

Use of Antibiotic Prophylaxis for Tooth Extractions, Dental Implants, and Periodontal Surgical Procedures

Katie J. Suda,^{1,2} Ursula Patel,³ Heather Henschel,³ Margaret Fitzpatrick,^{1,4} Charlesnika T. Evans^{1,5}

¹Center of Innovation for Complex Chronic Healthcare, Edward Hines, Jr. VA Hospital, Hines, IL; ²University of Illinois at Chicago, Chicago, IL; ³Pharmacy Services, Edward Hines, Jr. VA Hospital, Hines, IL; ⁴Loyola University Chicago Stritch School of Medicine, Maywood, IL; ⁵Northwestern University Feinberg School of Medicine, Chicago, IL;

Background

- Approximately 30% of antibiotics prescribed in primary care settings are considered unnecessary.
- Dentists prescribe 10% of all antibiotics in the community, ranking fourth after family practitioners, pediatricians, and internists.
- Current evidence indicates that antibiotics administered prior to most dental procedures lack a clear benefit and, when antibiotics are not given, the risk of infection is minimal.
- Use of antibiotics for short durations for dental infection prophylaxis has been associated with serious antibiotic-related adverse events, including *Clostridium difficile* infection (CDI).
- Guidelines for the use of antibiotics for infective endocarditis prophylaxis prior to dental procedures recommend the use of antibiotics in patients with specific cardiac conditions undergoing certain dental procedures. Prophylaxis should be administered in cardiac patients undergoing dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa (such as extractions and implants). Guidelines for the use of antibiotics in patients with prosthetic joints discourage the routine prescribing of antibiotics for any dental procedure.
- While the indication for the majority of dental antibiotics is for infection prophylaxis, appropriateness of dental prescribing of antibiotics for prophylaxis prior to a dental procedure has not been determined in the United States.

Objectives

Our aims were to:

1. Determine if dental antimicrobial prophylaxis at a VA dental clinic are in accordance with guidelines.
2. Evaluate the use of post-procedure antibiotics
3. Identify any serious adverse effects that may be associated with the antibiotic and/or dental procedure three months post-procedure.

Methods

- **Study design:** Cross-sectional study
- **Patient population:** Patients ≥ 18 years of age treated at a Veteran Affairs (VA) dental clinic between January 1, 2015 and December 31, 2015.
- **Inclusion criteria:** Patients receiving tooth extractions, dental implants, and periodontal procedures (bone and gum grafting; scaling and root planing). These procedures entail manipulation of the gingival tissue or the periapical region of the teeth or perforate the oral mucosa. For patients receiving multiple procedures at different visits, only the first dental procedure meeting the inclusion criteria was assessed.
- **Exclusion criteria:** Antibiotic prescribed for a separate indication (e.g., UTI or systemic oral infection)
- **Data collection:** Review of the electronic health record was conducted to obtain demographic, medical, dental, laboratory and prescription information.
- **Primary outcome: Appropriateness of infection prophylaxis**
 - Infective endocarditis prophylaxis was considered appropriate if the patient had an appropriate cardiac condition, dental procedure, and a single dose of an antibiotic administered 1 hour before the procedure ('pre-procedure')
 - All antibiotic prescribing for prosthetic joint infection prophylaxis was defined as inappropriate
 - One antibiotic dose 1 hour prior to the procedure was considered appropriate for tooth extractions and implant placements regardless of patient co-morbidities
 - Antibiotic prophylaxis for bone grafting, gum grafting, scaling and root planing was considered inappropriate.
- **Secondary outcome: Adverse drug events**
 - Allergic reactions, CDI, infective endocarditis, prosthetic joint infections, and post-procedural infections three months post-procedure
- **Statistical analysis:** SAS 9.4 (SAS Institute, Cary, NC) was used for data and statistical analyses. For categorical data, a chi square or Fisher's exact test were applied as appropriate. A student's t-test was used for continuous data. A p-value ≤ 0.05 was considered significant.

Results

Table 1. Baseline demographics of cohort undergoing dental procedures (n=183).

VA Class	Included patients (n=183)
Age, mean + StDev (range)	62.0 + 12.7 (24-91)
Male sex, n (%)	173 (94.5)
Race, n (%)	-
Black	36 (19.7)
Hispanic	7 (3.8)
Other	2 (1.0)
White	130 (71.0)
Unknown	8 (4.4)
Penicillin allergic, n (%)	27 (14.8)
Dental Procedure*	-
Extraction, n (%)	119 (65.0)
Periodontal surgery, n (%)	94 (51.4)
Dental implant placement, n (%)	63 (34.4)
Cardiac condition included in guidelines, n (%)	5 (2.7)
History of infective endocarditis	0
Congenital heart defect	0
Cardiac transplant with valvulopathy	0
Prosthetic cardiac valve/material	5 (2.7)
Orthopedic joint replacement, n (%)	9 (4.9)
History of a prosthetic joint infection, n (%)	1 (0.6)

*Some patients underwent multiple dental procedures at one visit

Figure 1. The majority of patients received antibiotics for infection prophylaxis.*

