The Role of Prescription Trends in the Opioid Epidemic and the Factors that Affect Physician Prescriptions

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ABSTRACT

Every day, more than 90 Americans die as a result of opioid overdose (NIH, 2017a), and opioid overdoses have quadrupled since 1999 (CDC, 2016). Opioids are best described as a class of drug that includes synthetic versions, such as fentanyl, the commonly known illegal drug, heroin, and prescribed medications such as oxycodone (OxyContin®) and hydrocodone (Vicodin®; NIH, 2017b). Opioids directly activate the analgesia, or pain relieving portion of the brain as well as the reward region (Volkow & McLellan, 2016). This makes the drug effective for reducing pain as well as giving the body a sense of reward. However, the drug manipulates the reward system by building a learned association between taking the drug and the satisfactory effect received from the drug (Volkow & McLellan, 2016). This learned association puts the patient or user at risk for misuse of the drug, making opioid prescribing difficult for physicians. Other factors affecting opioid prescribing are racial disparities, patient-physician mistrust, pain perception, and the difference between acute and chronic pain (Mathur, Richeson, Paice, Muzyka, & Chiao 2014; Volkow & McLellan, 2016). The purpose of this article is to explore the factors that affect physicians’ decisions to prescribe opioids, and to examine how prescription trends influence the opioid epidemic.
LITERATURE REVIEW

Opioids are a significant tool utilized by physicians for their pain relieving, or analgesic, effect. Opioids produce their analgesic effect by binding to mu-opioid receptors in the brain. Mu-opioid receptors are primarily located in the thalamus, periaqueductal gray, insula, anterior cingulate (region associated with pain perception), ventral tegmental area, nucleus accumbens (region associated with reward), amygdala (region associated with emotional regulation and memory), and the brainstem (nuclei that regulates breathing; Volkow & McLellan, 2016). The location of mu-opioid receptors demonstrates how opioids are able to relieve pain and present euphoria.

The mu-opioid receptors located in the brainstem are responsible for the suppressed breathing characterized in opioid-related overdose. In addition to activating the analgesic and reward regions of the brain, opioids also create a learned association between receiving the drug and the effect of the drug (Volkow & McLellan, 2016). This learned association happens fairly quickly and puts the user at risk for developing a dependence.

Substances derived from opium can be placed into two categories: those directly derived from opium; and those

![Figure 1. Opioids, divided by classification.](image-url)
derived from morphine, which is more potent than simple opium (Opium, 2016). Another category of derivatives does not contain opium, but is synthetic and made to mimic the effects of opium. Drugs derived directly from opium include codeine and morphine; drugs derived from morphine or other derivatives include heroin, oxycodone, hydrocodone, and hydromorphone. Common synthetic versions of opium are methadone, fentanyl, fentanyl duragesic patches, propoxyphene, butorphanol, and levorphanol (Figure 1; Opium, 2016).

Prescribing Methods as a Factor in the Opioid Epidemic Trends in Opioid Prescriptions.

Opioid overdose and the prescription of opioids have a parallel relationship. There were 52,404 deaths from drug overdose reported in the United States in 2015, and 63.1% were opioid related (Guy et al., 2017). Since the 1990s, opioid sales and prescriptions have quadrupled (Kunins, 2015). The commonly prescribed drugs oxycodone, methadone, hydrocodone, and other semisynthetic drugs accounted for a 9% increase in overdoses (Lucyk & Nelson, 2017).

A letter published in 1980 in the *New England Journal of Medicine* may have sparked this sharp increase in opioid sales and prescriptions. Hershel Jick, a physician at the Boston University School of Medicine, submitted a letter to the editor, published under the title, “Addiction Rare in Patients Treated with Narcotics” (Quinones, 2016). Using data collected by the Boston Collaborative Drug Surveillance Program, Jick analyzed patient records to determine whether the patients developed an addiction after taking prescribed narcotic painkillers. Jick concluded that, out of the almost 12,000 patients who were treated with opiates in a hospital setting, only four had developed an addiction (Quinones, 2016). Jick did not disclose information about the dosage the patients received, the duration they received the medication, or how often it was administered. The letter read:

*To the Editor...The addiction was considered major in one instance. The drugs implicated were meperi-dine in two patients, Percodan in one, and hydromor-*
phone in one. We conclude that despite widespread use of narcotic drugs in hospitals, the development of addiction is rare in medical patients with no history of addiction. (Porter & Jick, 1980, p. 123) Jick did not make scientifically verified claims, however; his words were routinely cited as actual evidence that addiction was unlikely to occur when a patient without a history of addiction received opioids in a clinical setting. By 1990, Jick’s pronouncement became revolutionary in the medical world, and influenced prescribing methods in hospitals, medical clinics, and family practices throughout the nation (Quinones, 2016).

