Scratching the Surface: Itching for Evidence to Reduce Surgical Health Disparities in Total Shoulder Arthroplasty

Total shoulder arthroplasty (TSA) is an effective procedure to improve symptoms, function, and quality of life for patients with different clinical conditions that affect the shoulder^{1,2}. TSA use has been increasing in the United States^{3,4}, but whether the short-term and longterm beneficial effects extend to all recipients is less clear. In this issue of *The Journal*, research by Singh and Cleveland⁵ adds to the growing body of literature evaluating the link between socioeconomic status (including insurance and income status) and postsurgical outcomes in patients with TSA. In this study, the authors conclude that public insurance, such as Medicaid and Medicare, were independently associated with more healthcare use (e.g., length of hospitalization and discharge to rehabilitation facilities) and suboptimal clinical outcomes, whereas lower income status was associated with less healthcare use and fewer postsurgical complications after TSA. The findings run counter to their hypothesis.

The study offers clear advantages relative to previous research. First, the authors used the National Inpatient Sample (NIS), a nationally representative sample generalizable to all shoulder arthroplasties performed in the United States. This publicly available database with all-payer inpatient care data reduces the likelihood of selection bias that may occur in a single or multisite retrospective design⁶. The authors combined more than 15 years of data to further examine surgical complications including transfusion and revision associated with TSA, thus extending previous research using the same data source^{7,8}. Most importantly, the NIS allowed the authors to evaluate the extent to which one of the key socioeconomic characteristics, the median household income, was associated with post-TSA outcomes. The availability of this variable allowed Singh and Cleveland to significantly add to the body of literature for TSA research, yet the study findings leave researchers and readers perplexed.

Despite the strengths of the national database, the current study's findings must be interpreted with caution, as others using the NIS have done previously^{5,7,8}. The extent to which

confounding by unmeasured factors could have been at play must be considered. Indeed, some important clinical characteristics of the study population were not included in the NIS. Obesity (e.g., body mass index > 40 kg/m²) is associated with complications such as revision and infection among patients with TSA⁹. Also, clinical depression is not uncommon in patients who have undergone TSA and is considered a risk factor for perioperative outcomes¹⁰. Although Singh and Cleveland analytically adjusted for important covariates such as comorbidity status, important patient characteristics such as body weight and depression were not available. Whether residual confounding from unmeasured variables affected the observed associations remains unclear.

Contrary to their hypothesis, their findings suggest that lower income status was inversely associated with lengthy hospital stays (> 2 days), discharge to a rehabilitation facility, and in-hospital complications such as transfusion and revision. Sensitivity analyses were conducted that additionally adjusted for hospital location/teaching status, hospital bed size, and the hospital region because these factors have also been associated with the outcomes evaluated. Yet, the results of the sensitivity analyses only confirmed the primary findings, ruling out these alternative explanations for the observed associations. Although no prior research directly evaluated the link between income status and surgical outcomes after TSA, comparisons to research conducted on postsurgical outcomes in patients with knee arthroplasty may provide insights^{11,12}.

If sources of bias including residual confounding and selection bias were not major threats to the validity of the present study, how do we interpret these findings that ran counter to the logical hypotheses posited by Singh and Cleveland? That Medicare/Medicaid insurance beneficiaries were more likely to have higher healthcare use and worse post-TSA outcomes than privately insured patients gives pause for reflection. Considering insurance status as a

---

See Insurance, income, and TSA outcomes, page 589

sociopolitical construct¹³ allows us to take into account several perspectives. What drives TSA outcomes is likely to be multifactorial and multilevel. Behavioral and contextual factors such as the individual's support systems (e.g., formal and informal caregivers), healthcare environment (e.g., co-pays for postsurgical physical therapy), and social norms may influence process and outcome measures associated with recovery from surgery¹⁴. Future investigations must identify individual barriers and limitations to accessing healthcare resources (e.g., concomitant medications use and/or cost) and address interpersonal areas such as family or social support. The extent to which caregivers face challenges in caring for functionally dependent care recipients warrants analysis. Consideration of these factors may shed light on potential mechanisms associated with postoperative outcomes and healthcare use for TSA patients.

The observed findings regarding discharge disposition were also contrary to their hypothesis. Family support and resources available may facilitate home discharge. The NIS lacked information that would have allowed the authors to examine the role of these factors in more detail. Inadequate postoperative management can lead to excessive discomfort, patient dissatisfaction, worse medical outcomes, and increased costs when patients go home without adequate support^{15,16,17}. With the movement toward shorter hospital stays and increase in home discharge in patients with total joint arthroplasty (TJA)^{18,19,20}, studies have been conducted evaluating the interaction between shorter hospital stays in combination with home discharge and the relationship with postoperative outcomes including longterm complications and readmissions after primary TJA^{21,22}. Yet the evidence regarding this interplay among patients with TSA is limited. Given the findings of the present study, research examining the extent to which these factors are associated with longterm medical outcomes may be worthwhile.

Using a national sample with more than 15 years of data, Singh and Cleveland report that insurance and income status are associated with healthcare use and in-hospital outcomes in patients receiving TSA. With the new evidence in hand, where do we go next? Understanding root causes of these "surgical health disparities" in postoperative outcomes and identifying remedies to reduce them is a research imperative for The National Institute on Minority Health and Health Disparities. Investigation of longterm medical outcomes in patients with TSA using different data sources is needed. It is time to go beyond documenting risks of important surgical outcomes and readmissions in patients with TSA by indicators of socioeconomic status. Using rigorous methodologies with patient-centered outcomes, studies are urgently needed of which modifiable factors may reduce disparities and which interventions work to reduce disparities. With results from such studies in hand, we may begin the implementation and diffusion of effective interventions to reduce disparities in patients undergoing TSA.

