Prescription of Opioid and Non-opioid Analgesics for Dental Care in Emergency Departments: Findings from the National Hospital Ambulatory Medical Care Survey

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Abstract

Objective—The aim of this study was to examine trends and associated factors in the prescription of opioid analgesics, non-opioid analgesics, opioid and non-opioid analgesic combinations and no analgesics by emergency physicians for nontraumatic dental condition (NTDC)-related visits. Our secondary aim was to investigate whether race/ethnicity is a possible predictor of receiving a prescription for either type of medication for NTDC visits in emergency departments (EDs) after adjustment for potential covariates.

Methods—We analyzed data from the National Hospital Ambulatory Medical Care Survey for 1997–2000 and 2003–2007, and used multinomial multivariate logistic regression to estimate the probability of receiving a prescription for opioid analgesics, non-opioid analgesics, or a combination of both compared to receiving no analgesics for NTDC-related visits.

Results—During 1997–2000 and 2003–2007, prescription of opioid analgesics and combinations of opioid and non-opioid analgesics increased and that of no analgesics decreased over time. The prescription rates for opioid analgesics, non-opioid analgesics, opioid and non-opioid analgesic combinations and no analgesics for NTDC-related visits in EDs were 43%, 20%, 12% and 25% respectively. Majority of patients categorized as having severe pain received prescriptions for opioids for NTDC-related visits in EDs. After adjusting for covariates, patients with self-reported dental reasons for visit and severe pain had a significantly higher probability of receiving prescriptions for opioid analgesics and opioid and non-opioid analgesic combinations.

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Conclusion—Prescription of opioid analgesics increased over time. ED physicians were more likely to prescribe opioid analgesics and opioid and non-opioid analgesic combinations for NTDC-related visits with reported severe pain.

Keywords

Nontraumatic dental conditions; dental health services; dental care; emergency physicians; opioid analgesics; non-opioid analgesics; toothache

INTRODUCTION

It is well established that nontraumatic dental conditions such as dental caries and periodontal diseases are best managed in dental offices where definitive care and continuity of care can be provided.[1–2] Nontraumatic dental condition (NTDC)-related visits to emergency departments (EDs) have increased over time[1] and have received considerable attention from policymakers and news media such as the New York Times[3]. Most patients with NTDCs present to emergency departments with toothache/pain and mainly receive prescriptions for medication.[2] Although short-term analgesics are critical for managing acute pain, long-term use of analgesics could mask symptoms of underlying injury or disease and create a potential for opioid tolerance, substance abuse and exacerbate drug-seeking behavior among addicts of analgesics. Reducing unnecessary prescription of addictive pain medication is crucial to preventing possible associated side effects.

Researchers show that racial/ethnic minority populations have higher rates of NTDC-related visits to EDs than whites.[1,4,5] Racial/ethnic disparities in the prescription of analgesics in EDs have been well documented for cancer pain, fracture treatment, post-operative pain,[6–12] and nontraumatic conditions such as migraine.[5] Despite the coverage of variability in the prescription of analgesics in emergency departments by the medical literature, little is known regarding the existence of disparities in the area for NTDC-related visits to EDs.

While Okunseri et al. examined national trends in prescription of analgesics and antibiotics in EDs for NTDC visits using the National Hospital Ambulatory Medical Care Survey from 1997 to 2007[2], that study did not specifically examine the prescribing practices of ED physicians for narcotics and non-narcotics for NTDC visits, given that most NTDC patients present with toothache/pain. This gap in knowledge is partly responsible for the slow progress in developing appropriate guidelines for managing NTDCs in emergency departments. The aim of this study was to examine trends in emergency physicians' prescribing practices of opioid analgesics, non-opioid analgesics, combinations (opioid and non-opioid analgesics), and no analgesics for NTDC-related visits to EDs in the United States. We also sought to investigate whether race/ethnicity is a possible predictor of receiving a prescription for either type of medication after adjustment for available covariates.

METHODS

Study Design, Settings and Selection of Participants

We used data from the National Hospital Ambulatory Medical Care Survey for 1997 to 2000 and 2003 to 2007, which is a cross-sectional national survey designed to promote an understanding of the utilization and provision of ambulatory care in hospital emergency and outpatient departments. Years 2001 and 2002 were excluded because information on pain severity, a key predictor of interest was not collected during this time. The data are based on a national sample of visits to the emergency and outpatient departments of non-institutionalized general and short-stay hospitals within the fifty states of the United States of America and the District of Columbia.[13] The data are collected by trained extractors based on review of medical records. A four-stage probability sampling design was used with samples of primary sampling units (which are geographically defined areas), hospitals within primary sampling units, emergency departments within hospitals, and patient visits within emergency departments.[13] Metropolitan Statistical Area (MSA), geographic region, and ownership are relevant to the research question for a variety of reasons, such as the fact that there might be differences in prescription practices between rural and urban areas based on ease of access to care, propensity for default/abuse, etc. Included in the NHAMCS data were sections pertinent to socioeconomic status, race/ethnicity, financing of care, information regarding clinical presentation, diagnosis and treatment.

