Antibiotic and opioid prescribing for dental-related conditions in emergency departments:

United States, 2012 through 2014

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Abstract

Background.—Patients visiting the emergency department (ED) for nontraumatic dental conditions usually receive nondefinitive health care and are referred to treatment elsewhere. This may lead to potentially avoidable antibiotic and opioid use.

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention or the US Food and Drug Administration.

Methods.—A retrospective study was conducted in IBM MarketScan Research Databases in Treatment Pathways from 2012 through 2014. This study included patients with commercial insurance or enrolled in Medicaid. Patients receiving a diagnosis of a dental condition in the ED with no secondary diagnosis warranting an antibiotic prescription were included. Patients were stratified on the basis of the primary payer and available demographics, as well as on the basis of repeat visits to the ED.

Results.—A higher proportion of Medicaid beneficiaries (280,410, 4.9%) had dental-related visits compared with the commercially insured (159,066, 1.3%). The most common diagnoses were similar for both groups and included caries. In both cohorts, the 18- through 34-year age group had the highest rate of dental-related ED visits. Within 7 days of a dental-related ED visit, 54.9% of Medicaid beneficiaries and 55.0% of commercially insured beneficiaries filled a prescription for an antibiotic and 39.6% of Medicaid patients and 42.0% of commercially insured patients filled an opioid prescription.

Conclusions.—Antibiotics and opioids are frequently prescribed during ED visits for dental conditions. Access to preventive and acute oral health care for routine dental symptoms, such as caries, may reduce unnecessary prescriptions in both the commercially insured and Medicaid beneficiary populations.

Practical Implications.—Treatment of dental conditions in the ED often indicates a lack of access to preventive or acute oral health care. Data-driven solutions, such as guideline implementation, could improve oral health access, reduce medication-related harms, and avert health care expenditures.

Keywords

Antibiotic prescribing; opioid prescribing; emergency department; access to care

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Overprescribing of antibiotics and opioids has major public health implications in the United States.[1,2] The use of antibiotics, whether necessary or not, leads to antibiotic resistance.[1] Understanding how and why antibiotics are used is critical in reducing illness and death caused by resistance and adverse drug events.[3] Prescription opioid use has increased since the late 1990s and is a contributing factor, along with illicit opioid use, to overdoses and death.[2] Variability in prescribing of both antibiotics and opioids across states and by race or ethnicity and sex suggests improved clinical guidance or more consistent adherence to guidance for antibiotic and opioid prescribing may be needed, as well as a closer look at the indications for prescribing.[2,4–6]

Studies have explored specific diagnoses associated with antibiotic prescriptions, and similarly, diagnoses associated with opioid prescriptions.[7–11] Diagnoses requiring an antibiotic do not necessarily require an opioid and vice versa, although frequent coprescribing has been documented among health care providers, including dentists and in the emergency department (ED) for dental conditions.[12–15] In addition, patients in EDs seeking treatment for dental symptoms are typically not evaluated by dentists. A 2019 Canadian review that explored factors associated with ED use for nontraumatic dental problems found that the inability to obtain or afford preventive oral health care, along with other economic, social, and demographic influences, may be reasons patients seek treatment

at the ED for nontraumatic dental conditions.[16] Studies in the United States have also found that patients accessing the ED for nontraumatic dental conditions do so because they are unable to access appropriate and timely preventive oral health care.[17,18] To better understand the frequency and patterns of antibiotic and opioid prescribing for dental-related ED visits in the United States, we analyzed commercial and Medicaid administrative claims data from 2012 through 2014. Our objective was to better understand and describe antibiotic and opioid prescribing by ED providers for dental-related conditions, and our hypothesis was that antibiotics and opioids would be commonly prescribed at the same time for dental conditions.

METHODS

We conducted a retrospective study using the IBM MarketScan Research Databases in Treatment Pathways, which capture convenience samples of medical claims data for people with employer-sponsored commercial insurance (Commercial Database) and people with Medicaid coverage (Multi-State Medicaid Database). Treatment Pathways includes data from many large employer health plans as well as a number of states. Data include whether service was inpatient or outpatient, diagnosis codes, prescription drug fills, and health insurance enrollment. We did not have access to dental claims for the people captured in this analysis, only medical claims through commercial or Medicaid coverage. We identified people in each payer group (commercial and Medicaid) with prescription coverage and at least 1 ED visit (all diagnoses) from 2012 through 2014 who were also continuously enrolled at least 67 days after their first ED visit. A length of 67 days was selected to allow us to look for a second dental-related ED visit within 30 and 60 days of the first visit and associated prescriptions within 7 days of the second visit. We then identified a subset of those who had a dental-related ED visit (*International Classification of Diseases, Clinical Modification, Ninth Revision* [ICD-9-CM] codes 520.xx-529.xx).[19] From this subset, we excluded people with at least 1 nondental diagnosis from any captured medical visit within 7 days of the ED visit that always or sometimes warrants an antibiotic. For both the index visit (which was the first occurrence of a dental ICD-9-CM diagnosis code in the study period) and subsequent visits (if any) we used the list of nondental diagnoses that always or sometimes warrant an antibiotic from a previously described tiered system of ICD-9-CM codes to eliminate visits for which an antibiotic was likely warranted.[8] We categorized the remaining into 2 groups (per payer type) of patients seen in the ED: 1 group with a dental-related diagnosis and 1 group without a dental-related diagnosis during their ED visit.

