

Research Article

Do Racial Disparities Impact Healthcare Costs and Resource Utilization after Total Joint Replacements?

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Dr. Sabesan completed her undergraduate degree from Duke University majoring in Biology and Religion. She went on to earn her medical degree from Indiana University School of Medicine and a Doris Duke Clinical Research Fellowship in Orthopaedic Surgery at the University of Iowa. After this she completed an Orthopaedic Surgery residency at Duke University Medical Center and received her fellowship training in Shoulder and Elbow Surgery/Sports Medicine at the Cleveland Clinic. Dr. Sabesan is passionate about research and leadership in her Orthopaedic community. She has published over 75 articles in the peer reviewed literature and has served on a number of regional, national, and international committees and boards. She has mentored over 150 medical students and 60 residents. She is committed to educating and training the next generation of orthopedic surgeons and is passionate about increasing diversity in her field.

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Background

Racial disparities currently exist in healthcare and can have a significant impact on patient outcomes and access to quality care. Previous studies have indicated that black patients are more likely to experience delays in treatment and increased surgical complications. Hispanic patients have more comorbidities and increased complications when undergoing orthopaedic surgeries. The purpose of this study was to evaluate the impact of racial disparities on postoperative complications and readmission rates following Total Joint Arthroplasty (TJA).

Methods

The largest single healthcare network database was queried to identify total joint arthroplasty patients treated in a single division between 2017 and 2021. Patient demographics including age, race, gender, and comorbidities were collected. Logistic regression and odds ratio point estimate analyses were utilized to assess for associations between race (defined as Whites, Blacks, Hispanics, Asians, and Others) and postoperative medical complications and surgical complications, which were collected for all patients. Patient outcomes included length of stay, hospital readmission status at 30 and 90 days postoperative, and emergency room (ER) visits up to 90 days.

Results

A total of 16,940 patients were included in this analysis consisting of 62% female, a mean age of 71 years and mean BMI of 29.4 kg/m². Racial demographics consisted of 61.6% White, 12.3% Black, 24.1% Hispanic, 0.8% Asian, and 1.2% Other. Race was not significantly associated with increased readmissions at 30 days ($p=0.2215$) and hispanic patients were 14% less likely to be readmitted within 90 days ($p = 0.0208$) but were not found to have differences in ER visits when compared to White patients. Black and Asian patients were not significantly more likely to visit the ER within 90 days or to be readmitted to the hospital within 90 days when compared to White patients. Race was not significantly associated with postoperative medical complications or surgical complications.

Conclusions

This study found a higher readmission rate of up to 20% for total joint arthroplasty patients within 90 days of follow-up. Although race did not appear to be a significant determinant of additional ER visits or readmissions, there was some variation seen amongst Hispanic patients undergoing TJR with a lower likelihood of readmission at 60 and 90 days postoperative.

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INTRODUCTION

Racial disparities are pervasive throughout our healthcare system and are closely related to overarching disparities that affect minority populations in society as a whole. Furthermore there are concerns that the recent changes in US

healthcare infrastructure have shifted the focus to providing more cost-effective patient care, leading to a reduction in care for high-risk minority patient populations (Galvani et al. 2020). A recent study demonstrated that 83% of physicians report feeling pressure to avoid access to total joint replacement (TJR) in patients with limited social sup-

port (Yates, Jones, Nelson, et al. 2021). As TJR becomes increasingly prevalent due to the aging population in the US, it is vital to address the existing racial disparities that could be exacerbated by the increased demand.

