

ORIGINAL RESEARCH

General Medicine

Longitudinal impact of a pre-populated default quantity on emergency department opioid prescriptions

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Funding and support: By *JACEP Open* policy, all authors are required to disclose any and all commercial, financial, and other relationships in any way related to the subject of this article as per ICMJE conflict of interest guidelines (see www.icmje.org). The authors have stated that no such relationships exist.

Abstract

Objective: Previously published studies indicate that a pre-populated default quantity may decrease opioid amounts on discharge prescriptions from the emergency department (ED). However, the longitudinal effect of defaulted quantities has not been described in the literature.

Methods: A retrospective review of electronic health record data from visits to 4 hospital EDs in a community health system examined opioid prescription dispense quantities 3.5 years pre- and 6.5 years post-implementation of a defaulted dispense quantity of seventeen. The primary purpose was to determine the percentage of ED discharge opioid prescriptions containing the prepopulated default dispense quantity after implementation. The longitudinal effect of a default quantity implementation on the average quantity prescribed (normalized per 1000 visits) was examined by comparing the pre-implementation period (January 1, 2009–July 31, 2012) to the post-implementation period (August 1, 2012–June 30, 2018).

Results: After implementation in 2012, the acceptance rate of the default dispense quantity increased each year, up to 48% in 2016 and maintained through 2018. A significant decrease in prescribed opioid quantities post-default quantity implementation was sustained, with the average quantity prescribed from 2015–2018 maintained at 17 or lower.

Conclusion: A pre-populated default quantity impacts discharge opioid prescribing as evidenced by a high sustained rate of prescriber utilization over years and reduction in the per prescription average pill quantity. The acceptance of a pre-populated default quantity may allow for selection of even a lower quantity to influence prescribing patterns of opioid analgesics.

KEYWORDS

default quantity, emergency department, long-term impact, opioid prescribing

1 | BACKGROUND

From 1999 to 2017, drug overdose deaths in the United States escalated with >50% of those deaths related to opioids.¹ During this time,

the Centers for Disease Control and Prevention (CDC) estimates that 218,000 people died from overdoses related to prescription opioids.² Prescribing rates of opioids peaked in 2012 and have steadily declined thereafter; however, most overdose deaths after 2012 are from illicit

Supervising Editor: Kenneth D. Katz, MD.

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manufactured fentanyl and analogues.^{1,2} Growing concern exists that individuals become dependent on prescription opioids and then transition to heroin or illicitly manufactured opioids, because they are easier to obtain and generally cheaper.³ Despite the rise in illicit fentanyl deaths, the public places the most blame for the opioid epidemic on doctors who inappropriately prescribe opioid analgesics.⁴ Regardless, opioids remain the most commonly prescribed class of medications in the United States and prescription opioids are involved in >35% of overdose deaths.^{2,3} From July 2016 to September 2017 alone, opioid overdoses increased by 30%.⁵ More than 115 people in the United States die daily after opioid overdoses.⁶

Acute painful conditions account for >40% of emergency department (ED) visits for which ED clinicians will often use opioids to help alleviate that pain.^{7,8} From 2001 to 2010, discharge prescriptions for opioids from EDs in the United States increased by ~10% with many visits related to these acute pain conditions.⁹ A wide variation in prescribing patterns of opioids exists even in the same ED, with the risk that patients receiving a prescription from high intensity prescribers are more likely to have long-term opioid use.¹⁰ Some studies cite this variance in ED opioid prescriptions as a significant contributor to opioid misuse, diversion, and death.¹¹ Other studies, however, demonstrate that the majority of ED opioid prescriptions are of low pill count, are immediate release formulations, and actually declining in contribution to the opioid epidemic as compared to outpatient office and inpatient prescribing patterns.^{8,9,12,13} Although prescribers cannot control illicit fentanyl and other illicitly manufactured opioids, they can control their prescribing practices, recognition of opioid use disorder, and referral to treatment.

