Hodson N, Zamzam M, Keinath C, Driessche A, North WT, Charters M. Twenty-four Hours of Perioperative Oral Antibiotics Results in Low Rate of Prosthetic Joint Infection Following Outpatient Arthroplasty Procedures. *Orthopedic Reviews*. 2026;18. doi:10.52965/001c.155084

General

Twenty-four Hours of Perioperative Oral Antibiotics Results in Low Rate of Prosthetic Joint Infection Following Outpatient Arthroplasty Procedures

Noah Hodson, MD[1], Mazen Zamzam, BS[1], Cassandra Keinath, MD[1], Alexander Driessche, MSE[1], W. Trevor North, MD[1], Michael Charters, MD[1]

[1] Orthopaedic Surgery, Henry Ford Health System

Keywords: prosthetic joint infection, infection, total knee arthroplasty, total hip arthroplasty

https://doi.org/10.52965/001c.155084

Orthopedic Reviews

Vol. 18, 2026

Background

Prosthetic joint infection (PJI) is a devastating complication following hip and knee arthroplasty, with significant morbidity and mortality. While 24 hours of intravenous antibiotics is standard for inpatient arthroplasty, there is no consensus on postoperative antibiotic prophylaxis for outpatient procedures. This study evaluated 90-day PJI rates in patients undergoing same-day discharge primary hip and knee arthroplasty with 24 hours of perioperative oral antibiotics.

Methods

A retrospective review was conducted on 1,843 patients who underwent primary total knee arthroplasty (TKA; 1,052, 57.1%), total hip arthroplasty (THA; 638, 34.7%), unicompartmental knee replacements (medial: 89, 4.8%; lateral: 5, 0.3%), isolated patellofemoral replacements (14, 0.8%), or conversion of previous hip surgeries (4, 0.2%) from 2021 to 2023 at two ambulatory surgery centers. All patients received 24 hours of perioperative oral antibiotics. Patient data were collected via chart review and the Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI). The primary outcome was PJI within 90 days of surgery.

Results

The median age was 66 years, and the median BMI was 31 kg/m^2. PJI occurred in 5 patients (0.3%; 3 THA, 2 TKA). There were no significant differences in PJI rates based on gender, BMI, race, smoking status, diabetes, ASA class, procedure type, or surgical approach ($P < 0.05$).

Conclusion

Twenty-four hours of perioperative oral antibiotics following outpatient TKA, THA, unicompartmental, and patellofemoral procedures is associated with low PJI rates. Larger, randomized prospective studies are needed to refine antibiotic protocols for outpatient arthroplasty.

INTRODUCTION

Total Joint Arthroplasty (TJA), including both total knee arthroplasty (TKA) and total hip arthroplasty (THA), have become two of the most successful and commonly performed orthopaedic surgeries.[1] Due to this success, and combined with increased demand, it is projected that over 600,000 THAs and over 1.2 million TKAs will be performed each year in the United States by 2030.[2] Both TKA and THA demonstrate high success in terms of implant survivorship and a low overall complication profile, however, the projected increase in number of surgeries performed undoubtedly will lead to an increase in the number of complications in these patients.[2-4] One such complication is prosthetic joint infection (PJI), which is associated with increased rate of readmissions, revisions, length of hospital stay, and increased risk of mortality within one year of revision surgery for PJI.[5-8]

PJI is estimated to account for 25% of TKA and 15% of THA revision surgeries, with a five-year mortality rate exceeding that of several common cancers.[9,10] By 2030, it is estimated that the cost related to PJI occurring in THA patients will exceed $750 million and over $1 billion for PJI associated with TKA.[10] Due to the immense cost in terms of

morbidity, mortality, and healthcare related expenditures, the use of antibiotic prophylaxis has been widely adopted to decrease PJI rate and associated costs.[11-13] Currently, most arthroplasty surgeons administer antibiotics prior to surgery and continue administration for 24 hours following surgery.[14,15]

In 2017, the Centers for Disease Control (CDC) and the World Health Organization (WHO) issued a recommendation against the use of postoperative prophylactic antibiotics following clean-contaminated surgeries.[13] This recommendation is problematic for arthroplasty surgeons, mainly because these recommendations are based on non-orthopaedic related surgeries and that there are few studies examining the impact of receiving a single dose of oral, postoperative antibiotics following outpatient THA or TKA.[16-18] The purpose of this study was to examine the overall rate of PJI following either THA or TKA procedures that occurred in the outpatient setting. Our group hypothesized that same day surgery discharge with 24 hours of perioperative oral antibiotics following outpatient THA or TKA would result in a low rate of PJI.

