Initial Opioid Prescription and Number Needed to Harm

LUKE BARRE, MD, MPH; MEGHAN McCORMICK, BS, MPH; JAMES V. McDONALD, MD, MPH

ABSTRACT

Prescription opioids are an important step in the development of persistent opioid use. Our study estimates the change in long-term opioid use before and after a 2017 regulatory update on acute pain prescribing. Prescribing information was abstracted from the Rhode Island Prescription Drug Monitoring Program (PDMP). Using the changed rates of initial opioid prescriptions of 8 or more days, and a calculated Number Needed to Harm for prescriptions of that duration, the rates of long-term opioid use were estimated decrease by 111 long-term opioid users per month.

KEYWORDS: opioids, primary prevention, regulations, acute pain management, prescription drug monitoring program

INTRODUCTION

In every patient experience we endeavor to provide the safest, most effective treatment for our patients while balancing risks of doing nothing versus treatment. Our struggle is as old as Hippocrates as noted in *Of The Epidemics*:

> *"The physician must be able to tell the antecedents, know the present, and foretell the future – must mediate these things, and have two special objects in view with regard to disease, namely, to do good or to do no harm. The art consists in three things – the disease, the patient, and the physician. The physician is the servant of the art, and the patient must combat the disease along with the physician."*

Relieving pain remains an important consideration of medicine. However, exposure to opioids is increasingly being recognized as a first step towards long-term opioid use. Therefore, opioid prescribing is balanced by compassionate treatment of pain with an understanding of the potential for harm.

In clinical practice the Number Needed to Harm (NNH) is used to estimate the number of patients exposed to an intervention to cause harm in one excess patient. Prior studies have evaluated prescription and patient characteristics and have calculated rates of long-term opioid use.[1,2] Our group has previously assessed the effects of the update to the Rhode Island Department of Health Acute Pain regulations on prescribing patterns of opioids.[3] This current study demonstrates a calculated NNH, to estimate the changed rates of new long-term opioid users before and after the 2017 update, as a result of changes in opioid prescribing patterns.

METHODS

Opioid prescribing within the state of Rhode Island was studied before and after an update to Rhode Island's regulations concerning opioid prescribing in 2017. Information regarding opioid prescribing within the state was obtained by extracting information from the Prescription Drug Monitoring Program (PDMP). The information extracted included whether a prescription was to an initiate, or to a non-opioid naïve patient. Initiate prescriptions were defined as those not having had an active prescription for an opioid in the preceding 60 days. Prescription characteristics extracted included the duration in days, number of doses and the dose in morphine milliequivalents (MME). Duration was categorized as fewer than 8 days, 8–30 days, and more than 30 days. Initiate prescriptions for each duration category were analyzed by statistical process control methodology.

The duration categories chosen were informed by previously published risk categories of initial prescriptions.[2,4] Published rates of long-term opioid use after initial prescriptions of fewer than 8 days, 8 or more days, and more than 30 days database were used to estimate changes in absolute risk and the number needed to harm.[2] Long-term opioid use in this analysis is defined as continued opioid use at 1 year after initial prescription.

Using the previously calculated absolute risk of long-term opioid use by duration and Rhode Island's rates of initiate opioid prescriptions, we estimate the number of new long-term opioid users before and after the promulgation of the 2017 regulation update.[5]

IRB application from the Rhode Island Department of Health occurred on March 1, 2018 for expedited review and exemption was received on April 9, 2018.

RESULTS

Number needed to harm

Long-term opioid use at one year post initial opioid prescription is reported in 6% of patients who received at least

one day of opioid therapy. This rate increases to 13.5% of patients whose first prescription was 8 or more days.[2,6] Based on those absolute risks, the Number Needed to Harm (NNH) is 14 (13.3). In other words, giving 14 patients an 8 or more days supply initially, as opposed to shorter than 8 days, will result in 1 additional long-term user.

Rhode Island Initiates

Figure 1 shows a Statistical Process Control X chart[7] of the monthly rate of initiate prescriptions of 8 or more days. Control limits on the chart are set at 3 standard deviations. The mean rate of those prescriptions was 4021.3 prior to the regulation update, which decreased to 2464.3 after the update. Prescriptions of 8 or more days to initiates decreased by an average of 1557 per month, which was considered to be statistically significant with a t test p value less than 0.0001.

Figure 2 shows the monthly rate of initiate prescriptions of any duration (i.e., including both less than and more than 8 days duration). There was no significant change in the monthly average number of initiate prescriptions over this period of time.

