Office Opioid Prescriptions at a Large Hospital System in Northeast Ohio: Assessing Compliance with Norms

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# Introduction

    In spite of strict laws governing opioid manufacture, sale, and distribution, an opioid crisis has developed in the United States. The opioid crisis is defined by increasingly high prevalence of prescription (i.e. oxycodone) and non-prescription opioid (i.e. heroin, non medical fentanyl) addiction with attendant high rates of associated complications (overdose, infections associated with intravenous drug use, neonatal abstinence syndrome, lost productivity, etc)(Kolodny et al. 2015) It is estimated that in 2016, 11.4 million Americans misused opioids in the past year and 2.4 million Americans suffer from opioid use disorder.(Ahrnsbrak et al. 2017) Opioids were associated with 42,249 deaths in 2016, representing a quintupling from 17 years prior, with signs of accelerating increases.(Seth et al. 2018) The Council of Economic Advisers estimates that the epidemic cost the United States roughly 504 billion dollars in 2016.(The Council of Economic Advisers 2017) Of note, Ohio is one area that is acutely affected by the opioid crisis: the Ohio’s age-adjusted drug overdose rate in 2016 was 35.8 per 100,000 almost three times the national average (13.3 per 100,000), the third highest in the nation.(Seth et al. 2018)

            While the opioid crisis has many causes and aggravating factors, one significant driver of the crisis is the widespread availability of medically prescribed opioids.(Kolodny et al. 2015) Opioid prescriptions per capita increased from 180 Morphine Equivalents (ME) per 100 persons to 782 ME per 100 persons from 1999 year to 2010.(Guy et al. 2017) Concomitantly, the rate of medical and nonmedical opioid overdoses has tripled since 2000.(Rudd et al. 2016) Roughly 60% of opioid overdoses involved a prescription drug. Further, it is hypothesized that wide availability of prescription opioids has driven increased rates of heroin use disorder; of those with heroin use disorder, 80% had their first exposures are from medical prescriptions to the patient, friends, or family.(Muhuri, Gfroerer, and Davies 2013)

            In order to curtail excessive exposure to medically prescribed opioids, several policies by several organizations have been implemented. State Prescription Drug Monitoring Programs prescription monitoring systems, of which the Ohio Automated Rx Reporting System (OARRS) is an example, aim to collect all prescriptions to aid in identifying patients engaging in aberrant behavior suggestive of opioid use disorder.(Kolodny et al. 2015) Additionally, several regulatory, professional, and advisory bodies have issued recommendations for opioid prescribing. Of note, the Ohio State Board of Pharmacy has mandated that for opioid prescriptions of acute pain should be for less than 30 Morphine Equivalent Daily Dose (MEDD) and for less than 7 days.(of Ohio Board of Pharmacy, n.d.) CDC has recommended that chronic, non-cancer pain prescriptions should be less than 90 MEDD, with recommendations to re-evaluate the treatment plan at least once every 3 months (90 days).(Dowell, Haegerich, and Chou 2016)

            The potential benefit for identifying high risk prescribing patterns is very high. It is estimated that roughly 21 to 29 % of patients prescribed opioids for chronic pain misuse them,(Vowles et al. 2015) 3% may develop opioid use disorder,(Fishbain et al. 2007) with significant potential for initiating heroin.(Carlson et al. 2016) In order to assess the need for increased opioid stewardship at the Cleveland Clinic, it is therefore necessary to estimate the compliance of office opioid prescriptions with these norms.

# Methods

## Data

All outpatient opioid prescriptions at all Cleveland Clinic Foundation facilities in Northeast Ohio ordered between January 1, 2016 – December 31, 2016.   Opioid prescriptions used for medication assisted therapy for opioid use disorder were excluded from analysis.

## Opioid Use

For each prescription, the free-text instruction was used to estimate the daily dosing of the medication. If the prescription instruction was for a range (i.e. Take 1-2 pills every 4 to 6 hours), the maximum dosing was assumed (i.e. 12 pills per day). From the daily dose, the Morphine Equivalents Daily Dose (MEDD) was calculated using standard conversions. (for Medicare and Services 2017)Total opioid content in Morphine Equivalents and start date were also extracted.

Unless specified, the length of prescription was calculated by dividing the total amount prescribed by the dosing instructions. For each patient-day, all applicable prescription MEDDs were summed. We defined a regimen to be a set of continuous patient-days with the same overlapping prescriptions. Regimens that were greater than 365 days were truncated at 365 days.

## Provider Practices

For any given opioid regimen, more than one prescription could be a component, and therefore, more than one provider could be involved in any given regimen. We distinguished a provider from being involved from being responsible. We assigned responsibility  for a given opioid regimen to the provider who made the most recent prescription.