MATERIALS AND METHODS

DATA SOURCES

Following Institutional Review Board approval a retrospective study identified all patients undergoing outpatient TJA from 2021 to 2023. All surgeries were performed by one of two fellowship trained arthroplasty surgeons at two ambulatory surgery centers. Patients undergoing complex revision or hardware removal were excluded. Per protocol, all patients received 24-hour antibiotic coverage, starting with preoperative cefazolin 2g or, if recently hospitalized, cefazolin 2g plus pharmacy-dosed vancomycin. Cefazolin was given within 1 hour of incision, vancomycin within 2 hours. Postoperatively, patients took cefalexin 500mg every 6 hours for three doses. Allergy alternatives included doxycycline 100mg every 6 hours or sulfamethoxazole-trimethoprim 800/160mg every 4 hours. Combined with preoperative doses, these regimens ensured 24-hour coverage. Prior to arrival at the surgery center, all patients were provided 2 chlorhexidine gluconate (CHG) sponges (BD E-Z Scrub 107; 18mL of 4% CHG w/v - antiseptic; Becton, Dickinson and Company, Franklin Lakes, NJ 07417-1884) and were instructed to shower the evening before surgery and morning before surgery with the CHG sponge. In the preoperative area, the patient used a CHG wipe (Medline ReadyPrep CHG; chlorhexidine gluconate 2% solution - antiseptic; Medline Industries, LP, Three Lakes Drive, Northfield, IL 60093 USA) on their entire body followed by nasal decolonization with intranasal Nozin® Nasal Sanitizer® Advanced Antiseptic Popswab® Ampule 0.6mL (active ingredient: alcohol 62%; Nozin® Global Life Technologies Corp, Chevy Chase, MD 20815) ⩾ 1 hour prior to incision. Hair was removed in the preoperative area with clippers. In the operating room, skin preparation was performed with pre-wash alcohol, wiped clean prior to applying preparation solution. Final skin preparation was performed with a solution of iodine povacrylex and isopropyl alcohol (3M DuraPrep™ Surgical Solution; iodine povacrylex [0.7% available iodine] and isopropyl alcohol [74% w/w]; 3M Health Care, 2510 Conway Ave., St. Paul, MN 55144) over the surgical field followed by an alcohol-based CHG (BD ChloraPrep™ Hi-Lite Orange™; 26mL applicator, 2% w/v CHG and 70% v/v isopropyl alcohol - antiseptic; CareFusion 213, LLC, El Paso, TX 79912, subsidiary of Becton, Dickinson and Co.) preparation on the remainder of the operative extremity. An Incise Drape (3M Health Care, 2510 Conway Ave., St. Paul, MN 55144) covered the surgical field. Patient and procedure data was collected via retrospective chart review as well as utilizing the Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI) dataset. Patient demographic and surgical data - age at the time of surgery, body mass index (BMI), gender, race, insurance status, past medical history, social history, joint undergoing surgery, surgical approach, use of antibiotic powder or cement, and ASA class - were collected.

OUTCOME MEASURES

The primary outcome measure of this study was the development of PJI. Secondary outcome measures included return to the emergency department, periprosthetic fracture, hardware failure, pulmonary embolism (PE), and unplanned readmission.

