# Establishing an Opioid Prescription Stewardship Program Utilizing Education and Machine Learning

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From Left to Right: Ashley Rimay, PharmD, BCPS; Louis Palmisciano, BIT; Christine Collins, RPh, MBA

#### Introduction

#### **Healthcare Facilities**

- 1,165 licensed bed health system
- Over 3,200 affiliated physicians, over 900 residents and fellows
- 4 inpatient hospitals including: Level I trauma hospital for adults and pediatric patients Rhode Island Hospital (RIH), The Miriam Hospital (TMH), Bradley Hospital (BH), Newport Hospital (NPH)
- Outpatient provider offices, ambulatory services and behavioral health residential locations
- Primary teaching hospitals for the Warren Alpert Medical School of Brown University

#### Background

- Between 1999 and 2016: 350,000 opioid overdose deaths in the US alone, with a 200% increase in death rates since 2000
- Provider diversion and a lack of accountability with controlled substances has led to multimillion dollar fines for health systems
- Over 1.5 million electronic prescriptions are written annually from our health system, including over 360,000 controlled substances scheduled 2 through 4, making the task of monitoring outpatient prescribing patterns a major challenge.

# **Purpose**

Develop a controlled substance prescriptions stewardship program to monitor vast amounts of electronic health record data to detect potential diversion and over-utilization of opioids

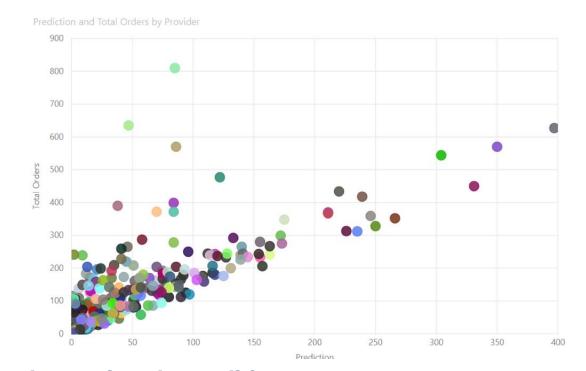
- Utilize machine learning to identify outlying prescribers
- Audit prescribers on outlying prescriptions
- Educate providers on controlled substance laws and guidelines
- Improve prescribing practices based on metrics of decreased Morphine Equivalent Daily Doses (MEDD), benzodiazepine coprescribing and naloxone co-prescribing.



### Description of the Program

Assembling the team: hospital and pharmacy leadership representing both inpatient and outpatient pharmacy, a pharmacy data scientist, a controlled substance pharmacist (CSP), a pharmacist informatics coordinator, a senior clinical pharmacist specialist, and physician chief medical officer (CMO)

- Creating a model:
- A supervised XgBoost classification model was trained
   Results were grouped by provider to visualize the entire organization for quick identification of uncommon prescribing practices
- Information about the encounter is stored in a data warehouse along with the model's prediction
- A web-based dashboard is refreshed daily as a scatterplot that aggregates patient-level predictions by provider. The scatterplot presents total prescriptions along the y axis and total predicted prescriptions along the x axis.



# Implementing the auditing process:

- Monitoring the dashboard for an outlying provider
- Selecting 15 random prescriptions that were not predicted to be written by our model
- Assessing for compliance to controlled substance laws
- Communicating results to appropriate physician leadership
- Physician peer clinical evaluation and follow-up audits

#### **Provider education includes:**

- 1) Background on national incidences related to opioid prescribing
- 2) Implications of diversion for organizations and physicians
- 3) Data from the Rhode Island (RI) Medical Board on license reprimands related to opioid prescribing
- 4) RI Controlled Substance Law on prescribing acute vs. chronic pain
- 5) Proper electronic prescribing in the electronic medical record

# **Experience with the Program**

Measurement	Result
Number of Providers Educated	Over 240 attending physicians and over 900 residents/fellows
Number of Outlying Physicians	25 initially identified
Number of Provider Audits	50 In-depth audits
Number of Prescriptions Reviewed	750 prescriptions

