



# Sociodemographic Disparities in Regional Anesthesia Utilization for Arthroplasty

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49th Annual Regional  
Anesthesiology and Acute  
Pain Medicine Meeting

March 21-23, 2024 | San Diego, CA

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## INTRODUCTION

Regional anesthesia (RA) utilization may improve outcomes, such as postoperative pain control and recovery time, and decrease complications in patients undergoing orthopedic surgeries.<sup>1</sup> Previous studies have demonstrated race and ethnicity and gender disparities in utilization of RA, though little research has been done to investigate potential disparities based on other sociodemographic variables.<sup>2-4</sup> The aim of this study was to identify potential disparities in RA utilization in orthopedic surgeries based on a variety of patient-level and hospital-level characteristics. Additionally, this study examined potential disparities in outcomes, including length of stay and hospital cost, between patients who received RA and those who did not receive RA.

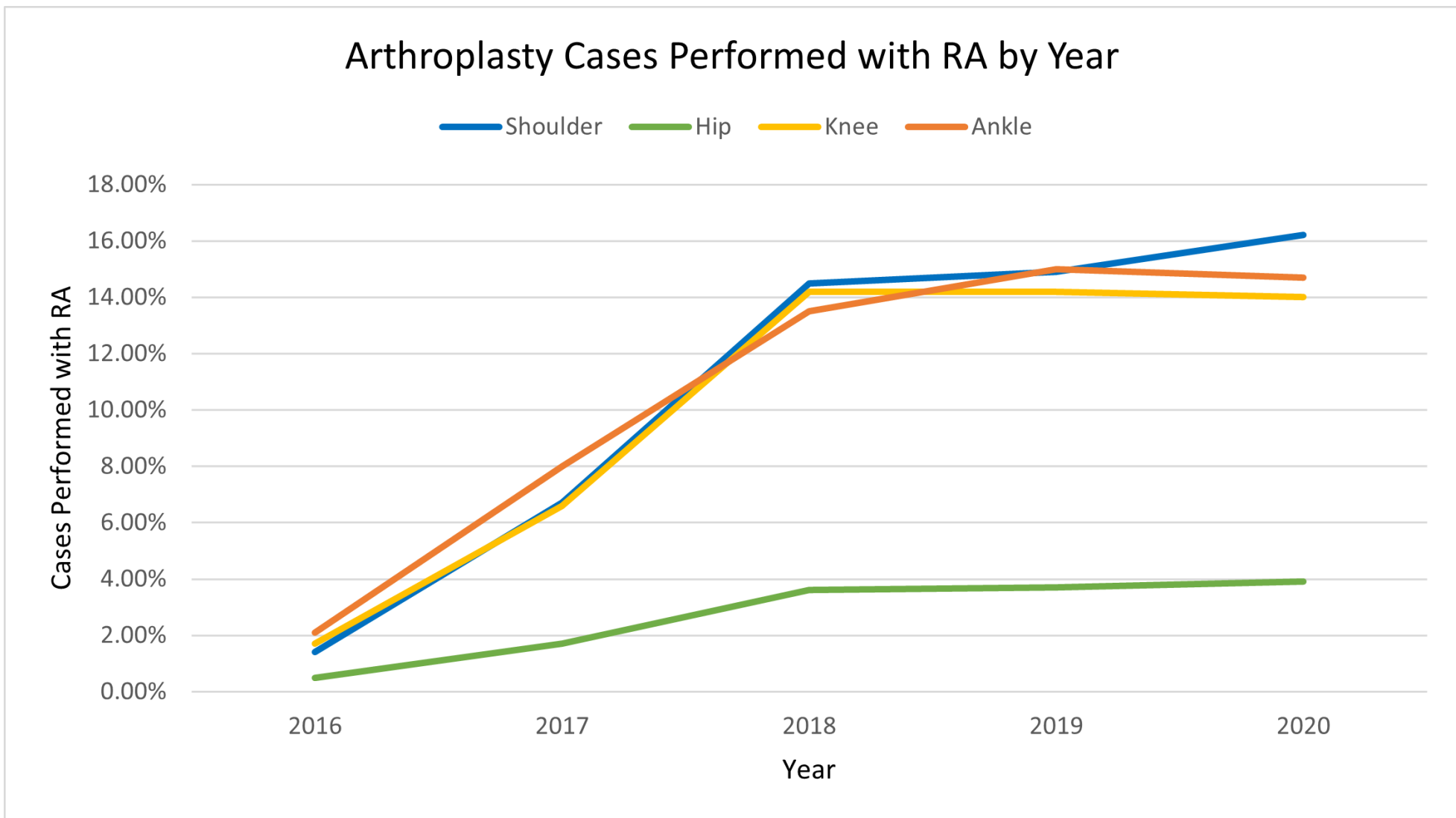
## METHODS

Data were obtained from the 2016-2020 National Inpatient Sample (NIS) Database. ICD-10-PCS procedure codes were used to identify patients over 18 years of age who underwent shoulder, hip, knee, or ankle arthroplasty. Patients who received RA were then identified using additional ICD-10-PCS procedure codes. Multiple patient-level characteristics and hospital-level factors were compared between the subgroups of patients who received RA versus those who did not receive RA. Length of stay and total cost outcomes were also compared.

## RESULTS

- Rates of RA utilization increased across all procedure types between the years 2016 and 2020 (Figure 1).

FIGURE 1



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## RESULTS

TABLE 1. Patient Demographics (Age, Sex, and Race)

|                        | Shoulder Arthroplasty |                          |          | Hip Arthroplasty    |                          |          | Knee Arthroplasty |                          |          | Ankle Arthroplasty |                        |         |
|------------------------|-----------------------|--------------------------|----------|---------------------|--------------------------|----------|-------------------|--------------------------|----------|--------------------|------------------------|---------|
