

# Antibiotic Prescriptions Associated With Dental-Related Emergency Department Visits



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**Study objective:** The frequency of antibiotic prescribing and types of antibiotics prescribed for dental conditions presenting to the emergency department (ED) is not well known. The objective of this study is to quantify how often and which dental diagnoses made in the ED resulted in an antibiotic prescription.

**Methods:** From 2011 to 2015, there were an estimated 2.2 million (95% confidence interval [CI] 1.9 to 2.5 million) ED visits per year for dental-related conditions, which accounted for 1.6% (95% CI 1.5% to 1.7%) of ED visits. This is based on an unweighted 2,125 observations from the National Hospital Ambulatory Medical Care Survey in which a dental-related diagnosis was made.

**Results:** An antibiotic, most often a narrow-spectrum penicillin or clindamycin, was prescribed in 65% (95% CI 61% to 68%) of ED visits with any dental diagnosis. The most common dental diagnoses for all ages were unspecified disorder of the teeth and supporting structures (44%; 95% CI 41% to 48%; *International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM] code 525.9*), periapical abscess without sinus (21%; 95% CI 18% to 25%; ICD-9-CM code 522.5), and dental caries (18%; 95% CI 15% to 22%; ICD-9-CM code 521.0). Recommended treatments for these conditions are usually dental procedures rather than antibiotics.

**Conclusion:** The common use of antibiotics for dental conditions in the ED may indicate the need for greater access to both preventive and urgent care from dentists and other related specialists as well as the need for clearer clinical guidance and provider education related to oral infections. [*Ann Emerg Med.* 2019;74:45-49.]

Please see page 46 for the Editor's Capsule Summary of this article.

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## INTRODUCTION

### Background

A recent Centers for Disease Control and Prevention (CDC) study estimated that as many as 30% of antibiotic prescriptions in the outpatient setting are unnecessary.<sup>1</sup> Overall, antibiotic use in the outpatient setting accounted for 269.4 million courses of antibiotics prescribed in the US health care system in 2015 alone, with 14.8 million antibiotic prescriptions per year prescribed by emergency physicians.<sup>2</sup> The emergency department (ED) is a source of care for many individuals in the United States not only for emergencies but also for complaints that could have otherwise been treated in other settings. In fact, one recent study examining 424 million ED visits suggested that as many as 3.3% of ED visits (14,123,939 visits) did not require any diagnostic or screening services, procedures, or medications, and the patients were discharged home; and the top 3 *International Classification of Diseases, Ninth Revision (ICD-9)* diagnoses associated with these visits

included dental disorders (along with alcohol abuse and depressive disorders).<sup>3</sup> Although it has long been recognized that there are opportunities to improve antibiotic prescribing for many common diagnoses in outpatient settings, including the ED, one potentially overlooked area for improvement is dental conditions.<sup>1,4</sup> There has been increased attention focused on understanding and improving antibiotic prescribing by dentists in recent years, including reporting the most commonly prescribed antibiotics and characteristics of patients receiving them.<sup>5,6</sup> Of all antibiotic courses prescribed in ambulatory care, general dentists prescribe nearly 10%, which includes antibiotics prescribed to treat presumed infections, as well as those prescribed as prophylaxis before dental procedures.<sup>5</sup> However, dental care is often sought in the ED instead of dental offices or clinics, and the diagnoses and prescriptions associated with these visits are not as well described in the literature. Additionally, studies have shown that without obvious

**Editor's Capsule Summary***What is already known on this topic*

Little is known about the frequency of antibiotic prescribing among emergency department (ED) patients presenting with dental complaints.

*What question this study addressed*

According to the National Hospital Ambulatory Medical Care Survey during 2011 to 2015, what is the frequency of various ED dental diagnoses and associated rates of antibiotic prescriptions?

*What this study adds to our knowledge*

Dental-related diagnoses accounted for approximately 2.2 million (1.6%) ED visits annually. The most common dental diagnostic codes were unspecified disorders of the teeth and supporting structures (44%), periapical abscess (21%), and dental caries (18%). Antibiotics, usually a narrow-spectrum penicillin or clindamycin, were prescribed in 65% of these encounters. Recommended treatments for many of these tooth-pain-related presentations are dental procedures, not antibiotics. The common use of antibiotics may indicate an unmet need for preventive and urgent dental care access.