Current literature demonstrates the impact of racial disparities on access to care, utilization of services, and patient outcomes following TJR (Chun et al. 2021; Hu, Hu, Lee, et al. 2022; Amen et al. 2020; Alvarez, McKeon, Spitzer, et al. 2022). In particular, underutilization of TJR has been identified in Black patients despite a higher prevalence of disease such as osteoarthritis (Chen et al. 2013; Shahid and Singh 2016). Furthermore, postoperative complications after TJR are experienced at disproportionately higher rates by minority populations (Aseltine, Wang, Benthien, et al. 2019; Klemm et al. 2021; Goodman, Parks, McHugh, et al. 2016; Cusano et al. 2021; Hinman et al. 2020; Bass, Do, Mehta, et al. 2021; Pierce, Elmallah, Lavernia, et al. 2015; Faison, Harrell, and Semel 2021). The factors that affect racial disparity in healthcare are complex and inconsistent depending on the demographics of the patient population studied (Klemm et al. 2021; Cusano et al. 2021; Hinman et al. 2020; Pierce, Elmallah, Lavernia, et al. 2015; Okike et al. 2019; Cavanaugh, Rauh, Thompson, et al. 2020). Some studies have demonstrated an increased risk of postoperative complications, readmission, and revision surgery in minority patients (Klemm et al. 2021; Cusano et al. 2021; Hinman et al. 2020; Bass, Do, Mehta, et al. 2021; Pierce, Elmallah, Lavernia, et al. 2015; Cavanaugh, Rauh, Thompson, et al. 2020) while others have failed to demonstrate differences across racial groups in other outcomes after TJR (Cusano et al. 2021; Hinman et al. 2020).

To create effective interventions to alleviate racial disparities, it is imperative to elucidate with more certainty where complications and readmission are being experienced disproportionately by minority patients. Further, avoiding preventable readmission is a prominent target for cost savings in TJR, and identifying complications associated with hospital readmission is critically important for predictive modeling and for decreasing the number of TJR readmissions (Adelani et al. 2018; Yu et al. 2016). Additional clarity concerning differences in complications and readmission rates across racial groups could help bring to light the root causes of poorer outcomes allowing for better protection of vulnerable populations from selection bias and mitigating rising healthcare costs. Therefore, the purpose of this study was to evaluate the impact of racial disparities on postoperative complications and readmission rates following TJA.

METHODS

PATIENT SELECTION AND DATA COLLECTION

A large healthcare network database was queried to identify all patients who underwent a total joint arthroplasty (TJA) (TKA, total hip arthroplasty (THA), and total shoulder arthroplasty (TSA)) in the regional healthcare system between 2017 and 2021 with a minimum follow-up of 90 days. CPT codes used were 27447 for primary TKA, 2347 for pri-

mary SA, and 27130 for primary THA. The database comprised of patients with different types of insurance. Patient demographics including age, gender, body mass index (BMI), and race were collected. Race was defined as White, Black, Hispanic, Asian, and Other.

Patient outcomes collected included length of stay, postoperative medical complications, postoperative surgical complications, hospital readmission status at 30 and 90 days postoperatively, and emergency room (ER) visits up to 90 days. Postoperative medical complications included sepsis, bacterial infections, pneumonia, acute/chronic kidney failure, disruption of the surgical wound, embolism, and thrombosis. Postoperative surgical complications included dislocation, instability, periprosthetic joint infection, periprosthetic fracture, aseptic loosening, hardware failure, revision, and wear and osteolysis ([Supplemental Table 1](#)).

STATISTICAL ANALYSIS

Categorical variables were compared using a chi-squared test and continuous variables were compared using analysis of variance. Multivariate logistic regression analysis was performed to assess for associations between postoperative medical complications and postoperative surgical complications with patient race. Odds ratio estimates and 95% confidence intervals were calculated for each of the composite outcomes for patients undergoing TJA. The level of significance was established at $p < .05$. All statistical analyses were conducted using SAS version 9.4 software (SAS Institute, Cary, NC, USA).

RESULTS

PATIENT DEMOGRAPHICS

A total of 16,940 patients consisting of 62% female with a mean age of 71 years and mean BMI of 29.5 kg/m² were included. The cohort included 12.3% Black (n=2089), 24.1% Hispanic (n=4,077), 0.8% Asian (n=131), 1.2% Other (n=203), and 61.6% White (n=10,440) patients. The average length of stay was 3.4 days ([Table 1](#)).

