Published in final edited form as:

Drug Alcohol Depend. 2015 November 1; 156: 261–266. doi:10.1016/j.drugalcdep.2015.09.023.

Prescription of Opioid Analgesics for Nontraumatic Dental Conditions in Emergency Departments

Christopher Okunseri^{a,*}, Raymond A. Dionne^{b,c}, Sharon M. Gordon^b, Elaye Okunseri^a, and Aniko Szabo^d

Christopher Okunseri: christopher.okunseri@marquette.edu

^aDepartment of Clinical Services, School of Dentistry, P.O. Box 1881, Marquette University, Milwaukee, WI 53201

^bDepartment of Foundational Sciences, School of Dental Medicine, East Carolina University, Greenville, NC 27834

^cDepartment of Pharmacology and Toxicology, Brody School of Medicine, East Carolina University, Greenville, NC 27834

^dDivision of Biostatistics, Institute of Health and Society, Medical College of Wisconsin, 8701 Watertown Plank Rd., Milwaukee, WI 53226

Abstract

Background—Opioid analgesics prescribed for nontraumatic dental conditions (NTDCs) by emergency physicians continue to receive attention because of the associated potential for misuse, abuse and addiction. This study examined rates of prescription of opioid analgesics and types of opioid analgesics prescribed for NTDC visits in U.S. emergency departments.

Methods—Data from the National Hospital Ambulatory Medical Care Survey from 2007-2010 was analyzed. Descriptive statistics and logistic regression analysis were performed and adjusted for the survey design.

Department of Clinical Services Room 356, Marquette University School of Dentistry, P.O. Box 1881 Milwaukee, Wisconsin. 53201-1881, Tel: 414 288 6524, fax: 414 288 3586.

Author contributions:

- Christopher Okunseri, Aniko Szabo and Elaye Okunseri obtained research funding and conceived the study with Raymond A. Dionne and Sharon M. Gordon.
- Statistical advice, study design, and data analysis were provided by Aniko Szabo, Raymond A. Dionne and Sharon M. Gordon and Christopher Okunseri.
- Christopher Okunseri, Raymond A. Dionne and Sharon M. Gordon and Elaye Okunseri provided research support and drafted the initial manuscript.
- All authors contributed substantially to the interpretation of results and the final manuscript including revision of all drafts. Christopher Okunseri takes responsibility for the paper as a whole.

Conflict of Interest: All authors have no commercial association or sources of support that might pose a conflict of interest

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Results—NTDCs made up 1.7% of all ED visits from 2007-2010. The prescription of opioid analgesics was 50.3% for NTDC and 14.8% for non-NTDC visits. The overall rate of opioid analgesics prescribed for NTDCs remained fairly stable from 2007 through 2010. Prescription of opioids was highest among patients aged 19-33 years (56.8%), self-paying (57.1%), and non-Hispanic Whites (53.2%). The probability of being prescribed hydrocodone was highest among uninsured patients (68.7%) and for oxycodone, it was highest among private insurance patients (33.6%). Compared to 34-52 year olds, children 0-4 years were significantly more likely to be prescribed codeine and less likely to be prescribed oxycodone. Compared to non-Hispanic Whites, non-Hispanic Blacks had significantly higher odds of been prescribed codeine and somewhat lower odds of been prescribed oxycodone, but it was not statistically significant.

Conclusions—There was no significant change in the rates of opioid analgesics prescribed over time for NTDC visits to EDs. Age, payer type and race/ethnicity were significant predictors for the prescription of different opioid analgesics by emergency physicians for NTDC visits.

Keywords

Opioid analgesic drugs; Emergency departments; Dental care

1. Introduction

Opioid analgesics prescribed for both acute and chronic pain management by dentists, emergency and primary care physicians, physician assistants and nurse practitioners with prescribing authority have, in recent times continued to receive attention from policymakers, clinicians and patient care advocates. This is because of their increased use and the associated potential for misuse, abuse and addiction. Studies indicate that the number of opioid prescriptions filled by pharmacies increased by 27% (from 174 million to 238 million) between 2000 and 2011 (Manchikanti 2012; Maxwell 2011; Warner et al., 2011). In addition, Mazer-Amirshahi (2014) reported that the number of opioid prescriptions in emergency departments increased from 20.8% to 31.0% indicating an absolute increase of 10.2% and a relative increase of 49.0% between 2001 and 2010. Another report documented that health insurers lose about \$72.5 billion annually because of opioid prescription drug diversion (Coalition against Insurance Fraud 2007; National Prescription Drug Abuse Prevention Strategy 2009). These descriptive statistics clearly identify increases in opioid prescriptions and the associated healthcare costs and public health implications.

