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Racial/Ethnic and Socioeconomic Disparities in Osteoarthritis Management

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Keywords

Osteoarthritis; Race; Black; Hispanic; Latino; Socioeconomic; Disparities; Total joint replacement

Introduction

Osteoarthritis (OA) of the knee and hip are common conditions with significant morbidity. According to Osteoarthritis Research Society International guidelines[1], recommended management includes osteoarthritis education, dietary weight management, exercise and physical therapy (PT), pharmacologic treatment with NSAIDs, intraarticular steroid injections, and total joint replacement. Oral and transdermal opioids are strongly not recommended. We focused our review of disparities in OA management on these interventions. We observed differences in the management of osteoarthritis by race/ethnicity and socioeconomic status (SES) (Table 1)[2], including differences in treatment utilization, barriers to access, and outcomes after treatment.

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Osteoarthritis Education

Osteoarthritis education includes providing patients with information about OA disease progression and self-care techniques. Interventions focused on OA education appear to have positive effects[3–6]. Community-based SMEs, for example, have demonstrated improvements in self-care behavior and self-efficacy compared to controls for up to 1 year after the intervention. Murphy et al.[7] encourages providers to consistently recommend SMEs to all patients.

There is a paucity of data on differences in OA educational interventions by race, and we found no studies explicitly investigating racial differences. A cross-sectional study found overweight/obese blacks and Hispanics with OA were more likely to be advised to lose weight than whites (adjusted OR 1.16 for blacks and 1.32 for Hispanics)[8]. Other studies found no difference by race in participation of self-management education (SME) programs[7] or osteoarthritis education[9].

More evidence is available for differences in OA education by SES. Generally, lower educational attainment is associated with receiving less education from providers[7–11] and lower participation in SMEs (6% for less than high school vs. 14% for college degree)[7].

Dietary Weight Management

There is a paucity of data on racial or socioeconomic differences in dietary weight management in OA patients, though a trial investigating racial differences in diet benefits for knee OA is ongoing[12]. However, there are well documented disparities in obesity by race and SES[13–16]. For example, obesity prevalence for U.S. adults was 37.9% for whites, 46.8% for blacks, and 47% for Hispanics in 2015–2016[15]. Obesity prevalence is higher among those with less education (40% for high school degree or less vs. 27.8% for college graduates) and lower incomes (39% for ≤130% of the federal poverty level vs. 31.2% for ≥350% of the federal poverty level)[16]. Obesity is a risk factor for OA and is affected by genetics, diet, physical activity, income, discrimination, and more[14]. Many of these factors are affected by systemic racism—the system (consisting of structures, policies, practices, and norms) that structures opportunity and assigns value based on phenotype (the social construction known as “race”)[17]. Examples of systemic racism affecting disparities in obesity include food insecurity, understanding of nutrition, ability to exercise regularly, neighborhood environment, and more. National disparities in diet quality have been observed by race, education, and income level, and are persistent or worsen over time[18].

Exercise/Physical Therapy

Utilization/Access

Race and SES have independent effects on PT use in OA. For example, a cross-sectional analysis found reduced likelihood of an outpatient PT visit for blacks [OR 0.55 (95% CI: 0.45–0.68)] and Hispanics [OR 0.73 (95% CI: 0.58–0.93)] compared to whites[19] Adjustment for SES factors attenuated the difference in PT use for Hispanics, but the decreased odds of PT use persisted for blacks. Cross-sectional studies find patients with higher education are

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more likely to receive PT, while patients who are black, Hispanic, have low educational attainment, or have public/no insurance are less likely to receive PT[20–22]. Referral patterns may contribute to these differences, as primary care visits covered by Medicaid are less likely to receive PT referral than those covered by private insurance[23]. Patients have reported affordability, insurance coverage, and lack of transportation as barriers for not seeking PT services[24].