STATISTICAL ANALYSIS

Descriptive statistics were used to summarize the patient cohort. Continuous covariates were described using medians with interquartile ranges. Categorical variables were described using counts and frequencies. Univariate analyses were conducted to compare patients who developed PJI to those who did not. Furthermore, patients were stratified based smoking status at the time of surgery, diabetes status, BMI, ASA class, surgical approach, gender, and race/ethnicity. Statistical significance was defined as $P < 0.05$ for all analyses. Analyses were performed using IBM Statistical Package for Social Sciences (SPSS) Version 29.0.2.0 (Detroit, MI).

RESULTS

DEMOGRAPHICS

1,843 patients were identified as having a TJA procedure from 2021 to 2023. This included 1092 (57.1%) primary TKA, 638 (34.7%) primary THA, 89 (4.8%) unicompartmental (medial) knee replacements, 5 (0.3%) unicompartmental (lateral) knee replacements, 14 (0.8) isolated patellofemoral replacements, 4 (0.2%) conversion of previous hip surgeries, and 1 (0.1%) revision knee arthroplasty. There were 1,168 (63.4%) females and 675 (36.6%) males in the cohort. The median age was 66 years (range: 22–92 years) and the median BMI was 31.02 kg/m^2 (range: 18.55–49.62 kg/m^2). A total of 199 (10.8%) were classified as having a healthy BMI, 591 (32.1%) were classified as overweight, and 1,053 (57%) were classified as being obese. Most patients, 941 (51%),

Table 1. Summary of patient characteristics and demographics.

Variable	Category	Count	Percent (%)
Gender	Female	1168	63.4
	Male	675	36.6
ASA Class	I	37	2.0
	II	865	46.9
	III	941	51.0
BMI Class	1	199	10.8
	2	591	32.1
	3	1053	57.0
	Missing	2	0.1
Race/Ethnicity	Asian	28	1.5
	Black	718	39.0
	Hispanic	2	0.1
	Native American	2	0.1
	Native Hawaiian/Pacific Islander	2	0.1
	Other	34	1.8
	Unknown	89	4.8
	White	967	52.5
Smoking	Current	140	7.6
	Never	1043	56.6
	Previous	660	35.8
HxDVT	No	1685	91.4
	Yes	118	6.4
Diabetes	No	1407	76.3
	Yes - Type 1 Diabetes Mellitus	3	0.2
	Yes - Type 2 Diabetes Mellitus	433	23.5
	Yes - Type Unknown	1	0.1

had an ASA class of 3, followed by 865 (46.9%) with an ASA class of 2, and 37 (2%) classified as ASA class 1. There were 967 (52.5%) patients identified as white, and 718 (39%) patients identified as Black. The remaining patients were either Asian, Hispanic, Native American, Pacific Islander, or did not have an identified race. A summary of demographic information can be found in Table 1.

PATIENT CHARACTERISTICS

Most patients (n=1,043, 56.6%) reported never smoking, 660 (35.8%) reported having smoked previously, and 140 (7.6%) reported being current smokers. Most patients included in the study did not have diabetes at the time of surgery (n=1,407, 76.3%), while 433 (23.5%) and 3 (0.2%) had type 2 diabetes or type 1 diabetes, respectively. A summary of patient characteristics can be found in Table 1. Antibiotic cement was only used in 14 (0.8%) of cases included in the study, and antibiotic powder prior to incision closure was done in 8 (0.4%) cases.

OUTCOMES

PJI occurred in a total of 5 (0.3%) patients, with 3 (60%) occurring in THA and 2 (40%) occurring in TKA. The rate of DVT (n=12) and PE (n=7) was 0.7% and 0.4%, respectively. A total of 173 (9.4%) had unplanned presentations to the emergency department following their surgery. Furthermore, 47 (2.6%) patients had an unplanned readmission related to their surgical procedure. There were 9 (0.5%) patients that experienced a periprosthetic fracture in the postoperative period and no patients experienced hardware failure. A summary of the outcome measures captured in this study can be found in Table 2. There were no statistically significant differences noted for our primary outcome measure when comparing gender, BMI class, race/ethnicity, smoking status, diabetes type, the joint receiving surgery, surgical approach, the use of antibiotic cement or powder, and ASA class ($P < 0.05$).