Nontraumatic dental condition (NTDC) visits to emergency departments is increasing and has become a subject of discussion by researchers, clinicians, policymakers and organized dentistry (Okunseri et al., 2012a, 2012b, Allareddy et al., 2014). This increase in NTDC visits is of serious concern to all stakeholders because emergency departments are not set up to provide routine dental care nor are some ED physicians trained to provide extractions or endodontic treatment (Okunseri et al., 2012a). Patients who visit EDs for NTDCs (such as toothache or tooth decay) typically receive prescriptions for painkillers and antibiotics. This has led to a discussion about whether the prescription of pain medication during such visits could be contributing to the prescription drug abuse problem (Fox et al., 2013). In addition, dental care in EDs have high cost implications and do not typically afford patients a chance

to build relationships with a primary dental provider and to establish a dental home (Allareddy et al., 2014; Okunseri et al., 2012a).

To the best of our knowledge, only one study has attempted to document emergency physician prescribing practices of opioid analgesics and opioid combinations for nontraumatic dental conditions (Okunseri et al., 2014). In addition, there is no study based on either a convenience or a population-based representative sample that has specifically examined the different opioids prescribed in emergency departments for NTDC visits. This is particularly important given that the rationale in favor of opioid prescriptions for pain management is often based on tradition, expert opinions, specialty focused guidelines, practical experience and uncontrolled anecdotal observations (Manchikanti, 2012). This study examined rates of prescription of opioid analgesics and types of opioid analgesics prescribed for NTDC visits in U.S. emergency departments from 2007-2010.

1 2. Methods

1.1 2.1. Study Design, Settings and Selection of Participants

We analyzed data from the National Hospital Ambulatory Medical Care Survey (NHAMCS) for 2007 to 2010. NHAMCS is a cross-sectional national survey of 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 (Ambulatory Health Care Data, 2012). A four-stage probability design was used with sampling from primary sampling units (which are geographically defined areas), hospitals within primary sampling units, emergency departments within hospitals, and patient visits within emergency departments (Ambulatory Health Care Data 2012). The data are collected by trained extractors based on review of medical records. Other data collected include socioeconomic status, race/ethnicity, financing of care, information regarding clinical presentation, diagnosis and treatment.

This study focused on nontraumatic dental condition-related visits, including all patients with dental conditions not related to trauma in the primary diagnosis field. This was in line with previous studies conducted by our research team as well as in other published studies that have analyzed dental visits to EDs and physicians' offices (Okunseri et al., 2008; 2011; 2012a; 2012b). 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) based on previous publication on the topic by researchers (Okunseri et al., 2008; 2011; 2012a; 2012b). The Medical College of Wisconsin and the Marquette University Institutional Review Boards approved the study as exempt.

1.2 2.2. Measures

The primary outcome measures chosen for this study were proportions of visits where patients received prescriptions for (i) any opioid-containing analgesic medication, and (ii) an opioid prescription containing specific active ingredients (oxycodone, hydrocodone,

codeine). The NHAMCS records up to 8 medications associated with each ED visit. Opioid 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) that contain opioids (level 3 Lexicon codes 060, 191). Drugs and drug combinations containing specific active ingredients of interest were identified using the Ambulatory Care Drug Database maintained by the Centers for Disease Control (CDC). (<http://www2.cdc.gov/drugs/ApplicationNav1.asp>). The list of drugs for each specific ingredient was cross-referenced with the Multum category of opioid analgesics defined above. This approach eliminated opioid-containing medications prescribed for non-analgesic indications, such as codeine-based cough suppressants. 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).

1.3 2.3. Statistical Analysis

We performed descriptive statistics and used multivariable logistic regression to examine the probability of receiving a prescription for any of the specific types of opioids in EDs for NTDC visits. 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. (2000) Potthoff et al. (1992) and Tamayo-Sarver et al. (2004).

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 distribution of categorical variables. The trend in the proportion of patients with various opioids prescribed over time was evaluated using logistic regression. Based on findings from the descriptive statistics, calendar year was treated as a linear continuous predictor in the analyses. 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 9.3 (SAS Institute Inc, Cary, NC), with the primary model fitted using the Surveylogistic procedure.