This study focused on nontraumatic dental condition-related visits as the primary diagnosis. This included all patients with dental conditions not related to trauma in the primary diagnosis field as used in previous studies conducted by our research team as well as in other published studies that have analyzed dental visits to EDs and physicians' offices.[1,2,4,5] Specifically, the following ICD-9-CM (International Classification of Diseases, 9th revision, Clinical Modification) codes were considered to be NTDC-related visits: 521.0–521.9 (diseases of dental hard tissues of teeth), 522.0–522.9 (diseases of pulp and periapical tissues), 523.0–523.9 (gingival and periodontal diseases), 525.3 (retained dental root), and 525.9 (unspecified disorder of the teeth and supporting structures).[2–4,10] The Medical College of Wisconsin and the Marquette University Institutional Review Boards approved the study as exempt.

Measures

The primary outcome measures chosen for this study were proportions of visits where patients received prescriptions for (i) only opioid-containing medications, (ii) only medications not containing opioids (non-steroidal anti-inflammatory drugs or acetaminophen), (iii) both opioid and non-opioid analgesics as separate drug products, and (iii) those who received no analgesics at all. Patients receiving only a combination drug (e.g., combination oxycodone/acetaminophen) were included in the opioid-only group.

The NHAMCS records up to 8 medications associated with each ED visit. Analgesic prescriptions were identified by searching the Multum Lexicon® codes for central nervous system agents (level 1 Lexicon code: 057) with analgesic therapeutic effects (level 2 Lexicon code: 058). Thereafter, analgesics were further classified into opioids (level 3

Lexicon codes 060, 191) and non-opioids (level 3 Lexicon codes 058, 059,061–063, 278). Although there were changes in the drug coding in our study period, we used the program provided by the Center for Disease Control and Prevention for the NHAMCS to recode older drug codes into appropriate Multum categories.

Independent variables included in our analysis were age, gender, race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, other), payer type or expected source of payment (self-pay, Medicare, Medicaid, private insurance, other, unknown), hospital emergency department ownership (voluntary non-profit, government (non-federal), proprietary), provider type (MD, staff), hospital location (Northeast, South, Midwest, West), pain category (severe, moderate, mild, none, unknown), location in a metropolitan statistical area (non-metropolitan statistical area and metropolitan statistical area), and patient-stated reason for visit (dental vs. non-dental). Information on presenting pain was recorded consistently in most years except that it was not collected at all in 2001 and 2002, so both years were excluded from the study.

Statistical Analysis

Our analysis is based on the conceptual framework that ED providers have mainly 4 options for management of pain due to NTDCs: no analgesics, opioids, non-opioids, and combinations of both (opioids and non-opioids).We performed descriptive statistics and used multinomial multivariate logistic regression to examine the probability of receiving a prescription for opioids, non-opioids and combinations compared to no analgesics in EDs for NTDC visits. Multinomial logistic regression gives estimates of the multiplicative effect of each predictor on the relative risk of an outcome category, such as receiving only an opioid prescription, to the reference category of no analgesic prescription. For example, if a patient with mild pain is 1.1 times more likely to receive an opioid-only prescription than no analgesic, and a patient with severe pain is 4.1 times more likely to receive an opioid-only prescription than no analgesic, then the relative risk ratio for severe versus mild pain is 4.1/1.1=3.7. No pre-screening was done to select the predictors; they were selected a priori based on our research question and availability. Prior studies have indicated that pain is the most common presenting complaint for NTDC-related visits to EDs.[2] We chose to include all the prescription options in our analysis so as to have the potential to discuss their public health implications.

We used multiple imputation methodology as implemented in MI and MiAnalyze SAS procedures to incorporate observations with missing payer type (7.0% of observations) and/or ethnicity (20.9%). NHMACS provides imputed ethnicity since 2003, but to make imputation consistent throughout the study period; those imputed values were not used. Missing pain category (26.9%) was treated as a separate category. First, five datasets were generated using a discriminant function based on year, age, sex, and sampling weight for imputing payer type. Next, logistic regression imputation based on year, age, sex, race, payer type, reason for visit and sampling weight was used for Hispanic ethnicity. A complete analysis was performed on each of the five imputed datasets and the estimates were combined into a final value using appropriate averaging.[14] For an additional sensitivity analysis, we repeated the analysis after deleting cases with missing ethnicity or payer type.

The general pattern of findings was similar, but the estimates were further away from the no-difference value. Thus our approach provides more conservative estimates of the effects.