Differences also exist in exercise activity by race and SES. While 25% of American adults do not engage in any leisure time physical activity, inactivity prevalence is higher for adults with lower education levels (44.1% for less than high school), Hispanics (32.7%), and blacks (33.1%)[25,26]. Other studies have also found that Hispanics, blacks, and patients with lower education are less likely to engage in exercise[27,28]. Among black adults, a systematic review identified family responsibilities, lack of childcare, financial costs of a gym membership or equipment, long working hours, difficult manual labor, concerns about neighborhood safety, and lack of parks or open spaces as barriers to exercise[29].

Interventions/Outcomes

Interventions focused on exercise improve functional outcomes and may help reduce health disparities. One study on older patients with knee OA found racial differences in baseline health status (RAND-36 general health scores and 6-minute walk distance) but found no difference in scores between whites and blacks after 18 months of exercise therapy[30]. Community based walking programs have also yielded improvements in symptoms, function, and overall health[31–35].

Pharmacologic: NSAIDs

The evidence linking NSAID use to race is mixed. Vina et al.[36] found Hispanics with knee or hip OA used over-the-counter (OTC) NSAIDs less than whites and used prescription NSAIDs more than whites. Prior literature supported differences in NSAID utilization between blacks and whites though directionality conflicted[37–39]. Other studies have found no difference in NSAID use or prescriptions by race[40–42].

Older literature supported differences by race in NSAID drug classes prescribed. Studies from 2003–2005 found blacks and whites were more likely to be prescribed non-selective NSAIDs while whites were more likely to be prescribed COX-2 selective analgesics[43–45]. We did not find more recent studies investigating NSAID drug class prescriptions by race.

There is a paucity of data regarding differences in NSAID use by SES.

Pharmacologic: Opioids (not recommended)

While NSAIDs can be obtained OTC or by prescription, opioids require prescription and thus differences in opioid prescribing patterns by race may reflect provider bias or unequal treatment. There is evidence for systematic undertreatment of pain in blacks compared to whites across medicine[46–52]. Research suggests this could be due, in part, to racial bias and false beliefs about biological differences between blacks and whites[53]. Recent increases in

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opioid prescriptions predominantly affected whites[54,55]. Physicians are less likely to prescribe opioids to blacks and Hispanics compared to whites[38,41,43,45,56]. A study of physicians watching videos of patient actors with knee OA found black and Hispanic patients were prescribed opioids less than whites (27% vs. 33% vs. 47%)[41]. When opioids are prescribed, black patients receive a lower days' supply compared to whites[45].

There is less data available for differences in opioid prescribing by SES. A study using national Medicare data found white race, low income, and living in a low education area were independently associated with prolonged opioid prescription (90 days or more)[54].

Intraarticular Steroid Injections

We found no studies examining differences in intraarticular steroid injection use or outcomes by race or SES.

Total Joint Replacement Utilization

There is copious literature on racial disparities in total joint arthroplasty (TJA) utilization[2,57–59]. Whites are more likely to receive TJA than blacks or Hispanics and these differences persist in groups with the same insurance or after controlling for health insurance status[60–71]. These differences also persist after controlling for age and other socioeconomic factors[72–74]. Although race and SES are interconnected, and some studies find socioeconomic factors partially explain racial disparities in TJA use, independent effects from race usually remain.

Racial disparities in TJA use have persisted over the past 30 years[73,75–80]. A retrospective study using the National Inpatient Sample found persistent or worsening disparities in TJA use from 2006–2015[80]. A prospective study of postmenopausal women by Cavanaugh et al.[73] found that among women with health indicators for total knee arthroplasty (TKA), black and Hispanic women were less likely to undergo TKA than whites, even after adjusting for age and SES (adjusted HR 0.75 and 0.65). A multicenter cohort study by Ghomrawi et al.[81] found blacks have higher odds of not receiving TKA when clinically appropriate, suggesting underutilization in blacks rather than overutilization in whites.

Disparities in TJA use by SES has been observed as well. Within a Medicare population, patients dually enrolled in Medicaid have lower rates of primary and revision TJA[65,66]. In settings abroad with universal health coverage, differential TJA use by SES has also been observed[82].