*How this is relevant to clinical practice*

Emergency providers should consider the appropriateness of antibiotic prescribing for patients presenting with dental complaints and assist with referral to a dentist for evaluation and preventive care.

signs of infection, antibiotics are not necessary for many dental complaints.<sup>7</sup> The objective of this study was to quantify the frequency of prescribing antibiotics for dental conditions treated in the ED.

**MATERIALS AND METHODS****Selection of Participants and Data Collection and Processing**

This is a secondary analysis of visits to the ED for dental conditions during 2011 to 2015, using the National Hospital Ambulatory Medical Care Survey (NHAMCS), which is an annual survey conducted by the National Center for Health Statistics. NHAMCS uses a multistage probability sampling design to select a nationally representative set of participating hospital-based EDs and patient visits. Data in NHAMCS reflect information about

patient demographics, diagnoses (coded with *International Classification of Diseases, Ninth Revision, Clinical Modification* [ICD-9-CM] codes), and the medications prescribed. Each visit is associated with a weight—equal to the inverse probability of that visit's being selected in the survey—that allows generation of nationally representative estimates.

In our study, a visit was considered a “dental-related condition” if it was associated with any of the following ICD-9-CM codes: 520 to 526, 528, 784.92, V52.3, V53.4, V58.5, and V72.2 (Table 1). Antibiotic classes considered included penicillins, cephalosporins, macrolides, quinolones, sulfonamides, tetracyclines, lincosamide derivatives, aminoglycosides, carbapenems, and miscellaneous antibiotics (eg, vancomycin). We excluded known topical formulations because the risks of adverse events and future antibiotic resistance are increased with systemic versus topical antibiotics. Antibiotic prescribing for dental-related conditions was described according to patient age, insurance status, and US Census region.

**Primary Data Analysis**

All analyses were performed with Stata (version 14; StataCorp, College Station, TX) and accounted for the complex survey design, including patient visit weights, strata, and primary sampling unit variables.  $\chi^2$  Tests were used to compare differences in proportions. Statistical significance was considered at a 2-sided  $P < .05$ .

**RESULTS**

From 2011 to 2015, there were an estimated 2.2 million (95% confidence interval [CI] 1.9 to 2.5 million) ED visits per year for dental-related conditions, which accounts for 1.6% (95% CI 1.5% to 1.7%) of all ED visits during this period. An antibiotic was prescribed in 65% (95% CI 61% to 68%) of ED visits with any dental-related diagnosis, which reflects an estimated 1.4 million (95% CI 1.2 to 1.6 million) visits resulting in antibiotic prescriptions (Table 1). Sixty-six percent (95% CI 62% to 69%) of dental-related ED antibiotic prescriptions were for penicillins, nearly all of which were narrow-spectrum penicillins (ie, penicillin or amoxicillin). Clindamycin accounted for nearly one quarter of dental-related ED antibiotic prescriptions (Table 2). The most common dental-related diagnoses made in the ED for all ages were unspecified disorder of the teeth and supporting structures (44%; 95% CI 41% to 48%; ICD-9-CM code 525.9), periapical abscess without sinus (21%; 95% CI 18% to 25%; ICD-9-CM code 522.5), and dental caries (18%;

**Table 1.** Average annual number of ED visits, including those in which an antibiotic was prescribed, for dental conditions by ICD-9 code, 2011 to 2015.

Diagnosis	ICD-9 Code	Raw No. of Visits With Diagnosis	Weighted No. (95% CI) of Visits (Average Annual) With Diagnosis	Weighted No. (95% CI) of Visits in Which Antibiotics Were Prescribed (Average Annual)	Proportion (95% CI) of Visits for Diagnosis in Which Antibiotics Were Prescribed, %
Diseases of hard tissues of teeth	521	356	348,786 (277,130–420,443)	259,583 (197,685–321,480)	74 (66–81)
Diseases of pulp and periapical tissues	522	406	418,311 (339,547–497,075)	355,294 (283,530–427,058)	85 (80–90)
Gingival and periodontal disease	523	100	102,655 (72,928–132,381)	55,931 (33,988–77,873)	54 (40–68)
Other diseases and conditions of teeth and supporting structures	525	928	961,842 (802,233–1,121,452)	630,649 (521,417–739,881)	66 (61–70)
Diseases of the oral soft tissues, excluding lesions specific for gingiva and tongue	528	173	173,636 (126,713–220,559)	42,107 (26,693–57,520)	24 (16–34)
Jaw pain	784.92	87	95,381 (66,144–124,618)	46,640 (22,170–71,110)	49 (33–65)
Any dental diagnosis		2,125	2,177,601 (1,885,381–2,469,820)	1,409,550 (1,208,671–1,610,428)	65 (61–68)