Similarly, Purdue Pharma, a pharmaceutical company, claimed a drug they created, OxyContin, had a lower possibility for abuse than other oxycodone products. Purdue wanted their product to be marketed with an emphasis on the benefits for cancer patients (Quinones, 2016). In 1996, Purdue used aggressive and persistent strategies to promote OxyContin; their strategies proved effective, and sales rose from $48 million in 1996 to $1.1 billion in 2000 (Van Zee, 2009). As reported by Van Zee (2009), a major goal of Purdue’s marketing plan was to increase physician prescribing of OxyContin. Purdue tailored their presentation of the drug to individual physicians by researching the physician’s background and prescribing practices. Highly paid physicians with a high rate of opioid prescriptions became targets for Purdue, whose sale representatives were told to report that the risk of addiction to OxyContin was “less than one percent” (Van Zee, 2009, p. 223).

Financial ties.

Purdue Pharma and other pharmaceutical industries may have influenced the opioid epidemic through financial relationships with opioid-related advocacy groups and physicians. According to the U.S. Senate Homeland Security and Governmental Affairs Committee (HSGAC, 2018), Purdue has paid about $4.2 million dollars to patient advocacy groups, greatly increasing the sales of their products. Figure 2 shows the amount Purdue Pharma and other pharmaceutical companies paid to patient advocacy groups between 2012 and 2017, a figure of more than $8.9 million dollars.
Despite their success, Purdue Pharma and many other drug manufacturers have come under fire for their aggressive marketing. Purdue, in particular, has received criticism for misrepresenting OxyContin to physicians as non-addictive. In 2007, an affiliate of Purdue Pharma, Purdue Frederick Company Inc., and its three top executives, were charged for the misbranding of OxyContin (Van Zee, 2009). According to Van Zee (2009), the increased rate of OxyContin abuse was a leading factor in the growing trend of prescription opioid abuse. While Purdue Pharma has eased up on their aggressive marketing techniques, ongoing financial ties between advocacy groups and professional societies suggest a continuing effort to promote opioid use (HSGAC, 2018).
The prescribing of opioids leveled off from 2010 to 2015, decreasing the amount of opioid prescriptions, yet the United States has seen an increase in opioid availability (Lucyk & Nelson, 2017), and the prescribing rates are still three times the number of 1999 (Centers for Disease Control and Prevention [CDC], 2017). Figure 3 shows the annual prescribing rate from 2006 to 2015 in morphine milligram equivalents (MME). In addition to the high prescribing rate, the prescription length increased from a 13.3 day supply in 2006 to 17.7 days in 2015 (Guy et al., 2017). According to Lucyk and Nelson (2017), the use of heroin and synthetic opioids, such as fentanyl, is the primary cause of the continually increasing rates of overdose.

The CDC (2017) report that, although there are various ways to obtain opioids, those who use them non-medically for more than 200 days a year are at the greatest risk for overdose. Figure 4 illustrates the sources of opioids for non-medical use: prescriptions (27%), friends and family (not purchased; 26%), friends and family (purchased; 23%), and purchasing from a dealer (15%).

**Figure 3.** Annual morphine prescribing rates, 2006-2015.
The U.S. faced similar drug crises in the 1970s with heroin and the cocaine epidemic of the 1980’s. The National Center for Health Statistics (NCHS) reports that the opioid epidemic is more sustained, has reached larger regions, and has had greater socioeconomic reach than previous epidemics (National Academy of Sciences, 2016).
of Sciences [NAS], 2017). Figure 5 shows the significant increase in deaths from overdoses over time; the opioid period has had the most deaths per 100,000 compared to previous drug epidemics.

**Fentanyl overdoses on the rise.**

Fentanyl is a synthetic opioid used for treating pain, especially cancer pain, and has become a major cause of synthetic opioid deaths when produced and obtained illicitly. According to the CDC (2017), fentanyl is 50-100 times more potent than morphine and is often mixed with heroin and cocaine when illicitly produced. From 2014 to 2015, there was a 196% increase in fentanyl-related overdoses (Figure 6).

![Graph showing opioid deaths by drug type, 2005-2017](image)

**Figure 6.** Opioid deaths by drug type, 2015 - 2017.

**Misuse of Buprenorphine.**

Buprenorphine is a semi-synthetic opioid prescribed to help treat opioid dependence. First thought to have a low risk of addiction, Buprenorphine tablets are water soluble, making them convenient for intravenous use. Buprenorphine misuse is common among opioid-dependent individuals (Moratti, Kashanpour, Lombardelli, & Maisto, 2010).