There are likely several factors underlying racial and socioeconomic disparities in TJA use. These include differential access due to systemic racism through factors such as housing, healthcare segregation, and insurance. Studies have investigated personally-mediated barriers at the provider and patient level.

Access

Many patients face issues reaching care. Lack of geographic proximity or transportation limit access. Higher rates of racial residential segregation have been associated with racial

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differences in joint arthroplasty rates[64]. This form of systemic racism, resulting in part from government discriminatory practices[83], has also affected the hospitals where blacks and Hispanics receive their care. Low-volume centers have been associated with worse outcomes[84–86] and minorities or patients with low SES receive disproportionately more surgery at low volume centers and lower quality hospitals[78,86–88].

Socioeconomic barriers contribute to lack of access to TJA. Providers and health systems may respond to financial incentives. Pandya et al.[59] suggest several reasons why underinsured or publicly insured individuals lack access to orthopaedic surgery, including preferential appointment processing for privately insured patients in high density areas with high competition, limited reimbursement for Medicaid patients in urban areas, mandates from health systems on percentages of private vs. publicly insured patients, and practices with self-imposed limits on the number of patients they are willing to treat with public or no insurance. Kim et al.[89] found patients with Medicaid are less likely to receive an orthopaedic appointment to be evaluated for TKA compared to Medicare or privately insured patients, with success rates for obtaining an appointment at 30%, 96%, and 100%, respectively. Patients with Medicaid also experienced longer waiting periods, and higher Medicaid reimbursement was correlated with higher likelihood of obtaining an appointment (for every $100 increase: adjusted OR 1.23 for primary TKA, 1.31 for revision). While geographic proximity affects access, being close to urban centers where more providers practice may not translate to greater access for patients with low SES. Medicaid patients are less likely than patients in less populous areas (away from academic centers) to obtain an outpatient orthopaedic appointment[90].

Language barriers also limit access. Greene et al.[91] called randomly selected orthopaedic offices in California specializing in knee surgery using a script to request an appointment for a hypothetical Spanish-speaking or English-speaking 65 year-old man with knee pain. 80% of hypothetical Spanish-speaking patients were asked to rely on nonqualified interpreters for their orthopaedic appointments (e.g. friend or family member) rather than being provided with professional interpretation services.

Provider-level barriers

Physicians have implicit bias[92–97]. In a systematic review, Hall et al.[95] concluded most providers have implicit bias, with positive attitudes toward whites and negative attitudes toward blacks, Hispanics, and dark-skinned individuals. Implicit bias was related to patient-provider interactions[98–101], treatment decisions[102,103], and patient health outcomes[104].

Black patients are less likely to receive an offer for TKA from their surgeons compared to whites[105]. The racial difference in TKA offer and complication rates have been estimated to cause a loss of 72,000 QALYs in black knee OA patients compared to white knee OA patients[106]. The difference in offer rate, however, may be affected by patient “preference” (discussed below). While Hausmann et al.[105] found lower TJA recommendation rates for blacks compared to whites (OR 0.46, 95% CI: 0.26–0.83), this difference was not statistically significant after adjusting for patient preference for TJA (OR 0.69, 95% CI: 0.36–1.31). Oliver et al.[94] found physicians had implicit racial biases (positive attitudes toward whites and negative attitudes toward blacks) and believed whites were more

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medically cooperative than blacks; however there was no statistically significant difference for TKA recommendation by race.

Lack of diversity in the physician workforce, especially in orthopaedics, likely contributes to disparities in TJA utilization. The paucity of black, Hispanic, and female orthopaedic surgeons may influence patient trust, "preferences" for care, health-seeking behavior, and physician-patient communication[107–111].

Patient-level barriers

Patient "preference" and mistrust—There is extensive literature investigating the role of patient preference in disparities in TJA use[112–114]. Blacks are less likely than whites to prefer TJA as a treatment option[38,113–120]. Surgeons may be responsive to patient preferences regarding the procedure, decreasing TJA offer rate for blacks[105].