We compared demographic characteristics of these groups separately for commercial and Medicaid populations and performed Pearson χ^2 tests. Owing to the large sample size, significance was considered at *P* less than .0001. Available demographic variables varied by payer type. For the groups with dental-related ED visits, we calculated the percentage of patients who filled at least 1 antibiotic, opioid, or non-opioid analgesic prescription, as well as various combinations of these drug types within 7 days of the ED visit. We also determined which types of opioids and antibiotics were most commonly prescribed, as well as whether there were repeat visits that resulted in subsequent prescriptions. Finally, we identified the most common dental diagnoses during these visits. The Centers for Disease Control and Prevention National Center for Emerging and Zoonotic Infectious Diseases

human subjects advisor determined that the analysis of MarketScan data does not involve human subjects under 45 CRF 46.102(f), so institutional review board review was not required.[20]

RESULTS

There were 12.4 million patients in the commercially insured group and 5.8 million in the Medicaid group with prescription coverage and at least 1 ED visit (all diagnoses) from 2012 through 2014 who were also continuously enrolled at least 67 days after their first ED visit.

A higher proportion of Medicaid than commercially insured enrollees with ED visits had dental-related ED visits: 4.9% (280,410) and 1.2% (159,066), respectively (*P* < .0001).

Of Medicaid patients with a dental-related ED visit during the study period, 64.4% were female (Table 1). The rate of diagnosis with a dental-related condition in the ED was higher for female than male patients (1,402 per 100,000 female patients and 988 per 100,000 male patients). Most patients were 34 years and younger, with the largest age cohort seen in the ED for dental conditions being 18 through 34 years (47.2%), followed by 0 through 17 years (29.7%). Over one-half of patients with a dental-related ED visit were white (54.8%; *P* < .0001).

Among patients with employer-sponsored commercial insurance and who had a dental-related ED visit, 51.8% were female. The age group with the most patients among the commercially insured was 18- through 34-year-olds (38.4%), followed by 35- through 44-year-olds (17.0%). The census region with the most patients having claims for a dental-related ED visit was the South (40.8%) (Table 2).

The most common dental-related diagnoses, regardless of whether the patient was prescribed an antibiotic or opioid, were similar for both payer types. Among patients with dental-related ED visits, 44.3% of commercial patients and 54.2% of Medicaid patients received diagnoses of an unspecified disorder of the teeth and supporting structures (ICD-9-CM code 525.9), along with other nonspecific symptoms. Another 9.0% of commercial patients and 27.1% of Medicaid patients received diagnoses of unspecified caries (code 521.00), and 19.1% of commercial patients and 16.0% of Medicaid patients received diagnoses of periapical abscess without sinus (code 522.5).

Prescribing of antibiotics and opioids

Within 7 days of a dental-related ED visit, more than one-half of commercially insured patients (55%) and Medicaid enrollees (54.9%) filled a prescription for an antibiotic. The percentage of patients who filled a prescription for an opioid within 7 days of a dental-related ED visit was also similar to those among patients in both payer groups (Medicaid, 39.6%; commercially insured, 42%). Slightly more commercially insured patients filled prescriptions for both an antibiotic and opioid (33.5%) than did patients with Medicaid (31.9%). Some enrollees in both populations filled prescriptions for a nonopioid analgesic within 7 days of a dental-related ED visit (20.9%, Medicaid; 14%, commercially insured) (Table 3).