2 3. Results

Overall, NTDC was the primary diagnosis category for 1.7% of all ED visits from 2007-2010 (Table 1). The rate of prescription of opioid analgesics was 50.3% for NTDC and 14.8% for non-NTDC visits. The rates of prescription for each specific ingredient examined (hydrocodone, oxycodone, and codeine) were significantly higher for NTDC (31.6%, 12.3%, 4.1%, respectively) than for non-NTDC visits (9.3%, 3.4%, 1.0%) in ED. The proportion of Medicaid enrollees with NTDC (29.8%) and non-NTDC (24.7%) visits were highest, closely followed by Medicare enrollees in a reversed order with NTDC (6.3%) and non-NTDC visits (17.1%). Non-Hispanic Whites were over-represented among NTDC visits (63.7% vs 60.9%). Females represented slightly more than half of the population for both NTDC and non-NTDC visits during the study period. Rates of opioid prescription did not decrease significantly in EDs for NTDC visits, but rather fluctuated between 47.6% in 2007

to 52.1% in 2008, 50.8% in 2009 and to 50.6% in 2010. Similar findings were recorded for the rates of codeine and hydrocodone-containing prescription, while the proportion of patients receiving oxycodone increased from 9.7% to 14.5% ($p=0.046$ for trend).

Table 2 shows that opioid prescriptions were highest among those aged 19-33 years (56.8%), self-paying patients (57.1%), and non-Hispanic Whites (53.2%). The prescription of opioids was lowest for children aged 0-4 years (4.5%) and the majority of those prescriptions were for codeine (77.6%). Uninsured patients had the highest probability of being prescribed hydrocodone (68.7%), while private participants had the highest probability of being prescribed oxycodone (33.6%).

Table 3 shows that in the multivariable analysis, among patients receiving an opioid prescription, compared to 34-52 year olds, children 0-4 years were significantly more likely to be prescribed codeine and less likely to be prescribed oxycodone. Compared to non-Hispanic Whites, non-Hispanic Blacks had significantly higher odds of been prescribed codeine and somewhat lower odds of been prescribed oxycodone, but it was not statistically significant.

3 4. Discussion

Public concern over the number of deaths attributed to opioids prescribed for therapeutic indications has prompted efforts to decrease misuse, abuse and diversion of opioid analgesics. In this study, the rate of prescription of opioid analgesics was 50.3% for NTDC visits in 2007-2010. Although the rate of prescription of opioid analgesics remained fairly stable, it was, however, higher than previously reported by Okunseri et al., (2012) where 38% of NTDC patients were prescribed opioids in 1997-2000 and 45% in 2003-2007. This clearly demonstrates a steady increase in the rate of prescription of opioid analgesics for NTDC visits in EDs over time.

Based on previous observations described in different reports and updated in this study, opioid prescribing in EDs for acute orofacial pain may be contributing to greater availability of opioid drugs, thereby indirectly adding to the serious morbidity and mortality issues associated with prescription opioids. The likelihood that an ED patient reporting back pain, dental pain or headache is 'doctor shopping' for an opioid prescription is estimated to be approximately 12% among ED patients (Weiner et al., 2014). A survey of patients seeking care at an emergency dental clinic indicated that 37% of patients reported nonmedical use of prescription pain medications in the previous 30 days (Ashrafioun et al., 2014). Individuals with opioid use disorders are more likely to have a prescription history of opioids, have more days' supply of opioid drugs and greater rates of medical service utilization (Cochran et al., 2014), suggesting that opioid analgesic availability contributes to opioid abuse. Estimates of the initiation of substance use indicate that nonmedical use of prescription pain medications was the second most prevalent use of illicit first-time drugs for persons aged 12 years or older in the US in 2013 (SAMSHA, National Survey on Drug Use and Health, 2013).

Heroin incidence rate was nineteen (19) times higher among those who reported prior nonmedical pain reliever use than among those who did not (Muhuri et al., 2013). Four out

of five recent heroin initiates (79.5%) previously used nonmedical pain relievers whereas only 1 % of recent NMPR initiates had prior use of heroin (Muhuri et al., 2013). These data are consistent with a gateway theory of drug use suggesting that some drugs expose individuals to biological and behavioral factors that influence their future use of other drugs, e.g., initial use of nonmedical pain relievers leading to eventual heroin use. Although not supported by data from this study, there could be a substantial proportion of patients seeking care for acute dental pain who are potential abusers of prescription opioids. These patients could be presenting at EDs in hopes of receiving additional opioids. There is also a finite number of prescription opioid users who will progress from their initial prescription drug to opioid abuse and dependence.