2 | IMPORTANCE

Interventions to assist with opioid prescribing practices include prescribing guidelines and the utilization of prescription database monitoring programs. Many national, state, and institutional organizations have adopted opioid prescribing guidelines, which have demonstrated significant reduction in opioid prescriptions.^{14–19} Although the long-term impact of changing prescribing practices on total opioid-related deaths is still unclear, a decrease in prescription overdose death rates occurred from 2016 to 2017 in the majority of ages <65 years old with a statistically significant decrease of 13.2% in males 15–24 years old.¹ Most guidelines currently recommend non-opioid analgesics as first-line therapies and limiting any opioid prescription to a 3-day supply of the lowest effective dose of a short-acting opioid for acute pain.^{16,17,20} Prescription database monitoring program use additionally demonstrates modest reduction in opioid dosages although the impact on long-term addiction and morbidity is unknown.^{20–23}

3 | GOALS OF THIS INVESTIGATION

As electronic medical records and computer order prescriptions have become more standardized across the United States, interest in using

The Bottom Line

In light of the current opioid epidemic, the authors retrospectively reviewed prescribing patterns both before and after implementation of a prepopulated, default dispense amount of opioid pills which could be chosen by emergency prescribers. This intervention significantly reduced the number of opioid pills per prescription and may serve as a helpful strategy for emergency departments.

these tools more effectively to improve physician work flow and reduce errors has grown.^{24,25} In respect to opioid prescriptions, further optimization of electronic medical record such as integration of prescription database monitoring programs and modification of prescribing practices can be accomplished. A possible technique to aid in the prescribing of safe quantities of opioids is a pre-populated default quantity on an electronically ordered opioid prescription for the patient at discharge. The purpose of our study is to analyze opioid prescribing patterns before and after the establishment of a unique default-dispense quantity of 17 tablets for opioid prescriptions in the electronic medical record, observed over multiple years.

4 | METHODS

4.1 | Study design and setting

We performed retrospective observational review of prescribing quantities of opioids from ED discharges. Our community health system involves 4 hospitals with EDs and an approximate combined annual volume of 125,000 patients. A combination of attending physicians, resident physicians, nurse practitioners, and physician assistants work in the EDs; however, attending physicians evaluate every patient in the ED at all 4 sites. Data was collected by the authors with the assistance of a health information technology analyst to extract information from the electronic health record as a report compatible with Microsoft Excel. Data extracted included the medication formulation (hydrocodone, oxycodone, codeine, and tramadol), strength, quantity, number of refills, prescription date and time, prescribing provider name, and type of prescriber (physician, nurse practitioner, or physician assistant). All patient identifiers were removed. This medication utilization evaluation was a quality assessment improvement project and therefore was exempt from Institutional Review Board review.

4.2 | Interventions

On August 1, 2012, a default dispense quantity of 17 was implemented for all tablet or capsule formulations of immediate release opioids

prescribed for patients being discharged from any 1 of the 4 EDs. This quantity number was selected for its uniqueness. Additionally, it was lower than the average quantity selected by individual ED providers at the time with the intent of decreasing overall opioid prescribing. Prior to this intervention, opioid analgesics either had a default quantity of 30 tablets or no default variable at all with an empty value requiring the provider to fill in the number of tablets. Prior to the change in default quantity, email notification of the change was the only education provided to prescribers. At the time of implementation, all prior individual saved defaults for opioids were deleted; however, the provider was free to create individualized new defaults afterward. This intervention occurred simultaneously in the electronic medical record (Epic) across all 4 hospitals at the same time. Although the default quantity was pre-populated, clinicians are allowed to change the dispense quantity at the time of prescribing based on individual patient needs.