|                        | No RA<br>(N=105641)   | Received RA<br>(N=13861) | P value  | No RA<br>(N=397524) | Received RA<br>(N=10993) | P value  | No RA (N=540888)  | Received RA<br>(N=57667) | P value  | No RA<br>(N=5389)  | Received RA<br>(N=703) | P value |
| AGE Mean (SD)          | 69.518<br>(9.428)     | 69.687 (9.117)           | 0.047*   | 66.040 (11.329)     | 65.905 (11.042)          | 0.220    | 66.693 (9.510)    | 66.800<br>(9.398)        | 0.010*   | 65.035<br>(10.226) | 65.664<br>(10.320)     | 0.126   |
| FEMALE                 | 59734<br>(56.5%)      | 7811 (56.4%)             | 0.666    | 222842<br>(56.1%)   | 6273 (57.1%)             | 0.036*   | 331722 (61.3%)    | 35244<br>(61.1%)         | 0.297    | 2504 (46.5%)       | 306 (43.5%)            | 0.142   |
| RACE                   |                       |                          | < 0.001* |                     |                          | < 0.001* |                   |                          | < 0.001* |                    |                        | 0.300   |
| Non-Hispanic White     | 90557<br>(88.7%)      | 11817<br>(89.7%)         |          | 328762<br>(85.6%)   | 9013 (84.5%)             |          | 424538 (81.3%)    | 45182<br>(82.1%)         |          | 4632 (89.9%)       | 598 (91.3%)            |         |
| Black                  | 4798 (4.7%)           | 570 (4.3%)               |          | 30486 (7.9%)        | 896 (8.4%)               |          | 45006 (8.6%)      | 4558 (8.3%)              |          | 170 (3.3%)         | 13 (2.0%)              |         |
| Hispanic               | 4160 (4.1%)           | 444 (3.4%)               |          | 13700 (3.6%)        | 364 (3.4%)               |          | 31255 (6.0%)      | 2934 (5.3%)              |          | 177 (3.4%)         | 20 (3.1%)              |         |
| Asian/Pacific Islander | 531 (0.5%)            | 81 (0.6%)                |          | 3360 (0.9%)         | 66 (0.6%)                |          | 7463 (1.4%)       | 748 (1.4%)               |          | 45 (0.9%)          | 3 (0.5%)               |         |
| Native American        | 365 (0.4%)            | 52 (0.4%)                |          | 1161 (0.3%)         | 43 (0.4%)                |          | 2348 (0.4%)       | 271 (0.5%)               |          | 17 (0.3%)          | 2 (0.3%)               |         |
| Other                  | 1664 (1.6%)           | 208 (1.6%)               |          | 6517 (1.7%)         | 281 (2.6%)               |          | 11594 (2.2%)      | 1349 (2.5%)              |          | 113 (2.2%)         | 19 (2.9%)              |         |