POSTOPERATIVE COMPLICATIONS

Postoperative medical complications were reported in 5.3% (n = 894) of patients and 4.4% (n = 740) of patients experienced postoperative surgical complications. No significant difference was reported between the Black (5.8%), Asian (6.9%), Hispanic (5.2%) or Other racial groups (4.4%) in postoperative medical complications when compared to White patients (5.2%) ($p=0.5721$). Additionally, no significant difference was reported between the Black (5.2%), Asian (5.3%), Hispanic (4.2%) or Other racial groups (3.9%) in postoperative surgical complications when compared to White patients (4.3%) ($p=0.6200$). ([Table 2 and Table 3](#)).

Table 1. Patient Demographics

	White (n=10440)	Black (n=2089)	Asian (n=131)	Hispanic (n=4077)	Other (n=203)	Total (n=16940)
	Avg. or No.	Avg. or No.	Avg. or No.	Avg. or No.	Avg. or No.	Avg. or No. (%)
Female	6127	1435	92	2718	125	10497
Age, y	72.0	66.9	70.2	71.5	70.3	71.2
Average BMI, kg/m ²	28.9	31.8	27.6	29.7	29.0	29.5
Length of stay, days	3.37	3.68	3.75	3.41	3.90	3.43

Legend: y, years; BMI, body mass index; No, number; *, p<0.05; ^, significantly greater proportion than expected.

Table 2. Complications and Readmission Rates by Race

Outcome	White (n=10440)	Black (n=2089)	Asian (n=131)	Hispanic (n=4077)	Other (n=203)	Total Incidence
Postoperative medical complications	5.22% (n=545)	5.79% (n=121)	6.87% (n=9)	5.15% (n=210)	4.43% (n=9)	5.3% (n=894/ 16,940)
Postoperative surgical complications	4.27% (n=446)	5.17% (n=108)	5.34% (n=7)	4.19% (n=171)	3.94% (n=8)	4.4% (n=740/ 16,940)
Readmission at 30d	8.95% (n=934)	8.90% (n=186)	8.40% (n=11)	7.68% (n=313)	8.37% (n=17)	8.6% (n=1461/ 16,940)
Readmission at 60d	14.53% (n=1517)	14.55% (n=304)	16.03% (n=21)	12.34% (n=503)	12.32% (n=25)	14% (n=2370/ 16,940)
Readmission at 90d	21% (n=2192)	20.54% (n=429)	22.14% (n=29)	18.67% (n=761)	17.24% (n=35)	20.3% (n=3446/ 16,940)
ER visit at 90d	7.28% (n=760)	7.75% (n=162)	3.05% (n=4)	6.79% (n=277)	6.4% (n=13)	7.2% (n=1216/ 16,940)

Legend: No., number; d, day.

READMISSION RATES

When assessing postoperative hospital readmission status, 8.6% (n = 1,461) of patients were readmitted within 30 days, 14% (n = 2370) of patients were readmitted within 60 days, and 20.3% (n = 3,446) of patients were readmitted within 90 days. Furthermore, 7.2% (n = 1,216) visited the ER within 90 days of surgery (Table 3). No significant difference was reported between the Black, Asian, Hispanic or Other racial groups in readmission at 30 days when compared to White patients (p=0.2215).

At 60-day and 90-day readmissions, Hispanic patients were 17% (OR, 0.836; 95% CI: 0.750-0.933) and 14% (OR, 0.864; 95% CI: 0.787 – 0.948) less likely to be readmitted compared to White patients, respectively (p = 0.0208). Black, Asian, and Other race patients were not significantly more likely to be readmitted to the hospital within 60 or 90 days when compared to White patients. No significant difference in ER visits at 90 days was reported in any race when compared to White patients (p=0.2215).

