



Non-medical use of prescription pain medications and increased emergency department utilization: Results of a national survey

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ABSTRACT

Background: There are no population-based studies of emergency department (ED) utilization by individuals using prescription pain medications non-medically. We examined whether non-medical use of prescription pain medications was independently associated with increased ED utilization.

Methods: We conducted a retrospective analysis of a nationally representative sample of the non-institutionalized, civilian U.S. population in the National Survey on Drug Use and Health, 2008–2013. We used multivariable logistic regression to examine the association between past year ED utilization and non-medical use of prescription pain medications, defined as use of medications “not prescribed for you or that you took only for the experience or feeling they caused”.

Results: An estimated 10.5 million adults annually reported past year non-medical use (NMU) of prescription pain medications, and 39%, or 4.1 million adults annually, also reported one or more past year ED visits. After adjustment for sociodemographic and clinical characteristics, adults with past year NMU of prescription pain medications had increased odds of past year ED utilization (adjusted odds ratio 1.32; 95% confidence interval 1.24–1.41). In secondary analyses, individuals with more frequent NMU had increased odds of ED utilization in unadjusted analyses, but this association was attenuated with adjustment for the source of prescription pain medication (i.e., physician, friend/family, other source).

Conclusions: Non-medical use of prescription pain medications is associated with increased ED utilization. Further work is needed to identify the optimal role of ED settings in providing screening, education, and treatment referral for individuals using prescription pain medications non-medically.

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1. Background

In the past decade, prescribing of opioid medications in the United States has quadrupled (Paulozzi et al., 2011). As the availability of opioid medications has increased so too have rates of opioid-related adverse health outcomes such as opioid

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overdose and opioid use disorders. Every day, 46 Americans die from an overdose related to prescription opioid medications (Frieden, 2014). In one study, a majority of prescription opioid-related overdose deaths involved the non-medical use of prescription opioids, defined as use without a prescription or use not as prescribed (Hall et al., 2008).

In an effort to describe morbidity associated with opioid medication use, several recent studies have examined emergency department (ED) visits related to the complications of opioid use (Cai et al., 2010). Hasegawa et al. (2014) reported that the rate of ED visits for opioid overdose (including heroin) quadrupled from 1993 to 2010. Yokell et al. (2014) estimated that prescription opioids

accounted for nearly four times as many ED visits as heroin in 2010 nationally. More broadly, in 2011, there were an estimated 500,000 ED visits related to non-medical use of prescription pain medications and another 121,000 ED visits involving individuals seeking detoxification from prescription pain medications, an increase of 286% and 348% respectively compared to 2004 (2013b). These studies highlight the multiple pathways to opioid-related ED utilization. However, they have relied on visit-based data extracted from medical records and are limited in their ability to assess patient-reported data on behaviors related to non-medical use of prescription medications.

Therefore, the objectives of this work were to examine utilization of ED services among a nationally representative sample of adults and its association with past year non-medical use of prescription pain medications. We hypothesized that past year non-medical use of prescription pain medications would be independently associated with ED utilization and that this association would be strongest among adults with more frequent non-medical use.

2. Methods

2.1. Data source

We analyzed data from the 2008 through 2013 National Survey of Drug Use and Health (NSDUH) public use files (2009; 2010; 2011; 2012; 2013a; 2014). The NSDUH is an annual cross-sectional survey that provides nationally representative estimates of substance use and other health-related behaviors among members of the non-institutionalized U.S. civilian population aged 12 years or older. The NSDUH sampling frame includes residents of households or non-institutional group quarters, persons without permanent residence (i.e., homeless people in shelters) and civilians living on military bases. The survey uses a 50-state design with an independent, multistage area probability sample for each state. The NSDUH contains sample weights for each respondent, which account for selection probability, adjust for nonresponse, and enable nationally representative estimates for all aspects of the survey. We restricted our analysis to adult respondents aged 18 years and older. The NSDUH has an annual sample size of approximately 70,000 respondents. The public use dataset includes data on approximately 55,000 respondents, of whom two-thirds are aged 18 years and older. We aggregated data across 6 survey years (2008–2013) to increase the sample size of this population, resulting in a final sample of 228,556 adult respondents.

The NSDUH uses a combination of computer-assisted personal interviewing conducted by a trained interviewer and audio computer-assisted self-interviewing (ACASI). ACASI provides respondents with a private and confidential means of responding to questions in order to maximize validity of reporting of sensitive behaviors such as substance use (Turner et al., 1998). Interviews are conducted in either English or Spanish and take approximately 1 h to complete. Respondents receive \$30 for completing the survey. From 2008 to 2013, the response rate was between 74% and 76%. The NSDUH imputes missing responses for the files made available for public use, and these imputed data were included in study analyses, when available. The NSDUH is sponsored by the Center for Behavioral Health Statistics and Quality within the SAMHSA, 2009; SAMHSA, 2010; SAMHSA, 2011; SAMHSA, 2012; SAMHSA, 2013a; Substance Abuse and Mental Health Services Administration (SAMHSA) and is conducted by RTI International, Research Triangle Park, North Carolina (2009; 2010; 2011; 2012; 2013a; 2014). Additional details are available online (<http://www.samhsa.gov/data/population-data-nsduh>).