Approximately 11% of opioids dispensed in the US are prescribed by dentists for orofacial pain, despite the prominent inflammatory mechanisms of acute pain (Hargreaves and Abbott, 2005). NSAIDs are generally more effective for acute orofacial pain with less potential for adverse events (Dionne et al., 2006), and rarely result in serious morbidity or mortality when administered for acute pain.

The prevalence of dental practices and pharmacies in counties within the state of Indiana was identified as the leading predictor of enrollment in drug abuse treatment programs in that state (Wright et al., 2014). This observation indicates that the availability of prescription opioids in communities is associated with higher rates of opioid abuse and suggests that management of acute orofacial pain with opioids could contribute disproportionately to the prevalence of abuse. While most states have authorized development of drug monitoring programs that can play a role in helping to reduce opioid abuse, diversion and overdose (Gugelman and Perrone, 2011), these systems cannot readily differentiate analgesic prescribing for an appropriate clinical indication from prescribing that is not evidence based, e.g., prescribing an opioid rather than a NSAID for acute inflammatory pain. Conversely, implementation of prescription guidelines for reducing opioid prescriptions for ED dental pain patients has been demonstrated to reduce the number of opioid prescriptions provided (Fox et al., 2013).

The following limitations are important when interpreting results from this study. Investigators were unable to verify the quantity of opioids prescribed for each NTDC visit, and whether the patients who visited the EDs specifically requested opioids for care. This information is important because of its potential to increase the rate of opioids prescription in EDs for dental care. Second, investigators could identify whether a prescription was written out to the patient, but not whether the prescription was actually filled, or the drugs taken. Finally, race/ethnicity classification was determined by hospital interviewers based on their perceptions.

An important strength of this study is the opportunity to understand the prescribing practices of emergency physicians managing NTDCs, as well as the difficulties faced by many in navigating the U.S. health care system. This study calls for action to address the need to achieve quality care and to reduce opportunities for potential drug seekers who use NTDCs as a means to obtain drugs. In addition, this study clearly reinforces the need to provide

sufficient evidence to emergency physicians for the use of NSAIDs as an alternative to opioid analgesics for dental pain.

There was no significant change in the rates of opioid analgesics prescribed for NTDC visits in EDs from 2007-2010. Age, payer type and race/ethnicity were significant predictors for the prescription of various opioid analgesics by emergency physicians for NTDC visits. Given the predominant inflammatory nature of acute dental pain and the relative lack of efficacy of opioid analgesics in comparison to non-steroidal anti-inflammatory drugs, the continued high rate of opioid prescribing in many EDs may result in less benefits and increased risks to patients and the society in general when misused, abused or diverted.