Age was categorized into 6 groups, with cut-offs chosen to approximate the lower and upper 10th and 25th percentiles, and the median in the entire population. A Rao-Scott chi- square test was used to examine differences in the proportion of opioids, non-opioids, combinations and no analgesics prescribed between patient groups and over time. Based on findings from the descriptive statistics, calendar year was treated as a linear continuous predictor in the analyses. Sample estimates were weighted to provide national estimates and standard errors were adjusted to reflect the complex sampling scheme of NHAMCS. The method employed for the adjustment of the complex sampling scheme was based on previous work done by authors such as Stone et al., Potthoff et al., and Tamayo-Sarver et al.[15–17] Reference groups are noted in the tables and text. An alpha level of 0.05 was used throughout to denote statistical significance. All statistical analyses were performed using SAS© software Version 9.2 (SAS Institute Inc, Cary, NC), with the primary model fitted using the Surveylogistic procedure.

RESULTS

A total of 3,762 records with nontraumatic dental condition as the primary diagnosis in ED visits were identified. Table 1 shows the weighted and unweighted frequencies for NTDC-related visits to emergency departments by study population characteristic. Non-Hispanic Whites made up 51%, females 54% and Non-Hispanic Blacks 19% of the study population. More than two-thirds of NTDC visits were made by subjects aged 19–52 years and about 63% had a self-stated dental reason for ED visit. Almost 80% of NTDC visits were in a Metropolitan Statistical Area and in 90% of the visits, an emergency physician was seen. In terms of pain severity, approximately 27% of NTDC visits had a designation of unknown and 30% were stated to be in severe pain. Overall, the largest proportion of NTDC visits were recorded in the South (40%), at voluntary nonprofit owned EDs (71%) and by those payer types designated as self-pay (33%).

Table 2 presents information on the proportion of visits resulting in opioids, non-opioids, combination therapy (both opioids and non-opioids), and no analgesics prescribed. There were significant differences in the percentage of opioids, non-opioids, combination therapy, and no analgesics prescribed in EDs for NTDC visits by age, payer type, race/ethnicity, region, year, and patient-stated reason for visit. The proportions of opioids prescribed were higher in NTDC visits where patients reported being in severe pain and were of the self-pay variety.

Overall, the prescription of opioids increased from 38% in 1997–2000 to 45% in 2003–2007 (p<0.001 for trend). Prescription of combination therapy medication increased from 5% to 8% from 1997 through 2000 and 11% to 13% in 2003 through 2007, but the increase was most pronounced in 2004 at 17% (p<0.001 for trend). At the same time, the prescription of no analgesics decreased from 35% in 1997 to 19% in 2007 (p<0.001 for trend). In general, the increase in analgesic prescriptions over time appears to be driven by an increase in prescriptions for opioids, while the prescription of non-opioid medications appears to have

been relatively stable. In the unadjusted analysis of NTDC visits to EDs, Non-Hispanic Whites were more likely to receive a prescription for opioids (47%) than Non-Hispanic Blacks (37%) and Hispanics (38%). Non-Hispanic Blacks (25%) and Hispanics (28%) were more likely to receive a prescription for non-opioids than Non-Hispanic Whites at 18% (p=0.0009), while all racial/ethnic groups received similar proportions of no analgesic prescriptions.

Table 3 shows results from the multinomial multivariate logistic regression analysis. Qualitatively, the results are similar to the unadjusted analyses for age, pain category, year and patient-stated reason for visit. Compared to NTDC-related visits where patients were designated as being in severe pain, those with mild and moderate pain had a significantly lower probability of receiving a prescription for either opioids or combination therapy. Compared to non-Hispanic Whites, Hispanics (RR=1.08, 95% CI 0.73–1.60; RR=1.47, 95% CI 0.95–2.26; RR=1.02, 95% CI 0.57–1.84) had a higher probability of receiving a prescription for opioids, non-opioids and opioids combination, and non-opioids for NTDC-related ED visits respectively, but it was not statistically significant. Also not statistically significant was the fact that Non-Hispanic Blacks had a lower probability (RR= 0.80, 95% CI 0.63–1.02) of receiving a prescription for opioids and a higher probability of (RR= 1.20, 95% CI 0.87–1.64; RR= 1.14, 95% CI 0.84–1.56) of receiving a prescription for non-opioid and opioid combination and non-opioids for NTDC-related visits in EDs.

Compared to young adults (19–33 years old), children (0–18 years old) had a significantly lower probability of receiving a prescription for opioids and combination therapy and a higher probability of receiving a prescription for non-opioids, (especially among 0–4 year olds, which was significant). Patient-stated reasons for visit were a significant predictor of receiving opioids, non-opioids and combination therapy during NTDC-related visits in EDs. Among the geographic regions, the Southern regions stood out with patients there having a significantly higher probability of receiving opioid prescriptions, while patients in the West had the lowest probability of receiving prescriptions for non-opioids. Payer type, provider type, location in a metropolitan statistical area, and sex were not significantly associated with receiving a prescription for opioids, non-opioids and combination therapy, compared to no analgesics.