For both populations, the opioid acetaminophen and hydrocodone was the most frequently filled medication (29.82%, commercial; 27.92%, Medicaid), followed by penicillin V (16.45%, commercial; 20.02%, Medicaid). Nonopioid analgesics such as ibuprofen and naproxen were filled more frequently in the Medicaid population (ibuprofen, 14.39%; naproxen, 4.67%) than in the commercial population (prescriptions for ibuprofen, not common; naproxen, 2.46%). Other commonly filled medications in both populations were amoxicillin and amoxicillin and clavulanate, clindamycin, acetaminophen and oxycodone, and tramadol hydrochloride (supplemental table; available online at the end of this article). Also in both populations, from 85% through 90% of antibiotic and opioid prescriptions were dispensed on the day of or on the day after the first dental-related ED visit. On examining repeat dental-related ED visits, we found that 3.4% of commercially insured patients returned within 30 days for another dental-related ED visit and 4.6% returned within 60 days (Table 4). Among these patients who returned within 30 days for a dental-related ED visit, 42.4% received a prescription for an antibiotic and 48.4% received a prescription for an opioid. Of the commercially insured patients who returned to the ED within 60 days, 45.3% received a prescription for an antibiotic and 49.3% received a prescription for an opioid. In addition, 28.6% were prescribed both an antibiotic and opioid when returning to the ED within 30 days, and 30.8% were prescribed both when the return visit was within 60 days.

In the Medicaid population, 7.6% returned to the ED within 30 days and 10.8% returned within 60 days. Of the patients who returned to the ED within 30 days, 49.1% were prescribed an antibiotic, 53.2% were prescribed an opioid, and 34.1% were prescribed both. Of those who returned to the ED within 60 days, 53.1% were prescribed an antibiotic, 53.0% were prescribed an opioid, and 36.2% were prescribed both.

Nonopioid analgesics were prescribed infrequently on return ED visits in both populations, although at a slightly higher rate in the Medicaid group.

DISCUSSION

We found that antibiotic and opioid coprescribing was common in 2012 through 2014, with more than 30% of patients who received a diagnosis of a dental condition in the ED being given both an antibiotic and opioid at the initial visit. This was similar for those patients who then returned to the ED within 30 or 60 days for a dental-related condition. Given previous findings that dental-related diagnoses are a common and potentially avoidable reason for ED visits,[21] the prescribing of antibiotics and opioids for these conditions becomes even more concerning.

Antibiotics were prescribed in approximately 55% of dental-related ED visits, with or without an opioid (55.0%, commercial; 54.9%, Medicaid). Many of the dental-related diagnoses in our study that resulted in an antibiotic prescription in the ED could have been avoided with access to both acute and preventive oral health care, which is a barrier for many patients. This barrier is likely why ED visits for dental conditions were more common in patients enrolled in Medicaid, a patient population for whom dental benefits are not common.[22–24] Dental caries (ICD-9-CM code 521.0), which was one of the most common

dental-related diagnoses associated with an ED visit in our study, is not an indication requiring antibiotic treatment,[25] can be appropriately treated in dental settings, and thus is an example of how improved access to preventive or acute dental health care could reduce unneeded ED visits and associated antibiotic and opioid prescriptions. Although guidance for the treatment of dental infections is limited, the guidance that is available recommends procedures such as draining or prophylaxis and restoring an infected site as the preferred definitive treatments, consideration of the timeliness with which these procedures can be performed and whether there is systemic involvement before prescribing an antibiotic.[26–28] Admittedly, these procedures are typically performed in dental offices and are unlikely to be handled in the ED, and therefore ED health care providers may prescribe pain relief agents, antibiotics, or both as palliative health care until more specialized health care can be received. Similar findings of common dental diagnoses in the ED have been published previously.[29]

Opioids were prescribed in approximately 40% of dental-related visits with or without an antibiotic (42.0%, commercial; 39.6%, Medicaid). This is not surprising as many of the dental diagnoses seen in this study would likely be associated with pain. A 2018 overview of systemic reviews,[30] as well as a 2018 policy statement by the American Dental Association,[31] indicate that, in general, a combination of ibuprofen and acetaminophen can be just as effective as any opioid-containing medications and that dentists should consider nonopioids for acute pain management.[30,31] An additional study using MarketScan Research Databases and Prescription Drug Monitoring Program data found that among all opioids prescribed by dentists from 2010 through 2015, just over 30% were for nonsurgical visits, and most of these were for restorative procedures, many of which could be treated with nonopioid analgesics.[32] A 2019 study comparing opioid prescribing by dentists in the United States and England found that of all prescriptions written by US dentists, 22.3% were written for opioids compared with 0.6% by English dentists, highlighting a potential opportunity to improve prescribing in this setting.[33]

Dental-related visits represent about 2% of all ED visits.[34,35] Although dental-related diagnoses were identified in only a small percentage of ED visits, the total number of visits in these samples was high (280,410, Medicaid; 159,066, commercial). Among the beneficiaries in our study with ED visits, the proportion of these visits that were dental-related was over 3 times higher among those with Medicaid than those who were commercially insured. This highlights potential disparities in terms of access to preventive oral health care and is consistent with earlier reports.[12,24,36]