However, disparities research has emphasized individual factors and systemic racism has been underexplored[121]. The Institute of Medicine report Unequal Treatment[122] discusses that for racial minorities, preferences for treatment are difficult to separate from mistrust of healthcare, which stems from racial discrimination and a long history of segregated and inferior care. As Bloche[123] has noted, for blacks "doubts about trustworthiness of physicians and healthcare institutions spring from collective memory of the Tuskegee experiments and other abuses of black patients by largely white health professionals. This legacy of distrust, which, some argue, contributes to disparities in health care provision by discouraging African Americans from seeking or consenting to state-of-the-art medical services, is thus itself a byproduct of past racism". Since patients' negative responses to discrimination may profoundly affect "preference", it is difficult to distinguish "preference" from provider/systemic racial discrimination[123].

Several factors affecting patient preference have been investigated and are listed below. It is important to note these factors are intimately connected to past and ongoing systemic racism.

Alternative therapies—Studies have observed that blacks and Hispanics may rely more on alternative therapies or non-surgical coping strategies, such as prayer or natural pain remedies, to deal with OA[38,110,124–126]. While this has often been attributed to cultural differences, it is also possible these behaviors reflect adaptions to marginalization and lack of access to the health care system.

Lack of familiarity—Racial differences in personal- and community-level knowledge of TJA procedures have been observed and may influence willingness to undergo surgery[114,115,127,128]. Blacks are less familiar with TJA and are less likely to have friends or family who have undergone the procedure. Lack of familiarity may also stem from exclusion and lower healthcare access. Additionally, there is a self-perpetuating loop where disparities in TJA utilization contribute to lack of familiarity, which reduces willingness to undergo joint replacement surgery.

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Outcome expectations—Blacks have lower expectations than whites regarding TJA, expecting longer, more painful postoperative courses and more functional disability after surgery[114,115,120,129–131]. The evidence is mixed on whether lower outcome expectations explain lower willingness to undergo surgery[120,128].

Interventions—While many studies have observed TJA use disparities, there is less research on interventions to reduce disparities. Some interventions have aimed to improve willingness to undergo surgery through education (e.g. decision aids, counseling), to improve familiarity/knowledge of the procedure and improve outcome expectations. Most studies have shown improved willingness for TKA after an intervention[132–135] while one showed more pessimistic TKA expectations[134]. A randomized clinical trial by Ibrahim et al.[135] found patients who received an education decision aid had a higher rate of undergoing TKA compared to controls over the next 12 months (14.9% vs. 7.7%). Limitations to education-focused interventions, however, have been acknowledged. A randomized clinical trial by Vina et al.[136] using a decision-aid and motivational interviewing resulted in no difference in willingness to undergo TKA between intervention and control groups. This may reflect that while individual-level interventions may improve familiarity/knowledge of the procedure, mistrust and the legacy of racism are much more difficult to address.

Total Joint Replacement Outcomes

Symptoms and function

Racial and socioeconomic disparities have been documented for a range of TJA outcomes[137]. Blacks and Hispanics have been found to have worse patient-reported outcomes (e.g. pain, function, satisfaction) after TJA[138–146]. A systematic review by Mehta et al.[138] found blacks had more pain and worse function after THA, though differences were not clinically significant. A systematic review by Goodman et al.[139] found that after TKA, blacks had worse qualify of life, pain, function, and satisfaction. Another study by Goodman et al.[140] found that while worse WOMAC pain and function scores were associated with higher levels of community poverty, this effect was more pronounced in blacks compared to whites. In areas with over 40% poverty, blacks scored 6 points lower than whites for WOMAC pain and 7 points lower than whites for WOMAC function on 2-year postoperative follow up. After TKA, blacks are 3 times more likely to be dissatisfied than whites[146].

Lower SES is associated with worse outcomes as well. Lower education[147,148], low income[145], and Medicaid insurance[149,150] are associated with worse function after TJA.

Length of stay (LOS)

Patients who are nonwhite[151–153] or with low SES have a higher risk for longer LOS after TJA[154–156].