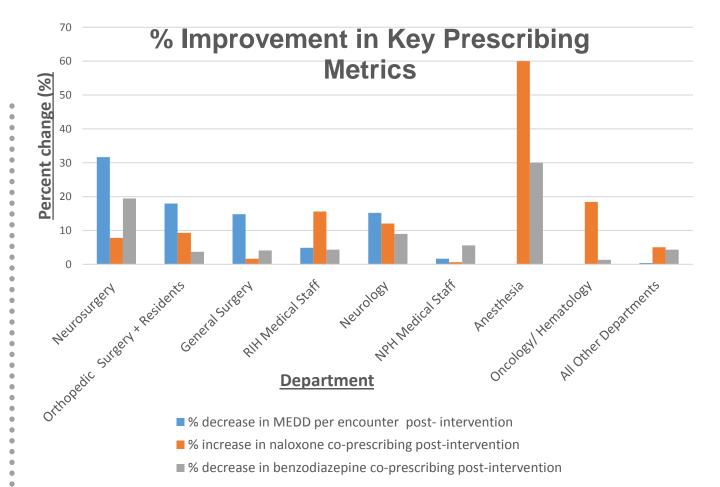
# January 1, 2019 to December 31, 2019 Metrics to determine prescribing improvements:

- Reductions in morphine equivalent daily doses (MEDD)
- Increased naloxone and opioid co-prescribing
- Decreased co-prescribing of opioids and benzodiazepines

# Results of audits and targeted education:

· No overtly inappropriate prescribing was detected.

Metric	Departments Educated	Departments Not Yet Educated
Average change in MEDD per encounter	-14.4%  (Excluding oncology/hematology)	+0.39%
Average change in benzodiazepine co-prescriptions	-9.7%	-4.35%
Average change in naloxone coprescriptions	+15.7%	+5.07%



#### Conclusion

- The implementation of a CS prescription stewardship program based on education and machine learning was effective at reducing inappropriate opioid prescribing in a large academic health system, based on metrics of decreased MEDD, increased Narcan prescribing and decreased opioid and benzodiazepine coprescribing.
- Health systems should foster collaboration between pharmacists, data scientists, physicians and leadership to develop a controlled substance prescription stewardship program

# References

- 1. Dowell D, Arias E, Kochanek K et al. Contribution of opioid-involved poisoning to the change in life expectancy in the United States, 2000-2015. *JAMA*. 2017; 318:1065-7.
- 2. Nesbit SA, Bicket MC. The opioid crisis, *Am J Health-Syst Pharm*. 2019; 76, 2:83-8.
- 3. Downes JM, Klepser DG, Foster J, Nelson M, Development of a standardized approach for managing opioids in adults with chronic noncancer pain, *Am J Health-Syst Pharm.* 2018; 75, 5:321-6.
- 4.. Rudd RA, Aleshire N, Zibbell JE, Gladden RM. Increases in drug and opioid overdose deaths—United States, 2000–2015. *MMWR*. 2016; 64:1378–82.
- 4. Centers for Disease Control and Prevention. Drug and Opioid-Involved Overdose Deaths. (2020, March
- 19). <a href="https://www.cdc.gov/mmwr/volumes/69/wr/mm6911a4.htm">https://www.cdc.gov/mmwr/volumes/69/wr/mm6911a4.htm</a> (accessed 2020 Jul 1).
- 5. United States Department of Justice. MGH to pay \$2.3 million to resolved drug diversion allegations. (2015) <a href="https://www.justice.gov/usao-ma/pr/mgh-pay-23-million-resolve-drug-diversion-allegations">https://www.justice.gov/usao-ma/pr/mgh-pay-23-million-resolve-drug-diversion-allegations</a> (accessed 2019 Mar 1).

# Acknowledgements

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