DISCUSSION

There has been an increasing interest in creating a cost-effective healthcare system among hospitals, physicians, and patients. With recent changes in healthcare infrastructure to meet these needs, there is growing concern that changes may negatively impact some patient populations

more than others. As access to appropriate and reliable healthcare is an important marker of social equality, it is of interest to determine where differences in care may arise. The results of this study revealed that racial differences were not significantly associated with postoperative medical or surgical complications in patients who underwent a TJR. However, there was a high overall 90-day readmission rate to almost 20% of patients. Although, Hispanic patients undergoing TJR had a lower likelihood of readmission at 60 and 90 days postoperative compared to White patients. Although race was not defined as a factor influencing postoperative complications, except for Hispanics with a slightly lower 60 and 90 day readmission, efforts need to be directed toward understanding other risk factors and addressing causes for readmission to address better cost-efficient healthcare. Specifically with CJR and value based care penalizing hospitals for readmissions better efforts and preoperative optimization are clearly needed to impact these costly high readmission rates.

The findings of our study conflict with previous literature, which has demonstrated increased postoperative complications and readmission rates of racial minorities. In a large systematic review, Alvarez et al. found that Black and Hispanic patients had significantly higher rates of postoperative complications and readmission rates following lower extremity arthroplasties (Alvarez, McKeon, Spitzer, et al. 2022). With many studies indicting persistent disparities, our results support improvement in racial disparities. However, it remains difficult to account for all differences

Table 3. The Effect of Race on Complications and Readmission Rates

Outcome	Odds Ratio (Black vs White)	95% CI	Odds Ratio (Asian vs White)	95% CI	Odds Ratio (Hispanic vs White)	95% CI	Odds Ratio (Other vs White)	95% CI	p-value
Postoperative medical complications	1.153	0.932-1.427	1.243	0.621-2.490	1.025	0.867-1.212	0.741	0.375-1.467	0.5721
Postoperative surgical complications	1.170	0.934-1.465	1.157	0.535-2.504	0.978	0.815-1.175	0.836	0.408-1.711	0.6200
Readmission at 30d	1.020	0.860-1.210	0.979	0.524-1.826	0.856	0.748-0.980	0.917	0.554-1.517	0.2215
Readmission at 60d	1.019	0.888-1.170	1.191	0.743-1.911	0.836*	0.750-0.933	0.820	0.537-1.254	0.0133*
Readmission at 90d	0.941	0.834-1.061	1.089	0.717-1.654	0.864*	0.787-0.948	0.754	0.522-1.091	0.0208*
ER visit at 90d	1.042	0.868-1.252	0.405	0.149-1.099	0.927	0.802-1.071	0.857	0.486-1.513	0.3011

Legend: CI, confidence interval; *, p<0.01.

between minority groups that may have an indirect impact on healthcare outcomes. For example, access to proper medical care remains a hurdle in medicine and is known to affect races to different degrees (Caraballo, Ndumele, Roy, et al. 2022). Additionally, racial differences in preoperative functional status may affect postoperative data, as poorer preoperative function is associated with worse postoperative outcomes (Fortin, Clarke, Joseph, et al. 1999; Hofstede, Gademan, Stijnen, et al. 2018). Previous studies, such as the analysis by Alvarez et al. have reported racial disparities in post-surgical outcomes attributing these differences to access to care and preoperative functional status, as well as treatment in lower-quality, lower-volume healthcare facilities (Alvarez, McKeon, Spitzer, et al. 2022; Cavanaugh, Rauh, Thompson, et al. 2020).

Our study did not show increases in postoperative complications and readmission rates among minority patients in a single healthcare system network suggesting that perhaps access to healthcare is the biggest contributor to disparities in outcomes for racial minorities. Access to healthcare is a factor more significantly impacting racial minorities and contributes to negative outcomes and increased disparities in health.

With the ever-changing healthcare industry, these results may indicate that the efforts made to correct the impacts of racial disparities in healthcare are improving. Systematic discrimination has been a continuous uphill battle for decades and is often perpetuated by large overarching institutions. Effectively addressing these discrepancies is vital to building a healthcare system with equal quality care for all. Improving data systems, increasing regulations, applying new initiatives to properly train medical professionals, and recruiting medical providers from various backgrounds are all methods that have been implemented to attempt to close these gaps (Williams and Rucker 2000). Although many studies have shown racial impact on access to care, utilization of services, and patient outcomes for patients undergoing a TJR, this large cohort study provides hope that there is some success in the attempts to create an equitable healthcare system (Chun et al. 2021; Hu, Hu, Lee, et al. 2022; Amen et al. 2020; Alvarez, McKeon, Spitzer, et al. 2022).