SHAO-HSIEN LIU , PhD, Assistant Professor,

Division of Epidemiology,
Department of Population and
Quantitative Health Sciences;

KATE L. LAPANE, PhD,

Professor and Division Chief,
Director, Clinical and Health Population
Research Doctoral Program, and
Associate Dean, Graduate School of Biomedical Sciences,
University of Massachusetts Medical School,
Worcester, Massachusetts, USA.

Address correspondence to S.H. Liu, Division of Epidemiology,
Department of Population and Quantitative Health Sciences, University of
Massachusetts Medical School, 368 Plantation St., Worcester,
Massachusetts 01605, USA. E-mail: shaohsien.liu@umassmed.edu

REFERENCES

1. Fevang BT, Lygre SH, Bertelsen G, Skredderstuen A, Havelin LI, Furnes O. Good function after shoulder arthroplasty. *Acta Orthop* 2012;83:467-73.
2. Roberson TA, Bentley JC, Griscom JT, Kissenberth MJ, Tolan SJ, Hawkins RJ, et al. Outcomes of total shoulder arthroplasty in patients younger than 65 years: A systematic review. *J Shoulder Elbow Surg* 2017;26:1298-306.
3. Day JS, Lau E, Ong KL, Williams GR, Ramsey ML, Kurtz SM. Prevalence and projections of total shoulder and elbow arthroplasty in the United States to 2015. *J Shoulder Elbow Surg* 2010;19:1115-20.
4. Kim SH, Wise BL, Zhang Y, Szabo RM. Increasing incidence of shoulder arthroplasty in the United States. *J Bone Joint Surg Am* 2011;93:2249-54.
5. Singh JA, Cleveland JD. Insurance payer type and patient income are associated with outcomes after total shoulder arthroplasty. *J Rheumatol* 2020;47:589-96.
6. van de Sande MA, Brand R, Rozing PM. Indications, complications, and results of shoulder arthroplasty. *Scand J Rheumatol* 2006;35:426-34.
7. Li X, Veltre DR, Cusano A, Yi P, Sing D, Gagnier JJ, et al. Insurance status affects postoperative morbidity and complication rate after shoulder arthroplasty. *J Shoulder Elbow Surg* 2017;26:1423-31.
8. Smucny M, Menendez ME, Ring D, Feeley BT, Zhang AL. Inpatient surgical site infection after shoulder arthroplasty. *J Shoulder Elbow Surg* 2015;24:747-53.
9. De Martino I, Gulotta LV. The effect of obesity in shoulder arthroplasty outcomes and complications. *Orthop Clin North Am* 2018;49:353-60.
10. Mollon B, Mahure SA, Ding DY, Zuckerman JD, Kwon YW. The influence of a history of clinical depression on peri-operative outcomes in elective total shoulder arthroplasty: A ten-year national analysis. *Bone Joint J* 2016;98-b:818-24.
11. Davis ET, Lingard EA, Schemitsch EH, Waddell JP. Effects of socioeconomic status on patients' outcome after total knee arthroplasty. *Int J Qual Health Care* 2008;20:40-6.
12. Singh JA, Lewallen DG. Income and patient-reported outcomes (PROs) after primary total knee arthroplasty. *BMC Med* 2013;11:62.
13. Witzig R. The medicalization of race: scientific legitimization of a flawed social construct. *Ann Intern Med* 1996;125:675-9.
14. Chin MH, Walters AE, Cook SC, Huang ES. Interventions to reduce racial and ethnic disparities in health care. *Med Care Res Rev* 2007;64:7s-28s.
15. Harden RN, Bruehl S, Stanos S, Brander V, Chung OY, Saltz S, et al. Prospective examination of pain-related and psychological predictors of CRPS-like phenomena following total knee arthroplasty: a preliminary study. *Pain* 2003;106:393-400.

16. Ranawat CS, Ranawat AS, Mehta A. Total knee arthroplasty rehabilitation protocol: what makes the difference? *J Arthroplasty* 2003;18:27-30.
17. Maheshwari AV, Blum YC, Shekhar L, Ranawat AS, Ranawat CS. Multimodal pain management after total hip and knee arthroplasty at the Ranawat Orthopaedic Center. *Clin Orthop Relat Res* 2009;467:1418-23.
18. Mor V, Intrator O, Feng Z, Grabowski DC. The revolving door of rehospitalization from skilled nursing facilities. *Health Aff* 2010;29:57-64.
19. Chandra A, Dalton MA, Holmes J. Large increases in spending on postacute care in Medicare point to the potential for cost savings in these settings. *Health Aff* 2013;32:864-72.
20. Froimson MI, Rana A, White RE Jr., Marshall A, Schutzer SF, Healy WL, et al. Bundled payments for care improvement initiative: the next evolution of payment formulations: AAHKS Bundled Payment Task Force. *J Arthroplasty* 2013;28:157-65.
21. Keswani A, Tasi MC, Fields A, Lovy AJ, Moucha CS, Bozic KJ. Discharge destination after total joint arthroplasty: an analysis of postdischarge outcomes, placement risk factors, and recent trends. *J Arthroplasty* 2016;31:1155-62.
22. Gholson JJ, Pugely AJ, Bedard NA, Duchman KR, Anthony CA, Callaghan JJ. Can we predict discharge status after total joint arthroplasty? A calculator to predict home discharge. *J Arthroplasty* 2016;31:2705-9.

J Rheumatol 2020;47:490–2; doi:10.3899/jrheum.190796