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Antibiotic Prescriptions Associated with Dental-Related Emergency Department Visits

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Abstract

Antibiotic prescribing for dental conditions in the emergency department (ED), is poorly understood. The objective of this study was to quantify how often and which dental diagnoses seen in the ED resulted in an antibiotic prescription. From 2010–2015, there were 2.2 million ED visits per year for dental-related conditions, which accounted for 1.6% of ED visits. An antibiotic, most often a narrow-spectrum penicillin or clindamycin, was prescribed in 65% of ED visits with any dental diagnosis. The most common dental diagnoses seen in the ED for all ages were unspecified disorder of the teeth and supporting structures (44%, ICD-9-CM code 525.9), periapical abscess without sinus (21%, ICD-9-CM code 522.5) and dental caries (18%, ICD-9-CM code 521.0).

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Recommended treatments for these conditions are usually dental procedures rather than antibiotics. The common use of antibiotics for dental conditions in the ED indicates the need for greater access to both preventative and urgent care from dentists and other related specialists as well as the need for clearer clinical guidance related to oral infections.

Background and introduction

A recent CDC study estimated that as many as 30% of antibiotic prescriptions in the outpatient setting are unnecessary. [1] Overall antibiotic use in the outpatient setting accounted for 269.4 million courses of antibiotics prescribed in the U.S. healthcare system in 2015 alone, with 14.8 million antibiotic prescriptions per year prescribed by emergency department (ED) physicians. [2] The 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 seen in other settings. In fact, one recent study examining 424 million ED visits suggested that as many as 3.3% ED visits (14,123,939 visits) did not require any diagnostic or screening services, procedures or medications, and were discharged home – and the top three ICD-9 diagnoses associated with these visits included dental disorders (along with alcohol abuse and depressive disorders). [3] While 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. [1,4] 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. [5,6] 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 prior to dental procedures. [5] However, dental care is often sought in the ED instead of dental offices or clinics and the diagnoses and prescriptions associated with these visits is not as well described in the literature. . Additionally, studies have shown that without obvious signs of infection, antibiotics are not necessary for many dental complaints. [7] The objective of this study was to quantify the frequency of prescribing antibiotics for dental conditions seen in the ED.

Methods

Data Source and Participants

This is a secondary analysis of visits to the ED for dental conditions during 2011–2015 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 using *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 being selected in the survey — that allows for 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: 520–526, 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 (e.g., vancomycin). We excluded known topical formulations, as the risks of adverse events and for 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 U.S. Census region.

Analysis

All analyses were performed using Stata 14 (Stata Corp, College Station, TX) and accounted for the complex survey design, including patient visit weights, strata, and primary sampling unit variables. Chi-square tests were used to compare differences in proportions. Statistical significance was considered at a 2-sided P value <0.05.

Results

From 2011–2015, there an estimated 2.2 million (95% CI: 1.9–2.5 million) ED visits per year for dental-related conditions, which accounts for 1.6% (95% CI: 1.5–1.7%) of all ED visits during this time period. An antibiotic was prescribed in 65% (95% CI: 61–68%) of ED visits with any dental-related diagnosis, which reflects an estimated 1.4 million (95% CI: 1.2–1.6 million) visits resulting in antibiotic prescriptions (Table 1). Sixty-six percent (95% CI: 62–69%) of dental-related ED antibiotic prescriptions were for penicillins, nearly all of which were narrow-spectrum penicillins (i.e., penicillin or amoxicillin). Clindamycin accounted for nearly one quarter of dental-related ED antibiotic prescriptions (Table 2). The most common dental-related diagnoses seen in the ED for all ages were unspecified disorder of the teeth and supporting structures (44%, 95% CI: 41–48%, ICD-9-CM code 525.9), periapical abscess without sinus (21%, 95% CI: 18–25%, ICD-9-CM code 522.5) and dental caries (18%, 95% CI: 15–22%, 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 <18 years of age for dental-related ED visits were much less likely to result in an antibiotic prescription (23%, 95% CI: 16–31%) than adult visits (69%, 95% CI: 66–72%) ($p<0.0001$) (Supplemental Table). Antibiotic prescribing also varied by insurance status. Approximately three quarters (74%, 95% CI: 69–79%) of self-pay patients with dental related complaints received antibiotics in the ED. followed by patients with private insurance (62%, 95% CI: 50–73%), Medicaid/CHIP (60%, 95% CI: 54–65%) and Medicare (58%, 95% CI: 47–68%) ($p=0.03$) (Supplemental Table).

Discussion

Of the approximately 2.2 million ED visits annually for dental-related conditions, a majority (65%) resulted in an antibiotic prescription. While it is likely that some of the 2.2 million visits warranted antibiotic treatment and were urgent in nature, it is likely that many dental complaints commonly seen 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 seen 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 recommend procedures such as draining or cleaning an infected site as the preferred treatment rather than antibiotics. [7–9] However, there is a need for more robust and definitive clinical guidance for common oral conditions that can be utilized by dentists as well as 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 see 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 where 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. On a positive note, when antibiotics were prescribed for dental conditions in the ED, narrow-spectrum penicillins were most likely to be prescribed, which is in-line with current clinical guidelines for the treatment of dental conditions when antibiotics are necessary. [10,11]

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. [12] Lack of access to or the underutilization 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 as access to dental care is unavailable to many in the U.S, patients with dental conditions often seek care in the ED.

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 dataset, which were not directly linked to medications mentioned during the visit. Additionally, as the data is based on the diagnosis assigned to the visit by the clinician, it may not reflect the actual diagnosis in some cases and is 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 the severity of the condition. Low numbers in the samples of adults and pediatric patients limited the power to compare these two groups adequately. Finally, there are additional settings of care outside of traditional EDs such as stand-alone EDs or urgent care centers which are not captured by this data source and would not be represented in this analysis.

Conclusions

Dental visits are an important proportion of visits to the ED in which antibiotics are prescribed, particularly in 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 seen 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. More accessible dental care, including both preventative and urgent, could reduce the number of patients seen 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 that 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 seen in the ED. Public health professionals, healthcare providers, community and professional organizations and other stakeholders focused on improving access to healthcare 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 healthcare being delivered in this country.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1:

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

Diagnosis	ICD-9 Code	Raw number of visits with diagnosis	Weighted number (95% CI) of visits (average annual) with diagnosis	Weighted number (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 due to 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).

Table 2:

Antibiotic classes and common antibiotics prescribed for dental conditions in the ED, 2011–2015

Antibiotic class and common antibiotics	Raw number of visits in which antibiotic was prescribed	Weighted number 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, 2010–2015

Diagnosis	ICD-9 Code	Raw number of visits with diagnosis and antibiotics prescribed	Weighted number (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).