



Contents lists available at ScienceDirect

Journal of Hand Surgery Global Online

journal homepage: www.JHSGO.org

Original Research

Implications of Patient–Provider Concordance on Treatment Recommendations for Carpal Tunnel Syndrome

Rachel C. Hooper, MD, * Ahmad Hider, BA, † Noelle Thompson, BA, ‡
Zhaohui Fan, MD, MPH, § Gary L. Freed, MD, † Jennifer F. Waljee, MD *, §

* Department of Surgery, Section of Plastic Surgery, Michigan Medicine, Ann Arbor, MI

† University of Michigan, Ann Arbor, MI

‡ College of Medicine and Life Sciences, University of Toledo, Toledo, OH

§ Department of Surgery, University of Michigan, Medical School, Ann Arbor, MI



ARTICLE INFO

Article history:

Received for publication November 28, 2023

Accepted in revised form November 29, 2023

Available online December 29, 2023

Key words:

Carpal tunnel syndrome

Cultural humility

Patient–provider concordance

Purpose: Differences in the utilization of carpal tunnel release (CTR) by Blacks and women are well documented, but less is known regarding the impact of patient–provider concordance on treatment recommendations. To investigate this, we surveyed hand surgeons using hypothetical scenarios to evaluate variations in treatment recommendations for carpal tunnel syndrome based on patient-related factors and patient–provider concordance.

Methods: Three pairs (six total) of hypothetical scenarios with clinical symptoms of carpal tunnel syndrome were created varying sex, race, and occupation. We used names as a proxy for sex and race. Occupation included manual laborers, secretaries, athletes, and retirees. American Society for Surgery of the Hand members were emailed an anonymous web-based link to participate. We used descriptive statistics to analyze the scenario-based treatment recommendations.

Results: We identified 3,067 eligible members for participation; 770 surgeons responded (25%) and provided recommendations for 3,742 scenarios. For scenarios involving symptomatic patients without electrodiagnostic studies (EDS), with normal EDS, and with abnormal EDS, no difference was noted in surgeon treatment recommendations based on patients' race, sex, and occupation. Surgeons recommended EDS for 31% and 32.8% of the scenarios with Black female and White male patients, respectively, who did not have EDS at presentation and CTR for 32.3% and 33% of White females and Black males with normal EDS, respectively. Among retired Black female and White male patients older than 80 years of age with abnormal EDS, surgeons recommended CTR in 89.9% and 89.3% of them, respectively. For patient–provider racially concordant pairs, White surgeons recommended CTR to a similar proportion of Black and White hypothetical patients; however, Black surgeons recommended CTR to a greater proportion of patients with Black-sounding names.

Conclusions: We found that surgeon treatment recommendation was not associated with patient race, sex, or occupation; however, differences did emerge based on patient–provider racial concordance, suggesting that alignment of patient and provider identities may influence treatment recommendations.

Type of study/level of evidence: Prognostic III.

Copyright © 2023, THE AUTHORS. Published by Elsevier Inc. on behalf of The American Society for Surgery of the Hand. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Carpal tunnel syndrome (CTS) is one of the most common compressive neuropathies and represents 90% of all entrapment syndromes, impacting 14% of the general population.^{1,2} The diag-

nosis can be made clinically based on the CTS-6 criteria or using electrodiagnostic studies (EDS). In 2016, the American Association of Orthopedic Surgeons clinical practice guidelines identified strong evidence for the use of physical examination signs and symptoms to diagnose CTS.^{3,4} Among patients with a high clinical suspicion for CTS, EDS has not been shown to change the diagnosis in a clinically significant manner.⁵ Despite established clinical practice guidelines, some providers may still require preoperative EDS before proceeding with carpal tunnel release (CTR) under circumstances where interpretation of symptoms and clinical findings are challenging.^{4–6}

Declaration of interests: No benefits in any form have been received or will be received related directly to this article.