References

- Allareddy VI, Rampa S, Lee MK, Allareddy V, Nalliah RP. Hospital-based emergency department visits involving dental conditions: profile and predictors of poor outcomes and resource utilization. *JADA*. 2014; 145:331–337. [PubMed: 24686965]
[Accessed June 3, 2012] Ambulatory Health Care Data. 2009. Available at: <http://www.cdc.gov/nchs/ahcd.htm>
- Ashrafioun L, Edwards PC, Bohnert AS, Ilgen MA. Nonmedical use of pain medications in dental patients. *Am J Drug Alcohol Abuse*. 2014; 40:312–316.10.3109/00952990.2014.930152 [PubMed: 24963730]
- Coalition Against Fraud. Prescription for peril: how insurance fraud finances, theft and abuse of addictive prescription drugs. Coalition Against Insurance Fraud; Washington, D.C; 2007. Available from: <http://www.insurancefraud.org/downloads/drugDiversion.pdf>
- Cochran BN, Heck NC, Van Den Bos J, Perlman D, Torres J, Valuck R, Carter J. Factors predicting development of opioid use disorders among individuals who receive an initial opioid prescription: mathematical modeling using a database of commercially-insured individuals. *Drug Alcohol Depend*. 2014; 138:202–208.10.1016/j.drugalcdep.2014.02.701 [PubMed: 24679839]
- Dionne, RA.; Kim, H.; Gordon, SM. Acute and chronic dental and orofacial pain. In: McMahan, SB.; Koltzenburg, M., editors. *Wall and Melzacks Textbook of Pain*. Elsevier; Amsterdam: 2006. p. 819-835.
- Feely M, Neuman J. Opioids Gateway Drugs For Many High-Risk Patients. *Medscape News*. 2015 May 4.
- Fox TR, Li J, Stevens S, Tippie T. A performance improvement prescribing guideline reduces opioid prescriptions for emergency department dental pain patients. *Ann Emerg Med*. 2013; 62:237–240.10.1016/j.annemergmed.2012.11.020 [PubMed: 23374416]
- Gugelman HM, Perrone J. Can prescription drug monitoring programs help limit opioid abuse? *JAMA*. 2011; 306:2258–2259. [PubMed: 22110107]
- Hargreaves K, Abbott PV. Drugs for pain management in dentistry. *Aust Dent J*. 2005; 50:S14–22. [PubMed: 16416713]
- Manchikanti L, Helm S 2nd, Fellows B, Janata JW, Pampati V, Grider JS, Boswell MV. Opioid epidemic in the United States. *Pain Physician*. 2012; 15:ES9–38. [PubMed: 22786464]
- Maxwell JC. The prescription drug epidemic in the United States: a perfect storm. *Drug Alcohol Rev*. 2011; 30:264–270. [PubMed: 21545556]
- Mazer-Amirshahi M, Mullins PM, Rasooly I, van den Anker J, Pines JM. Rising opioid prescribing in adult U.S. emergency department visits: 2001-2010. *Acad Emerg Med*. 2014; 21:236–243.10.1111/acem.12328 [PubMed: 24628748]
- Muhuri, PK.; Gfroerer, JC.; Davies, MC. [Accessed May 15, 2015] Association of nonmedical pain reliever use and initiation of heroin use in the United States. CBHSQ Data Review, August 2013. 2013. <http://www.samhsa.gov/data/sites/default/files/DR006/DR006/nonmedical-pain-reliever-use-2013.htm> National Prescription Drug Abuse Prevention Strategy. Available at: http://cdaa.org/wpcontent/uploads/2013/10/Nat_Prescript_Drug_Abuse_Prev_Strat_2009.pdf

- Okunseri C, Pajewski NM, Brousseau DC, Tomany-Korman S, Snyder A, Flores G. Racial and ethnic disparities in nontraumatic dental condition visits to emergency departments and physicians' offices: a study of the Wisconsin Medicaid program. *J Am Dent Assoc.* 2008; 139:1657–1666. [PubMed: 19047672]
- Okunseri C, Pajewski NM, Jackson S, Szabo A. Wisconsin Medicaid enrollees' recurrent use of emergency departments and physicians' offices for treatment of nontraumatic dental conditions. *J Am Dent Assoc.* 2011; 42:540–550. Erratum in: *J. Am. Dent. Assoc.* 142, 608. [PubMed: 21531936]
- Okunseri C, Okunseri E, Thorpe JM, Xiang Q, Szabo A. Medications prescribed in emergency departments for nontraumatic dental condition visits in the United States. *Med Care.* 2012; 50:508–512. [PubMed: 22584886]
- Okunseri C, Okunseri E, Thorpe JM, Xiang Q, Szabo A. Patient characteristics and trends in nontraumatic dental Condition visits to emergency department in the United States. *Clin Cosmet Investig Dent.* 2012; 4:1–7.
- Okunseri C, Okunseri E, Xiang Q, Thorpe J, Szabo A. Prescription of opioid and non-opioid analgesics for dental care in emergency departments: findings from the National Hospital Ambulatory Medical Care Survey. *J Public Health Dent.* 2014; 74:283–92. Epub 2014 May 26. 10.1111/jphd.12055 [PubMed: 24863407]
- Potthoff RF, Woodbury MA, Manton KG. “Equivalent sample size” and “equivalent degrees of freedom”: refinements for inference using survey weights under super population models. *J Am Stat Assoc.* 1992; 87:383–396.
- Substance Abuse and Mental Health Services Administration. HHS Publication No (SMA) 14-4863. Substance Abuse and Mental Health Services Administration; Rockville, MD: 2014. Results from the 2013 National Survey on Drug Use and Health: Summary of National Findings, NSDUH Series H-48.
- Stone S, Stone S, Gonzales R, Maselli J, Lowenstein SR. Antibiotic prescribing for patients with colds, upper respiratory tract infections, and bronchitis: a national study of hospital-based emergency departments. *Ann Emerg Med.* 2000; 36:320–327. [PubMed: 11020678]
- Tamayo-Sarver JH, Dawson NV, Cydulka RK, Wigton RS, Baker DW. Variability in emergency physician decision making about prescribing opioid analgesics. *Ann Emerg Med.* 2004; 43:483–493. [PubMed: 15039692]
- Warner M, Chen LH, Makuc DM, Anderson RN, Miniño AM. Drug poisoning deaths in the United States, 1980-2008. *NCHS Data Brief.* 2011; 81:1–8. [PubMed: 22617462]
- Weiner SG, Griggs CA, Langlois BK, Mitchell PM, Nelson KP, Friedman FD, Feldman JA. Characteristics of emergency department “doctor shoppers”. *J Emerg Med.* 2015; 48:424–431.e1.10.1016/j.jemermed.2014.11.008 [PubMed: 25638051]
- Wright ER, Kooreman HE, Greene MS, Chambers RA, Banerjee A, Wilson J. The iatrogenic epidemic of prescription drug abuse: County-level determinants of opioid availability and abuse. *Drugs Alcohol Depend.* 2014; 138:209–215.