ED visits for conditions that could be avoided with adequate preventive or acute oral health care or treated by a dentist in an outpatient setting are an additional costly burden to the health care system. In addition, antibiotic prescribing at or after a dental-related ED visit was common, as was opioid prescribing and coprescribing of the 2 medication classes together. The Medicaid population had slightly higher return rates to the ED within 30 and 60 days. Our study design took into account all nondental diagnoses for which an antibiotic could be warranted at the index visit as well as subsequent visits, and therefore we believe that the patients with dental-related ED visits represented here did not have nondental diagnoses requiring an antibiotic prescription. EDs may not have access to dental

consultants who can provide definitive management in the ED, and ED clinicians also may be concerned about the patients' ability to access follow-up dental health care. Important action steps to improve prescribing in this area could include additional training for ED providers on the management of dental conditions. Guidelines released by the American Dental Association on antibiotic use for the management of dental pain may be useful for clinicians seeing patients seeking treatment for dental symptoms in all health care settings.[28] Because most public health efforts to improve antibiotic and opioid use are conducted by distinct subject matter experts in different parts of public health organizations (that is, infectious versus chronic disease), there are likely opportunities for synergistic public health efforts to tackle both problems.

This analysis has limitations. The data set is several years old and may not reflect current medical practice. Because claims do not link antibiotics to visits or diagnoses, assumptions were required to attribute a dental-related diagnosis to prescribed antibiotics or opioids. It is possible that an antibiotic attributed to a dental-related diagnosis could have been unnecessarily prescribed for a nondental condition that did not warrant an antibiotic. We cannot be certain that the index dental visit (the first dental visit of the study period) was for a new dental symptom. However, it is possible that the index visit was a follow-up for a dental visit that occurred before 2012. This would be most likely for index visits occurring in the first few months of 2012. This study did not include medical record review; therefore, some patients may have received verbal recommendations to use over-the-counter nonopioid analgesics, which would not be reflected in these data. Regulatory status changes for some opioid products may have an impact on prescribing, but we cannot assess that with these data. These data do not capture the specialty or site of health care for the prescribing provider. Thus, providers other than the ED providers, including dentists, could have prescribed the antibiotic or opioid. It is possible that a post-ED visit to a dental provider (not captured in these data) for follow-up, and not the ED visit itself, may have resulted in the antibiotic or opioid prescription. It is also possible that some opioid-seeking patients are seeking treatment at the ED with a dental symptom in an effort to receive an opioid prescription, knowing they will not be seen by a dentist, but we are not able to address this with the data set used for this analysis. Misclassification of ED visits is possible as we could not clinically validate ICD-9-CM diagnoses for dental conditions in the claims data. These data represent a convenience sample and may not be generalizable to populations, including many people at least 65 years of age, not captured in MarketScan.[37] We also did not take into account underlying conditions that may influence the decision to prescribe an antibiotic or opioid for a patient, such as HIV infection, diabetes, or immunosuppression.

CONCLUSIONS

Both public health and health care efforts are necessary to improve how antibiotics and opioids are used in the United States, specifically for dental symptoms. Although considerable work has been previously published describing overall antibiotic and opioid prescribing in the United States separately, this study is unique in further exploring the direct relationship between opioid and antibiotic prescribing for patients who receive health care in the ED for dental conditions that should otherwise be provided by a dentist. Improved preventive and acute oral health care, including improved access, could lessen the burden

of patients seeking treatment at the ED; however, this alone will not solve the problem of antibiotic and opioid overprescribing. Additional research examining prescribing patterns for these 2 types of medications for dental symptoms could be useful for better understanding and addressing the various reasons why a patient may seek care in the ED for dental symptoms rather than an outpatient dental setting. Given the apparent relationship between antibiotic and opioid prescribing, public health efforts to tackle this problem should identify where there are opportunities to integrate interventions. Finally, additional clinical guidance on appropriate use of antibiotics and opioids for dental conditions and additional provider education on dental conditions for nondentists will be important for improving the quality of health care in the United States.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

ABBREVIATION KEY

DX	Diagnosis
ED	Emergency department
ICD-9-CM	*International Classification of Diseases, Clinical Modification, Ninth Revision*

References

1. Centers for Disease Control and Prevention. Antibiotic Resistance Threats in the United States, 2019. Available at: https://www.cdc.gov/drugresistance/pdf/threats-report/2019-ar-threats-report-508.pdf. Accessed December 1, 2019.

2. Guy GP Jr, Zhang K, Bohm MK, et al. Vital signs: changes in opioid prescribing in the United States, 2006–2015. MMWR Morb Mortal Wkly Rep. 2017;66(26):697–704. [PubMed: 28683056]

3. Centers for Disease Control and Prevention. Antibiotic Use in the United States, 2017: Progress and Opportunities. Available at: https://www.cdc.gov/antibiotic-use/stewardship-report/pdf/stewardship-report.pdf. Accessed December 1, 2019.

