



The HIMSS Nicholas E. Davies Award of Excellence

Yale  
NewHaven  
Health

# HIMSS Davies Award Presentation

## Rational Opioid Prescribing Project

Adam Ackerman, MD

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# Background

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- The nationwide opioid crisis continues to escalate in severity
  - Estimated 160 deaths daily due to drug overdose
  - Approximately 1 in 3 Americans were prescribed opioids in 2015
  - Major efforts are underway to influence opioid prescribing, thereby reducing harm through decreased patient exposure; focus is mainly on the outpatient setting
- Opioids are frequently administered intravenously in the hospital
- Adverse effects of opioids are more common with the intravenous route when compared with the subcutaneous and oral routes<sup>1</sup>
- Patient satisfaction does not correlate with opioid prescriptions<sup>2</sup>

1. Daoust R, Paquet J, Lavigne G, Piette É, Chauny J-M. Impact of age, sex and route of administration on adverse events after opioid treatment in the emergency department: A retrospective study. *Pain Res Manag* 2015;20(1):23-28.

2. Lee JS, Hu HM, Brummett CM, Syrjamaki JD, Dupree JM, Englesbe MJ, Waljee JF. Postoperative Opioid Prescribing and the Pain Scores on Hospital Consumer Assessment of Healthcare Providers and Systems Survey. *JAMA*. 2017;317(19):2013–2015. doi:10.1001/jama.2017.2827

# Background

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- Opioid exposure rapidly changes the brain
  - fMRI study<sup>1</sup> of 8 opiate-naïve volunteers
    - Morphine sulfate 4 mg IV administered once
    - Signal changes seen in brain “reward structures” similar to other euphoric drugs of abuse (opioids, cocaine, methamphetamine)
- Pharmacokinetics impact the development and propagation of addiction in animal models

*“[The literature] includes recent data highlighting the importance of intermittent, ‘spiking’ brain levels of drug in producing an increase in the motivation to take drug over time. Rapid drug onset and intermittent drug exposure both appear to push the addiction process forward most effectively.”<sup>2</sup>*

<sup>1</sup>Becerra, L., et al. Functional magnetic resonance imaging measures of the effects of morphine on central nervous system circuitry in opioid-naïve healthy volunteers. *Pain Medicine*. 103(1):208-16(2006).

<sup>2</sup>Allain, F., et al. How fast and how often: The pharmacokinetics of drug use are decisive in addiction. *Neuroscience and Biobehavioral Reviews*. 56:166-79(2015).

# Subcutaneous administration of opioids

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- Decades of proven efficacy of pain control in postoperative settings
  - Cardiac surgery<sup>1</sup>
  - Caesarean section<sup>2</sup>
  - Pediatric surgery<sup>3</sup>
- *Palliative Medicine* systematic review<sup>4</sup> looking at opioid utilization in both chronic and acute cancer pain (18 papers, 674 patients)
  - “A comparison of subcutaneous and intravenous routes found no differences [in efficacy], confirming that both routes are feasible, effective and safe. As the risk of complications is lower with subcutaneous application, this route should be preferred.”

<sup>1</sup>Munro, A., Long, G., Sleight, J. Nurse-administered subcutaneous morphine is a satisfactory alternative to intravenous patient-controlled analgesia morphine after cardiac surgery. *Anesthesia Analgesia* 1998;87:11-5.

<sup>2</sup>Safavi, M., Honarmand, A. Postoperative analgesia after caesarean section: intermittent intramuscular versus subcutaneous morphine boluses. *Acute Pain*. 2007;9:215-19.

<sup>3</sup>Lavies NG, Wandless JG. Subcutaneous morphine in children: taking the sting out of postoperative analgesia. *Anaesthesia* 1989; 44:1000-1.

<sup>4</sup>Radbruch, L. et al. Systematic review of the role of alternative application routes for opioid treatment for moderate to severe cancer pain: an EPCRC opioid guidelines project. *Palliative Medicine*. 2011;25(5):389-90.