Highlights

- Opioid analgesics were prescribed in emergency departments (EDs) for nontraumatic dental condition (NTDC) visits
- The rate of opioid analgesic prescribed was 50% for NTDC visits in ED from 2007-2010
- Compared to previous findings, rates of opioid analgesic prescribed has increased.
- Predictors of opioid analgesic prescriptions for NTDC- Age, gender and race/ethnicity
- Hydrocodone and oxycodone were most prescribed for uninsured and privately insured

Table 1

Study Population Characteristics

Predictor	Frequency	Weighted	Overall % (SE)	NTDC % (SE)	non-NTDC % (SE)	Rao-Scott test p-value
Age Group						
0-4 years	14,115	53,004,224	10.5 (0.4)	4.3 (0.6)	10.6 (0.4)	<.0001
05-18 years	19,628	73,159,883	14.4 (0.3)	8.9 (0.8)	14.5 (0.3)	
19-33 years	34,521	124,316,23	24.5 (0.3)	50.5 (1.3)	24.1 (0.3)	
34-52 years	35,313	41 24,613,01	24.6 (0.3)	28.7 (1.2)	24.5 (0.3)	
53-72 years	22,177	78 0,607,977	15.9 (0.2)	6.3 (0.6)	16.1 (0.2)	
over 73	13,748	50,777,657	10.0 (0.2)	1.3 (0.3)	10.2 (0.2)	
Codeine						
No	138,073	501,136,32	98.9 (0.1)	95.9 (0.6)	99.0 (0.1)	<.0001
Yes	1,429	5,342,671	1.1 (0.1)	4.1 (0.6)	1.0 (0.1)	
Hydrocodo						
No	126,896	457,513,12	90.3 (0.4)	68.4 (1.7)	90.7 (0.3)	<.0001
Yes	12,606	48,965,870	9.7 (0.4)	31.6 (1.7)	9.3 (0.3)	
NTDC						
NTDC	2,341	8,730,101	1.7 (0.1)			
Other	137,161	497,748,891	98.3 (0.1)			
Opioid						
No	119,247	428,210,15	84.5 (0.4)	49.7 (1.8)	85.2 (0.4)	<.0001
Yes	20,255	78,268,842	15.5 (0.4)	50.3 (1.8)	14.8 (0.4)	
Oxycodone						
No	134,903	488,715,42	96.5 (0.2)	87.7 (1.2)	96.6 (0.2)	<.0001
Yes	4,599	17,763,563	3.5 (0.2)	12.3 (1.2)	3.4 (0.2)	
Payer Type						
Medicaid	37,400	125,686,35	24.8 (0.7)	29.8 (1.5)	24.7 (0.7)	<.0001
Medicare	23,150	85,477,647	16.9 (0.4)	6.3 (0.7)	17.1 (0.4)	