4.3 | Measurements

The primary purpose of this evaluation was to determine the percentage of opioid prescriptions for ED patients at discharge containing dispense quantity 17 after the default quantity was implemented. The opioid prescriptions in this review included all immediate release schedule II opioids (with the exception of morphine immediate release), codeine products, and tramadol products. Opioids not included were any extended release products, opioids that are typically used for chronic pain (ie, fentanyl, hydromorphone, and morphine), and propoxyphene and oxycodone products removed from United States markets.² Secondly, the first 6 months of 2018's ED opioid prescribing were characterized to understand the most current prescribing practices and to determine if another default quantity change was warranted. The longitudinal effect of a default quantity implementation on the average quantity prescribed was also examined by comparing the pre-implementation period (January 1, 2009–July 31, 2012) to the post-implementation period (August 1, 2012–June 30, 2018). To account for prescription volume changes from year to year, the number of opioid prescriptions written per year was normalized per 1000 patient visits.

4.4 | Outcomes

The primary outcome measure was to determine the percentage of opioid prescriptions for ED patients at discharge containing dispense quantity 17 after default quantity was implemented on August 1, 2012 and to determine if this resulted in a change in the average quantity of opioid prescribed prior to this intervention. Additional outcome measures included determining the number of prescriptions written for a value other than the default quantity and the values selected for these prescriptions. Duplicate prescriptions at the same encounter and prescriptions written in error were manually removed after chart review. Data points were characterized using χ^2 test or descriptive statistics.

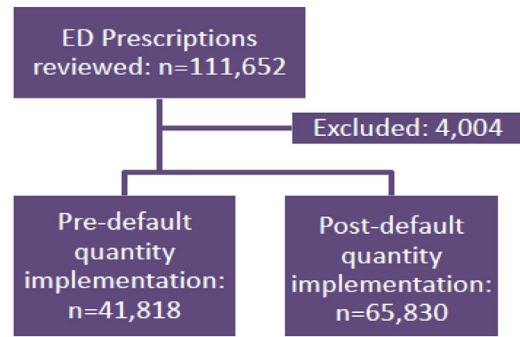


FIGURE 1 A total of 111,652 prescriptions were analyzed. A total of 4004 were excluded from the final total. A total of 41,818 prescriptions were examined from prior to the default quantity, and 65,830 were examined after the default quantity was implemented

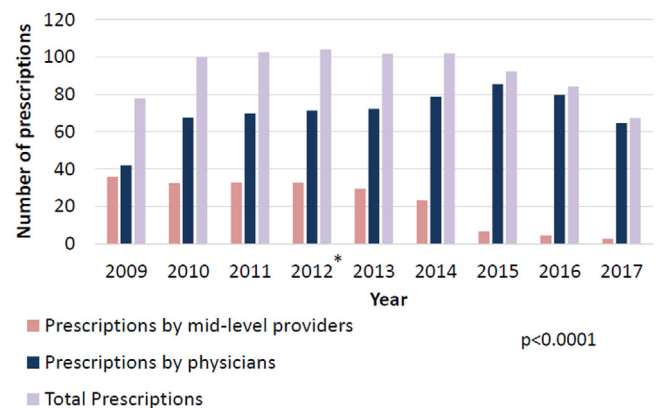


FIGURE 2 To account for prescription volume changes from year to year, the number of opioid prescriptions written per year was normalized per 1000 patient visits. This was then further divided by provider type for 2009–2017

5 | RESULTS

A total of 111,652 prescriptions were reviewed, and 4004 were excluded from the final data set due to prescriptions being written in error or duplicate prescriptions within the same encounter. Between January 1, 2009 and July 31, 2012 (pre-implementation period), 41,818 prescriptions for opioids were written from the ED. From August 1, 2012 to June 30, 2018, 65,830 opioid prescriptions were written from the ED (Figure 1). Overall, a steady decline in opioid prescriptions occurred and midlevel practitioner opioid prescribing decreased ($P < 0.0001$) dramatically in 2015 (Figure 2).