Complications

Blacks and Hispanics have higher complication rates after arthroplasty. A review by Nwachukwu et al.[157] found racial minorities have higher risk for early complications after

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TKA, particularly joint infections, and perhaps higher mortality risk after THA. Other studies have found blacks have higher complication rates after TJA (OR 1.58)[78,158].

The evidence for differences in mortality or medical complications is mixed. Some studies have found increased mortality risk for blacks after TJA[65,66,78] while others have found no difference in major complication rate or mortality[159–161].

Race and SES may be associated with surgical complications after TJA. Some studies have found higher risk for postoperative infection in blacks after TKA[66,160,162]. In an insured cohort, blacks and Hispanics had lower odds of deep infection after THA compared to whites (OR 0.62 and 0.58)[161]. Medicaid insurance is associated with higher risk of postoperative in-hospital infection (OR 1.7), wound dehiscence (OR 2.2), and hematoma/seroma (OR 1.3)[163]. Compared to Medicare insurance, privately insured patients have fewer complications and lower mortality after TKA and THA[164,165].

Readmissions

Blacks have higher readmission rates after TJA than whites[66,76,166–168]. Studies have found higher odds for 30-day readmission for blacks compared to whites even after covariate adjustment (OR 1.2)[166–168]. These differences may be worsening over time—30-day readmissions in 1991 were 6% higher for blacks than for whites but 24% higher in 2008[76]. In an insured population, however, blacks and whites had similar 90-day readmission rates after THA[161]. SES may be associated with readmission, as patients from zip codes with lower median incomes are more likely to be readmitted after TKA or THA compared to patients from high median income zip codes (11% vs 8%)[156].

Failure/Revision

Most studies find blacks have higher risk for TJA failure/revision than whites[169–171]. A systematic review by Bass[172] found a pooled hazard ratio of 1.38 (95% CI: 1.20–1.58) for risk of revision TKA in blacks compared to whites. However, in an insured population blacks and Hispanics had lower lifetime all-cause THA revision compared to whites (adjusted HR 0.79 and 0.73)[161]. Risk of inpatient THA dislocation has been found to be higher for blacks (adjusted OR 1.66), Hispanics (adjusted OR 1.56), and patients with low SES as measured by Medicaid insurance (adjusted OR 1.30) or zip code with lower median income (adjusted OR 1.22).

Several factors likely contribute to these disparities. Systemic racism impacts social determinants of health and worsens health outcomes for blacks and Hispanics. Increased rates of comorbidities in racial minorities and poor patients increase risk for worse postsurgical outcomes. Barriers to healthcare access may cause marginalized groups to reach care with more advanced disease. Healthcare segregation leads racial minorities to disproportionately receive care from low-volume and low-quality hospitals. Provider- and institutional-level bias/racism may affect communication, mutual understanding, trust, referral patterns, and treatment decisions.

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Conclusion

Racial and socioeconomic disparities exist across several different treatment modalities for the management of OA. Given the historical emphasis on individual/interpersonal mechanisms, future disparities research may benefit from a structural framework, informed by critical race theory[121,173], to highlight institutional and systemic causes for disparities[174]. Clinically, better relations are needed between the healthcare system and historically marginalized communities to increase access, inclusion, and trust. Greater efforts are needed to increase the diversity of clinicians, researchers, and leadership. Continued study, discussions, and training/education can increase engagement on issues of inequity and racism. Quality metrics may help care centers continue to monitor disparities and incentivize improvements. Systemic change to increase health equity ultimately requires policy implementation and active efforts from individuals, health systems, and the greater community.

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Synopsis

We reviewed the literature on racial and socioeconomic disparities in the management of osteoarthritis. Treatments investigated included arthritis education, dietary weight management, exercise/physical therapy, pharmacologic therapy with NSAIDs and opioids, intraarticular steroid injections, and total joint replacement. The amount of evidence for each treatment modality varied, with the most evidence available for racial and socioeconomic disparities in total joint arthroplasty. Blacks, Hispanics, and patients with low SES are less likely to undergo total joint replacement than whites or patients with high SES, and generally have worse functional outcomes and more complications.