As shown in Table 2, the overall prescriptions for pain medication were in the following proportions: Opioids 43%, non-opioids 20%, combinations 12%, and no analgesics 25%. Restating the percentages shown in Table 2 in simpler terms, in 1997–2000, opioids were prescribed in 2 out of every 5 NTDC-related visits, non-opioids were prescribed in 1 out of every 5 NTDC-related visits, combination therapy (opioids and non-opioids) was prescribed in 1 out of every 12 NTDC-related visits and no analgesic was prescribed in 1 out of every 3 NTDC-related visits to EDs. In 2003–2007, opioids were prescribed in 9 out of every 20 NTDC-related visits, non-opioids were prescribed in 1 out of every 5 NTDC-related visits, combination therapy (opioids and non-opioids) was prescribed in 1 out of every 6 NTDC-related visits and no analgesic was prescribed in 1 out of every 5 NTDC-related visits to EDs in the United States (data not shown in table).

DISCUSSION

To the best of our knowledge, this study is the first to examine ED providers' prescribing practices for opioids, non-opioids, combinations and no analgesics for NTDC-related visits to EDs using a nationally representative dataset in the United States. First, we found a substantial increase in the prescribing rates of opioids and a combination of opioids and non-opioids for such visits. The overall rate increase in the prescription of pain medication for NTDC-related visits in EDs appears to have been driven mainly by an increase in the prescribing rates of opioids, while the prescription of non-opioid medications remained relatively stable over time. Our finding is consistent with prior studies that have examined ED use for different conditions and reported increased rates of opioid prescriptions in the United States.[11] While there is no specific data in the NHAMCS related to the reason for increased prescribing rates of opioids for NTDCs, possible reasons could include the lack of training and experience among ED providers in the provision of definitive dental care to patients, the non-availability of dental health professionals in EDs to provide routine dental care (which most of these patients require) and ED providers' desire to ensure optimal pain management for patients, which is an attribute of patient-centered care that is documented in patient satisfaction surveys. We must note that this increase in opioid prescriptions for NTDCs is disturbing because patients could become addicted to opioids and could grow to expect that these medications could be prescribed by dental professionals following simple dental procedures. Our study provides additional empirical data to support the possible overuse of opioids in EDs even for NTDC-related visits.

We found that the prescribing rates of opioids were significantly higher in cases where severe pain was reported for NTDC visits. Although our data does not allow for the accurate assessment of the legitimacy of the reporting of severe pain at NTDC visits, our findings are suggestive of appropriate clinical care. In addition, our findings could also be reflective of a current trend in emergency medical practice to treat pain aggressively and to err on the side of adequate pain control.[17] The association between severe pain and opioid prescription could have resulted from factors such as subjectivity of pain assessment, limited training of emergency physicians in the diagnosis of common dental disease and the inability of emergency physicians to validate their patients' self-reported complaints of severe pain. Furthermore, given that some of the complaints with the highest pain scores in EDs are dental and back pain,[11] prescribing opioids for NTDCs could be a more pragmatic way of dealing with inadequate access to dental care in emergency departments. This question merits further exploration given that recently, the United Sates Office of National Drug Control Policy under President Barack Obama's administration released a comprehensive action plan to address a response to America's prescription drug abuse crisis,[18] of which opioid prescriptions in EDs for NTDC visits could be a part. In addition, the report highlighted the increasingly grave consequences of prescription drug abuse, based on an increase in treatment admissions, emergency room visits and overdose-related death. In our study, we found that ED physicians' prescribing patterns for 5–19 year olds have not increased as much as those for other age groups. This finding could be suggestive of a possible increased awareness among ED physicians of prescription drug abuse among adolescents.

In our multinomial multivariate logistic regression, race/ethnicity was not a significant predictor for receiving a prescription for opioids, non-opioids and combinations for NTDC-related ED visits. While our findings regarding the prescription of pain medications is somewhat surprising given the level of documentation about disparities in many medical conditions, they are consistent with studies regarding long-bone fracture,[10, 19–22] patients in a pediatric trauma registry,[23] and burn patients.[24] However, it is important to note that Rupp and Delaney's review of the literature shows that inconsistencies and inadequate analgesia in emergency medicine are possibly due to physician bias and disbelief of pain reporting based on racial and ethnic stereotyping, as well as on unappreciated cultural and gender differences in pain reporting by patients.[25] To the best of our knowledge, our study is the first to document the non-existence of racial/ethnic disparities in ED physicians' prescribing practices of pain medications for NTDC-related visits in EDs after adjustment of available covariates.