DISCUSSION

Avoidance of PJI is crucial for reduction of healthcare costs and improvement of patient outcomes. The growing outpatient setting for TJA is shifting treatment guidelines, par-

Table 2. Summary of primary and secondary outcome measures analyzed.

Variable	Category	Count	Percent (%)
PJI	No	1838	99.7
	Yes	5	0.3
DVT	No	1831	99.3
	Yes	12	0.7
Return to ED	No	1670	90.6
	Yes	173	9.4
Fracture	No	1834	99.5
	Yes	9	0.5
Hardware Failure	No	1842	99.9
	Yes	1	0.1
PE	No	1836	99.6
	Yes	7	0.4
Unplanned Readmission	No	1796	97.4
	Yes	47	2.6

ticularly for infection control.[19] Evidence shows prophylactic antibiotics significantly reduce surgical site infection (SSI) risk.[20] The "golden period" – the first six hours post-surgery – allows host defenses to control bacterial growth, with antibiotics extending this window.[21] Current recommendations advise stopping antibiotics within one hour of incision and not continuing after clean closure.[22] However, concerns about PJI prevention remain, and the optimal timing for prophylaxis is still debated. In this retrospective review, patients who completed twenty-four hours of perioperative oral antibiotic prophylaxis following same-day discharge for primary THA or TKA demonstrated low rates of with no significant differences across gender, BMI, race, smoking status, diabetes, ASA class, joint, procedure type, or surgical approach ($P > 0.05$).

The current guidelines are primarily based on a limited number of orthopaedic studies, with only two directly examining TJA.[23-29] This limited evidence is concerning, given the need for updated guidance on optimal antibiotic protocols in joint replacement surgeries, particularly as PJI remains a major issue. Additionally, the increasing prevalence of patients with higher BMI — a known risk factor for SSI and PJI - highlights this need.[30.31] The unique challenges in arthroplasty, such as biofilm formation, complicate infection management by limiting the effectiveness of antimicrobial treatments. This reliance on outdated, non-specific studies underscores the urgency to revisit and update current antibiotic practices.

Recent studies have explored the effects of extended postoperative antibiotic use with some demonstrating benefits. Frank and Yang et al reported that prolonged antibiotic courses reduced reinfection rates in patients undergoing revision for PJI, particularly in those high risk for infection during primary arthroplasty.[32.33] Similarly, Kheir et al found that extended antibiotics in high-risk patients reduced PJI rates, associated complications, mortality, and healthcare costs.[30] While these studies focused on longer antibiotic regimens, our study, which used only 24 hours of perioperative oral antibiotics, found a low PJI rate of 0.3% with no significant differences across patient demographics or surgical factors. This suggests that, in some cases, shorter antibiotic courses may offer adequate protection. However, variability in patient populations and surgical contexts highlights the need for further research to determine optimal antibiotic duration for different risk profiles.

In contrast, a recent study by Kubsad et al evaluated the impact of extended oral antibiotic use in primary THA and reported a higher incidence of PJI at 90 days in the cohort receiving extended antibiotics compared to those who did not.[31] Unlike the findings of Frank, Yang, and Kheir in high-risk groups,[30,32,33] Kubsad et al. focused on a general patient population and found no significant benefit from extended antibiotics.[31] While our study used a shorter 24-hour antibiotic course and observed low infection rates (0.3%), these results should be interpreted with caution given the differences in study populations and contexts. The variability in findings across studies underscores the need for further research to determine the optimal duration and patient selection for postoperative antibiotic use.

At first glance, limiting perioperative antibiotics to clean closure may seem more cost-effective than extending them for 24 hours. In our study, patients were discharged with one of three oral antibiotics based on allergy profiles. According to Affordable Care Act (ACA) Federal Upper Limit (FUL) drug pricing, the cost per tablet was as follows: cefalexin 500mg at $0.14, sulfamethoxazole-trimethoprim 800/160mg at $0.07, and doxycycline 100mg at $0.15.[34] Total discharge antibiotic costs ranged from $0.21 to $0.57. In contrast, treating a single PJI costs approximately $30,000, with annual hospital costs for hip and knee PJI projected to reach $1.85 billion by 2030.[10] Thus, the modest cost of 24-hour antibiotics is far more economical than managing a PJI.