NSDUH data are de-identified and publicly available. All survey respondents provide informed consent prior to participation. Conduct of the NSDUH was approved by the Research Triangle Institute's Institutional Review Board. This analysis was reviewed by the Colorado Multiple Institutional Review Board and determined to be Non-Human Subjects Research.

2.2. Main measures

Our main outcome variable was self-reported past year ED utilization. We created a dichotomous past year ED utilization variable based on non-zero responses to a single survey question, "During the past 12 months . . . how many different times have you been treated in an emergency room for any reason?" Our primary explanatory variable was self-reported past year non-medical use (NMU) of prescription pain medications, defined as used of prescription pain medications that were "not prescribed for you or that you took only for the experience or feeling they caused." We created a dichotomous variable to identify individuals reporting any past year non-medical use of prescription pain medications.

In secondary analyses, we categorized respondents' self-reported frequency of past year NMU of prescription pain medications as 1–29 days, 30–99 days, 100–199 days or 200–365 days consistent with prior definitions of frequency of non-medical

use (Jones, 2012; Jones et al., 2014). We hypothesized that more frequent NMU would increase exposure to the risks of opioid medications and therefore increase ED utilization related to opioid-related adverse events.

We also specified two additional patient-reported measures that were deemed potentially relevant to ED utilization among individuals using prescription pain medications non-medically, (1) source of prescription pain medications used non-medically, and (2) past year opioid withdrawal symptoms. First, we created three mutually exclusive categories to characterize respondents' most recent source of prescription pain medications: (1) one or more physicians; (2) friends or family; or (3) all other sources (i.e., theft, purchase from drug dealer) (Becker et al., 2011; Wang et al., 2014). Second, we created a dichotomous variable to identify individuals reporting past year opioid withdrawal symptoms. Respondents were asked whether they had experienced at least 3 of 9 opioid withdrawal symptoms after cutting back or stopping prescription pain medications. These symptoms included feeling kind of blue or down; vomiting or feeling nauseous; having cramps or muscle aches; having teary eyes or a runny nose; feeling sweaty, having enlarged eye pupils, or having body hair standing up on your skin; having diarrhea; yawning; having a fever; or having trouble sleeping.

2.3. Study covariates

A priori, we identified sociodemographic and clinical characteristics which may confound the association of interest. Sociodemographic variables included gender, age, race/ethnicity, marital status, education, employment, insurance status, family income and rural residence. Clinical characteristics included self-reported health status, dichotomized as 'excellent/very good/good health' versus 'fair/poor health.' Serious psychological distress was defined as a score ≥ 13 on the K6 Psychological Distress Scale, a validated screening tool for serious mental illness (Kessler et al., 2003). Substance use characteristics included past year abuse or dependence of: (1) alcohol; (2) cannabis; and (3) other illicit drugs (including heroin, cocaine, hallucinogens and inhalants), based on diagnostic criteria for substance abuse and dependence as specified in the *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition (DSM-IV). We created a variable to identify self-reported past year non-medical use of prescription sedative, tranquilizer or stimulant medications. Past month nicotine dependence was based on meeting criteria from the Nicotine Dependence Syndrome Scale or a single question from the Fagerström Test of Nicotine Dependence (Heatherton et al., 1991, 1989; Shiffman et al., 2004).

2.4. Statistical analyses

We used the chi-square (χ^2) test to examine differences in respondent characteristics, stratified by past year non-medical use of prescription pain medications. For our primary analysis, we used logistic regression to characterize the independent association between NMU of prescription pain medications and ED utilization among all adult survey respondents. We present staged model results to provide context on the role of sociodemographic characteristics, health status and substance use in the association of interest. Model 1 was adjusted for age, gender, race/ethnicity, education, insurance, family income, employment, marital status, rural location, and survey year; Model 2 was additionally adjusted for self-rated health and past year serious psychological distress; and Model 3 additionally adjusted for substance use variables. In subgroup analyses, we replicated Model 3 within pre-specified, clinically relevant subgroups.

In secondary analyses, we calculated unadjusted rates of past year ED utilization stratified by key variables of interest (i.e., frequency of non-medical use). We created a logistic regression model to characterize the association between increasing frequency of NMU of prescription pain medications and ED utilization. In addition to the covariates included in our full primary model, we adjusted for past year opioid withdrawal symptoms (Model 4) and source of prescription pain medications (Model 5) to characterize to contributions of opioid withdrawal and medication seeking to the association of interest. We report all model results as adjusted odds ratios (AOR) and 95% confidence intervals (CI).

All analyses were performed as recommended by SAMHSA and used the Surveyfreq, Surveylogistic, and Surveymeans procedures in SAS 9.4 (SAS Institute Inc., Cary, NC, USA) to account for the complex sampling design of the NSDUH. All statistical tests were two-sided and were considered statistically significant when $P < 0.05$.

3. Results

The study sample consisted of 228,556 adult respondents, representing an estimated 231 million civilian, non-institutionalized adults in the United States. An estimated 10.5 million American adults annually, or 4.6% of the adult population (95% CI 4.4–4.7%), reported past year non-medical use of (NMU) of prescription pain medications. Adults with past year NMU of prescription pain medications were more likely to be young, male, white, publicly insured or uninsured, and unemployed compared with adults without past year NMU (Table 1). Adults with past year NMU were also

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