This study, like any analysis of large databases, is subject to limitations. The retrospective nature of this study results in inherit bias based on the data collected and requested for analyses. Our results on postoperative medical and surgical complication rates were not stratified by surgery type (THA, TKA, and TSA) and were instead grouped into TJA. Future studies to delineate specific procedures and account for additional confounding variables will allow for more specific associations to be assessed for race-based differences in outcomes. Additionally, we did not stratify for surgeon volume or training, hospital location, hospital volume, or prosthetic type which can all be confounding variables. Despite these limitations, the study's strength lies in the large inclusive sample size.

CONCLUSION

This study found that this cohort of total joint patients had a high readmission rate of up to 20% within 90 days. Although race did not appear to be a significant determinant of additional ER visits or readmissions, there was some variation seen amongst Hispanic patients undergoing TJR with a lower likelihood of readmission at 60 and 90 days postoperative. Further research is needed on the cultural impact of healthcare resource utilization and complications after TJR, and perhaps more community integration may be key to minimizing costly healthcare resources.

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Supplemental Table 1. Postoperative Complications and their Prospective Codes

Postoperative Complication	Code
Postoperative Medical Complications	
Disruption of wound, unspecified, initial encounter	T81.30XA
Disruption of external operation (surgical) wound, not elsewhere classified, initial encounter	T81.31XA
Disruption of external operation (surgical) wound, not elsewhere classified, subsequent encounter	T81.31XD
Disruption of internal operation (surgical) wound, not elsewhere classified, initial encounter	T81.32XA
Disruption of traumatic injury wound repair, initial encounter	T81.33XA
Other postprocedural complications and disorders of the circulatory system, not elsewhere classified	I97.89
Other postprocedural complications and disorders of respiratory system, not elsewhere classified	J95.89
Other postprocedural complications and disorders of genitourinary system	N99.89
Other postprocedural complications and disorders of digestive system	K91.89
Other intraoperative and postprocedural complications and disorders of the musculoskeletal system	M96.89
Postprocedural (acute) (chronic) kidney failure	N99.0
Infection following a procedure, other surgical site, initial encounter	T81.49XA
Surgical instruments, materials and orthopedic devices (including sutures) associated with adverse incidents	Y79.3
Surgical operation with implant of artificial internal device as the cause of abnormal reaction of the patient, or of later complication, without mention of misadventure at the time of the procedure	Y83.1
Surgical operation with anastomosis, bypass or graft as the cause of abnormal reaction of the patient, or of later complication, without mention of misadventure at the time of the procedure	Y83.2
Surgical operation with formation of external stoma as the cause of abnormal reaction of the patient, or of later complication, without mention of misadventure at the time of the procedure	Y83.3
Other surgical procedures as the cause of abnormal reaction of the patient, or of later complication, without mention of misadventure at the time of the procedure	Y83.8
Surgical procedure, unspecified as the cause of abnormal reaction of the patient, or of later complication, without mention of misadventure at the time of the procedure	Y83.9
Other specified misadventures during surgical and medical care	Y65.8
Unspecified misadventure during surgical and medical care	Y69
Encounter for other specified surgical aftercare	Z48.89
Unspecified complication of foreign body accidentally left in body following surgical operation, initial encounter	T81.500A
Sepsis following a procedure, initial encounter	T81.44XA
Sepsis due to Methicillin resistant Staphylococcus aureus	A41.02
Sepsis due to Escherichia coli (E. coli)	A41.51
Sepsis due to Pseudomonas	A41.52
Other specified sepsis	A41.89
Sepsis, unspecified organism	A41.9
Severe sepsis without septic shock	R65.20
Severe sepsis with septic shock	R65.21
Mycoplasma pneumoniae 'M. pneumoniae' as the cause of diseases classified elsewhere	B96.0
Klebsiella pneumoniae 'K. pneumoniae' as the cause of diseases classified elsewhere	B96.1
Influenza due to other identified influenza virus with unspecified type of pneumonia	J10.00
Pneumonia due to other specified bacteria	J15.8
Unspecified bacterial pneumonia	J15.9
Pneumonia, unspecified organism	J18.9
Infection following a procedure, superficial incisional surgical site, initial encounter	T81.41XA
Infection following a procedure, organ and space surgical site, initial encounter	T81.43XA
Unspecified displaced fracture of surgical neck of right humerus, initial encounter for closed fracture	S42.211A
Unspecified displaced fracture of surgical neck of left humerus, initial encounter for closed fracture	S42.212A
Unspecified displaced fracture of surgical neck of left humerus, subsequent encounter for fracture with nonunion	S42.212K
2-part displaced fracture of surgical neck of right humerus, initial encounter for closed fracture	S42.221A
2-part displaced fracture of surgical neck of left humerus, initial encounter for closed fracture	S42.222A