In terms of secondary outcomes, our study found no statistically significant relationship between the administra-

tion of 24 hours of perioperative antibiotics and rates of DVT, PE, unplanned emergency department presentations, unplanned readmissions, periprosthetic fractures, or hardware failure. The incidence of DVT and PE 0.7% and 0.4%, respectively, and the overall rate of unplanned readmissions was 2.6%. 9.4% of patients had an unplanned visit to the emergency department, and 0.5% experienced a periprosthetic fracture. Importantly, no cases of hardware failure were observed. These findings suggest that using a 24-hour antibiotic protocol did not significantly impact these secondary outcomes, which are often influenced by other perioperative factors including patient comorbidities, surgical technique, and postoperative care protocols. While PJI prevention was effectively addressed by the antibiotic regimen, the low rates of these secondary complications may support the safety and efficacy of a short antibiotic course without introducing an increased risk of other adverse events.

This study was not without limitations. Being retrospective in nature, we were unable to control for certain patient-specific factors that could directly affect the risk of PJI. However, when we examined well-established risk factors for PJI, such as smoking status, BMI, and the presence of diabetes, no significant differences in infection rates were found.[37] Another limitation is the exclusion of patients who underwent complex revision surgeries, which may affect the generalizability of our findings to those higher-risk procedures. That said, protocols for antibiotic management in revision arthroplasty both at our institution and internationally are distinct from those used in primary arthroplasty, so this exclusion aligns with different standards of care.[23,33] Additionally, our study included patients from only two surgeons, which may reduce the generalizability. However, both surgeons used the same perioperative antibiotic regimen, and their patients participated in a standardized preoperative joint education course, which may have helped minimize variations in care and education. Furthermore, the inclusion of surgeries performed at two separate ambulatory centers improves the generalizability of our findings across different surgical environments. Future research should aim to include a broader range of surgeons and facilities, as well as a more diverse patient population to confirm the widespread applicability of these results. A prospective, multicenter study would provide the rigorous evidence needed to further establish the effectiveness of postoperative antibiotic protocols in reducing PJI.

CONCLUSION

In conclusion, this study demonstrates that 24 hours of perioperative oral antibiotic administration following outpatient total hip and knee arthroplasty is associated with a low rate of PJI, without significant differences across various patient demographics and surgical factors. These findings suggest that extending antibiotic use beyond the current guidelines of cessation at clean closure may provide broader protection against PJI in both low- and high-risk patients. Given the substantial costs associated with treating PJI, this approach appears to be a cost-effective and clinically effective strategy. Further prospective studies are warranted to confirm these findings and refine guidelines for perioperative antibiotic use in outpatient arthroplasty procedures.

Submitted: July 11, 2025 EDT. Accepted: July 21, 2025 EDT.
Published: January 31, 2026 EDT.

REFERENCES

1. Matar HE, McGonagle T, Serebro HA. Three orthopaedic operations, over 1,000 randomized controlled trials, in over 100,000 patients: what have we learnt? *Bone Joint Res*. 2022;11:23-25.

2. Sloan M, Premkumar A, Sheth NP. Projected volume of primary total joint arthroplasty in the U.S., 2014 to 2030. *J Bone Joint Surg Am*. 2018;100(17):1455-1460. doi:10.2106/JBJS.17.01617

3. Kurtz S, Ong K, Lau E, Mowat F, Halpern M. Projections of primary and revision hip and knee arthroplasty in the United States from 2005 to 2030. *J Bone Joint Surg Am*. 2007;89:780-785. doi:10.2106/00004623-200704000-00012

4. Schwartz AM, Farley KX, Guild GN, Bradbury TL. Projections and epidemiology of revision hip and knee arthroplasty in the United States to 2030. *J Arthroplasty*. 2020;35:S79-S85. doi:10.1016/j.arth.2020.02.030. PMID:32151524

