Addictive Behaviors 76 (2018) 348–354

Contents lists available at ScienceDirect

Addictive Behaviors

journal homepage: www.elsevier.com/locate/addictbeh

Associations between statewide prescription drug monitoring program (PDMP) requirement and physician patterns of prescribing opioid analgesics for patients with non-cancer chronic pain

Hsien-Chang Lin[a], Zhi Wang[a], Carol Boyd[b], Linda Simoni-Wastila[c], Anne Buu[b,*]

[a] Department of Applied Health Science, School of Public Health, Indiana University, 1025 E. 7th Street, SPH 116, Bloomington, IN 47405, USA
[b] Department of Health Behavior and Biological Sciences, School of Nursing, University of Michigan, 400 North Ingalls, Ann Arbor, MI 48109, USA
[c] Department of Pharmaceutical Health Services Research, School of Pharmacy, University of Maryland, 20 North Pine Street, Baltimore, MD 21201, USA

HIGHLIGHTS

- State PDMP implementation was not associated with physician opioid prescribing.
- State PDMP requirement levels was not associated with physician opioid prescribing.
- Medicare patients were more likely to be prescribed opioid analgesics.
- Hispanic patients were less likely to prescribed opioid analgesics.

ARTICLE INFO

Keywords:
Chronic pain
Prescription drug
Drug abuse
Drug policy
Ambulatory care

ABSTRACT

Objective: State-level prescription drug monitoring programs (PDMPs) have been implemented in most states. PDMPs enable registered prescribers to obtain real-time information on patients' prescription history to reduce non-medical use of controlled drugs. This study examined whether PDMP implementation and different levels of PDMP requirements were associated with physicians' patterns of prescribing opioid analgesics for patients with non-cancer chronic pain.

Methods: This is a secondary analysis study using cross-sectional national data. Patients with non-cancer chronic pain from the 2012 National Ambulatory Medical Care Survey were included (weighted N = 81,018,131; unweighted N = 3295). Heckman two-step selection procedure employing two logistic regressions was used to explore the associations between PDMP requirements and physicians' prescribing behaviors, controlling for physician characteristics, patient characteristics, physician-healthcare system interaction, and physician-patient relationship, guided by the Eisenberg's model of physician decision making.

Results: State PDMP implementation status and requirement levels were not associated with physician opioid prescribing for non-cancer chronic pain treatment (p's ranged 0.30–0.32). Patients with Medicare coverage were more likely to be prescribed opioid analgesics than those with private health insurance (OR = 1.55, $p < 0.01$). Hispanic patients were less likely to be prescribed opioid analgesics than non-Hispanic white patients (OR = 0.61, $p < 0.05$).

Conclusions: Findings indicated that the effectiveness of PDMPs on physicians' opioid prescribing tendency for non-cancer chronic pain treatment could not be supported. Policy makers should be aware of the need for redesigning PDMPs regarding requirements and enforcement for prescribers and related stakeholders. Future studies also are needed to identify characteristics contributing to PDMP effectiveness in reducing non-medical use of prescription opioids.

1. Introduction

Non-medical use and misuse of opioid analgesics is a major public health concern in the U.S. (Kolodny et al., 2015; Paulozzi, 2012). There are serious consequences associated with opioid misuse, including traumatic physical and psychological consequences, and increased

* Corresponding author.
E-mail addresses: linhsi@indiana.edu (H.-C. Lin), zw34@indiana.edu (Z. Wang), caroboyd@med.umich.edu (C. Boyd), lsimoniw@rx.umaryland.edu (L. Simoni-Wastila), buu@umich.edu (A. Buu).

http://dx.doi.org/10.1016/j.addbeh.2017.08.032
Received 7 June 2017; Received in revised form 17 August 2017; Accepted 29 August 2017
Available online 05 September 2017

emergency department visits, hospitalizations, substance treatment admissions, and economic costs (Coben et al., 2010).

Previous studies of non-medical use of prescription opioid analgesics have focused on patient drug seeking behaviors such as doctor or pharmacy shopping or using family's or friends' opioids (Shei et al., 2015; Yang et al., 2015). However, the problem of non-medical use may begin with healthcare providers who fail to adequately play a gatekeeping role when prescribing opioid analgesics (e.g., over-prescribing, providing unnecessary refills, etc.). In fact, prescriptions of opioid analgesics have dramatically increased (Volkow & McLellan, 2011), despite the ongoing controversy of prescribing for non-cancer chronic pain (Chou et al., 2015; Rosenblum, Marsch, Joseph, & Portenoy, 2008). Clinical practice guidelines stipulate that opioid analgesics should never be used as a first-line pharmacological treatment for non-cancer chronic pain, and only be prescribed after other non-opioid pain medications have been shown to be ineffective (Chou et al., 2009; World Health Organization (WHO), 1990). However, these guidelines are often not followed—an estimated 1 out of 5 patients with non-cancer pain are prescribed opioid analgesics in office-based settings (Daubresse et al., 2013). Indeed, prescriber prescribing behaviors may play a crucial role in the epidemic of non-medical use of prescription opioid analgesics.