4. Hicks LA, Bartoces MG, Roberts RM, et al. US outpatient antibiotic prescribing variation according to geography, patient population, and provider specialty in 2011. Clin Infect Dis. 2015;60(9):1308–1316. [PubMed: 25747410]

5. Janakiram C, Chalmers NI, Fontelo P, et al. Sex and race or ethnicity disparities in opioid prescriptions for dental diagnoses among patients receiving Medicaid [published correction appears in JADA. 2019;150(10): 817]. JADA. 2018;149(4):246–255. [PubMed: 29599018]

6. Okunseri C, Zheng C, Steinmetz CN, Okunseri E, Szabo A. Trends and racial/ethnic disparities in antibiotic prescribing practices of dentists in the United States. J Public Health Dent. 2018;78(2):109–117. [PubMed: 28857224]

7. Fairlie T, Shapiro DJ, Hersh AL, Hicks LA. National trends in visit rates and antibiotic prescribing for adults with acute sinusitis. Arch Intern Med. 2012;172(19):1513–1514. [PubMed: 23007315]

8. Fleming-Dutra KE, Hersh AL, Shapiro DJ, et al. Prevalence of inappropriate antibiotic prescriptions among US ambulatory care visits, 2010–2011. JAMA. 2016; 315(17):1864–1873. [PubMed: 27139059]

9. Hersh AL, Jackson MA, Hicks LA. Principles of judicious antibiotic prescribing for upper respiratory tract infections in pediatrics. Pediatrics. 2013;132(6):1146–1154. [PubMed: 24249823]

10. Mack KA, Zhang K, Paulozzi L, Jones C. Prescription practices involving opioid analgesics among Americans with Medicaid, 2010. J Health Care Poor Underserved. 2015;26(1):182–198. [PubMed: 25702736]

11. Kenan K, Mack K, Paulozzi L. Trends in prescriptions for oxycodone and other commonly used opioids in the United States, 2000–2010. Open Med. 2012;6(2):e41–e47. [PubMed: 23696768]

12. Sun BC, Chi DL, Schwarz E, et al. Emergency department visits for nontraumatic dental problems: a mixed-methods study. Am J Public Health. 2015;105(5): 947–955. [PubMed: 25790415]

13. Hocker MB, Villani JJ, Borawski JB, et al. Dental visits to a North Carolina emergency department: a painful problem. N C Med J. 2012;73(5):346–351. [PubMed: 23189415]

14. Koppen L, Suda KJ, Rowan S, McGregor J, Evans CT. Dentists' prescribing of antibiotics and opioids to Medicare Part D beneficiaries: medications of high impact to public health. JADA. 2018;149(8):721–730. [PubMed: 29929728]

15. Dana R, Azarpazhooh A, Laghapour N, Suda KJ, Okunseri C. Role of dentists in prescribing opioid analgesics and antibiotics: an overview. Dent Clin North Am. 2018;62(2):279–294. [PubMed: 29478458]

16. VanMalsen JR, Figueiredo R, Rabie H, Compton SM. Factors associated with emergency department use for non-traumatic dental problems: scoping review. J Can Dent Assoc. 2019;84:j3. [PubMed: 31199731]

17. Ranade A, Young GJ, Garcia R, Griffith J, Singhal A, McGuire J. Emergency department revisits for nontraumatic dental conditions in Massachusetts. JADA. 2019;150(8):656–663. [PubMed: 31235066]

18. Ranade A, Young GJ, Griffith J, Garcia R, Singhal A, McGuire J. Determinants of emergency department utilization for non-traumatic dental conditions in Massachusetts. J Public Health Dent. 2019;79(1):71–78. [PubMed: 30537185]

19. International Classification of Diseases, Clinical Modification, Ninth Revision. Available at: https://www.cdc.gov/nchs/icd/icd9cm.htm. Accessed December 26, 2019.

20. HHS Protection of Human Subjects, Title 45: CFR §46. (2019).

21. Hsia RY, Niedzwiecki M. Avoidable emergency department visits: a starting point. Int J Qual Health Care. 2017;29(5):642–645. [PubMed: 28992158]

22. Vujicic M, Buchmueller T, Klein R. Dental care presents the highest level of financial barriers, compared to other types of health care services. Health Aff. 2016; 35(12):2176–2182.

23. Mostajer Haqiqi A, Bedos C, Macdonald ME. The emergency department as a "last resort": why parents seek care for their child's nontraumatic dental problems in the emergency room. Community Dent Oral Epidemiol. 2016; 44(5):493–503. [PubMed: 27283335]

24. Chalmers NI, Compton RD. Children's access to dental care affected by reimbursement rates, dentist density, and dentist participation in Medicaid. Am J Public Health. 2017;107(10):1612–1614. [PubMed: 28817336]

25. Caufield PW, Dasanayake AP, Li Y. The antimicrobial approach to caries management. J Dent Educ. 2001; 65(10):1091–1095. [PubMed: 11699982]

26. Cope A, Francis N, Wood F, Mann MK, Chestnutt IG. Systemic antibiotics for symptomatic apical periodontitis and acute apical abscess in adults. Cochrane Database Syst Rev. 2014;6:CD010136.