TABLE 2. Patient Demographics (Income and Primary Payer)

|                                                | Shoulder Arthroplasty |                          |          | Hip Arthroplasty    |                          |         | Knee Arthroplasty   |                          |          | Ankle Arthroplasty |                        |         |
|------------------------------------------------|-----------------------|--------------------------|----------|---------------------|--------------------------|---------|---------------------|--------------------------|----------|--------------------|------------------------|---------|
|                                                | No RA<br>(N=105641)   | Received RA<br>(N=13861) | P value  | No RA<br>(N=397524) | Received RA<br>(N=10993) | P value | No RA<br>(N=540888) | Received RA<br>(N=57667) | P value  | No RA<br>(N=5389)  | Received RA<br>(N=703) | P value |
| INCOME QUARTILE                                |                       |                          | < 0.001* |                     |                          | 0.639   |                     |                          | < 0.001* |                    |                        | 0.156   |
| 0-25 <sup>th</sup> percentile                  | 23555 (22.6%)         | 2751 (20.1%)             |          | 79650 (20.3%)       | 2166 (20.0%)             |         | 121107 (22.7%)      | 11576 (20.3%)            |          | 1020 (19.1%)       | 110 (15.8%)            |         |
| 26 <sup>th</sup> -50 <sup>th</sup> percentile  | 29244 (28.0%)         | 4004 (29.2%)             |          | 100840 (25.7%)      | 2829 (26.1%)             |         | 143833 (27.0%)      | 15563 (27.3%)            |          | 1426 (26.8%)       | 194 (27.9%)            |         |
| 51 <sup>st</sup> -75 <sup>th</sup> percentile  | 28232 (27.1%)         | 3928 (28.7%)             |          | 105396 (26.9%)      | 2889 (26.6%)             |         | 143222 (26.8%)      | 15649 (27.5%)            |          | 1457 (27.3%)       | 207 (29.7%)            |         |
| 76 <sup>th</sup> -100 <sup>th</sup> percentile | 23233 (22.3%)         | 3014 (22.0%)             |          | 106165 (27.1%)      | 2967 (27.3%)             |         | 125442 (23.5%)      | 14139 (24.8%)            |          | 1426 (26.8%)       | 185 (26.6%)            |         |
| PRIMARY PAYER                                  |                       |                          | < 0.001* |                     |                          | 0.004*  |                     |                          | < 0.001* |                    |                        | 0.069   |
| Medicare                                       | 74849 (70.9%)         | 9828 (71.0%)             |          | 222979 (56.2%)      | 6018 (54.8%)             |         | 309148 (57.2%)      | 32595 (56.6%)            |          | 3115 (57.9%)       | 401 (57.3%)            |         |
| Medicaid                                       | 3566 (3.4%)           | 380 (2.7%)               |          | 20289 (5.1%)        | 534 (4.9%)               |         | 23567 (4.4%)        | 2112 (3.7%)              |          | 203 (3.8%)         | 18 (2.6%)              |         |
| Private insurance                              | 21928 (20.8%)         | 3016 (21.8%)             |          | 139976 (35.3%)      | 4035 (36.7%)             |         | 186612 (34.5%)      | 20747 (36.0%)            |          | 1804 (33.5%)       | 259 (37.0%)            |         |
| Self-pay                                       | 563 (0.5%)            | 77 (0.6%)                |          | 3152 (0.8%)         | 108 (1.0%)               |         | 2682 (0.5%)         | 312 (0.5%)               |          | 18 (0.3%)          | 2 (0.3%)               |         |
| No charge                                      | 30 (0.0%)             | 3 (0.0%)                 |          | 274 (0.1%)          | 5 (0.0%)                 |         | 235 (0.0%)          | 17 (0.0%)                |          | --                 | --                     |         |
| Other                                          | 4607 (4.4%)           | 543 (3.9%)               |          | 10281 (2.6%)        | 284 (2.6%)               |         | 17943 (3.3%)        | 1828 (3.2%)              |          | 243 (4.5%)         | 20 (2.9%)              |         |