**Naloxone to treat overdoses.**

Naloxone is a medication used to reverse an opioid overdose by binding to opioid receptors and blocking or reversing...
the effect of other opioids (National Institutes of Health [NIH], 2018). As reported by the National Institute on Drug Abuse (NIDA), Naloxone is an extremely safe, prescribed medication usually administered by a paramedic via injection; there is now a nasal spray available under the brand name NARCAN®.

**Patient-Clinician Mistrust and Pain Perception**

Today, many physicians express concerns regarding how to prescribe opioids in a safe manner, detect early signs of addiction, and discuss substance abuse/dependency with their patients (Volkow & McLellan, 2016). Mistrust between patients and physicians poses a particular problem. In a series of patient and physician interviews, Buchman, Ho, and Illes (2016) evaluated patient and clinician viewpoints, clinicians’ trust of their patients, and patients’ concerns that they appear “untrustworthy” to clinicians. Clinicians fear that they will be subjected to false injury claims made by patients to obtain opioid medications, which they describe as “being burned” (Buchman et al., 2016, p. 1400). One physician stated, “We have a responsibility to be careful with prescribing these medications, [for] when we get burned, society gets burned, patients get burned” (Buchman et al., 2016, p. 1400).

Many patients experience difficulties in communicating their pain and may fear their pain will go untreated (Buchman et al., 2016). Buchman et al. (2016) identified a number of problems in patient/physician communication in relation to pain treatment. First, some patients feared their pain would worsen as a result of their physician dismissing the importance of their pain; second, some patients experienced difficulties in accurately describing their pain level to medical practitioners. Third, some patients did not trust their physician because they believed their physician did not trust *them*, and the fourth problem arose from the stigmas faced by patients who had experienced previous substance abuse and were viewed as addicts, even if they no longer abused substances.

Buchman et al. (2016) found that physicians reported difficulties prescribing medications for chronic pain due to their patients having come from a different background. Many physicians were concerned that some patients were only seeking medication to support a substance use disorder; physicians also
reported they were wary about prescribing addictive medications, such as opioid analgesics. They felt the need to be extra cautious about the veracity of the patient’s reported symptoms, which led to mistrust in the physician-patient relationship.

Neuroanatomy of pain perception.

Pain intensity, caused by a nociceptive process, can be very difficult for patients to describe accurately to their physician. The nociceptive process begins when an individual comes into contact with harmful stimuli, either externally or internally. A message is then sent by neural pathways from injured tissue, through the peripheral nervous system, to the central and autonomic nervous system (Garland, 2012). Physical, cognitive, and emotional factors play a role in the nociceptive process and help adjust the pain intensity (Tracey, 2008).

Differences exist between nociception and clinical pain. Nociception is a neural process that can result in tissue damage, compared to clinical pain, which is pain described by patients who are interpreting their perception of the nociception process occurring in their body (Mao, 2012).

Acute and chronic pain.

The biggest difficulty in pain management is effectively prescribing opioids for chronic pain, and particularly non-cancer chronic pain. Opioids are most effective when treating acute pain, which is pain expected to last less than six months. In general, opioids are no longer needed once the underlying cause no longer exists (Cleveland Clinic, 2017). Opioids can help to relieve acute pain while improving functions, however, the benefits of opioids for long-term chronic pain management are uncertain (Volkow & McLellan, 2016). Opioid analgesics and non-steroidal anti-inflammatory drugs (NSAIDs) can help cut or shorten the acute pain caused by surgery or trauma, while opioids and NSAIDs lessen pain by cutting the nociceptive input short (Mao, 2012).

Chronic pain may continue, even when the underlying cause (i.e., surgery or injury) no longer exists (Cleveland Clinic, 2017). The mismatch between nociception and chronic pain makes treating chronic pain in a clinical setting difficult; a mismatch arises...
when chronic pain is influenced by psychosocial factors, such as depression and anxiety (Mao, 2012). Such comorbid psychosocial factors can result in a higher perceived pain level in patients.

Chronic pain has a 40% prevalence rate in U.S. older American adults and explains why prescribing opioids has become an issue in the U.S. (Volkow & McLellan, 2016). There are approximately 100 million Americans with chronic pain, and pain management costs the U.S. some $560-635 billion dollars a year (Institute of Medicine [IOM], 2011). According to Guy et al. (2017), three main reasons explain the sharp increase in opioid prescriptions: first, an increase of opioid prescriptions for chronic pain, specifically chronic non-cancer pain; second, extended durations over which opioids are prescribed; and third, higher dosages of opioids prescribed for patients with chronic pain, over extended lengths of time.