Postoperative Complication	Code
3-part fracture of surgical neck of left humerus, initial encounter for closed fracture	S42.232A
4-part fracture of surgical neck of right humerus, initial encounter for closed fracture	S42.241A
4-part fracture of surgical neck of left humerus, initial encounter for closed fracture	S42.242A
Embolism and thrombosis of iliac artery	I74.5
Embolism and thrombosis of unspecified artery	I74.9
Acute embolism and thrombosis of unspecified deep veins of right lower extremity	I82.401
Acute embolism and thrombosis of unspecified deep veins of unspecified lower extremity	I82.409
Acute embolism and thrombosis of right femoral vein	I82.411
Acute embolism and thrombosis of left femoral vein	I82.412
Acute embolism and thrombosis of right popliteal vein	I82.431
Acute embolism and thrombosis of left popliteal vein	I82.432
Acute embolism and thrombosis of right tibial vein	I82.441
Acute embolism and thrombosis of unspecified deep veins of right distal lower extremity	I82.4Z1
Chronic embolism and thrombosis of unspecified deep veins of unspecified lower extremity	I82.509
Chronic embolism and thrombosis of femoral vein, bilateral	I82.513
Acute embolism and thrombosis of superficial veins of right upper extremity	I82.611
Acute embolism and thrombosis of deep veins of right upper extremity	I82.621
Acute embolism and thrombosis of unspecified vein	I82.90
THROMBOSIS DUE TO VASCULAR PROSTHETIC DEVICES, IMPLANTS AND GRAFTS, INITIAL ENCOUNTER	T82.868A
Acute kidney failure, unspecified	N17.9
Hypertensive chronic kidney disease with stage 5 chronic kidney disease or end stage renal disease	I12.0
Hypertensive heart and chronic kidney disease with heart failure and with stage 5 chronic kidney disease, or end stage renal disease	I13.2
Hydronephrosis with renal and ureteral calculous obstruction	N13.2
Acute kidney failure with tubular necrosis	N17.0
End stage renal disease	N18.6
Dependence on renal dialysis	Z99.2
Postoperative Surgical Complications	
Other instability, right shoulder	M25.311
Other instability, left shoulder	M25.312
PERIPROSTHETIC FRACTURE AROUND INTERNAL PROSTHETIC LEFT SHOULDER JOINT, INITIAL ENCOUNTER	M97.32XA
Dislocation of other internal joint prosthesis, initial encounter	T84.028A
Mechanical loosening of other internal prosthetic joint, initial encounter	T84.038A
Infection and inflammatory reaction due to unspecified internal joint prosthesis, initial encounter	T84.50XA
Mechanical loosening of prosthetic joint	996.41
Recurrent dislocation of patella, right knee	M22.01
Chronic instability of knee, right knee	M23.51
Chronic instability of knee, left knee	M23.52
Other instability, right hip	M25.351
Other instability, left hip	M25.352
Other instability, right knee	M25.361
Osteolysis, unspecified site	M89.50
Osteolysis, left thigh	M89.552
Osteolysis, left lower leg	M89.562
Osteolysis, other site	M89.58
PERIPROSTHETIC FRACTURE AROUND INTERNAL PROSTHETIC RIGHT HIP JOINT, INITIAL ENCOUNTER	M97.01XA
PERIPROSTHETIC FRACTURE AROUND INTERNAL PROSTHETIC LEFT HIP JOINT, INITIAL ENCOUNTER	M97.02XA
PERIPROSTHETIC FRACTURE AROUND INTERNAL PROSTHETIC RIGHT KNEE JOINT, INITIAL ENCOUNTER	M97.11XA