Corresponding author: Rachel C. Hooper, MD, Section of Plastic Surgery, Department of Surgery, Michigan Medicine, 1500 E Medical Center Drive, TC 2130, Ann Arbor, MI 48109.

E-mail address: hooperra@med.umich.edu (R.C. Hooper).

<https://doi.org/10.1016/j.jhsg.2023.11.005>

2589-5141/Copyright © 2023, THE AUTHORS. Published by Elsevier Inc. on behalf of The American Society for Surgery of the Hand. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

When implementing clinical guidelines for CTS, it is possible that provider–patient discordance can impact provider interpretation of symptoms, leading to variable treatment recommendations. Patient–provider concordance represents similarity in some trait (race, ethnicity, sex, and/or age) during a clinical encounter; these commonalities have been shown to enhance communication, improve patient compliance, and can potentially lead to improved health care outcomes.^{7–10} Therefore, CTS is ideally suited to examine patient–provider concordance because this diagnosis relies on the patient’s clinical presentation and provider’s interpretation of the symptoms and physical findings. Inequities in the treatment of CTS based on race and sex have been documented in the literature; however, the impact of specific patient-related factors and patient–provider concordance on surgical and nonsurgical treatment recommendations is poorly understood.^{11–13}

Because CTS is one of the most common hand conditions, we sought to understand whether differences in the utilization of carpal tunnel release (CTR) are related to provider recommendation based on the interpretation of symptom severity, availability of diagnostic testing, and patient race, sex, and occupation. In this national study of hand surgeons, we sought to understand the impact of patient–provider concordance on treatment recommendations for CTS, using a survey-based clinical scenario approach. Our primary outcome included surgeon treatment recommendations based on patient-related factors (race, sex, and occupation). Secondary outcomes included treatment recommendations under circumstances of patient–provider concordance. We hypothesized that surgeon treatment recommendation would vary based on patient–provider concordance and patient race and sex.

Methods

Study sample

This quantitative survey-based study underwent peer review by the American Society for Surgery of the Hand (ASSH) Research Committee. The purpose of the study was to elicit differences in hand surgeon treatment recommendations for hypothetical patients with CTS when variation in patient race and sex is present. Because this was a deidentified survey study, we received an exemption from our institutional review board. Active and candidate members of the ASSH were invited to participate in a web-based questionnaire via an anonymous link in February 2023; retired, international, and nonphysician members were excluded. A total of 3,067 eligible members were emailed.

Survey instrument and data analysis

With the aid of the Center for Bioethics and Social Sciences in Medicine at our institution, we developed the survey instrument including six hypothetical scenarios of patients with clinical symptoms of CTS. The Center for Bioethics and Social Sciences in Medicine is comprised of a multidisciplinary group of experts within ethics and health sciences research (<https://cbssm.med.umich.edu>). Scenarios included patients without EDS, with normal EDS, and with abnormal EDS (nonrecordable median nerve sensory latency and abductor pollicis brevis muscle changes). These scenarios were pilot-tested for understanding with six hand surgeons at the University of Michigan. Patient occupation (manual laborer, winery owner, secretary, athlete, and retiree) and age (30, 40, and 80 years) were varied in the scenarios. Adopting the approach by Bertrand and Mullainathan¹⁴, two versions (A and B) of the instrument were created; each version contained identical clinical presentations, but the patient’s name was varied as a proxy for race and sex. Version A or version B of the surveys were

Table 1
Surgeon Demographics

Surgeon Group	Sample (N = 770)
Race	
Non-Hispanic White	367 (47.7%)
Non-Hispanic-Black	13 (1.7%)
Hispanic	20 (2.6%)
Asian	52 (6.8%)
Middle Easter	11 (1.4%)
Other	14 (1.8%)
Mixed	6 (0.8%)
Missing/unknown	287 (37.3%)
Sex	
Male	413 (82.9%)
Female	85 (17.1%)
Practice y	
1–15	241 (46.3%)
16–30	166 (31.9%)
>30	114 (21.9%)
Practice setting	
Academic	138 (26.5%)
Nonacademic	383 (73.5%)

randomly distributed using the platform Qualtrics (see [Appendix](#), available on the *Journal’s* website at www.jhsgo.org, for clinical vignettes.) On the initial survey request, surgeons were allowed to choose one answer; however, after receiving email feedback, we gave surgeons participating in the second round of invites the option to select more than one response.