Prior to the implementation of the prepopulated default quantity, no prescriptions contained a dispense quantity of 17. After implementation of the default dispense quantity, providers accepted this value with increasing frequency (Figure 3).

The average quantity prescribed in the pre-implementation phase was 19.9 ± 7.7 (P -value = 0.7109) and post-implementation was 16.8 ± 5.5 (P -value = < 0.001) using χ^2 test. (Figure 4). The average quantity prescribed was sustained at 17 or lower since 2015 (Figure 5).

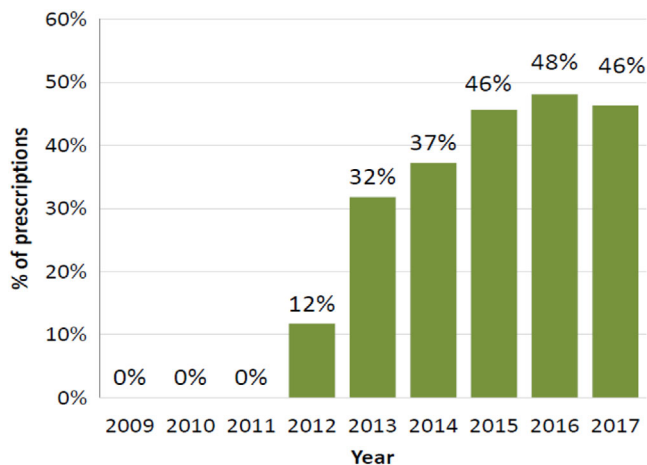


FIGURE 3 The prepopulated default quantity was implemented by August 1, 2012. This shows the percentage of prescriptions written for the default quantity of 17 pre- and post-implementation

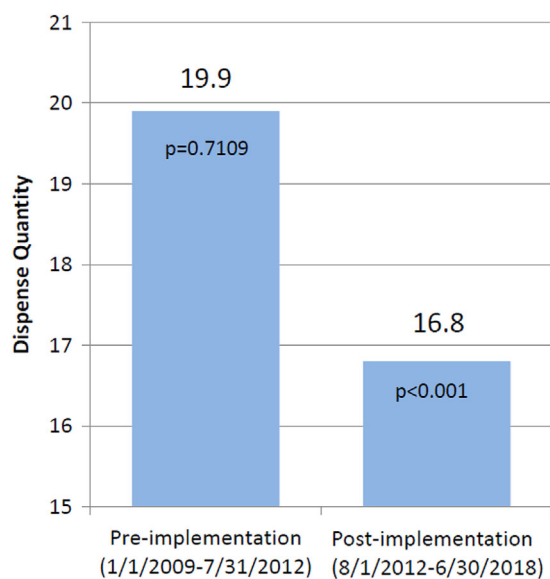


FIGURE 4 Average quantity selected, comparing pre- and post-implementation of the prepopulated, defaulted quantity

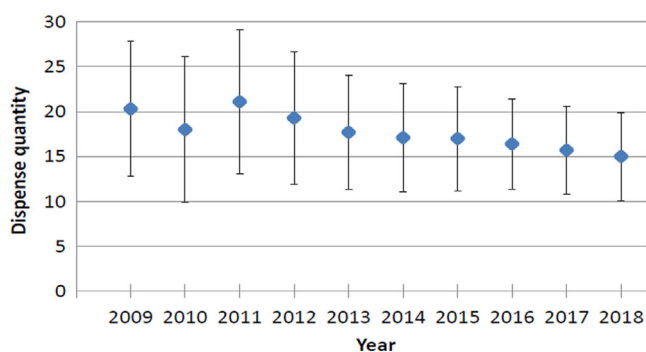


FIGURE 5 Average quantities prescribed by year (\pm SD) shows the average quantity, with the range of quantities prescribed each year from 2009–2018

To garner current prescribing practices, the last 6 months of data (3082 prescriptions) were selected. Between January 1, 2018 and June 30, 2018, the default quantity of 17 was prescribed 45% of the time. Providers were prescribing 17 or less at least 88% of the time. Only 12% of the prescribed quantities were >17 with 20 tablets constituting 8% of the total.