## Norms

Regimens were assessed for MEDD using the guidelines of 30 and 90. We added a higher bound level of 300. No interest was defined as ≤ 30 MEDD, low interest as >30 and ≤ 90, Medium  interest as >90 and ≤ 300, and High interest > 300.

Regimens were assessed for their length using the guidelines of 7, 30, and 90 days. No interest was defined as ≤ 7 days, low interest as >7 and ≤30, Medium interest as >30 and ≤ 90, and High interest >90.

Patients and Provider prescription patterns were assessed for index of interest.

## Risk factors for high interest regimen

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To identify risk factors that are associated with high risk regimen, we tested associations with logistic regression.

Risk factors tested included number of providers involved in a given regimen, presence of different opioid formulations.

# Results

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A little under 500,000 (447,888) prescriptions were made to 175,880 patients by 4,476 providers for a total of 500,166 regimens.

292,726,953 Morphine Equivalents were prescribed over 5,707,617 days (15,637 years) for a mean of 51 MEDD (median of 30 MEDD, weighted by length of regimen). The median number of prescriptions in a regimen was 1 (range 1 - 16). 27% of regimens had more than one prescription. A prescription was applicable to a median of 1 regimen (range 1 - 31). 33% of prescriptions were applicable to more than one regimen.  The median number of providers involved in a regimen was 1 (range 1 - 5). Oxyocode was involved in 41% of all opioid regimen.

The median number of opioid prescriptions a patient received was 1 (range 1 - 90, mean 2.5). Of all patients, 103,269 (59%) patients received 1 prescription, representing 23% of all prescriptions. The median number of opioid regimens a patient had was 1 (range 1 - 106, mean 2.84). Of all patients, 106,704 had a single opioid regimen, representing 21% of all regimens.  The median number of days a patient was prescribed an opioid regimen was 9 (range: 2 - 752, mean 32.5). The median amount of total ME a patient was prescribed was 225 ME (range 1- 1,837,800). The median median MEDD of patients was 30 MEDD (range 0.15 - 4380). Median number of providers patient had 1 (range 1 - 23).

The median number of opioid prescriptions a provider made was 25 (range  1- 4723) for a median total opioid prescribed of 6400 ME (range 4- 7496758). The median number of patients a provider made prescriptions for was 19 (range 1 -  1723). The median numer of opioid regimens a provider was responsible for was 26 (range 1- 7615) spanning  a median of 201.5 days  (range 1-127,264) for a median median MEDD of 30 (range 0.7- 1051.2).

237,882 (48%) No interest regimens were prescribed to 115,701 patients (66%) by 4,125 providers (92%) for a total of 3,442,573 days (9431.1 years) (60%). Median length of no interest segments were 9 days (range 1- 365). The median number of prescriptions comprising the regimen was 1 (range 1 - 6). The median number of providers involved in the regimen was 1(range: 1 - 4). The median number of no interest regimens a provider was responsible for was 10 (range: 0 - 5089), comprising a median of 49% (range 0 - 100%). Hydrocodone was involved in 39% of all No interest regimen.

187,539 (37%)  Low interest regimens were prescribed to 88,212 patients (50%) by 3,903 providers (87%)  for a total of 1,632,334 (4472.1 years) (29%). Median length of segment was 6 days (range 1 - 365). The median number of prescriptions involved in each regimen was 1(range: 1-8). The median number of providers involved in the regimen was 1(range: 1 - 4). The median number of low interest regimens a provider was responsible for was 9 (range: 0 - 2310), comprising a median of 36% of their regimen (range 0 - 100%). Oxycodone was involved in 61% of all Low interest regimen.

59,193 (12%) were of Medium interest regimens were prescribed to 18,351 patients (10%)  by 2,755 providers (62%)  for 507,763 (1391.1 years) (9%). Median length of segment was 5 days (range 1 - 365). The median number of prescriptions involved in each regimen 2(range: 1 - 12) .  The median number of providers involved in the regimen was 1(range: 1 - 5). The median number of Medium interest regimens a provider was responsible for was 1 (range: 0 - 2057), comprising a median of 3.7% of their regimen (range 0 - 100%).  Oxycodone was involved in 50% of all Medium interest regimen.

15,552 (3%) were of High interest regimens were prescribed to 2,357 patients (1%) by 1,055 providers (24%)  for 124,947 (342.3 years) (2%). Median length of segment was 4 days (range 1 - 150).  The median number of prescriptions involved in each regimen was 3 (range: 1 -16).  The median number of providers involved in the regimen was 1(range: 1 - 5). The median number of high interest regimens a provider was responsible for was 0 (range: 0 - 897), comprising a median of 0% of their regimen (range 0 - 100%). Oxycodone were involved in 39% of all High interest regimen.