Figure 1. Initiate Prescriptions per Month of 8 or More Days

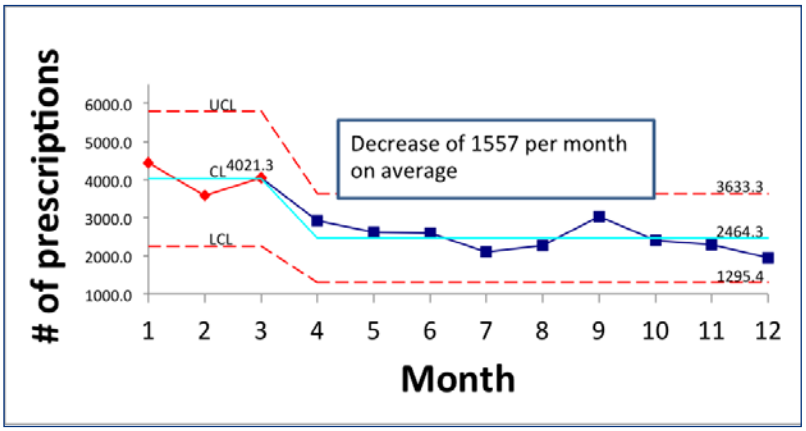
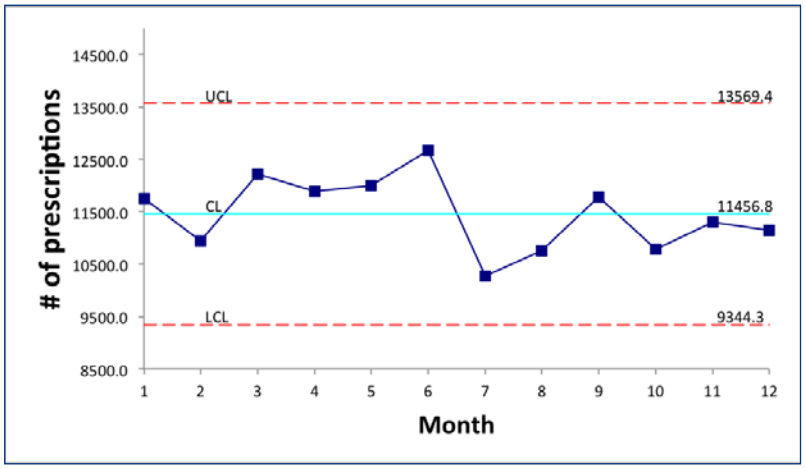


Figure 2. Initiate Prescriptions per Month, 2017



Harm avoided

While the total number of initial prescriptions remained unchanged, Rhode Island saw a monthly average decrease of 1557 initiate prescriptions of 8 or more days. Initiate prescriptions of 8 or more days have a documented number needed to harm of 14 (13.3). Therefore, there would be a theoretical decrease of 111 new long-term opioid users per month.

DISCUSSION

Rhode Island regulations concerning opioid prescribing were updated in 2017 based on a process that included stakeholders and an evaluation of the evidence regarding the characteristics of prescriptions that cause harm to patients.

It has been previously described that longer duration initiate prescriptions increase the risk of harm, by potentially creating a long-term opioid use, dependency and increasing the risk of overdose. The updated regulations in Rhode Island were successful in changing the prescribing of opioids to fewer longer duration initiate opioid prescriptions.

Clinicians are well acquainted with the concept of the NNH, and use it routinely to evaluate the risk of testing and treatments. The NNH of 14 of a longer duration initiate opioid prescription is surprisingly low compared to other commonly prescribed medications. Compared to significant GI bleeding in patients taking dual antiplatelet therapy (aspirin and Plavix®) the NNH is 51; in other words 51 patients need to be prescribed dual antiplatelet therapy to cause 1 additional GI bleed.[8] The immunosuppressant Rituximab® has the feared complication of causing Progressive Multifocal Leukoencephalopathy (PML); however, in that case, the NNH is more than 25,000.[9,10]

Estimating the impact of public health interventions is difficult. However, using the concept of NNH and calculating a predicted harm avoided, the change in initiate opioid prescribing is estimated to reduce new long-term opioid users by 111 per month.

Prescribing that leads to long-term opioid use is harmful to patients. Understanding the impact of such primary preventive efforts in reducing this harm is important. A great deal of focus is correctly geared towards secondary and tertiary prevention by identifying cases of addiction, increasing the availability of Narcan and improving the availability of addiction treatment. However, given the scope of the opioid epidemic, particularly with the many competing interests currently facing healthcare, we need to stop prescribing ourselves into problems if we ever want to get out of this opioid epidemic.

LIMITATIONS

The rates of long-term opioid use that were subsequently used in the calculation of NNH, were based on data from the IMS Lifelink+. While this data set is broad and intended to be similar to the national commercially insured population, it may not accurately represent Rhode Island demographics or the risk among patients over 65. However, it should be noted, that similar increases in the rates of long-term opioid use have been shown in that demographic.