Limitations and Strengths

Certain limitations should be noted. First, we are unable to identify with complete accuracy the quantity of opioids or non-opioids prescribed for each NTDC visit, and whether the patients who visited the EDs specifically requested opioids or non-opioids. In addition, we can only identify the presence of a prescription, but not whether the prescription was actually filled, or the drugs taken. Second, the classification of race/ethnicity was determined by hospital interviewers based on their perceptions. Although we adjusted for all available covariates in the database, there might be other potential confounders not adjusted for that could impact the interpretation of our results. While data for level of pain is missing in about 26.9% of the encounters, we have nonetheless imputed this data as NHAMCS recommends that data should not be presented if the non-response rate is greater than 30%.[26,27]

The strengths of this study include the opportunity to understand the prescribing practices of emergency physicians as they relate to managing NTDC visits, as well as the difficulties faced by many in navigating the U.S. health care system. In addition, this study could serve as a starting point for the development of data-driven programs and policy interventions aimed at developing guidelines for best practice. Given that the American Pain Society's Quality of Care Committee suggests that inadequate treatment of pain is a major public health problem and a serious problem in the United States,[28,29] we must balance the need to achieve quality care with the reduction of opportunities for potential drug seekers to use NTDCs as a means to obtain drugs. It is therefore important that NTDC patients be managed appropriately in EDs. Some ways by which this could be done include improved utilization of electronic monitoring databases to track patients who demonstrate drug-seeking behaviors, which help check prescribing behavior in the management of NTDCs.[30] Finally, this study addresses some gaps in the literature regarding whether race/ethnicity is a possible predictor of receiving a prescription for opioids, non-opioids, or a combination of both compared to that of receiving no analgesic prescriptions for NTDC visits in EDs.

In summary, nationally there has been a substantial increase in the rates of prescription of opioids for NTDC-related visits to EDs over time. In 1997–2000, opioids were prescribed in

2 out of every 5 NTDC-related visits, non-opioids were prescribed in 1 out of every 5 NTDC visits, combination therapy (opioids and non-opioids) was prescribed in 1 out of every 12 visits and no analgesic was prescribed in 1 out of every 3 NTDC-related visits to EDs. In 2003–2007, opioids were prescribed in 9 out of every 20 NTDC-related visits, non-opioids were prescribed in 1 out of every 5 NTDC-related visits, combination therapy (opioids and non-opioids) was prescribed in 1 out of every 6 visits and no analgesic was prescribed in 1 out of every 5 NTDC-related visits to EDs in the United States. Additionally, we found no substantial racial/ethnic disparities in emergency physicians' prescribing practices for opioids, non-opioids and combination of opioids and non-opioids for NTDC-related visits in EDs.

Acknowledgments

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Table 1

Population Characteristics of Participants in the National Hospital Ambulatory Medical Care Survey for Nontraumatic Dental Condition-related Visits to Emergency Department: 1997–2000 and 2003–2007

Predictor category	Unweighted Frequency	Weighted Frequency	
		Counts	Percent (SE)
Age Group (years)			
0–4	198	673,272	5.0 (0.5)
5–18	348	1,241,230	9.3 (0.7)
19–33	1,759	6,373,270	47.7 (1.4)
34–52	1,173	4,138,313	31.0 (1.1)
53–72	218	711,752	5.3 (0.4)
73 over	66	220,426	1.7 (0.3)
Health Provider Type			
Staff only	369	1,345,814	10.1 (1.0)
MD	3,393	12012449	89.9 (1.0)
Metropolitan Statistical Area (MSA)			
MSA	3,172	10810731	80.9 (3.3)
Non-MSA	590	2,547,532	19.1 (3.3)
Emergency Department Ownership			
Voluntary non-profit	2,592	9,551,041	71.5 (2.0)
Government, non-Federal	766	2,337,385	17.5 (1.8)
Proprietary	404	1,469,837	11.0 (1.5)
Pain Category			
Unknown	959	3,587,320	26.9 (1.4)
None	146	519,292	3.9 (0.4)
Mild	485	1,774,781	13.3 (1.0)
Moderate	958	3,459,428	25.9 (1.1)
Severe	1,214	4,017,442	30.1 (1.5)
Payer Type			
Private insurance	909	3,311,057	24.8 (1.0)
Medicare	207	727,180	5.4 (0.5)
Medicaid	1,068	3,628,443	27.2 (1.1)
Self-pay	1,180	4,355,925	32.6 (1.2)
Other	124	397,448	3.0 (0.4)
Unknown	274	938,210	7.0 (0.8)
Race/Ethnicity			
Non-Hispanic White	1,907	6,829,591	51.1 (1.7)
Non-Hispanic Black	725	2,505,691	18.8 (1.2)
Other	66	203,082	1.5 (0.3)

Predictor category	Unweighted Frequency	Weighted Frequency	
		Counts	Percent (SE)
Hispanic	335	1,029,417	7.7 (0.7)
Unknown ethnicity	729	2,790,482	20.9 (1.4)
Emergency Department Location			
Northeast	956	2,800,608	21.0 (2.0)
Midwest	852	3,243,042	24.3 (2.4)
South	1,360	5,301,447	39.7 (2.8)
West	594	2,013,166	15.1 (1.7)
Patient-stated Reason for Visit			
Non-dental reason	1,424	4,912,992	36.8 (1.2)
Dental reason	2,338	8,445,271	63.2 (1.2)
Sex			
Female	1,981	7,242,323	54.2 (1.0)
Male	1,781	6,115,940	45.8 (1.0)
Year			
1997	241	1,018,804	7.6 (0.9)
1998	240	991,417	7.4 (0.9)
1999	210	954,677	7.1 (0.8)
2000	317	1,356,238	10.2 (1.3)
2003	574	1,589,127	11.9 (0.8)
2004	517	1,617,857	12.1 (1.0)
2005	519	1,854,987	13.9 (1.0)
2006	574	2,043,929	15.3 (1.1)
2007	570	1,931,227	14.5 (1.1)