Predictor	Frequency	Weighted	Overall % (SE)	NTDC % (SE)	non-NTDC % (SE)	Rao-Scott test p-value
Other	6,470	23,606,646	4.7 (0.3)	3.3 (0.5)	4.7 (0.3)	
Private	43,853	163,579,24	32.3 (0.6)	22.8 (1.1)	32.5 (0.6)	
Self-pay	19,949	74,888,339	14.8 (0.5)	29.2 (1.6)	14.5 (0.5)	
Unknown	8,680	33,240,761	6.6 (0.8)	8.7 (1.3)	6.5 (0.8)	
Race/Ethni						
Hispanic	19,493	68,877,669	13.6 (1.0)	9.7 (1.1)	13.7 (1.0)	0.0010
Non-Hispanic	31,882	111,302,179	22.0 (1.4)	23.4 (1.7)	22.0 (1.4)	
Non-Hispanic	81,797	308,678,381	60.9 (1.4)	63.7 (2.0)	60.9 (1.4)	
Other	6,330	7,620,763	3.5 (0.4)	3.2 (0.6)	3.5 (0.4)	
Sex						
Female	75,500	276,306,01	54.6 (0.2)	55.2 (1.3)	54.5 (0.2)	0.6111
Male	64,002	230,172,973	45.4 (0.2)	44.8 (1.3)	45.5 (0.2)	
Year						
2007	35,490	116,802,06	23.1 (1.0)	22.1 (1.6)	23.1 (1.0)	0.1410
2008	34,134	123,761,41	24.4 (0.9)	22.2 (1.5)	24.5 (0.9)	
2009	34,942	136,072,13	26.9 (1.0)	27.9 (2.0)	26.8 (1.0)	
2010	34,936	129,843,377	25.6 (1.1)	27.8 (1.7)	25.6 (1.1)	

Table 1b Study Population Characteristics: Opioid and Specific Opioids Analgesics prescribed for NTDC visits from 2007-2010

Outcome Measure	2007	2008	2009	2010	Trend p-value
Total NTDC					
Percent	1.7	1.6	1.8	1.9	0.052
95% CI	1.4 - 1.9	1.4 - 1.8	1.6 - 2.0	1.7 - 2.1	
Opioids					
Percent	47.6	52.1	50.8	50.6	0.624
95% CI	40.4 - 54.8	46.1 - 58.1	45.3 - 56.3	45.1 - 56.1	
Codeine					
Percent	4.8	3.8	4.8	3.1	0.340

Table 1b Study Population Characteristics: Opioid and Specific Opioids Analgesics prescribed for NTDC visits from 2007-2010

Outcome Measure	2007	2008	2009	2010	Trend p-value
95% CI	2.3 - 7.3	1.8 - 5.8	2.0 - 7.6	1.4 - 4.8	
Hydrocodone					
Percent	30.5	35.2	30.5	30.7	0.746
95% CI	24.7 - 36.3	28.7 - 41.6	25.4 - 35.6	25.1 - 36.3	
Oxycodone					
Percent	9.7	11.0	13.1	14.5	0.0457
95% CI	5.8 - 13.7	7.7 - 14.3	8.3 - 17.8	10.4 - 18.7	

Table 2
The Different Types of Opioid Analgesic Prescribed for NTDC visits in EDs

Predictors	Opioids Analgesic		Codeine		Hydrocodone		Oxycodone	
	% visits (SE)	p-value	% opioids (SE)	p-value	% opioids (SE)	p-value	% opioids (SE)	p-value
Age Group								
0-4 years	4.5 (1.8)	<.0001	77.6 (15.9)	<.0001	22.4 (15.9)	0.2094	0.0 (0.0)	0.6694
05-18 years	32.2 (4.3)		25.1 (5.9)		49.6 (7.5)		23.9 (7.1)	
19-33 years	56.8 (2.1)		7.3 (1.3)		64.0 (2.7)		24.3 (2.4)	
34-52 years	52.6 (3.2)		7.0 (2.1)		62.2 (3.4)		24.7 (3.5)	
53-72 years	51.6 (5.4)		2.8 (2.7)		68.3 (7.7)		27.6 (6.7)	
over 73 years	18.3 (9.2)		0.0 (0.0)		57.1 (26.5)		2.8 (3.1)	
Payer Type								
Medicaid	47.6 (2.8)	0.0508	9.4 (1.9)	0.2122	61.4 (4.3)	0.0147	25.1 (3.6)	0.0410
Medicare	43.3 (5.4)		3.4 (2.5)		64.0 (8.0)		20.8 (7.3)	
Other	52.7 (7.0)		10.5 (5.2)		70.5 (8.4)		19.0 (6.2)	
Private insurance	47.3 (3.1)		10.9 (2.6)		51.6 (4.0)		33.6 (4.2)	
Self-pay	57.1 (2.8)		5.6 (1.4)		68.7 (3.0)		20.8 (3.0)	
Unknown	49.0 (5.1)		9.5 (3.7)		68.2 (6.0)		17.4 (4.5)	
Race/Ethnicity								
Hispanic	42.3 (5.8)	0.0290	8.5 (4.6)	0.1008	51.1 (6.6)	0.1768	32.2 (7.8)	0.3711
Non-Hispanic Black	48.1 (3.2)		11.9 (2.5)		64.1 (4.5)		20.1 (3.7)	
Non-Hispanic White	53.2 (2.1)		6.6 (1.2)		64.0 (2.8)		24.8 (2.5)	
Other	33.9 (7.3)		17.9 (9.1)		53.4 (8.7)		26.1 (9.5)	
Sex								
Female	50.4 (2.2)	0.9274	9.7 (1.9)	0.1030	63.4 (2.8)	0.6522	22.1 (2.7)	0.1086
Male	50.2 (2.2)		6.2 (1.2)		61.9 (3.1)		27.3 (2.7)	
Year								
2007	47.6 (3.7)	0.7620	10.1 (2.6)	0.5441	64.0 (3.8)	0.4766	20.5 (3.8)	0.3545
2008	52.1 (3.0)		7.4 (1.9)		67.5 (4.0)		21.1 (3.2)	