Racial Disparities as a Factor in the Opioid Epidemic

Statistics of race and use.

The Henry J. Kaiser Family Foundation (2017) analyzed 2015 overdose data from the CDC’s National Vital Statistics System. In the U.S., there were a total of 33,091 deaths from opioids, natural and synthetic; the majority of the deceased were White, Non-Latino Americans, with 27,056 deaths. Black and Latino populations experienced significantly fewer deaths from opioid overdose: 2,741 overdose deaths within the Black population and 2,507 overdose deaths within the Latino population. Figure 7 shows the deaths per 100,000 for non-Hispanic White, non-Hispanic Black, and Hispanic individuals.

The differences in opioid overdose deaths between White and non-White populations were discussed in a 2017 interview with Noel King, National Public Radio (NPR) host, and Dr. Andrew Kolodny, a drug abuse expert (NPR, 2017). Kolodny believed these differences in numbers are a result of prescribing methods; physicians are often more cautious when they prescribe addictive medication to non-White patients than to White patients. Kolodny explained that this caution stems from the belief that Black and Latino patients are more likely to abuse and become addicted to the medication. Physicians may be
unaware of this racial bias because it happens on an unconscious level. Comparing the current opioid epidemic to the cocaine epidemic of the 1980’s, which largely affected the low-income Black population, Kolodny pointed out that the responses to each were different. Cocaine abusers were arrested and incarcerated; the response to the current opioid epidemic, which targets a largely White population, is to ensure proper treatment to those with a drug dependency.

**Provider bias.**

Compared to White patients, non-White patients are less likely to receive quality pain treatment (Mathur, Richeson, Paice, Muzyka, & Chiao, 2014). This issue has, ironically, served as a protective factor for minority populations. In a study done in Michigan, researchers examined the differences in prescription opioid availability in pharmacies located in zip codes that were either predominantly White or minority. From previous research, the article established that a physician’s method of pain management varied on the type of pain and the patient’s demographics. Green, Ndao-Brumblay, Khady, West, and Washington (2005) stated that, “Physicians reported lesser goals for chronic pain, and their prescribing habits differed on the basis of race, ethnicity, age, and gender, with the pain complaints of minorities, elderly persons, and women receiving less attention than the complaints of white men” (p. 689). When collecting and

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**Figure 7.** Drug overdose deaths by race and ethnicity, 1999 - 2015.

![Drug overdose deaths by race and ethnicity, 1999 - 2015.](https://commons.emich.edu/mcnair/vol11/iss1/4)
analyzing variability data, researchers found that pharmacies in primarily White neighborhoods were more likely to carry opioid analgesics than those in minority neighborhoods.

In the Michigan study, Green et al. (2005) selected zip codes with at least 70% minority residents and zip codes with more than or equal to 70% White residents. They examined the racial composition of 965 zip codes and found that only 3.4% of the zip codes had a composition that could not be classified to a majority race. After sampling and excluding pharmacies that had missing information or were unresponsive, 93 minority pharmacies and 95 White pharmacies were included in the analysis.

The researchers contacted the managers of the pharmacies via phone and asked them about the availability of 15 common opioid analgesics at their location. The 15 common opioid analgesics fall into three categories of opioids: long-acting, short-acting, and combination products. The researchers collected data on the quantities of opioid analgesics the pharmacies carried and noted the reasons why some pharmacists carried low quantities of opioids: (1) low demand, (2) concerns about illicit use, (3) too much paperwork, (4) fear of robbery, (5) lack of directions on drug disposal, and (6) “other” (Green et al., 2005).

The study found that pharmacies in predominantly White zip codes were more likely to have sufficient supplies of opioids than in minority zip codes (Green et al., 2005). The study also examined distances between pharmacies and hospitals and found no correlation between the pharmacy’s distance from a hospital and its opioid stock. Researchers also found that non-corporate pharmacies were more likely to have sufficient supplies of opioids than corporate pharmacies.

Pharmacies with low opioid supplies reported that low demand was the main reason. Paperwork and fear of robbery were not major reasons for this choice. Those with a sufficient supply were less likely to report concerns about illicit opioid use than pharmacies that did not have a sufficient supply (Green et al., 2005). Overall, the study found significantly less access to opioids in minority zip codes than White zip codes, regardless of the community’s income level. However, when not comparing race, low-income areas were less likely to have access to sufficient opioid supplies than higher income regions (Green et al., 2005).
Racial priming.