Outcomes

The primary outcome was surgeon recommendation based on perceived race, sex, and occupation of each hypothetical patient. Secondary outcome included surgeon treatment recommendations under conditions of patient–provider concordance.

Exposure

We defined patient–provider racial concordance when both the hypothetical patient and provider shared the same race (ie, the surgeon self-identified as White who made a treatment recommendation for a White patient in the scenario) and sex concordance when the patient and the provider were of the same sex.

Analysis

In our a priori power calculation, we assumed that 60% of surgeon recommendations would be based on clinical factors alone, regardless of race, sex, and occupation; we estimated an interclass correlation of 0.10. To detect 0.05 significance and 80% power, 264 surgeons were needed. For each surgeon, we nested treatment recommendations to the clinical scenarios to get a total number of recommendations per scenario. Responses were collected electronically and coded. The data were collected and organized at patient and surgeon levels, respectively. Descriptive statistics and simple chi-square tests were used to compare the treatment recommendations among patients with different races/ethnicities, sexes, and occupations. We also compared surgeon recommendations under conditions of patient–provider concordance based on the race/ethnicity and sex of the respective groups. Finally, we used mixed-effect logistic regression to assess the recommendation for CTR controlling for patient sex, race, occupation, surgeon race, surgeon sex, surgeon practice year, and practice academic setting. Stata 15.1 was used to perform our statistical analysis.

Table 2
Surgeon Treatment Recommendation Among Patients Without EDS

Patient Characteristics	Sample (N = 1447)	CTR (n1 = 236)	Splint (n2 = 457)	Steroid (n3 = 184)	NCS/EDS (n4 = 461)	Other (n5 = 109)	P Value
Race							.85
White	717	121 (16.9%)	220 (30.7%)	87 (12.1%)	235 (32.8%)	54 (7.5%)	
Black	730	115 (15.8%)	237 (32.5%)	97 (13.3%)	226 (31.0%)	55 (7.5%)	
Sex							.85
Male	717	121 (16.9%)	220 (30.7%)	87 (12.1%)	235 (32.8%)	54 (7.5%)	
Female	730	115 (15.8%)	237 (32.5%)	97 (13.3%)	226 (31.0%)	55 (7.5%)	
Occupation							.92
Automotive assembly line	769	121 (15.7%)	244 (31.7%)	101 (13.1%)	248 (32.3%)	55 (7.2%)	
Winery owner	678	115 (17.0%)	213 (31.4%)	83 (12.2%)	213 (31.4%)	54 (8.0%)	

Table 3
Surgeon Treatment Recommendation Among Patients with Normal EDS

Patient Characteristics	Sample (N = 1200)	CTR (n1 = 391)	Splint (n2 = 188)	Steroid (n3 = 581)	Other (n4 = 40)	P value
Race						.10
White	607	200 (33.0%)	91 (15.0%)	303 (49.9%)	13 (2.1%)	
Black	593	191 (32.2%)	97 (16.4%)	278 (46.9%)	27 (4.6%)	
Sex						.10
Male	593	191 (32.2%)	97 (16.4%)	278 (46.9%)	27 (4.6%)	
Female	607	200 (33.0%)	91 (15.0%)	303 (49.9%)	13 (2.1%)	
Occupation						.79
High school basketball coach	624	202 (32.4%)	97 (15.5%)	301 (48.2%)	24 (3.9%)	
Secretary	576	189 (32.8%)	91 (15.8%)	280 (48.6%)	16 (2.8%)	