The following diagnoses included fewer than 30 observations and were not analyzed because of small numbers: disorders of tooth development and eruption (520); dentofacial anomalies, including malocclusion (524); diseases of the jaws (526); procedures/aftercare for dental prosthetic device (V52.3); procedures/aftercare for fitting orthodontic devices (V53.4); procedures/aftercare for unspecified orthodontic care (V58.5); and dental examination (V72.2).

95% CI 15% to 22%; ICD-9-CM code 521.0). Of the visits with a diagnosis of dental caries, an antibiotic was prescribed 75% of the time (Table 3).

Visits by children younger than 18 years for dental-related ED visits were much less likely to result in an antibiotic prescription (23%; 95% CI 16% to 31%) than adult visits (69%; 95% CI 66% to 72%) ( $P < .001$ ) (Table E1, available online at <http://www.annemergmed.com>). Antibiotic prescribing also varied by insurance status. Approximately three quarters (74%; 95% CI 69% to 79%) of self-pay patients with dental-related complaints received antibiotics in the ED, followed by patients with private insurance (62%; 95% CI 50% to 73%), Medicaid or a Children's Health Insurance Program (CHIP) (60%; 95% CI 54% to 65%), and Medicare (58%; 95% CI 47% to

68%) ( $P = .03$ ) (Table E1, available online at <http://www.annemergmed.com>).

## LIMITATIONS

There are limitations associated with this study. As with all studies using NHAMCS data, indications for antibiotics were based on diagnosis codes available in the NHAMCS data set, which were not directly linked to medications mentioned during the visit. Additionally, because the data are based on the diagnosis assigned to the visit by the clinician, they may not reflect the actual diagnosis in some cases and are often not specific. It is therefore not possible to know for certain that the antibiotic prescribed during any visit was for a specific diagnosis, or to know the severity

**Table 2.** Antibiotic classes and common antibiotics prescribed for dental conditions in the ED, 2011 to 2015.

Antibiotic Class and Common Antibiotics	Raw No. of Visits in Which Antibiotic Was Prescribed	Weighted No. of Visits (95% CI) in Which Antibiotic Was Prescribed (Average Annual)	Proportion (95% CI) of Dental-Related Visits With Antibiotic Prescribed, %	Proportion (95% CI) of Antibiotics for Dental Conditions, %
Penicillins	958	929,738 (789,403–1,070,074)	43 (40–46)	66 (62–69)
Amoxicillin	313	299,305 (231,655–366,955)	14 (12–16)	21 (18–25)
Amoxicillin-clavulanate	58	55,936 (33,468–78,404)	3 (2–4)	4 (3–6)
Penicillin	589	577,548 (480,761–674,336)	27 (24–29)	41 (37–45)
Cephalosporins	92	78,958 (52,749–105,167)	4 (3–5)	6 (4–8)
First-generation cephalosporins	56	44,599 (26,393–62,805)	2 (1–3)	3 (2–5)
Clindamycin	341	405,037 (325,843–484,231)	19 (16–21)	29 (25–32)
Any antibiotics	1,395	1,409,550 (1,208,671–1,610,428)	65 (61–68)	100