27. Fedorowicz Z, van Zuuren EJ, Farman AG, Agnihotry A, Al-Langawi JH. Antibiotic use for irreversible pulpitis. Cochrane Database Syst Rev. 2013;12:CD004969.

28. Lockhart PB, Tampi MP, Abt E, et al. Evidence-based clinical practice guideline on antibiotic use for the urgent management of pulpal- and periapical-related dental pain and intraoral swelling. JADA. 2019;150(11): 906–921.e12. [PubMed: 31668170]

29. Roberts RM, Hersh AL, Shapiro DJ, Fleming-Dutra KE, Hicks LA. Antibiotic prescriptions associated with dental-related emergency department visits. Ann Emerg Med. 2019;74(1):45–49. [PubMed: 30392733]

30. Moore PA, Ziegler KM, Lipman RD, Aminoshariae A, Carrasco-Labra A, Mariotti A. Benefits and harms associated with analgesic medications used in the management of acute dental pain: an overview of systematic reviews. JADA. 2018;149(4):256–265.e3. [PubMed: 29599019]

31. American Dental Association. Substance use disorders: statement on the use of opioids in the treatment of dental pain, American Dental Association, October 2016. Available at: https://www.ada.org/en/advocacy/current-policies/substance-use-disorders. Accessed December 19, 2019.

32. Gupta N, Vujicic M, Blatz A. Opioid prescribing practices from 2010 through 2015 among dentists in the United States: what do claims data tell us? JADA. 2018; 149(4):237–245.e6. [PubMed: 29599017]

33. Suda KJ, Durkin MJ, Calip GS, et al. Comparison of opioid prescribing by dentists in the United States and England. JAMA Netw Open. 2019;2(5):e194303. [PubMed: 31125102]

34. Health Policy Institute, American Dental Association. Emergency Department Visits for Dental Conditions: a Snapshot. Available at: https://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIgraphic_0819_1.pdf?laen Accessed December 1, 2019.

35. Wall T, Nasseh K, Vujicic M. Majority of Dental-Related Emergency Department Visits Lack Urgency and Can Be Diverted to Dental Offices. Available at: https://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIBrief_0814_1.ashx. Accessed December 1, 2019.

36. Chalmers NI. Racial disparities in emergency department utilization for dental/oral health-related conditions in Maryland. Front Public Health. 2017;5:164. [PubMed: 28770189]

37. Adamson DM, Chang S, Hansen LG. Health Research Data for the Real World: the MarketScan Databases. January 2008. Available at: https://www.researchgate.net/publication/281570301_Health_research_data_for_the_real_world_The_MarketScan_databases. Accessed December 1, 2019.

Table 1.

Demographics of MarketScan Medicaid enrollees and those diagnosed with select dental conditions[*] in the emergency department, 2012 through 2014.

PATIENT CHARACTERISTIC	MARKETSCAN MEDICAID ENROLLEES (N = 22,981,080)	ENROLLEES, %	TOTAL NO. OF PATIENTS WITH AT LEAST 1 ED[†] VISIT (ALL DX[‡]) 2012–2014 AND CONTINUOUSLY ENROLLED 67[§] D POSTVISIT (N = 5,757,625)	PATIENTS, %	PATIENTS DIAGNOSED WITH DENTAL CONDITIONS IN ED 2012–2014 (CONTINUOUSLY ENROLLED 67[§] D POSTVISIT AND EXCLUDING TIER 1 OR TIER 2[¶] DX) (N = 280,410)	PATIENTS, % (95% CONFIDENCE INTERVAL)	RATE PER 100,000 MEDICAID ENROLLEES	P VALUE (FROM χ^2 TEST)
Sex								<.0001
Male	10,099,272	43.9	2,462,632	42.8	99,825	35.6 (35.4 to 35.8)	988	
Female	12,881,808	56.1	3,294,993	57.2	180,585	64.4 (64.2 to 64.6)	1,402	
Age Group, y								<.0001
0–17	15,340,057	66.8	3,545,520	61.6	83,395	29.7 (29.6 to 29.9)	544	
18–34	4,579,454	19.9	1,314,058	22.8	132,472	47.2 (47.1 to 47.4)	2,893	
35–44	1,512,144	6.6	402,469	7.0	37,140	13.2 (13.1 to 13.4)	2,456	
45–54	1,095,194	4.8	293,526	5.1	19,469	6.9 (6.9 to 7.0)	1,778	
55–64	342,443	1.5	186,349	3.2	7,585	2.7 (2.6 to 2.8)	2,215	
65[#]	111,788	0.5	15,703	0.3	349	0.12 (0.11 to 0.14)	312	
Mean Age, y	13	NA[**]	17	NA	24	NA	NA	
Race or Ethnicity								<.0001
White	10,930,981	47.6	2,873,981	49.9	153,714	54.8 (54.6 to 55.0)	1,406	
Black	6,484,672	28.2	1,933,210	33.6	90,338	32.2 (32.0 to 32.4)	1,393	
Hispanic	1,556,512	6.8	297,213	5.2	8,147	2.9 (2.8 to 3.0)	523	
Other	740,270	3.2	139,590	2.4	5,034	1.8 (1.8 to 1.9)	680	
Missing	3,268,645	14.2	513,631	8.9	23,177	8.3 (8.2 to 8.4)	709	

