

Dental procedures and subsequent prosthetic joint infections

Findings from the Medicare Current Beneficiary Survey

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Debate continues concerning the need for antibiotic prophylaxis to prevent patients from developing prosthetic joint infections (PJIs) after undergoing dental procedures. The 2009 American Academy of Orthopaedic Surgeons' (AAOS) recommended that clinicians consider prescribing antibiotic prophylaxis for all patients who have undergone total joint arthroplasty before those patients undergo any invasive procedures that may cause bacteremia, regardless of the time since joint implantation, because of the potential for adverse outcomes and cost of treating PJIs.¹ The AAOS statement did not define invasive dental procedures that frequently produce a transient bacteremia. Previous statements promulgated jointly by the AAOS and the American Dental Association^{2,3} (ADA) did not advocate that clinicians consider prescribing antibiotic prophylaxis for invasive dental procedures that are associated with a high incidence of bacteremia two years after the patient has had total joint arthroplasty, except for patients

ABSTRACT



Background. The publication of the 2009 American Academy of Orthopedic Surgeons' (AAOS) guidelines for antibiotic prophylaxis after joint replacement (arthroplasty) has renewed debate concerning appropriate prophylaxis for dental patients. The authors examined an administrative data set to assess whether dental procedures were associated with prosthetic joint infections (PJIs).

Methods. Using data for the years 1997 through 2006 from the Medicare Current Beneficiary Survey (MCBS), the authors identified participants who had undergone total joint arthroplasty and those who had experienced a PJI. They explored associations between dental procedures and subsequent PJIs by using time-to-event analyses ($N = 1,000$). A nested case-control study included case participants who had had PJIs ($n = 42$) and matched control participants who had had total arthroplasty but had no PJIs ($n = 126$). The authors calculated hazard ratios (HRs) and odds ratios (ORs).

Results. Control participants (people without PJIs) were more likely than were case participants (those with PJIs) to have undergone an invasive dental procedure, though this trend was not statistically significant in either the time-to-event analysis ($HR = 0.78$; 95 percent confidence interval [CI], 0.18-3.39) or the case-control analysis ($OR = 0.56$; 95 percent CI, 0.18-1.74). Only four of 42 case participants had undergone an invasive dental procedure in the 90 days before the infection occurred. Consideration of all dental procedures yielded similar results.

Conclusions. Dental procedures were not associated significantly with subsequent risk for PJIs, although this study's power was somewhat low. The clinical importance of prophylactic antibiotics in dentistry for patients who have undergone joint arthroplasty, therefore, may be questioned.

Clinical Implications. These results support the view that the 2009 AAOS Information Statement on antibiotic prophylaxis for people with prosthetic joints should be reconsidered for patients in that population who are receiving oral health care.

Key Words. Prosthetic joint arthroplasty; prosthetic joint infection; antibiotic prophylaxis; dental procedures.

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with any of the following conditions:

- those who are immunocompromised;
- those who have had a previous prosthetic joint infection;
- those who have high-risk comorbidities.

The AAOS statement has been criticized⁴⁻⁶ for its lack of input from organized dentistry and its reliance on several assumptions:

- PJIs can arise from dental procedures that induce bacteremias associated with oral flora;
- a temporal relationship exists between dental procedures and PJI;
- antibiotic prophylaxis may prevent dental procedure-related bacteremias and subsequent PJIs;
- comparisons between late PJI and infective endocarditis are questionable because of differing anatomy, blood supply, microorganisms and infection mechanisms.

More than 750,000 total joint arthroplasties are completed annually in the United States; about 7 percent of these are revisions involving the replacement of existing prosthetic joints.⁷ Given the aging U.S. population, the demand for primary and revision total hip and knee arthroplasties is expected to rise substantially. Between 2005 and 2030, Kurtz and colleagues⁸ projected, the number of primary total hip arthroplasties will increase an estimated 174 percent to 572,000 cases annually and the number of total knee arthroplasties will increase an estimated 673 percent to 3.48 million. During this period, Kurtz and colleagues⁸ estimated, the total number of hip and knee revisions will grow by 137 percent (96,700 cases annually) and 601 percent (268,200 cases annually), respectively. In addition to patient morbidity, the financial burden of revision arthroplasties is substantial. Medical costs alone for revision procedures have been estimated to be 4.8 times higher than the costs for primary joint arthroplasties.⁹

The need for antibiotic prophylaxis for patients who have undergone total joint arthroplasty has been debated at length without producing a consensus.¹⁰ Previous recommendations have been based on relatively limited data,¹¹⁻¹³ and several authors have questioned the need for antibiotic prophylaxis because of the lack of supporting data.^{14,15} The 1997 and 2003 ADA/AAOS advisory statements attempted to clarify clinical decision making by providing guidelines to assist dentists in determining which patients undergoing which dental procedures could benefit from antibiotic prophylaxis and by providing appropriate antibiotic regimens.^{2,3} The 2009 AAOS statement appears

contrary to some of the previous recommendations and has created confusion and uncertainty for oral health care providers treating patients who have a history of total joint arthroplasty.

To address the renewed controversy surrounding the need to provide antibiotic prophylaxis before dental procedures to prevent PJI, we used a nationally representative administrative data set—that from the Medicare Current Beneficiary Survey (MCBS), which is sponsored by the Centers for Medicare and Medicaid Services¹⁶ (CMS)—to assess the prevalence of total joint arthroplasty and PJIs in adults seeking oral health care. We also aimed to test for associations between dental procedures and PJIs. With the recent finding that high- and low-risk dental procedures were not associated with PJIs in a tertiary care hospital,¹⁷ we hypothesized that dental procedures, including invasive ones associated with a higher risk of experiencing bacteremia, were not associated with an increased risk of developing PJIs in a nationally representative sample of Medicare beneficiaries who are aged or have disabilities.

METHODS

The MCBS is an annual, continuous, nationally representative survey of the U.S. Medicare population that includes all beneficiaries 65 years and older and people with disabilities younger than 65 years.¹⁶ The data are collected from the CMS Medicare enrollment file and disseminated by WESTAT (Rockville, Md.). The MCBS file gives a continuous, complete profile of demographic characteristics, health care and dental service utilization, health outcomes and prescribed drugs. The survey's rotating panel design allows approximately 12,000 participants to be interviewed three times annually for up to four consecutive years. Approximately 4,000 participants exit the study annually because of death, refusal to participate and rotation out of the survey; they are replaced. For this study, we analyzed data from the 1997-2006 MCBS Cost and Use files for community-dwelling beneficiaries.¹⁶ Given that the MCBS is a deidentified public data set, the University of Minnesota Institutional Review Board determined that the study protocol was exempt from review.

ABBREVIATION KEY. **AAOS:** American Academy of Orthopaedic Surgeons. **ADA:** American Dental Association. **CMS:** Centers for Medicare and Medicaid Services. **ICD-9-CM:** International Classification of Diseases (Ninth Revision, Clinical Modification). **JR:** Joint replacement. **LRD:** Last relevant date. **MCBS:** Medicare Current Beneficiary Survey. **PJI:** Prosthetic joint infection.

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