6 | DISCUSSION

The primary outcome was to evaluate opioid prescribing after implementation of a unique default-dispense quantity of 17 in the electronic medical record. Prior to implementation, zero prescriptions contained this value. After assigning the value 17 to the default, nearly one-third to one-half of the prescriptions contained the default value (Figure 2). In the last 6 months of the data set, the majority of prescriptions were for this exact amount or less (88%). The default dispense quantity of 17 was the most commonly prescribed amount after implementation. Additionally, the dispense quantity significantly decreased statistically between the pre-implementation and post-implementation periods (Figure 4). This strongly suggests that prescribing behaviors are significantly influenced by a default quantity chosen in the electronic medical record. Additionally, the default value of 17 accounted for 45%–48% of the opioid prescriptions from 2015 to 2018 demonstrating the prolonged impact of this intervention. The idea of a default quantity is not a new topic, although its sustained impact has not been well studied. Santistevan et al¹³ recently examined the impact of deleting the default quantity of 20 on opioid prescriptions at discharge at a single institution ED with analysis of prescribing patterns 12 months prior to deleting the default quantity and 10 months afterward. Their study concluded that the quantity of opioids dispensed actually decreased once the default quantity was eliminated, and providers were choosing lower quantities than was pre-populated. Chiu et al²⁶ examined the impact of lowering the default quantity of opioids prescribed from a quantity of 30 to 12 on discharge of post-surgical patients at a multi-hospital health system in Connecticut over a period of 6 months. Their study did demonstrate a significant decrease in the overall quantity of opioids prescribed and increased compliance with the default quantity. Delgado et al²⁷ found that implementation of a default quantity of 10 tablets resulted in a strong increase in the proportion of prescriptions written for that default value but no overall decrease in the quantity supplied.

The prepopulated default quantity of 17 was chosen due to its uniqueness and difficulty in altering the prescription once it left the ED. This quantity also confers roughly a 3-day supply, and is accordance with most recommendations for an acute opioid pain regimen.¹⁶ Once this prepopulated quantity was implemented, it became the most frequently prescribed amount. The default quantity potentially acted as a suggestion for the provider and the data implies that it had a strong influence on prescribing habits (Figure 3). As the overall average quantity of opioid prescribing decreased, the acceptance of the default was sustained for multiple years, compared with previous studies describing the effect over several months.^{13,26}

Although the default dispense quantity was the most common individual number of prescribed opioids, 43% of prescriptions had lower than the default value, and 12% of prescriptions had greater than the default. This suggests that providers tailored patient care based on the clinical scenario and did not simply rely on the default quantity. This prescribing behavior can also be inferred as the default prior to intervention was either 30 tablets or no default value and yet between 2009 to 2012, prescriptions averaged roughly 20 tablets (Figures 4 and 5). The default quantity change, however, had the effect of influencing prescribing habits and, over time, potentially resulting in a significant reduction of roughly 200,000 fewer prescribed opioids pills when comparing averages (Figure 4). The impact of changing the default dispense quantity on clinically important outcomes such as mortality, development of opioid use disorder, overdose rates, or secondary complications from opioid use is unknown. Nevertheless, the cost of this intervention is negligible, widespread, and nearly immediate. Additionally, it can curb systematic prescribing practices, identify high prescribers to target for opioid education, and potentially identify fraudulent prescriptions. A recent survey demonstrated that a default tablet quantity of prescribed opioids was present in 54% of EDs with wide variability from <12 tablets to >30 tablets but a median number of 15 tablets.²⁸

In October of 2014, the Drug Enforcement Agency (DEA) rescheduled hydrocodone products from Schedule III to Schedule II. Mid-level practitioners such as physician assistants and nurse practitioners are unable to prescribe Schedule II substances. This regulatory change is reflected with a sharp and statistically significant decrease in midlevel prescribing of opioids with a slight and statistically significant compensatory increase in physician prescribing of opioids ($P < 0.0001$) as seen in Figure 2. With this change in rescheduling of hydrocodone, there was also an overall decrease in opioid prescriptions between 2014 and 2015. Direct causation in the overall decrease in opioid prescriptions to the federal change though is difficult to prove. A further decrease in opioid prescribing continued from 2015 to 2017 implying additional external forces influencing prescribing habits aside from altering the default value (Figures 4 and 5).