[*] *International Classification of Diseases, Clinical Modification, Ninth Revision* codes 520.xx through 529.xx.[19]

Totals for each patient characteristic may not equal 100%, due to rounding.

[†] ED: Emergency department.

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†DX: Diagnosis.

§A length of 67 d was selected to allow a search for a second dental-related ED visit within 30 and 60 d of the first visit and associated prescriptions 1 wk after the second visit.

¶For tier 1 and tier 2 definitions, see Fleming-Dutra and colleagues.[8]

#This specific population is infrequent in this data set as MarketScan does not routinely capture data on people older than 65 y.

**NA: Not applicable.

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Table 2.

Demographics of MarketScan commercially insured enrollees and those diagnosed with select dental conditions[*] in the emergency department, 2012 through 2014.

PATIENT CHARACTERISTIC	MARKETSCAN COMMERCIAL ENROLLEES (N = 99,098,893)	ENROLLEES, %	TOTAL NO. OF PATIENTS WITH AT LEAST 1 ED[†] VISIT (ALL DX[‡] 2012–2014 AND CONTINUOUSLY ENROLLED 67[§] D POSTVISIT (N = 12,397,453)	PATIENTS, %	ALL PATIENTS DIAGNOSED WITH DENTAL CONDITIONS IN ED 2012–2014 (CONTINUOUSLY ENROLLED 67[§] D POSTVISIT AND EXCLUDING TIER 1 OR TIER 2[‖] DX) (N = 159,066)	PATIENTS, % (95% CONFIDENCE INTERVAL)	RATE PER 100,000 COMMERCIAL ENROLLEES	P VALUE (FROM χ^2 TEST)
Sex								< .0001
Male	48,044,029	48.5	5,627,371	45.4	76,728	48.2 (48.0 to 48.4)	160	
Female	51,054,864	51.5	6,770,082	54.6	82,338	51.8 (51.5 to 52.0)	161	
Age Group, y								< .0001
0–17	27,705,328	28.0	2,762,614	22.3	21,108	13.3 (13.1 to 13.4)	76	
18–34	27,198,911	27.4	3,014,815	24.3	61,022	38.4 (38.1 to 38.6)	224	
35–44	14,680,170	14.8	1,687,879	13.6	27,028	17.0 (16.8 to 17.2)	184	
45–54	14,866,564	15.0	1,844,286	14.9	23,812	15.0 (14.8 to 15.2)	160	
55–64	10,220,301	10.3	1,726,305	13.9	16,573	10.4 (10.3 to 10.6)	162	
65[#]	4,427,619	4.5	1,361,554	11.0	9,523	6.0 (5.9 to 6.1)	215	
Mean age, y	32	NA[**]	37	NA	35	NA		
Census Region								< .0001
Northeast	16,726,919	16.9	2,376,805	19.2	33,745	21.2 (21.0 to 21.4)	202	
Midwest	22,167,196	22.4	2,974,712	24.0	38,459	24.2 (24.0 to 24.4)	173	
South	40,074,576	40.4	4,766,020	38.4	64,913	40.8 (40.6 to 41.1)	162	
West	18,113,600	18.3	2,038,327	16.4	19,321	12.1 (12.0 to 12.3)	107	
Missing	2,016,602	2.0	241,589	1.9	2,628	1.7 (1.6 to 1.7)	130	
Population Density/MSA[††]								< .0001
Non-MSA designation	13,789,051	13.9	1,889,270	15.2	30,086	18.9 (18.8 to 19.1)	218	
MSA designation	83,331,263	84.1	10,272,149	82.9	126,390	79.5 (79.3 to 79.7)	152	