**Table 3.** Most common dental ICD-9 codes for which antibiotics were prescribed in the ED, 2011 to 2015.

Diagnosis	ICD-9 Code	Raw No. of Visits With Diagnosis and Antibiotics Prescribed	Weighted No. (95% CI) of Visits in Which Antibiotics Were Prescribed (Average Annual)	Proportion (95% CI) of Antibiotics Prescribed for Specific Dental Conditions (Overall), %	Proportion (95% CI) of Visits for This Condition for Which Antibiotics Were Prescribed, %
Unspecified disorder of the teeth and supporting structures	525.9	611	622,300 (514,353–730,246)	44 (41–48)	66 (61–71)
Periapical abscess without sinus	522.5	284	302,183 (240,564–363,802)	21 (18–25)	84 (78–88)
Dental caries	521.0	259	257,611 (195,786–319,436)	18 (15–22)	75 (66–82)
Other	*	164	157,736 (116,880–198,591)	11 (9–14)	50 (42–59)

\*Includes ICD-9 diagnoses with fewer than 30 visits. These include jaw pain (784.92), acute apical periodontitis of pulpal origin (522.4), other and unspecified diseases of the oral soft tissues (528.9), chronic gingivitis (523.1), cellulitis and abscess of oral soft tissues (528.3), and acute gingivitis (523.0).

of the condition. Low numbers in the samples of adults and pediatric patients limited the power to compare these 2 groups adequately. Finally, there are additional settings of care outside of traditional EDs, such as stand-alone EDs or urgent care centers, that are not captured by this data source and would not be represented in this analysis.

## DISCUSSION

Of the approximately 2.2 million ED visits annually for dental-related conditions, a majority (65%) resulted in an antibiotic prescription. Although it is likely that some of the 2.2 million visits warranted antibiotic treatment and were urgent, it is also likely that many dental complaints commonly treated in the ED are for issues related to tooth or mouth pain that might be more appropriate for outpatient dental visits and may not require antibiotic treatment. The most common diagnoses related to dental complaints treated in the ED were unspecified disorder of the teeth and supporting structures, periapical abscess without sinus, and dental caries, most of which require definitive management by dentists to treat the cause of the infection or pain. Current guidance for the treatment of many dental infections recommends procedures such as draining or cleaning an infected site as the preferred treatment rather than antibiotics.<sup>7-9</sup> However, there is a need for more robust and definitive clinical guidance for common oral conditions that can be used by dentists and other providers treating these conditions. In most cases, EDs do not have a dentist consultant available; thus, antibiotics may be used as a bridge therapy until the patient can consult a dentist. Additionally, by the time a patient seeks care in the ED for a dental-related condition, it may have progressed to the point at which a provider believes an antibiotic to be the best treatment. ED providers may also be concerned about whether the patient will follow up with a dental provider after leaving the ED, which may influence

providers' decisions to prescribe antibiotics. When antibiotics were prescribed for dental conditions in the ED, narrow-spectrum penicillins were most likely to be prescribed, which aligns with current clinical guidelines for the treatment of dental conditions when antibiotics are necessary.<sup>10,11</sup>

Limited access to dental care has been shown to be a barrier to preventive care and treatment of minor complaints for many persons in the United States.<sup>12</sup> Lack of access to or the underuse of preventive and urgent dental care, especially among adults, may lead to dental conditions that necessitate emergency treatment. Ideally, urgent dental conditions would be treated by a dentist or dental specialist; however, because access to dental care is unavailable to many individuals in the United States, patients with dental conditions often seek care in the ED.

Dental visits are an important proportion of visits to the ED in which antibiotics are prescribed, particularly for adults. It is possible that many of these visits are due to lack of access to a dentist for many patients. Many common dental conditions treated in the ED that result in antibiotic prescriptions, such as dental caries or localized oral infections, could be treated by a dentist in the outpatient setting and potentially result in no antibiotics prescribed if identified early. Although this was not directly determined by this study, it is likely that more accessible dental care, including both preventive and urgent, could reduce the number of patients treated in EDs for dental complaints, as well as potentially unnecessary antibiotic prescriptions. Clear and updated clinical guidance for the treatment of common oral infections would also be useful to dentists and other providers who are treating patients presenting with dental complaints. Additional randomized controlled studies could be used to further evaluate the utility of antibiotics for patients presenting with dental infections. Specific training for ED clinicians on common dental conditions could also improve the management of these

conditions that are treated in the ED. Public health professionals, health care providers, community and professional organizations, and other stakeholders focused on improving access to health care should look closely at how patients are seeking dental care and what can be done to improve access in an effort to improve the quality of health care being delivered in the United States.

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