Additionally, initiates in this data set were captured when a patient did not have a prescription in the PDMP in the prior 60 days. However, some patients meeting this definition might not be true initiates in the case where patient entries in the PDMP contain clerical entry errors, and in cases where patients are new to Rhode Island and were established on opioids elsewhere.

CONCLUSION AND RECOMMENDATIONS

Opioids remain part of the treatment algorithm for certain painful conditions. The appropriate prescribing of opioids must balance the knowledge of alternative treatments, and the potential harm of opioid prescribing itself.

Our study shows that Rhode Island's acute pain management regulations, updated in March 2017, had a dramatic impact on opioid prescribing, particularly in opioid naïve patients. Understanding that short prescription opioids may still be necessary in certain situations, shorter duration prescriptions pose less harm to patients. By reducing the rate of longer duration initial prescriptions, with an understanding of the NNH of such prescriptions, we show the primary preventive effect of those regulations in decreasing the rate of new long-term opioid users. This should encourage physicians to strongly consider non-opioid options when attempting to treat pain in a patient new to the prescription of opioids to do so in a manner so as to Do No Harm.

References

1. Mohamadi A, Chan JJ, Lian J, et al. Risk Factors and Pooled Rate of Prolonged Opioid Use Following Trauma or Surgery. *J Bone Jt Surg*. 2018;100(15):1332-1340. doi:10.2106/JBJS.17.01239
2. Shah A, Hayes CJ, Martin BC. Characteristics of Initial Prescription Episodes and Likelihood of Long-Term Opioid Use — United States, 2006–2015. *MMWR Morb Mortal Wkly Rep*. 2017;66(10):265-269. doi:10.15585/mmwr.mm6610a1
3. Barre L, Oliver B, Alexander-Scott N, Mccormick M, Elmaleh R, Mcdonald J V. Impact of State Regulations on Initial Opioid Prescribing Behavior in Rhode Island. *rimed.org*. 2019.
4. Scully RE, Schoenfeld AJ, Jiang W, et al. Defining Optimal Length of Opioid Pain Medication Prescription After Common Surgical Procedures. *JAMA Surg*. 2018;153(1):37. doi:10.1001/jamasurg.2017.3132
5. *Licensure and Discipline of Physicians*. Rhode Island Department of State rules.sos.ri.gov/regulations/part/216-40-05-1.
6. Arthritis and Rheumatism Council for Research in Great Britain and the Commonwealth. *Annals of the Rheumatic Diseases*. BMJ Pub. Group http://ry2ue4ek7d.search.serialssolutions.com/?sid=google&auinit=C&aulast=Gaujoux-Viala&atitle=Efficacy+and+safety+of+steroid+injections+for+shoulder+and+elbow+tendonitis:+a+meta-analysis+of+randomised+controlled+trials&id=pmid:19054817. Accessed January 22, 2019.
7. Mohammed MA, Panesar JS, Laney DB, Wilson R. Statistical process control charts for attribute data involving very large sample sizes: A review of problems and solutions. *BMJ Qual Saf*. 2013;22(4):362-368. doi:10.1136/bmjqs-2012-001373
8. Abraham NS, Hartman C, Richardson P, Castillo D, Street RL, Naik AD. Risk of lower and upper gastrointestinal bleeding, transfusions, and hospitalizations with complex antithrombotic therapy in elderly patients. *Circulation*. 2013;128(17):1869-1877. doi:10.1161/CIRCULATIONAHA.113.004747
9. Clifford DB, Ances B, Costello C, et al. Rituximab-associated progressive multifocal leukoencephalopathy in rheumatoid arthritis. *Arch Neurol*. 2011;68(9):1156-1164. doi:10.1001/archneurol.2011.103
10. Focosi D, Tuccori M, Maggi F. Progressive multifocal leukoencephalopathy and anti-CD20 monoclonal antibodies: What do we know after 20 years of rituximab. *Rev Med Virol*. 2019;29(6). doi:10.1002/rmv.2077

Acknowledgments

The Rhode Island Department of Health

Authors

Luke Barre, MD, MPH, Staff Rheumatologist, Hawthorn Medical Associates, Dartmouth MA.

Meghan McCormick, BS, MPH, Health Program Administrator, Rhode Island Department of Health.

James V. McDonald, MD, MPH, Chief Administrative Officer, Board of Medical Licensure and Discipline, Rhode Island Department of Health.

Disclosures

No financial disclosures

Correspondence

James McDonald, MD, MPH
Chief Administrative Officer,
Board of Medical Licensure and Discipline
Medical Director, Division of Customer Services
Medical Director, Division of Policy, Information, and Communication
Medical Director, Overdose Prevention Program
Medical Director, Prescription Drug Monitoring Program
Rhode Island Department of Health
3 Capitol Hill
Providence, Rhode Island 02908