7 | LIMITATIONS

Information gained was a retrospective analysis that may be subject to observational bias, and that many factors over the course of nearly 10 years can influence prescribing patterns. Beginning in 2012, a steady decline in opioid prescribing occurred after implementation of a default dispense quantity (Figure 2). This decline also mirrors national prescribing tendencies and could be due to additional factors beyond the change in default quantity implementation.² Significant media attention and educational materials have increased public and provider awareness regarding the opioid epidemic in the United States. Additionally, many prescribing guidelines have been implemented by institutional, local, and national agencies during the study time period. Regulatory changes such as the rescheduling of hydrocodone and the

mandatory checking of the prescription database monitoring program in the State of Illinois also occurred during the study period. Over the course of 9 years, ED provider and staff changes ensued and the data was not analyzed for individual providers although extreme outliers can be easily identified. Fifty-seven attending physicians practice at all 4 hospitals, and during the study period, 39 new physicians were hired and 23 physicians either retired or left the institution. This turnover in physicians can also affect prescribing patterns via opioid education received during residency training, prior prescribing habits adopted at other institutions, or personal preferences in regards to opioid prescribing. Data were not deconstructed by number of years post residency per provider to determine if opioid prescribing patterns were affected by education in residency training. Additionally, handwritten prescriptions could not be assessed although these are estimated to be few and generally occurring only during electronic medical record "downtime." This data also does not provide clinically relevant outcomes such as if the prescription was filled, the number of pills consumed by patients, development of opioid use disorder, prescription opioid overdose rates, and mortality outcomes. Furthermore, this data is from a single health system of 4 hospitals and regional opioid prescribing patterns vary. National opioid prescribing patterns, however, also mimic this data with a peak in opioid prescribing in 2012 and then a general decline.² Additionally, the data are robust with a large sample size over the course of 9 years and utilized an extremely unique prime number that, prior to the intervention, had not previously been prescribed (see Figure 3) providing strength that the intervention significantly altered prescribing patterns. Further studies would be needed to determine if altering opioid prescribing directly impacts clinical outcomes and the long term development of opioid dependence in the general population.

In summary, a prepopulated default quantity for opioid prescriptions impacted the prescribing patterns of providers over a sustained period of time as evidenced by a high rate of utilization of the default value for years after implementation. Establishing a default quantity can decrease the variance of prescribing patterns to further adhere to current recommendations for opioid prescribing for acutely painful conditions with the intent of limiting the risk for development of opioid dependence and overdose. With widespread use of electronic medical record, creating a default quantity is an easy and cost effective strategy to limit opioid prescriptions, particularly if the default value is of a low quantity. Combating the opioid epidemic requires multiple interventions and influencing provider prescribing practices is only one facet of this effort, potentially acting as a form of primary prevention. Strategies must be implemented to identify those with opioid use disorder, those at risk for developing addiction, overdose, and death, while developing a framework to deliver appropriate treatment options and harm reduction interventions for these individuals and still providing appropriate pain control to those in need.

AUTHOR CONTRIBUTIONS

Michael E. Nelson takes the final responsibility of the paper.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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How to cite this article: Carlson A, Nelson ME, Patel H. Longitudinal impact of a pre-populated default quantity on emergency department opioid prescriptions. *JACEP Open*. 2021;2:e12337. <https://doi.org/10.1002/emp2.12337>