Table 2

Prescribed Opioid analgesics, Non-Opioid analgesics, Combination (opioids analgesic and non-opioids analgesic) and No analgesics for different patient groups in the National Hospital Ambulatory Medical Care Survey for Nontraumatic Dental Condition-related visits in Emergency Departments: 1997–2000 and 2003–2007

	No analgesics (%) SE	Non-opioids analgesics only (%) SE	Opioids analgesics only (%) SE	Both opioid and non-opioids analgesics (%) SE	P-value
Overall	24.9 (1.2)	20.1 (1.0)	42.9 (1.4)	12.2 (0.8)	
Age Group (years)					<.0001
0–4	43.3 (4.4)	45.1 (4.8)	9.9 (2.9)	1.7 (1.0)	
5–18	30.9 (3.1)	29.5 (3.4)	30.7 (3.7)	8.9 (1.7)	
19–33	21.0 (1.7)	18.2 (1.3)	46.9 (2.1)	13.9 (1.1)	
34–52	21.4 (1.6)	16.8 (1.3)	48.5 (1.9)	13.3 (1.3)	
53–72	43.5 (4.7)	11.6 (2.4)	36.5 (4.4)	8.4 (2.5)	
73 and over	51.9 (8.0)	32.7 (8.1)	12.3 (6.4)	3.1 (2.0)	
Provider Type					0.38
MD	25.0 (1.2)	19.6 (1.0)	43.4 (1.5)	12.0 (0.8)	
Staff only	24.2 (2.7)	23.8 (3.4)	38.6 (3.4)	13.4 (2.2)	
Metropolitan Statistical Area (MSA)					0.58
MSA (Metropolitan Statistical Area)	24.7 (1.3)	19.9 (1.1)	42.7 (1.6)	12.7 (0.9)	
Non-MSA	25.6 (2.6)	20.7 (1.8)	43.8 (3.5)	9.9 (1.5)	
Emergency Department Ownership					0.28
Government, non-Federal	27.3 (2.1)	21.6 (2.2)	37.5 (2.5)	13.6 (1.6)	
Proprietary	22.3 (2.9)	17.3 (2.6)	48.5 (4.2)	11.9 (2.3)	
Voluntary non-profit	24.7 (1.4)	20.1 (1.1)	43.4 (1.5)	11.9 (0.9)	
Pain Category					<.0001
None	62.5 (4.7)	25.9 (4.7)	10.3 (2.8)	1.2 (0.7)	
Mild	32.8 (2.6)	23.6 (2.4)	37.0 (3.5)	6.5 (1.1)	
Moderate	21.5 (1.8)	19.5 (2.0)	46.6 (2.3)	12.4 (1.5)	

	No analgesics (%) SE	Non-opioids analgesics only (%) SE	Opioids analgesics only (%) SE	Both opioid and non-opioids analgesics (%) SE	P-value
Severe	13.1 (1.6)	15.9 (1.5)	54.1 (2.4)	16.9 (1.6)	
Unknown	32.0 (2.1)	22.6 (1.7)	34.4 (1.9)	11.1 (1.3)	
Payer Type					0.0081
Medicaid	25.8 (1.9)	21.3 (1.7)	40.6 (2.2)	12.2 (1.4)	
Medicare	35.8 (4.0)	18.5 (3.5)	35.4 (4.3)	10.3 (2.7)	
Private insurance	27.1 (2.0)	21.4 (1.8)	40.6 (2.1)	10.8 (1.3)	
Self-pay	19.8 (1.6)	18.7 (1.4)	47.7 (2.2)	13.8 (1.0)	
Other	25.7 (4.9)	15.2 (4.3)	51.6 (5.9)	7.5 (2.7)	
Unknown	27.9 (4.5)	19.8 (3.5)	39.6 (5.4)	12.8 (2.4)	
Race/Ethnicity					0.01
Hispanic	23.7 (2.6)	28.1 (3.2)	37.5 (3.4)	10.6 (2.1)	
Non-Hispanic Black	25.4 (2.0)	24.5 (2.3)	36.5 (2.2)	13.7 (1.5)	
Non-Hispanic White	24.3 (1.5)	17.7 (1.1)	47.1 (1.9)	10.9 (1.0)	
Other	27.0 (8.2)	26.8 (7.2)	39.7 (8.6)	6.5 (3.6)	
Unknown ethnicity	26.1 (2.5)	18.4 (2.1)	40.7 (2.7)	14.8 (1.6)	
Emergency Department Location					0.01
Midwest	25.3 (2.5)	20.3 (1.8)	44.5 (2.5)	10.0 (1.4)	
Northeast	26.2 (2.2)	24.7 (2.3)	34.2 (2.3)	14.9 (1.9)	
South	23.2 (1.8)	19.5 (1.6)	46.2 (2.6)	11.1 (1.0)	
West	26.9 (3.0)	14.6 (2.0)	43.7 (3.8)	14.8 (2.2)	
Patient-stated Reason for Visit					<.01
Dental reason	17.3 (1.3)	18.3 (1.1)	51.5 (1.6)	12.9 (0.9)	
Non-dental reason	38.0 (1.8)	23.0 (1.4)	28.1 (1.8)	10.9 (1.1)	
Sex					0.49
Female	25.1 (1.4)	19.4 (1.3)	42.5 (1.8)	13.0 (1.0)	
Male	24.6 (1.4)	20.9 (1.3)	43.3 (1.7)	11.2 (1.0)	