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Predictors	Opioids Analgesic			Codeine			Hydrocodone			Oxycodone		
	% visits (SE)	p-value		% opioids (SE)	p-value		% opioids (SE)	p-value		% opioids (SE)	p-value	
2009	50.8 (2.8)			9.4 (2.8)			60.0 (4.2)			25.7 (4.3)		
2010	50.6 (2.8)			6.1 (1.7)			60.7 (4.1)			28.8 (4.1)		

Table 3

Multivariable Logistic Regression: Factors Associated with Specific Opioid Prescription Type among Patients Receiving an Opioid Prescription for NTDC visits in EDs.

Comparison	Codeine			Hydrocodone			Oxycodone		
	OR (95% CI)	p-value		OR (95% CI)	p-value		OR (95% CI)	p-value	
Age Group (years)									
0-4 vs 34-52	53.7 (7.34-392)	<.0001		0.23 (0.03-1.47)	0.3363		0.00 (0.00-0.00)	<.0001	
05-18 vs 34-52	4.41 (1.77-11.0)			0.65 (0.33-1.26)			0.87 (0.37-2.05)		
19-33 vs 34-52	1.08 (0.63-1.85)			1.06 (0.78-1.45)			0.99 (0.66-1.47)		
53-72 vs 34-52	0.35 (0.04-2.99)			1.50 (0.75-2.98)			1.05 (0.46-2.39)		
over 73 vs 34-52	0.00 (0.00-0.00)			0.69 (0.08-5.91)			0.12 (0.01-1.14)		
Payer Type									
Medicaid vs. Private insurance	0.73 (0.38-1.37)	0.4045		1.49 (0.92-2.39)	0.0138		0.70 (0.40-1.22)	0.0270	
Medicare vs. Private insurance	0.39 (0.09-1.64)			1.54 (0.77-3.07)			0.52 (0.20-1.31)		
Other vs. Private insurance	0.97 (0.25-3.74)			2.24 (0.97-5.18)			0.48 (0.21-1.11)		
Self-pay vs. Private insurance	0.58 (0.28-1.18)			2.02 (1.33-3.05)			0.50 (0.31-0.82)		
Unknown vs. Private insurance	0.89 (0.31-2.57)			1.99 (1.08-3.67)			0.43 (0.22-0.84)		
Race/Ethnicity									
Hispanic vs. Non-Hispanic White	1.23 (0.32-4.67)	0.0362		0.59 (0.33-1.07)	0.3253		1.39 (0.62-3.14)	0.5562	
Non-Hispanic Black vs. Non-Hispanic White	2.09 (1.25-3.50)			0.98 (0.64-1.50)			0.77 (0.48-1.23)		
Other vs. Non-Hispanic White	2.32 (0.79-6.80)			0.73 (0.37-1.44)			1.03 (0.37-2.88)		
Sex									
Female vs. Male	1.66 (0.91-3.03)	0.1011		1.07 (0.80-1.44)	0.6488		0.75 (0.52-1.08)	0.1275	
Year									
	0.89 (0.68-1.15)	0.3713		0.92 (0.79-1.06)	0.2526		1.17 (0.97-1.41)	0.0911	