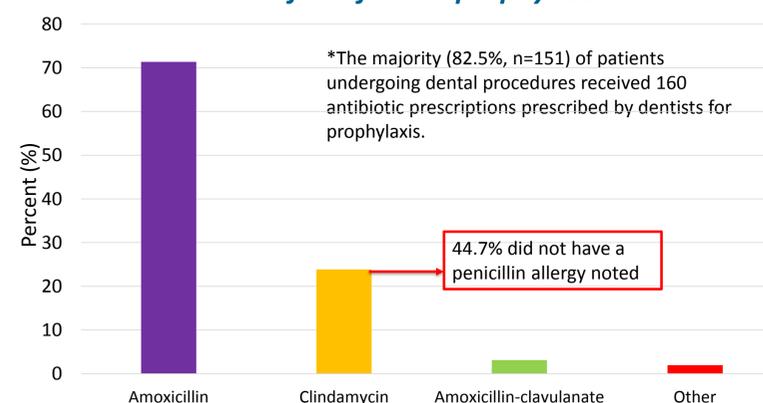


Figure 2. Indication and duration of antibiotics prescribed for infection prophylaxis.

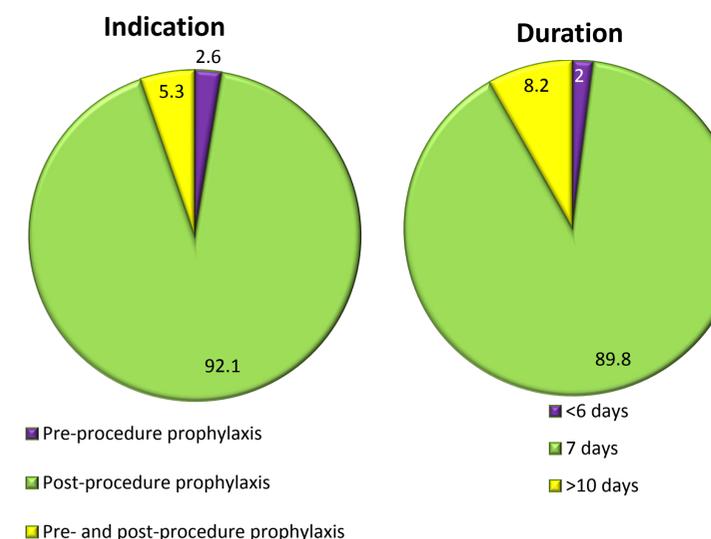


Table 2. Antibiotic indication, timing, and appropriateness of the prescription.

	Frequency (%)
Indicated to receive antibiotics (procedure/cardiac)	166 (90.7)
Received pre- and/or post-procedure antibiotics	145 (87.3)
Not indicated to receive antibiotics	17 (9.3)
Did not receive antibiotic prophylaxis	11 (64.7)
Antibiotic prescribing consistent with study definitions	
No antibiotics prescribed, no antibiotics were indicated	11 (6.0)
Pre-procedure antibiotics were prescribed, pre-procedure antibiotics were indicated	4 (2.2)
Antibiotic prescribing inconsistent with study definitions	
No antibiotics prescribed, pre-procedure antibiotics were indicated	21 (11.5)
Post-procedure antibiotics were prescribed, no antibiotics were indicated	6 (3.3)
Post-procedure antibiotics were prescribed, pre-procedure antibiotics were indicated	133 (72.7)
Pre-procedure and post-procedure antibiotics were prescribed, pre-procedure antibiotics were indicated	8 (4.4)

Table 3. Co-variates assessed for an association with prescribing of antimicrobial prophylaxis

Characteristics	Antibiotic prophylaxis indication consistent with guidelines n=156	Antibiotic prophylaxis indication inconsistent with guidelines n=27	P-value
Age, mean + StDev	62.2 \pm 12.0	60.7 \pm 16.6	0.65
Male sex, n (%)	148 (94.9)	25 (92.6)	0.64
White, n (%)	108 (69.2)	22 (81.5)	0.19
Extraction, n (%)	105 (67.3)	14 (51.9)	0.12
Periodontal surgery, n (%)	79 (50.6)	15 (55.6)	0.33
Penicillin allergic, n (%)	23 (14.7)	3 (11.1)	0.77
Orthopedic joint, n (%)	8 (5.1)	1 (3.7)	1.0

Conclusions

- While the majority of patients indicated for prophylaxis did receive antibiotics, 84.9% (n=141) received post-procedure antibiotics for a mean of 7.2 days when only pre-procedure administration was indicated (excess = 824 days in the cohort).
- The majority of patients that underwent a dental procedure were administered antibiotic prophylaxis. However, **only 8.2%** of antibiotic prescribing for infection prophylaxis was appropriate based on currently available evidence.
- Almost half of patients prescribed clindamycin did not have a penicillin allergy noted
- Modifying post-procedure antibiotic prescribing for implants and extractions to only one dose prior to the procedure could significantly decrease overprescribing in dentistry.
- Guidelines beyond the prevention of infective endocarditis and prosthetic joint infections should be developed to provide guidance in prescribing of antibiotics for prophylaxis.
- Implementing antimicrobial stewardship efforts in dental clinics is essential to improve antibiotic prescribing in dentistry.

Acknowledgements/Disclaimer

- Funding: The Department of Veterans Affairs, Veterans Health Administration, Office of Research and Development, RR&D (B-1583-P).
- The views expressed in this presentation are the presenters and do not necessarily reflect the position or policy of the Department of Veterans Affairs or the U.S. government.