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Key Points

1. Studies suggest that blacks and Hispanics are less likely to get exercise/physical therapy or opioid prescriptions than whites.
2. Studies suggest that patients with low SES receive less arthritis education from providers, participate less in self-education programs, and get less exercise/physical therapy.
3. There is strong evidence blacks and Hispanics are less likely than whites to undergo total joint replacement and that blacks and Hispanics have worse functional outcomes and more complications.
4. There is moderate evidence that patients with low SES are less likely to undergo total joint replacement than patients with high SES and that low SES is associated with worse functional outcomes and more complications after total joint replacement.

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Table 1:

Summary of Literature on Racial and Socioeconomic Disparities in OA Management

OA Treatment	Quantity of Evidence (minimal, some, moderate, many)	Quality of Evidence	Is Data Consistent or Conflicting? In Which Direction?
Recommended Management			
Arthritis Education (race)[7–9]	Minimal	Large cross-sectional	No association
Arthritis Education (SES)[3–11]	Moderate	Large cross-sectional with adjustment	Consistent: higher education associated with higher self-education program use, more provider education
Dietary Weight Management[13–16,18]	Minimal (OA patients)	-	-
	Many (general population)	Large cross-sectional	Consistent: blacks, Hispanics, low income, low education associated with higher obesity rates, worse diet quality
Exercise/Physical Therapy: Access/Use (race)[19,25–29]	Some	Large cross-sectional surveys with adjustment	Consistent: Hispanics, blacks get less PT/exercise
Exercise/Physical Therapy: Access/Use (SES)[20–29]	Moderate	Cross-sectional surveys with adjustment	Consistent: higher education and private insurance associated with more PT/exercise; lower education and Medicaid or no insurance with less PT/exercise
Exercise/Physical Therapy: Outcomes[30–35]	Some	Prospective studies, 6 weeks-18 months follow up	Consistent: PT/exercise programs help regardless of education/race, may help reduce disparities in functional outcomes
Pharmacology: NSAIDs (race)[36–45]	Moderate	Moderate/large retrospective and cross-sectional, with adjustment	Mixed for OTC/prescription NSAID use; Consistent for drug classes: blacks, Hispanics get non-selective NSAIDs, whites get more COX-2 selective NSAIDs (older literature)
Pharmacology: NSAIDS (SES)	Minimal	-	-
Intraarticular Steroid Injections	Minimal	-	-
Total Joint Replacement: Access/Use (race)[2,38–57–74,74–79,81,86–88,91,94,105,112–120,127–131]	Many	Large retrospective with adjustment	Consistent: blacks, Hispanics receive less TKA, THA than whites; Evidence for structural, provider-and patient-level barriers
Total Joint Replacement: Access/Use[59,65,66,82,86,87,89,90]	Moderate	Large retrospective with adjustment	Consistent: low SES associated with less THA, TKA
Total Joint Replacement: Outcomes[65,66,76,78,106,137–146,151–153,157–162,166–172]	Many	Large retrospective and some prospective, with adjustment	Mostly consistent: blacks, Hispanics have worse functional outcomes and more complications
Total Joint Replacement: Outcomes (SES)[137,140,145,147–150,154–156,161,163–165,169,170]	Moderate	Large retrospective with adjustment	Mostly consistent: low SES (insurance, income) associated with worse functional outcomes and more complications
Not Recommended			
Pharmacology: Opioids (race)[38,41,43,45,54–56]	Moderate (OA), Many (general)	Large retrospective and cross-sectional, with adjustment	Mostly consistent: whites more likely than blacks or Hispanics to receive

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OA Treatment	Quantity of Evidence (minimal, some, moderate, many)	Quality of Evidence	Is Data Consistent or Conflicting? In Which Direction?
			opioid prescription; days' supply for whites is higher than for blacks
Pharmacology: Opioids (SES)[54]	Minimal	Large retrospective with adjustment	Living in a low-education area or having low income associated with prolonged opioid prescription