5. Ashkenazi I, McKegg PC, Driessche A, et al. The financial burden of patient comorbidities on total hip arthroplasties: a matched cohort analysis of high comorbidity burden and non–high comorbidity burden patients. *J Arthroplasty*. Published online 2024. doi:10.1016/j.arth.2024.02.052

6. Zmistowski B, Karam JA, Durinka JB, Casper DS, Parvizi J. Periprosthetic joint infection increases the risk of one-year mortality. *J Bone Joint Surg Am*. 2013;95:2177-2184. doi:10.2106/JBJS.L.00789

7. Schairer WW, Sing DC, Vail TP, Bozic KJ. Causes and frequency of unplanned hospital readmission after total hip arthroplasty. *Clin Orthop Relat Res*. 2014;472:464-470. doi:10.1007/s11999-013-3121-5. PMID:23801061

8. Gundtoft PH, Pedersen AB, Varnum C, Overgaard S. Increased mortality after prosthetic joint infection in primary THA. *Clin Orthop Relat Res*. 2017;475:2623-2631. doi:10.1007/s11999-017-5289-6. PMID:28236084

9. Kurtz SM, Lau EC, Ong KL, et al. Are we winning or losing the battle with periprosthetic joint infection: trends in periprosthetic joint infection and mortality risk for the Medicare population. *J Arthroplasty*. 2018;33:3238-3245. doi:10.1016/j.arth.2018.05.042

10. Premkumar A, Kolin DA, Farley KX, Wilson JM, Guild GN, Bradbury TL. Projected economic burden of periprosthetic joint infection of the hip and knee in the United States. *J Arthroplasty*. 2021;36:1484-1489.e3. doi:10.1016/j.arth.2020.12.005

11. Parvizi J, Gehrke T. Proceedings of the International Consensus Meeting on Periprosthetic Joint Infection. *J Bone Joint Surg Am*. 2014;96:441-451. doi:10.2106/JBJS.N.00023

12. Parvizi J, Gehrke T, Chen AF. Prevention of periprosthetic joint infection: new guidelines. *Bone Joint J*. 2017;99:3-10. doi:10.1302/0301-620X.99B4.BJJ-2016-1212.R1

13. Tan TL, Shohat N, Rondon AJ, et al. Perioperative antibiotic prophylaxis in total joint arthroplasty: a single dose is as effective as multiple doses. *J Bone Joint Surg Am*. 2019;101:429-437. doi:10.2106/JBJS.18.00336

14. Hawn MT, Richman JS, Vick CC, Deierhoi RJ, Graham LA, Henderson WG. Timing of surgical antibiotic prophylaxis and the risk of surgical site infection. *JAMA Surg*. 2013;148:649-657. doi:10.1001/jamasurg.2013.134

15. Anderson DJ, Kaye KS, Classen D, et al. Strategies to prevent surgical site infections in acute care hospitals: 2014 update. *Infect Control Hosp Epidemiol*. 2014;35:605-627. doi:10.1086/676022. PMID:24799638

16. Hellbusch LC, Helgeson MD, Garrett MP, Crawford NR. Single-dose vs multiple-dose antibiotic prophylaxis in instrumented lumbar fusion: a prospective study. *Surg Neurol*. 2008;70:622-627. doi:10.1016/j.surneu.2007.08.017

17. Shohat N, Parvizi J. Prevention of periprosthetic joint infection: examining the recent guidelines. *J Arthroplasty*. 2017;32:2040-2046. doi:10.1016/j.arth.2017.02.072

18. Mohri Y, Tonouchi H, Kobayashi M, Nakai K, Kusunoki M. Randomized clinical trial of single- versus multiple-dose antimicrobial prophylaxis in gastric cancer surgery. *Br J Surg*. 2007;94:683-688. doi:10.1002/bjs.5837

19. Peacock S, Wolfstadt J, Peer M, Gleicher Y. Rapid implementation of an outpatient arthroplasty care pathway: a COVID-19-driven quality improvement initiative. *BMJ Open Qual*. 2022;11:e001730. doi:10.1136/bmjoq-2021-001698. PMID:35318244