Another method used to gauge how race can impact an individual’s perception is racial priming. Racial priming is a way to influence a bias or perception by revealing the race of another at either a subconscious or relatively conscious level (Mendelberg, 2008). Mathur et al. (2014) used racial priming to observe participants’ reaction to pain experienced by different races. The sample included 324 student volunteers. The volunteers were asked to pretend they worked at their university’s student health center and to review patient reports. The reports had a description of the patient’s reason for visiting, as well as a facial photograph.

To test for implicit racial priming, the face of either a Black or White male was flashed on a screen for no more than 30 milliseconds. This was considered long enough to influence the respondents’ perception of the patient, but too short for the respondent to identify exactly what they saw. To make use of explicit facial priming, the image of either a Black or White male


Figure 8. Implicit and explicit racial bias priming.
was presented to the respondent for a full seven seconds (Figure 8; Mathur et al., 2014).

In addition to reviewing reports, respondents completed a seven question survey regarding the reports. The survey consisted of an 11-point Likert scale (0=not at all and 10=very much; Mathur et al., 2014). The questions focused on pain perception (“How much pain do you think the patient is experiencing?”), empathy (“Do you feel bad for the patient?”), helping motivation (likeliness of respondent helping the patient), excused absence (“Do you think the patient should be excused from class/exam?”), treatment recommendation, perceived trustworthiness (“Is the patient trustworthy?”), and perceived responsibility (“Do you think the patient is responsible for their own pain?”).

According to Mathur et al. (2014), the researchers’ study, which used two races and two prime conditions, explicit and implicit prime, showed a major relationship between prime type and the race of the primed patient; there were more responses to the perceived pain of the Black male patients in explicit priming and more responses to the perceived pain of White male patients in the implicit priming. The researchers also noted that the sex of the volunteer was of interest; female volunteers tended to respond more to the pain of all of the patients than male volunteers. As far as race, researchers did not expect the volunteers to respond more to Black male patient pain in the explicit prime report, where the race of the patient was made more obvious. Researchers propose this was likely due to the fact the volunteer was more conscious and did not want to appear to be prejudiced or biased.

Recommendations for Prescribing: The Michigan Prescription Drug and Opioid Task Force

Education and training.

The Michigan Prescription Drug and Opioid Task Force (2015) recommends that medical professionals should receive training on how to treat patients using opioids and how to treat addiction to opioids and other substances. The Task Force sees education and training as the best model for opioid abuse prevention.
Reducing prescriptions.

The Task Force (2015) recognizes the need for a collaborative relationship between stakeholders and state government for reducing opioid and prescription drug abuse. A collaborative effort from state and local agencies is needed to provide information about prescription drug abuse, preventions, and treatment. Reductions in the overall prescribing of opioids are also recommended. Effective interventions for reducing the amount of unused medication include the availability of drop-off bins, where unused medications can be disposed of in a safe, convenient manner, and take-back programs, which can help increase public awareness of the importance of unused medication disposal.

The Task Force (2015) also recognizes the need to address individuals who are dealing with substance dependency and are seeking prescription drugs for non-medical use. These individuals engage in what is called pharmacy shopping, when they go from one pharmacy to another, often seeing several doctors to try to obtain multiple prescriptions. One way to address this is to “lock-in” the prescription, making it difficult to refill more than once. In addition, limiting patients to a single doctor or pharmacy may be another way to address pharmacy shopping.

Raising awareness.

The Task Force (2015) reports that public understanding of opioid and prescription abuse is low and recommends campaigns to help raise awareness. Campaigns should address risks associated with abuse, how to dispose of unused medications safely and properly, as well as informing the public about prescribing practice etiquette and aiming to reduce stigma around addiction.

CONCLUSION

Prescribing practices have been a major influence on our nation’s current opioid epidemic. Factors, such as racial disparities, patient-physician mistrust, pain perception, and the differences between acute and chronic pain, have affected opioid prescribing practices. There is a critical need to address the patient experience when administering prescriptions with a potential risk for substance abuse, especially in patients who have experienced substance abuse in the past.
Large pharmaceutical companies and inaccurate claims that minimize the dangers of opioid dependency have increased the potential for opioid addiction. Although we have had success in decreasing availability of opioid prescriptions, we must now face the issue of heroin use and the misuse of Buprenorphine. It is imperative that we address these issues through education and training, reducing prescriptions, and raising awareness of the problem.

REFERENCES