Table 4
Surgeon Treatment Recommendation Among Patients Abnormal EDS

Patient Characteristics	Sample (N = 1095)	CTR (n1 = 981)	Splint (n2 = 28)	Steroid (n3 = 69)	Other (n4 = 17)	P Value
Race						.98
White	549	490 (89.3%)	15 (2.7%)	35 (6.4%)	9 (1.6%)	
Black	546	491 (89.9%)	13 (2.4%)	34 (6.2%)	8 (1.5%)	
Sex						.98
Male	549	490 (89.3%)	15 (2.7%)	35 (6.4%)	9 (1.6%)	
Female	546	491 (89.9%)	13 (2.4%)	34 (6.2%)	8 (1.5%)	

Results

We identified 3,067 eligible surgeons for participation in the study. In the first and second round of email invitations, 446 and 314 responses were received, respectively, resulting in a total of 770 surgeons who responded (25%), providing recommendations for 3,742 scenarios. In total, 37% of the respondents did not provide demographic data. Among the respondents, 47% were White, and men comprised 83% of the cohort (Table 1). Most of the participants were <15 years in practice (46%) and worked in a nonacademic setting.

Treatment recommendation among patients without EDS

Surgeons were presented scenarios with a Black female (Latoya Johnson) or a White male (Steven Walsh) in their 30s who presented with symptomatic CTS, without EDS. Surgeons recommended CTR for 15.8% and 16.9% and recommended EDS/NCS for 31% and 32.8% of patients with Black- and White-sounding names, respectively ($P = .85$; Table 2). Overall, no difference was observed in surgeon treatment recommendation (surgery, splint, and steroid injection) among the scenarios when stratified based on patient race, sex, and occupation, suggesting that the presence or absence of EDS/NCS was the main driving factor for treatment recommendation.

Treatment Recommendation Among Patients With Normal EDS

Surgeons were presented with scenarios including a Black male (Jamal Johnson) or a White female (Emma Smith) in their 40s, presenting with symptomatic CTS and normal EDS. Among these

symptomatic patients with normal EDS, one-third of the surgeons recommended CTR; steroid injections were recommended for 46.9% and 49.9% of patients with Black- and White-sounding names, respectively, ($P = .102$; Table 3). Overall, no difference was observed in surgeon recommendation based on patient race, sex, and occupation. These findings suggest that some hand surgeons weigh their clinical interpretation of symptomatic CTS patients over normal EDS; however, most surgeons chose to use a steroid injection as an additional diagnostic maneuver.

Treatment recommendation among patients with abnormal EDS

Surgeons were presented with a Black female (Sheronda Williams) or a White male (John Miller) who was older than 80 years of age, with symptomatic CTS and grossly abnormal EDS (nonrecordable median nerve sensory latency and fibrillations of the abductor pollicis brevis muscle). In these scenarios, surgeons recommended CTR for 89.9% and 89.3% of patients with Black- and White-sounding names, respectively (Table 4). No difference was noted in surgeon recommendations when patients were stratified based on race and sex. These findings suggest that despite advanced age, clinical symptoms and grossly abnormal EDS were the main drivers of surgeon recommendation.

Treatment recommendation based on patient–provider concordance

Our cohort included 13 self-identified Black surgeons and 20 Hispanic surgeons. Overall, Black and Hispanic surgeons

Table 5
Surgeon Recommendations for CTR Overall

Surgeon Characteristics	Sample (N = 3,742)	Carpal Tunnel Release		
		Yes (N1 = 1,637)	No (N2 = 2,105)	P value
Race				<.0001
NH-White	2,194	1,021 (46.5%)	1,173 (53.5%)	
NH-Black	78	45 (57.7%)	33 (42.3%)	
Hispanic	120	70 (58.3%)	50 (41.7%)	
Asian	312	138 (44.2%)	174 (55.8%)	
Other	1038	363 (35%)	675 (65%)	

Table 6
Patient–Provider Concordance (Race and Sex)