Postoperative Complication	Code
PERIPROSTHETIC FRACTURE AROUND INTERNAL PROSTHETIC LEFT KNEE JOINT, INITIAL ENCOUNTER	M97.12XA
PERIPROSTHETIC FRACTURE AROUND UNSPECIFIED INTERNAL PROSTHETIC JOINT, INITIAL ENCOUNTER	M97.9XXA
Unspecified dislocation of right shoulder joint, initial encounter	S43.004A
Unspecified dislocation of left shoulder joint, initial encounter	S43.005A
Unspecified dislocation of unspecified shoulder joint, initial encounter	S43.006A
Unspecified dislocation of right hip, initial encounter	S73.004A
Unspecified dislocation of left hip, initial encounter	S73.005A
Unspecified dislocation of left patella, initial encounter	S83.005A
Dislocation of internal right hip prosthesis, initial encounter	T84.020A
Dislocation of internal left hip prosthesis, initial encounter	T84.021A
Instability of internal right knee prosthesis, initial encounter	T84.022A
Instability of internal left knee prosthesis, initial encounter	T84.023A
Dislocation of unspecified internal joint prosthesis, initial encounter	T84.029A
Mechanical loosening of internal right hip prosthetic joint, initial encounter	T84.030A
Mechanical loosening of internal left hip prosthetic joint, initial encounter	T84.031A
Mechanical loosening of internal right knee prosthetic joint, initial encounter	T84.032A
Mechanical loosening of internal left knee prosthetic joint, initial encounter	T84.033A
Periprosthetic osteolysis of internal prosthetic right hip joint, initial encounter	T84.050A
Periprosthetic osteolysis of internal prosthetic left hip joint, initial encounter	T84.051A
Periprosthetic osteolysis of internal prosthetic right knee joint, initial encounter	T84.052A
Wear of articular bearing surface of internal prosthetic right hip joint, initial encounter	T84.060A
Wear of articular bearing surface of internal prosthetic left hip joint, initial encounter	T84.061A
Wear of articular bearing surface of internal prosthetic right knee joint, initial encounter	T84.062A
Wear of articular bearing surface of internal prosthetic left knee joint, initial encounter	T84.063A
Wear of articular bearing surface of other internal prosthetic joint, initial encounter	T84.068A
Fibrosis due to internal orthopedic prosthetic devices, implants and grafts, initial encounter	T84.82XA
Hemorrhage due to internal orthopedic prosthetic devices, implants and grafts, initial encounter	T84.83XA
Pain due to internal orthopedic prosthetic devices, implants and grafts, initial encounter	T84.84XA
Other specified complication of internal orthopedic prosthetic devices, implants and grafts, initial encounter	T84.89XA
Unspecified complication of internal orthopedic prosthetic device, implant and graft, initial encounter	T84.9XXA
Other mechanical complication of other specified internal prosthetic devices, implants and grafts, initial encounter	T85.698A
Infection and inflammatory reaction due to other internal prosthetic devices, implants and grafts, initial encounter	T85.79XA
Unspecified complication of internal prosthetic device, implant and graft, initial encounter	T85.9XXA



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