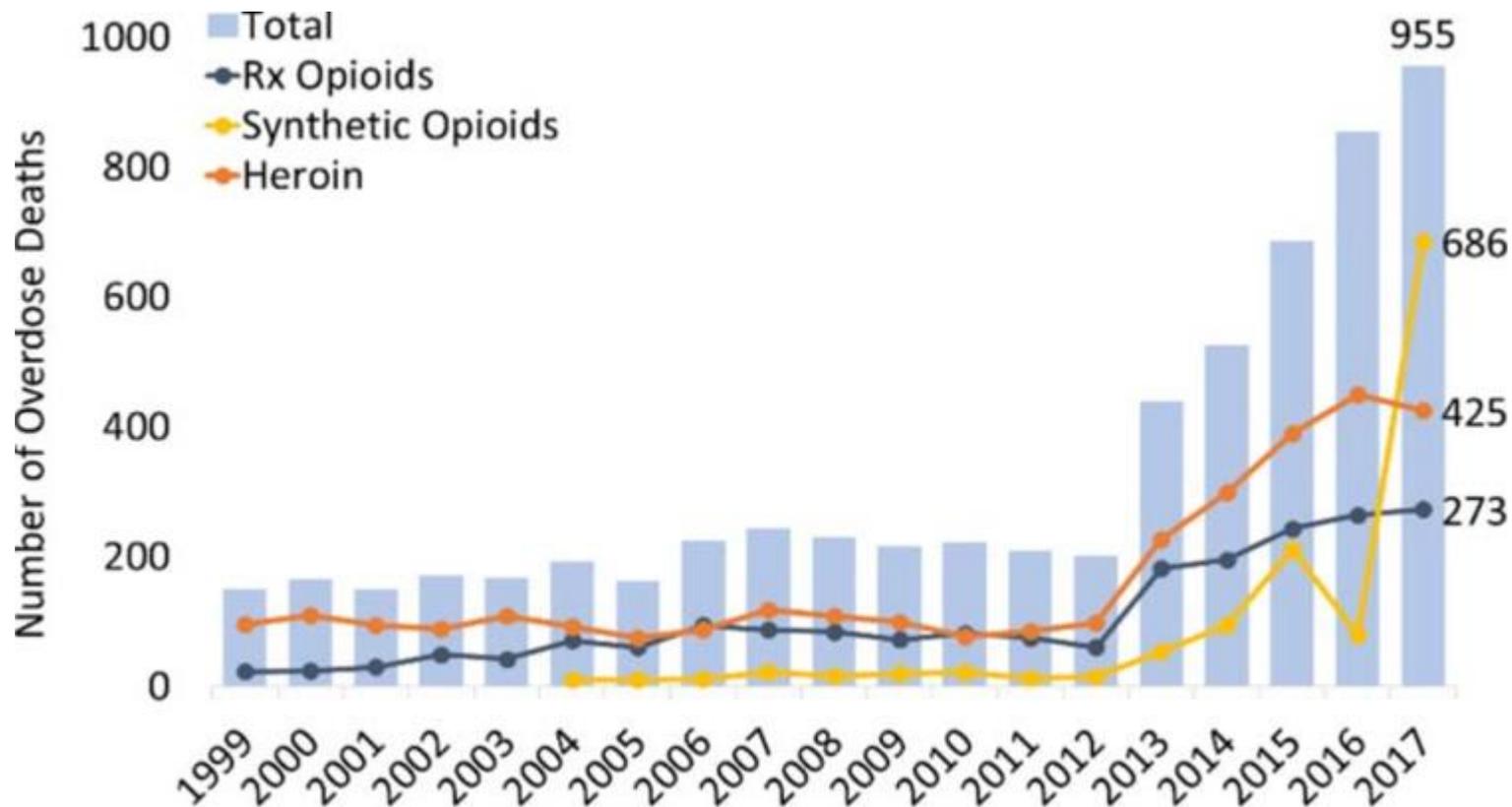
# Avoid opioid IV route; reduce risk

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Route	Nausea or vomiting	Systolic BP < 90 mmHg	O <sub>2</sub> Saturation < 92%	Major adverse events	Global adverse events
Oral	Reference	Reference	Reference	Reference	Reference
Subcutaneous	2.44 (1.81–3.30)	2.56 (1.43–4.58)	1.90 (1.28–2.83)	2.07 (1.48–2.89)	2.23 (1.77–2.81)
Intravenous	4.21 (3.12–5.67)	3.39 (1.90–6.06)	7.30 (5.04–10.58)	6.10 (4.43–8.39)	5.18 (4.13–6.49)