Race/Ethnicity		Carpal Tunnel Release		
Surgeon Group	Sample	Yes	No	P value
Race				
Non-Hispanic White	1098	515 (46.9%)	583 (53.1%)	.34
Non-Hispanic Black	39	21 (53.9%)	18 (46.2%)	
Race				
NH-White	1096	506 (46.2%)	590 (53.8%)	.06
NH-Black	39	24 (61.5%)	15 (38.5%)	
Sex				
Surgeon Group	Sample	Yes	No	P Value
Sex				
Male	1,237	588 (47.5%)	649 (52.5%)	.66
Female	252	116 (46.0%)	136 (54.0%)	
Sex				
Male	1,237	586 (47.4%)	651 (52.6%)	.74
Female	253	117 (46.3%)	136 (53.8%)	

recommended CTR for 57.7% and 58.3% of the patients in the study ($P < .001$; Table 5). Surgeons who did not identify their race/ethnicity (other) recommended CTR for 35% of hypothetical symptomatic patients, $P < .001$ (Table 5). Self-identified Black and White surgeons recommended CTR to a similar proportion of White patients, 53.9% and 46.9%, respectively ($P = .393$); however, differences in surgeon recommendation for CTR among Black patients exist (Table 6). Black surgeons recommended CTR for 61.5% of Black patients, whereas White surgeons recommended CTR for 46.2% of the Black patients ($P = .059$; Table 6). When we examined patient–provider sex concordance, no differences were observed in the treatment recommendation among sex concordant and discordant pairs (Table 6).

Treatment recommendation based on mixed effects of patient–provider variables

On mixed-effects logistic regression (surgeon- and patient-level data nested together), patient sex (male vs female), patient race (White vs Black), patient occupation, surgeon sex, surgeon race, surgeon years in practice, and practice setting had no significant impact on treatment recommendation (Table 7). The presence of EDS was the most significant factor ($P = .00$) that correlated with a recommendation for surgery; patients with abnormal EDS were recommended for surgery at a statistically significant higher rate compared with those with normal EDS and no EDS.

Discussion

We evaluated the impact of patient characteristics and provider clinical interpretation of symptoms on treatment recommendations

for CTS. Overall, we found no significant difference in surgeon treatment recommendations based on patient race, sex, and occupation. Despite this, differences in treatment recommendations based on race and sex have been documented in the medical literature. In a study among cardiologists, the investigators created a computerized survey instrument with Black and White patients who presented with chest pain and found that cardiologists recommended cardiac catheterization at a significantly lower rate among women and Black patients compared with men and White patients.¹⁵ Disparities in prescription pain medications based on patient race have been observed among pediatric patients with appendicitis and adult patients with fractures; Black patients received a prescription at a significantly lower rate compared with their White counterparts.^{16,17} Although these clinical studies have demonstrated treatment recommendations that differ based on patient race and sex, it is possible that among our cohort of surgeons, the preference and utilization of clinical guidelines and EDS were the main drivers of recommendations rather than patients' race, sex, and occupation.

We found differences in treatment recommendation based on patient–provider racial concordance; surgeons who self-identified as White recommended surgical intervention to a similar proportion of White and Black patients. In contrast, Black surgeons recommended surgery to a greater proportion of Black patients compared with White surgeons; however, this effect was diminished on multi-variable regression. Perhaps, the difference in Black surgeons' recommendation for CTR among Black patients in this study is attributable to the recognition of the name as a proxy for race. Patient–provider race/ethnicity and sex concordance are influential in communication, shared decision making, understanding of the disease, compliance with treatment recommendations, and overall outcomes.^{7,18–20} Patient–provider racial concordance has had