TABLE 3. Hospital Demographics (Bedsizes, Location/Teaching Status, and Region)

|                                       | Shoulder Arthroplasty |                          |          | Hip Arthroplasty    |                          |          | Knee Arthroplasty   |                          |          | Ankle Arthroplasty |                        |         |
|---------------------------------------|-----------------------|--------------------------|----------|---------------------|--------------------------|----------|---------------------|--------------------------|----------|--------------------|------------------------|---------|
|                                       | No RA<br>(N=105641)   | Received RA<br>(N=13861) | P value  | No RA<br>(N=397524) | Received RA<br>(N=10993) | P value  | No RA<br>(N=540888) | Received RA<br>(N=57667) | P value  | No RA<br>(N=5389)  | Received RA<br>(N=703) | P value |
| HOSPITAL BEDSIZE                      |                       |                          | < 0.001* |                     |                          | < 0.001* |                     |                          | < 0.001* |                    |                        | 0.170   |
| Small                                 | 14732 (32.6%)         | 3095 (37.2%)             |          | 48368 (32.9%)       | 2569 (45.0%)             |          | 55400 (35.0%)       | 11702 (44.9%)            |          | 811 (34.8%)        | 159 (39.2%)            |         |
| Medium                                | 12403 (27.5%)         | 1856 (22.3%)             |          | 40023 (27.2%)       | 1126 (19.7%)             |          | 44487 (28.1%)       | 5429 (20.8%)             |          | 524 (22.5%)        | 92 (22.7%)             |         |
| Large                                 | 18035 (39.9%)         | 3361 (40.4%)             |          | 58632 (39.9%)       | 2012 (35.3%)             |          | 58588 (37.0%)       | 8939 (34.3%)             |          | 995 (42.7%)        | 155 (38.2%)            |         |
| HOSPITAL LOCATION/<br>TEACHING STATUS |                       |                          | < 0.001* |                     |                          | < 0.001* |                     |                          | < 0.001* |                    |                        | 0.096   |
| Rural                                 | 3950 (8.7%)           | 688 (8.3%)               |          | 12319 (8.4%)        | 470 (8.2%)               |          | 16227 (10.2%)       | 2460 (9.4%)              |          | 104 (4.5%)         | 21 (5.2%)              |         |
| Urban nonteaching                     | 10209 (22.6%)         | 2493 (30.0%)             |          | 31290 (21.3%)       | 1624 (28.5%)             |          | 35161 (22.2%)       | 7916 (30.4%)             |          | 462 (19.8%)        | 98 (24.1%)             |         |
| Urban teaching                        | 31011 (68.7%)         | 5131 (61.7%)             |          | 103414 (70.3%)      | 3613 (63.3%)             |          | 107087 (67.6%)      | 15694 (60.2%)            |          | 1764 (75.7%)       | 287 (70.7%)            |         |
| HOSPITAL REGION                       |                       |                          | < 0.001* |                     |                          | < 0.001* |                     |                          | < 0.001* |                    |                        | 0.030*  |
| Northeast                             | 6982 (15.5%)          | 983 (11.8%)              |          | 31077 (21.1%)       | 592 (10.4%)              |          | 34237 (21.6%)       | 4602 (17.7%)             |          | 348 (14.9%)        | 52 (12.8%)             |         |
| Midwest                               | 11337 (22.6%)         | 3055 (36.8%)             |          | 35118 (23.9%)       | 2435 (42.7%)             |          | 37194 (23.5%)       | 8804 (33.8%)             |          | 599 (25.7%)        | 133 (32.8%)            |         |
| South                                 | 17568 (38.9%)         | 2796 (33.6%)             |          | 51362 (34.9%)       | 1940 (34.0%)             |          | 57411 (36.2%)       | 9156 (35.1%)             |          | 787 (33.8%)        | 124 (30.5%)            |         |
| West                                  | 9283 (20.6%)          | 1478 (17.8%)             |          | 29466 (20.0%)       | 740 (13.0%)              |          | 29633 (18.7%)       | 3508 (13.5%)             |          | 596 (25.6%)        | 97 (23.9%)             |         |

## DISCUSSION

- As the rate of RA utilization increases, it becomes growingly important to address potential disparities in RA utilization to prevent certain populations of patients from being deprived of the benefits RA offers.
- In this study, analysis of RA utilization data in shoulder, hip, knee, and ankle arthroplasty cases from 2016-2020 demonstrated significant differences in RA utilization based on various patient-level and hospital-level characteristics. Additionally, this study found that RA utilization was associated with significantly decreased length of stay and total charges.
- Though using data from the NIS Database provided many advantages, such as data on a wide variety of sociodemographic variables, this study faces some limitations. For example, RA utilization may be impacted by variables not included in the NIS database, such as patient language, patient refusal of RA, and the presence of regional pain services at some hospitals.
- Overall, given the benefits of RA in orthopedic surgery to both patients and hospitals, further investigation is needed into the causes of disparities in RA utilization and solutions to mitigate these disparities.

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