20. AlBuhairan B, Hind D, Hutchinson A. Antibiotic prophylaxis for wound infections in total joint arthroplasty: a systematic review. *J Bone Joint Surg Br*. 2008;90:915-919. doi:10.1302/0301-620X.90B7.20498

21. Illingworth KD, Mihalko WM, Parvizi J, et al. How to minimize infection and thereby maximize patient outcomes in total joint arthroplasty: a multicenter approach: AAOS exhibit selection. *J Bone Joint Surg Am*. 2013;95:e50. doi:10.2106/JBJS.L.00596

22. Calderwood MS, Anderson DJ, Bratzler DW, et al. Strategies to prevent surgical site infections in acute-care hospitals: 2022 update. *Infect Control Hosp Epidemiol*. 2023;44(5):695-720. doi:10.1017/ice.2023.67

23. Berríos-Torres SI, Umscheid CA, Bratzler DW, et al. Centers for Disease Control and Prevention guideline for the prevention of surgical site infection. *JAMA Surg*. 2017;152:784-791. doi:10.1001/jamasurg.2017.0904

24. Ritter MA, Campbell E, Keating EM, Faris PM. Comparison of intraoperative versus 24-hour antibiotic prophylaxis in total joint replacement: a controlled prospective study. *Orthop Rev*. 1989;18:694-696.

25. Wymenga AB, Hekster YA, Theeuwes A, et al. Antibiotic use after cefuroxime prophylaxis in hip and knee joint replacement. *Clin Pharmacol Ther*. 1991;50:215-220. doi:10.1038/clpt.1991.127

26. Gatell JM, Garcia S, Lozano L, Soriano E, Ramon R, SanMiguel JG. Perioperative cefamandole prophylaxis against infections. *J Bone Joint Surg Am*. 1987;69:1189-1193. doi:10.2106/00004623-198769080-00012

27. Garotta F, Pamparana F. Antimicrobial prophylaxis with ceftizoxime versus cefuroxime in orthopedic surgery. *J Chemother*. 1991;3(suppl 2):34-35.

28. Buckley R, Hughes GN, Snodgrass T, Huchcroft SA. Perioperative cefazolin prophylaxis in hip fracture surgery. *Can J Surg*. 1990;33:122-127.

29. Ali M, Raza A. Role of single-dose antibiotic prophylaxis in clean orthopedic surgery. *J Coll Physicians Surg Pak*. 2006;16:45-48.

30. Kheir MM, Tan TL, Shohat N, et al. The AAHKS Clinical Research Award: extended oral antibiotics prevent periprosthetic joint infection in high-risk cases: 3855 patients with 1-year follow-up. *J Arthroplasty*. 2017;32(9S):S15-S20.

31. Kubsad S, Collins AP, Dasari SP, et al. Impact of extended prophylactic antibiotics on risk of prosthetic joint infection in primary total hip arthroplasty: a matched cohort analysis. *J Am Acad Orthop Surg*. Published online 2024. doi:10.5435/JAAOS-D-24-00290

32. Frank JM, Kayupov E, Moric M, et al. The Mark Coventry, MD, award: oral antibiotics reduce reinfection after two-stage exchange: a multicenter, randomized controlled trial. *Clin Orthop Relat Res*. 2017;475:56-61. doi:10.1007/s11999-016-4890-4

33. Yang J, Parvizi J, Hansen EN, et al. 2020 Mark Coventry Award: microorganism-directed oral antibiotics reduce the rate of failure due to further infection after two-stage revision hip or knee arthroplasty for chronic infection: a multicentre randomized controlled trial at a minimum of two years. *Bone Joint J*. 2020;102-B:3-9. doi:10.1302/0301-620X.102B6.BJJ-2019-1596.R1

34. Centers for Medicare & Medicaid Services. Pharmacy pricing. Medicaid.gov. Accessed December 3, 2024. https://www.medicaid.gov/medicaid/prescription-drugs/pharmacy-pricing/index.html