Table 7
Mixed-Effects Model to Predict Recommendation for CTR

Patient	Mixed-Effects Model to Predict Recommendation for CTR	P Value
	Male vs female	.97
	NH-White vs NH-Black	.62
	Normal EDS/NCS vs no EDS/NCS	.00
	Abnormal EDS/NCS vs no EDS/NCS	.00
	Winery vs automotive assembly line vs automotive assembly line	.76
	HS basketball coach vs automotive assembly line	.76
Surgeon	Black vs White	.13
	Hispanic vs White	.05
	Asian vs White	.48
	Other vs White	.69
	Male vs female	.21
	Practice y: 16–30 y vs 1–15 y	.13
	Practice y: >=30 y vs 1–15 y	.06
	Academic vs nonacademic	.55

demonstrable effects on health care outcomes; Black newborn mortality was reduced by 58% when under the care of a Black physician, Black men seeking primary care demonstrated an increased willingness to see a physician and acceptance of preventive services when under the care of an Black physician.^{21–23} Beyond communication, patient–provider racial concordance has been associated with decreased health care expenditure among Black, Hispanic, and Asian patients perhaps related to compliance and preventive care.⁷ For CTS, it is possible that some of the differences in treatment recommendation under conditions of racial concordance and discordance impact differences in the utilization of CTR among Black patients.^{11–13}

The study has some limitations. First, survey responses may differ from actual clinical practice; however, to minimize this, we made the survey responses anonymous. Second, name was used as a proxy in our scenarios for race and sex. This was done to identify implicit rather than explicit bias; however, there may have been some surgeons who did not recognize the significance of the names when responding to the survey or who did recognize the names and made changes to their recommendations. Third, we had a proportion of surgeons who did not report their own race/ethnicity; however, no indication reports that one's race impacts treatment recommendation. Additionally, it is possible that the treatment recommendation of the 37% who did not self-identify race/ethnicity may have impacted our patient–provider concordance outcomes. Fourth, we do not have access to the demographic composition of the ASSH membership, and this makes determining a nonresponder bias difficult. Despite this, we present data from a diverse group of surgeons across several racial/ethnic backgrounds, sex, practice settings, and experience. Finally, perhaps the survey hypothetical scenario methodology to examine implicit bias employed here without specifically showing a picture of the patient or their hand may explain the lack of variation in treatment recommendation here relative to other studies that observed differences in provider recommendation based on race.

In this study, we did not directly observe differences in patient treatment recommendation based on age, race, or sex. We did find a propensity for Black surgeons to recommend CTR at a greater rate among Black patients. Because patient–provider concordance leads to improved communication; shared cultural beliefs, values, and experiences; and treatment recommendations have a high likelihood of being enacted, this could change utilization in the future.^{18–25} Although opportunities for creating more racially concordant patient–physician pairings are limited by workforce diversity, increased awareness of the impact of cultural humility and sensitivity may serve to decrease the barriers that racial

discordance can present to achieve equitable surgical care. Under conditions of patient–provider discordance, it is critical that providers remain vigilant about the impact implicit and explicit bias can have on the interpretation of clinical symptoms, treatment recommendations, and overall patient care.