	No analgesics (%) SE	Non-opioids analgesics only (%) SE	Opioids analgesics only (%) SE	Both opioid and non-opioids analgesics (%) SE	P-value
Year					<.01
1997	35.2 (3.6)	27.7 (3.3)	31.9 (4.1)	5.2 (1.8)	
1998	34.5 (5.0)	22.2 (3.7)	36.5 (4.1)	6.8 (1.9)	
1999	32.9 (4.7)	16.6 (3.1)	39.8 (4.1)	10.7 (2.7)	
2000	28.0 (3.1)	20.4 (2.3)	43.5 (4.1)	8.1 (1.9)	
2003	28.4 (2.8)	18.2 (2.2)	41.5 (2.9)	11.9 (2.1)	
2004	20.6 (3.1)	18.7 (2.2)	43.7 (3.2)	17.0 (2.1)	
2005	18.4 (2.4)	19.5 (2.6)	45.7 (3.8)	16.4 (1.9)	
2006	21.4 (2.6)	16.2 (2.1)	49.0 (3.2)	13.5 (1.8)	
2007	19.0 (2.2)	23.7 (2.5)	44.4 (3.1)	13.0 (1.7)	
Year group					<.01
1997–2000	32.3 (1.8)	21.7 (1.8)	38.3 (2.0)	7.7 (1.0)	
2003–2007	21.3 (1.2)	19.3 (1.2)	45.1 (1.8)	14.3 (1.0)	

P-values are from a Rao-Scott chi-square test

Table 3

Results of Multinomial Multivariate Logistic Regression: Relative risk of receiving a prescription for non-opioid analgesic, only opioid analgesic, or Combination (opioids analgesic and non-opioids analgesic) compared to No analgesic in the National Hospital Ambulatory Medical Care Survey for Nontraumatic Dental Condition-related visits in Emergency Departments: 1997–2000 and 2003–2007

Predictor	Adjusted Relative Risk Ratio (95% Confidence Interval)					
	Non-opioids analgesic only vs no analgesics	Non-opioids analgesic only *p-value*	Opioids analgesic only vs no analgesics	Opioids only *p-value*	Both opioid and non-opioid analgesics vs no analgesics	Opioids analgesic and Non-opioids analgesic *p-value*
Age Group (years)						
0–4	1.96 (1.20–3.18)	0.01	0.29 (0.14–0.59)	0.01	0.15 (0.04–0.55)	0.01
5–18	1.37 (0.89–2.11)	0.16	0.64 (0.41–1.02)	0.05	0.59 (0.33–1.06)	0.08
19–33	1.00 (ref)		1.00 (ref)		1.00 (ref)	
34–52	0.97 (0.72–1.30)	0.82	1.10 (0.82–1.46)	0.53	1.00 (0.71–1.41)	0.10
53–72	0.42 (0.22–0.79)	0.01	0.59 (0.33–1.06)	0.08	0.43 (0.20–0.94)	0.03
73 and over	1.27 (0.51–3.16)	0.61	0.21 (0.05–0.84)	0.03	0.16 (0.03–0.80)	0.03
Provider Type						
MD	1.00 (ref)		1.00 (ref)		1.00 (ref)	0.56
Staff only	1.08 (0.69–1.70)	0.73	0.75 (0.50–1.12)	0.16	0.86 (0.53–1.42)	
MSA (Metropolitan Statistical Area)						
MSA	1.00 (ref)		1.00 (ref)		1.00 (ref)	0.57
Non-MSA	1.10 (0.81–1.49)	0.55	0.99 (0.64–1.52)	0.97	0.89 (0.59–1.34)	
Emergency Department Ownership						
Government, non-Federal	1.00 (0.70–1.43)	0.10	0.67 (0.47–0.96)	0.03	0.97 (0.63–1.49)	0.88
Proprietary	0.95 (0.58–1.56)	0.84	1.04 (0.68–1.60)	0.84	1.14 (0.65–1.99)	0.66
Voluntary non-profit	1.00 (ref)		1.00 (ref)		1.00 (ref)	
Pain Category						
None	0.36 (0.20–0.66)	0.01	0.08 (0.04–0.16)	<.01	0.03 (0.01–0.11)	<.01
Mild	0.73 (0.47–1.15)	0.17	0.43 (0.28–0.67)	<.01	0.26 (0.15–0.47)	<.01