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| --- | --- | --- | --- |
| Number of prescriptions in regimen | OR for one additional provider | 95% CI | P value |
| 2 | 0.55 | (0.50 - 0.59) | <0.01 |
| 3 | 0.72 | (0.68 - 0.77) | <0.01 |
| 4 | 1.01 | (0.95 - 1.07) | 0.75 |
| 5 | 1.34 | (1.25 - 1.45) | <0.01 |

Relationship of MEDD interest level with number of providers, stratified by number of prescriptions involved in regimen. For those regimen with 2 prescriptions involved, more than one provider was associated with a lower odds of having a High interest regimen; this pattern was similar for regimen with 3 prescriptions. For those regimen with 4 prescriptions, more providers was not associated with a higher odds of having a high interest regimen. For those regimen with 5 prescriptions, more providers was associated with higher odds of having a higher interest regimen.  

Relationship of MEDD interest level with number of providers, stratified by number of prescriptions involved in regimen. For those regimen with 2 prescriptions involved, more than one provider was associated with a lower odds of having a High interest regimen; this pattern was similar for regimen with 3 prescriptions. For those regimen with 4 prescriptions, more providers was not associated with a higher odds of having a high interest regimen. For those regimen with 5 prescriptions, more providers was associated with higher odds of having a higher interest regimen.

 Table 1. Drug formulation and distribution of level of interest.

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| --- | --- | --- | --- | --- | --- |
| Drug Formulation | Component of regimen | No Interest (%) | Low Interest (%) | Medium Interest (%) | High Interest (%) |
| Buprenophine Patch | 1,219 | 491 (40) | 516 (42) | 200 (16) | 12 (1) |
| Buprenorphine Film | 209 | 95 (45) | 71 (34) | 43 (21) | 0 (0) |
| Butorphanol Nasal | 82 | 33 (40) | 39 (48) | 10 (12) | 0 (0) |
| Codeine PO | 26,990 | 20,776 (77) | 5,308 (20) | 783 (3) | 123 (0) |
| Fentanyl Buccal | 63 | 0 (0) | 3 (5) | 20 (32) | 40 (63) |
| Fentanyl Lozenge | 7 | 1 (14) | 1 (14) | 5 (71) | 0 (0) |
| Fentanyl Nasal | 63 | 0 (0) | 6 (10) | 16 (25) | 41 (65) |
| Fentanyl Patch | 15,989 | 489 (3) | 2,919 (18) | 8,657 (54) | 3,924 (25) |
| Fentanyl Sublingual | 2 | 0 (0) | 0 (0) | 1 (50) | 1 (50) |
| Hydrocodone PO | 142,349 | 93,240 (66) | 40,504 (28) | 7,835 (6) | 770 (1) |
| Hydromorphone PO | 6,164 | 434 (7) | 1,721 (28) | 2,759 (45) | 1,250 (20) |
| Hydromorphone Suppository | 71 | 0 (0) | 37 (52) | 25 (35) | 9 (13) |
| Levorphanol PO | 21 | 0 (0) | 5 (24) | 15 (71) | 1 (5) |
| Meperidine PO | 163 | 81 (50) | 56 (34) | 26 (16) | 0 (0) |
| Methadone PO | 6,810 | 200 (3) | 1,439 (21) | 2,163 (32) | 3,008 (44) |
| Morphine PO | 21,660 | 2,454 (11) | 6,342 (29) | 9,531 (44) | 3,333 (15) |
| Morphine Suppository | 12 | 1 (8) | 10 (83) | 1 (8) | 0 (0) |
| Opium Suppository | 291 | 38 (13) | 131 (45) | 101 (35) | 21 (7) |
| Oxycodone PO | 229,079 | 52,603 (23) | 126,042 (55) | 40,897 (18) | 9,537 (4) |
| Oxymorphone PO | 2,417 | 76 (3) | 429 (18) | 1,299 (54) | 613 (25) |
| Pentacozine PO | 51 | 3 (6) | 33 (65) | 12 (24) | 3 (6) |
| Tapentadol PO | 6,500 | 48 (1) | 1,749 (27) | 3,673 (57) | 1,030 (16) |
| Tramadol PO | 91,678 | 68,959 (75) | 18,135 (20) | 4,111 (4) | 473 (1) |

# Discussion

* Represent roughly 5% of all opioid prescriptions in Ohio in 2016 (of Ohio Board of Pharmacy 2016)
* Can’t evaluate regimen because possible that opioids were prescribed before January 1, 2016 and December 31, 2016.

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