References

- Masud M, Rashid M, Malik SA, Ibrahim Khan M, Sarwar SU. Does the duration and severity of symptoms have an impact on relief of symptoms after carpal tunnel release? *J Brachial Plexus Peripher Nerve Inj.* 2019;14(1):e1–e8.
- Currie KB, Tadisina KK, Mackinnon SE. Common hand conditions: a review. *JAMA.* 2022;327:2434–2445.
- American Academy of Orthopedic Surgeons. Management of carpal tunnel syndrome evidence-based clinical practice guideline. Accessed July 2, 2023. <https://www.aaos.org/quality/quality-programs/upper-extremity-programs/carpal-tunnel-syndrome/>
- Billig JI, Sears ED. Utilization of diagnostic testing for carpal tunnel syndrome: a survey of the American Society for Surgery of the Hand. *J Hand Surg Am.* 2022;47:11–18.
- Graham B. The value added by electrodiagnostic diagnosis of carpal tunnel syndrome. *J Bone Joint Surg Am.* 2008;90:2587–2593.
- Grandizio LC, Boualam B, Shea P, et al. The reliability of CTS-6 for examiners with varying levels of experience. *J Hand Surg Am.* 2022;47:501–506.
- Jetty A, Jabbarpour Y, Pollack J, Huerto R, Woo S, Patterson S. Patient-physician racial concordance associated with improved healthcare use and lower healthcare expenditures in minority populations. *J Racial Ethn Health Disparities.* 2002;9:68–81.
- Hoffman KM, Trawalter S, Axt JR, Olicer MN. Racial Bias in pain assessment and treatment recommendations and false beliefs about differences between blacks and whites. *PNS.* 2016;113:4296–4301.
- Schoenthaler A, Ravenell J. Understanding the patient experience through the lens of racial/ethnic and gender patient-physician concordance. *JAMA Netw Open.* 2020;3(11):e2025349.
- Sweeny CF, Zinner D, Rust G, Fryer GE. Race/ethnicity and health care communication does patient-provider concordance matter? *Med Care.* 2016;54:1005–1009.
- Lander RD, Jones CMC, Hammert WC. Identification of clinical and demographic predictors for treatment modality in patients with carpal tunnel syndrome. *Hand.* 2021;1–7.
- Brodeur PG, Patel DD, Licht AH, Loftus DH, Cruz AI, Gil JA. Demographic disparities among patients receiving carpal tunnel release: a retrospective review of 92,921 patients. *Plast Reconstr Surg Glob Open.* 2021:e3959.
- Hooper RC, Tong Y, Sanders HM, Wang L, Chung KC. Analysis of treatment choices among White and African American patients with carpal tunnel syndrome. *Plast Reconstr Surg.* Published online May 15, 2023. <https://doi.org/10.1097/PRS0000000000010640>
- Bertrand M, Mullainathan S. Are Emily and Greg More employable than Lakeisha and Jamal? A field experiment on labor market discrimination. *Am Econ Rev.* 2004;94:991–1013.
- Schulman KA, Berlin JA, Hairless W, et al. The effect of race and sex on physicians' recommendations for cardiac catheterization. *N Engl J Med.* 1999;340:618–626.
- Todd KH, Deaton C, D'Adamo AP, Goe L. Ethnicity and analgesic practice. *Ann Emerg Med.* 2000;35(1):11–16.
- Goyal MK, Kuppermann N, Cleary SD, Teach SJ, Chamberlain JM. Racial disparities in pain management of children with appendicitis in the emergency departments. *JAMA Pediatr.* 2015;169:996–1002.
- Cooper-Patrick L, Gallo JJ, Gonzales JJ, et al. Race, gender, and partnership in the patient-physician relationship. *JAMA.* 1999;282:583–589.
- Brown CE, Marshall AR, Snyder CR, et al. Perspectives about racism and patient-clinician communication among black adults with serious illness. *JAMA Netw Open.* 2023;6(7):e2321746.
- Takehita J, Wang S, Loren AW, et al. Association of racial/ethnic and gender concordance between patients and physicians with patient experience ratings. *JAMA Netw Open.* 2020;3(11):e2024583.
- Robert Wood Johnson Foundation: Discrimination in America: experiences and views of African Americans. 2017. Accessed June 15, 2020. <https://legacy.npr.org/assets/img/2017/10/23/discriminationpoll-african-americans.pdf>
- Alsan M, Garrick O, Graziani GC. Does diversity matter for health? Experimental evidence From Oakland. NBER Working Paper Series. Working Paper 24787. <http://www.nber.org/papers/w24787>
- Green BN, Hardeman RR, Huang L, Sojourner A. Physician-patient racial concordance and disparities in birthing mortality for newborns. *Proc Natl Acad Sci USA.* 2020;117:21194–21200.
- Nehemiah A, Roberts S, Song Y, et al. Looking beyond the numbers: increasing diversity and inclusion through holistic review in general surgery recruitment. *J Surg Ed.* 2020;78:763–769.
- Aibana O, Swails JL, Flores RJ, Love L. Bridging the gap: holistic review to increase diversity in graduate medical education. *Acad Med.* 2019;94:1137–1141.