EDITOR'S CHOICE

The Impact of Social Deprivation on Pediatric PROMIS Health Scores After Upper Extremity Fracture

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Purpose Although social deprivation is acknowledged to influence physical and mental health in adults, it is unclear if and how social deprivation influences perceived health in children. This study was conducted to evaluate the impact of social deprivation on Patient-Reported Outcomes Measurement Information System (PROMIS) scores in children presenting for treatment of upper extremity fractures.

Methods This cross-sectional evaluation analyzed data from 975 new pediatric patients (8−17 years old) with upper extremity fractures presenting to a tertiary orthopedic center between June 1, 2016, and June 1, 2017. They completed self-administered PROMIS Computer Adaptive Tests (CATs). The Area Deprivation Index was used to quantify social deprivation. Bivariate statistical analysis determined the effect of disparate area deprivation (based on most and least deprived national quartiles) for the entire population.

Results A total of 327 children (34%) lived in areas categorized as the most socially deprived quartile of the United States, whereas 202 (21%) arrived from homes in the least socially deprived quartile. Children in the most deprived quartile had significantly worse mean PROMIS Upper Extremity Function, Mobility, Pain Interference, and Peer Relations scores than those in the least deprived quartile. Significantly more children from the most socially deprived areas were black. Patient age, sex, and fracture type were not significantly different between patients from the least and the most socially deprived quartiles.

Conclusions Children living in areas of greatest social deprivation report worse Upper Extremity Function, Mobility, Pain Interference, and Peer Relations scores on self-administered PROMIS CATs than children from areas of least social deprivation at presentation for care of upper extremity fractures. The impact of social deprivation on perceived health and function is evident before adulthood and, therefore, interventions to mitigate this effect should be offered to children as well as adults. *(J Hand Surg Am. 2018;■(■):■−■. Copyright © 2018 by the American Society for Surgery of the Hand. All rights reserved.)*

Type of study/level of evidence Prognostic II.

Key words Social deprivation, PROMIS, pediatric, fracture, upper extremity.

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Social, mental, and physical health are interrelated, with each facet of health influencing the others. Lower socioeconomic status has been associated with obesity, negative psychological characteristics, substance abuse, depression, diabetes, childhood mortality, and physical and psychological symptoms in children.[1–9] In addition, lower socioeconomic status in childhood has been correlated with an increased risk of developing depression as an adult.[10]

Socioeconomic status is acknowledged to influence both the occurrence of and the treatment outcomes for musculoskeletal conditions.[11–18] Increased social deprivation has been associated with increased risk for hand injuries and upper extremity fractures.[11–14] In children, lower socioeconomic status has been associated with increased incidence of Perthes disease.[15] However, the relationship between socioeconomic status and patient-reported outcomes in pediatric upper extremity surgical practice is unclear.

The National Institutes of Health developed the Patient-Reported Outcomes Measurement Information System (PROMIS) to allow for standardized measurement of patient-reported outcomes and health-related quality of life. Pediatric PROMIS assessments have multiple social, mental, and physical health domains including Peer and Family Relationships, Emotional Stress, Fatigue, Pain Interference, Mobility, and Upper Extremity Function.[16–19] The questionnaire may be administered in a computerized adaptive testing (CAT) format and is validated for self-administration for patients 8 to 17 years old.[20]

Although social deprivation is acknowledged to influence physical and mental health in adults, it is less clear if social deprivation influences perceived health in children. The primary aim of this study was to evaluate the association between social deprivation and PROMIS scores in pediatric patients with upper extremity fractures. This tested the null hypothesis that there would be no difference in PROMIS Upper Extremity Function, Mobility, Pain Interference, and Peer Relationship assessments among patients with more social deprivation than among those with less social deprivation.

MATERIALS AND METHODS

Approval for this study was obtained from our institutional review board. All records were evaluated with a waiver of written consent. This cross-sectional evaluation analyzed data from 1,181 pediatric patients who had presented to a tertiary orthopedic center with upper extremity fractures between June 1, 2016, and June 1, 2017. All new clinic patients 8 to 17 years old with upper extremity fractures were eligible for inclusion. Patients were identified using *International Classification of Diseases*, 10th Revision, codes: Humeral Shaft (S42.2, S42.3), Distal Humerus (S42.4), Proximal Forearm (S52.0, S52.1, S52.2, S52.3), Distal Forearm (S52.5, S52.6), Unspecified Forearm (S52.9), and Wrist/Hand (S62.0, S62.1, S62.2, S62.3, S62.5, S62.6, S62.9). Patients were excluded if PROMIS scores were incomplete or absent (n = 136).

PROMIS scores

All patients presenting to our institution's orthopedic pediatric clinics were provided a computer tablet (iPad mini; Apple, Cupertino, CA) at check-in preloaded with PROMIS Pediatric Upper Extremity Function, Mobility, Pain Interference, and Peer Relations CATs. The PROMIS scores were generated and uploaded into the patients' electronic health record upon module completion. The PROMIS CATs are normalized such that a score of 50 represents the normative population mean with an SD of 10.[21] A higher score represents a higher level of a given metric such that a higher Physical Function score indicates better function, whereas a higher Pain Interference score indicates more pain. The PROMIS has been validated in many patient populations, including a variety of orthopedic populations.[22–29] In addition, the PROMIS CATs have strongly correlated with multiple orthopedic legacy measures of pain and function with favorable floor and ceiling effects.[23,24,26]

Measuring social deprivation

The Area Deprivation Index (ADI) quantified the social deprivation of each patient community according to 9-digit home zip code. The ADI is a validated measure of social deprivation that accounts for 17 U.S. Census measures across the domains of poverty, education, housing, and employment, which mirror those used in other countries to measure social deprivation.[30–33] Singh[30] found a reliability coefficient of 0.95 for the ADI, indicating a high degree of consistency, and demonstrated expected correlations between the ADI and known mortality measures to confirm validity. The ADI of each geographical area is determined by the sum of each included socioeconomic factor multiplied by its predetermined factor coefficient. After standardization, index values range from −53 to 129, with increasing values indicating increasing levels of social deprivation: a patient whose zip code translates to an ADI of 100 is from a more deprived area than someone with an ADI of 30. Socioeconomic disadvantage is a complex entity that