PATIENT CHARACTERISTIC	MARKETSCAN COMMERCIAL ENROLLEES (N = 99,098,893)	ENROLLEES, %	TOTAL NO. OF PATIENTS WITH AT LEAST 1 ED[†] VISIT (ALL DX[‡]) 2012–2014 AND CONTINUOUSLY ENROLLED 67[§] D POSTVISIT (N = 12,397,453)	PATIENTS, %	ALL PATIENTS DIAGNOSED WITH DENTAL CONDITIONS IN ED 2012–2014 (CONTINUOUSLY ENROLLED 67[§] D POSTVISIT AND EXCLUDING TIER 1 OR TIER 2[¶] DX) (N = 159,066)	PATIENTS, % (95% CONFIDENCE INTERVAL)	RATE PER 100,000 COMMERCIAL ENROLLEES	P VALUE (FROM χ^2 TEST)
Missing	1,978,579	2.0	236,034	1.9	2,590	1.6 (1.6 to 1.7)	131	

[*] *International Classification of Diseases, Clinical Modification, Ninth Revision* codes 520.xx through 529.xx.[19]

Totals for each patient characteristic may not equal 100%, due to rounding.

[†] E: Emergency department.

[‡] DX: Diagnosis.

[§] A length of 67 d was selected to allow a search for a second dental-related ED visit within 30 and 60 d of the first visit and associated prescriptions 1 wk after the second visit.

[¶] For tier 1 and tier 2 definitions, see Fleming-Dutra and colleagues.[8]

[#] This specific population is infrequent in this data set as MarketScan does not routinely capture data on those older than 65 y.

[**] NA: Not applicable.

[††] MSA: Metropolitan Statistical Area.

Table 3.

Number and percentage of Medicaid and commercially insured patients diagnosed with a dental condition[*] in the emergency department and prescribed an antibiotic, opioid, or nonopioid analgesic within 7 days, 2012 through 2014.

POPULATION	TOTAL ED[†] VISITS (ALL DX[‡])	TOTAL VISITS WITH DENTAL CONDITIONS	PRESCRIBED ANTIBIOTIC, NO. (%)	PRESCRIBED OPIOID, NO. (%)	PRESCRIBED NONOPIOID ANALGESIC, NO. (%)	PRESCRIBED ANTIBIOTIC PLUS OPIOID, NO. (%)	PRESCRIBED ANTIBIOTIC PLUS NONOPIOID ANALGESIC, NO. (%)	PRESCRIBED ANTIBIOTIC PLUS OPIOID PLUS NONOPIOID ANALGESIC, NO. (%)
Medicaid	5,757,625	280,410	153,962 (54.9)	111,011 (39.6)	58,704 (20.9)	89,502 (31.9)	45,441 (16.2)	23,901 (8.5)
Commercial	12,397,453	159,066	87,543 (55.0)	66,770 (42.0)	22,286 (14.0)	53,365 (33.5)	17,547 (11.0)	10,970 (6.9)

[*]*International Classification of Diseases, Clinical Modification, Ninth Revision* codes 520.xx through 529.xx.[19]

[†]ED: Emergency department.

[‡]DX: Diagnosis.

Table 4.

Number of patients with repeat emergency department visits for a dental condition[*] and percentage receiving antibiotics, opioids, and nonopioid analgesics: Medicaid and commercially insured populations, 2012 through 2014.

PERIOD[†]	PATIENTS, NO. (%)	PRESCRIBED ANTIBIOTICS, NO. (%)	PRESCRIBED OPIOIDS, NO. (%)	PRESCRIBED NONOPIOID ANALGESICS, NO. (%)	PRESCRIBED ANTIBIOTICS PLUS OPIOIDS, NO. (%)	PRESCRIBED ANTIBIOTICS PLUS NONOPIOID ANALGESICS, NO. (%)	PRESCRIBED ANTIBIOTICS PLUS OPIOIDS PLUS NONOPIOID ANALGESICS, NO. (%)
Medicaid	280,410						
30 d	21,176 (7.6)	10,406 (49.1)	11,259 (53.2)	4,333 (20.5)	7,230 (34.1)	2,988 (14.1)	1,948 (9.2)
60 d	30,223 (10.8)	16,057 (53.1)	16,019 (53.0)	6,389 (21.1)	10,927 (36.2)	4,684 (15.5)	2,941 (9.7)
Commercial	159,066						
30 d	5,458 (3.4)	2,315 (42.4)	2,641 (48.4)	667 (12.2)	1,563 (28.6)	441 (8.1)	307 (5.6)
60 d	7,330 (4.6)	3,324 (45.3)	3,616 (49.3)	949 (12.9)	2,259 (30.8)	660 (9.0)	443 (6.0)

[*]*International Classification of Diseases, Clinical Modification, Ninth Revision* codes 520.xx through 529.xx.[19]

[†]A second dental-related emergency department visit within 30 and 60 d of the first visit.