In order to improve physician prescribing practices surrounding pain medications and to reduce diversion, all states (except Missouri) and District of Columbia (D.C.) have implemented state-level prescription drug monitoring programs (PDMPs), which enable registered prescribers and pharmacists to obtain real-time information on patients' prescription history and thus, prevent “doctor shopping” with concomitant extra prescriptions. However, PDMPs are statewide programs and vary by design, requirement, and operation across states, which has caused barriers to evaluating the effectiveness (Rutkow, Turner, Lucas, Hwang, & Alexander, 2015). For example, each state has various, and often different, terms of provider engagement. As of 2012 (the year of data in this study), 44 states had implemented PDMPs. Among them, two states mandated physicians to enroll in the PDMP query system, whereby physicians could see a patient's fill/refill records of controlled medications. Seven states mandated physicians to query a patient's fill/refill records of controlled medications before prescribing them. The remaining 35 states did not require prescribers to enroll in or query the PDMP systems (Table 1).

Some studies supported the effectiveness of PDMP mandates including mandatory enrollment and mandatory query (Excellence & America, 2013; Freeman, Goodin, Troske, & Talbert, 2015; Haffajee, Jena, & Weiner, 2015). One study found substantial increases in PDMP queries and reductions in opioid prescriptions following implementation of comprehensive use mandates in Kentucky, Tennessee, New York, and Ohio (Kreiner, Nikitin, & Shields, 2014). In contrast, others have found an insignificant impact of PDMPs on physician prescribing of opioids (Brady et al., 2014; Paulozzi, Kilbourne, & Desai, 2011).

To date, studies evaluating the PDMP effectiveness at reducing physician prescribing of opioids have important limitations. First, existing studies usually included both acute and chronic pain cases in the analyses. However, patients with chronic pain tend to receive prescriptions for pain medication multiple times and for a longer period (Chou et al., 2015; Kuo, Raji, Chen, Hasan, & Goodwin, 2016) and thus are at higher risk for developing opioid dependence (Chou et al., 2014; Dowell, Haegerich, & Chou, 2016) as well as misuse or diversion (Volkow & McLellan, 2016), implying that analysis should focus on patients with chronic pain. Second, there have been few studies of PDMPs using national data. Recently, one study used the National Ambulatory Medical Care Survey (NAMCS) and concluded that PDMP implementation was associated with a 30% reduction in opioid prescribing (Bao et al., 2016). However, this study neither distinguished chronic pain from acute pain nor considered different levels of PDMP requirement. Given the aforementioned literature gaps, it is needed to use national data to re-examine the effectiveness of different state-level PDMPs on physicians' opioid prescribing, considering for differences in treatment for acute and chronic pain as well as different levels of PDMP requirements among different states.

This study fills the literature gaps by analyzing physician-reported data on opioid prescribing for patients with non-cancer chronic pain collected from the 2012 NAMCS. We used the Heckman two-step selection procedure to control potential selection bias between patients who needed pain medications and who did not. The Heckman procedure modeled physicians' decision making in two steps: (1) determine whether a pain medication should be prescribed, and (2) if yes, whether opioid analgesics should be prescribed.

2. Methods

2.1. Conceptual framework

We applied the Eisenberg Model of Physician Decision Making to analyze physicians' prescribing patterns, which describes the sociological factors that influence physician decision making. Physician decision making is influenced by four groups of factors: (1) physician characteristics (e.g., physician specialty); (2) patient characteristics (e.g., age, sex, race/ethnicity); (3) physician's relationship with the healthcare system (e.g., practice setting, ownership); and (4) physician's relationship with the patient (e.g., patient seen before) (Eisenberg, 1979). This model has been widely used to characterize physician decision-making when prescribing treatment (Goldberg & Lin, 2017; Lin, Erickson, & Balkrishnan, 2011).

2.2. Data and study sample

This study used data from the 2012 NAMCS, a national probability sample survey conducted by the National Center for Health Statistics and the Centers for Disease Control and Prevention (CDC, 2016). The NAMCS included ambulatory visits to non-federally employed office-based physicians. A physician or staff member provided information about a patient's sociodemographics, physician specialty, reasons for

Table 1
Statewide PDMP implementation status and requirement in 2012.

Status and requirement	States
No PDMP implemented	• Arkansas, District of Columbia, Georgia, Maryland, Missouri, New Hampshire[a,b], Wisconsin[b]
No Requirement	• Alaska, California, Colorado, Connecticut, Delaware[a], Florida, Hawaii, Idaho[a], Illinois, Iowa, Louisiana, Maine[a], Massachusetts, Michigan, Mississippi, Montana[a], Nebraska, New Jersey, New Mexico[a], New York, North Carolina, North Dakota, Ohio, Oregon, Pennsylvania, Rhode Island[a], South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont[a], Virginia, West Virginia[a], Wyoming[a]
Mandatory enrollment	• Alabama, Arizona
Mandatory query	• Indiana, Kansas, Kentucky, Minnesota, Nevada[a], Oklahoma, Washington

Data source: compiled by this study.

[a] Not included in this study due to lack of state identifiers in NAMCS or inability to identify state PDMP status based on NAMCS census division identifiers.

[b] PDMPs that were enacted but not yet implemented in 2012.