demographic.

SIGNIFICANCE/CLINICAL RELEVANCE: In a cohort of patients undergoing thoracolumbar spine surgery involving greater than 3 surgical levels, SES does not appear to affect preoperative PROMs, post-operative PROMs or changes in PROMs when compared to baseline. Furthermore, SES does not play a factor in risk for 90-day post-operative complication or re-operation.