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Predictor	Adjusted Relative Risk Ratio (95% Confidence Interval)					
	Non-opioids analgesic only vs no analgesics	Non-opioids analgesic only *p-value*	Opioids analgesic only vs no analgesics	Opioids only *p-value*	Both opioid and non-opioid analgesics vs no analgesics	Opioids analgesic and Non-opioids analgesic *p-value*
Moderate	0.79 (0.51–1.23)	0.30	0.63 (0.43–0.92)	<.01	0.56 (0.37–0.87)	0.01
Severe	1.00 (ref)		1.00 (ref)		1.00 (ref)	
Unknown	0.68 (0.44–1.03)	0.07	0.41 (0.28–0.60)	<.01	0.48 (0.29–0.80)	0.01
Payer Type						
Medicaid	0.93 (0.64–1.35)	0.70	0.91 (0.68–1.21)	0.51	0.93 (0.62–1.40)	0.74
Medicare	0.88 (0.49–1.59)	0.68	1.01 (0.58–1.73)	0.98	1.15 (0.57–2.30)	0.70
Other	0.75 (0.33–1.72)	0.49	1.19 (0.63–2.25)	0.58	0.62 (0.23–1.65)	0.34
Private insurance	1.00 (ref)		1.00 (ref)		1.00 (ref)	
Self-pay	1.12 (0.78–1.60)	0.55	1.15 (0.84–1.56)	0.38	1.25 (0.87–1.78)	0.23
Race/Ethnicity						
Hispanic	1.45 (0.95–2.23)	0.09	1.08 (0.73–1.61)	0.69	1.05 (0.58–1.89)	0.87
Non-Hispanic Black	1.13 (0.83–1.54)	0.44	0.80 (0.63–1.03)	0.08	1.21 (0.88–1.66)	0.24
Non-Hispanic White	1.00 (ref)		1.00 (ref)		1.00 (ref)	
Other	1.22 (0.52–2.84)	0.65	1.05 (0.51–2.20)	0.89	0.52 (0.14–1.98)	0.33
Emergency Department location						
Midwest	0.82 (0.55–1.22)	0.32	1.38 (0.93–2.05)	0.11	0.70 (0.41–1.19)	0.19
Northeast	1.00 (ref)		1.00 (ref)		1.00 (ref)	
South	0.87 (0.59–1.26)	0.45	1.62 (1.17–2.24)	0.001	0.78 (0.50–1.23)	0.29
West	0.54 (0.35–0.83)	0.01	1.42 (0.89–2.27)	0.14	1.06 (0.60–1.88)	0.85
Patient-stated reason for visits						
Dental reason	1.00 (ref)		1.00 (ref)		1.00 (ref)	
Non-dental reason	0.58 (0.45–0.74)	<.01	0.32 (0.25–0.41)	<.01	0.53 (0.39–0.73)	<.01
Sex						
Female	0.95 (0.73–1.23)	0.71	1.00 (0.82–1.23)	0.96	1.19 (0.88–1.61)	0.27
Male	1.00 (ref)		1.00 (ref)		1.00 (ref)	

Predictor	Adjusted Relative Risk Ratio (95% Confidence Interval)					
	Non-opioids analgesic only vs no analgesics	Non-opioids analgesic only *p-value*	Opioids analgesic only vs no analgesics	Opioids only *p-value*	Both opioid and non-opioid analgesics vs no analgesics	Opioids analgesic and Non-opioids analgesic *p-value*
Year						
1997	1.00 (ref)		1.00 (ref)		1.00 (ref)	
1998	0.71 (0.37–1.36)	0.29	0.95 (0.53–1.70)	0.87	1.21 (0.40–3.70)	0.74
1999	0.58 (0.31–1.09)	0.09	1.23 (0.63–2.41)	0.55	2.42 (0.85–6.83)	0.09
2000	0.88 (0.52–1.50)	0.63	1.31 (0.71–2.39)	0.39	1.70 (0.65–4.42)	0.28
2003	0.75 (0.44–1.25)	0.27	1.13 (0.65–1.96)	0.66	2.03 (0.83–4.98)	0.12
2004	1.07 (0.59–1.96)	0.81	1.70 (0.89–3.27)	0.11	4.16 (1.67–10.4)	0.01
2005	1.24 (0.74–2.07)	0.42	1.78 (1.01–3.14)	0.05	4.16 (1.82–9.50)	0.01
2006	0.82 (0.48–1.41)	0.47	1.56 (0.91–2.70)	0.11	2.87 (1.15–7.15)	0.02
2007	1.40 (0.86–2.26)	0.17	1.57 (0.93–2.68)	0.09	3.13 (1.29–7.61)	0.01

Unknown payer type and ethnicity incorporated using multiple imputations.