Daoust R, Paquet J, Lavigne G, Piette É, Chauny J-M. Impact of age, sex and route of administration on adverse events after opioid treatment in the emergency department: A retrospective study. *Pain Res Manag* 2015;20(1):23-28.

# Opioid Related Overdose Deaths - Connecticut



**Figure 1. Number of overdose deaths involving opioids in Connecticut, by opioid category. Drug categories presented are not mutually exclusive, and deaths might have involved more than one substance. Source: CDC WONDER.**

# Local Problem

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- Over prescribing oral quantities in discharge prescriptions
- Over prescribing IVs
- Lack of opioid/analgesia training
- No official guidance on proper prescribing

# Rational Opioid Prescribing Project

## Phase I: Single-Unit Pilot

# Objective

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## **Reduce potential harm from parenteral opioid medications in adult patients in the Emergency Department, observation, and inpatient units across the Yale New Haven Health System**

- Adopt a System-wide opioid standard of practice
  - The **oral** route of administration is preferred in patients tolerating oral intake of any kind
  - The **subcutaneous** route of administration is preferred when parenteral opioids are required
- Educate clinicians, nurses, ancillary staff, patients and families on a multimodal approach for treatment of pain

# Intervention

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- Local opioid standard of practice adopted
  - Oral route preferred in patients tolerating oral intake
  - Subcutaneous route preferred in patients receiving parenteral opioids
- Education implemented for prescribers and nurses
  - Awareness of new local opioid standard of practice
  - Awareness of the subcutaneous route of administration
  - Opioid equianalgesic equivalent dosing
  - Typical starting doses of morphine and hydromorphone

# Methods

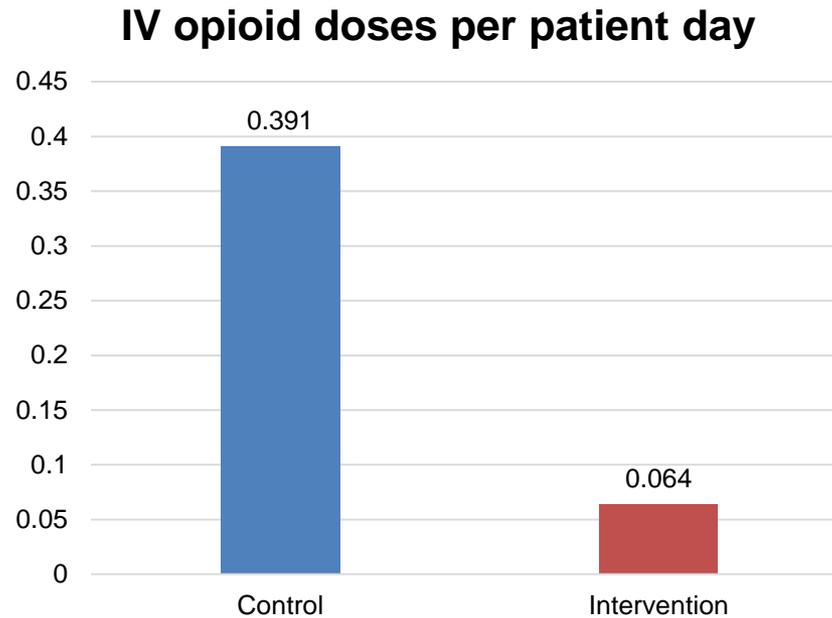
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Population of patients present on single general medicine unit

- Epic data
- Control group
  - 6 months prior to intervention
  - 4500 patient days
- Intervention group
  - 3 months after intervention
  - 2495 patient days

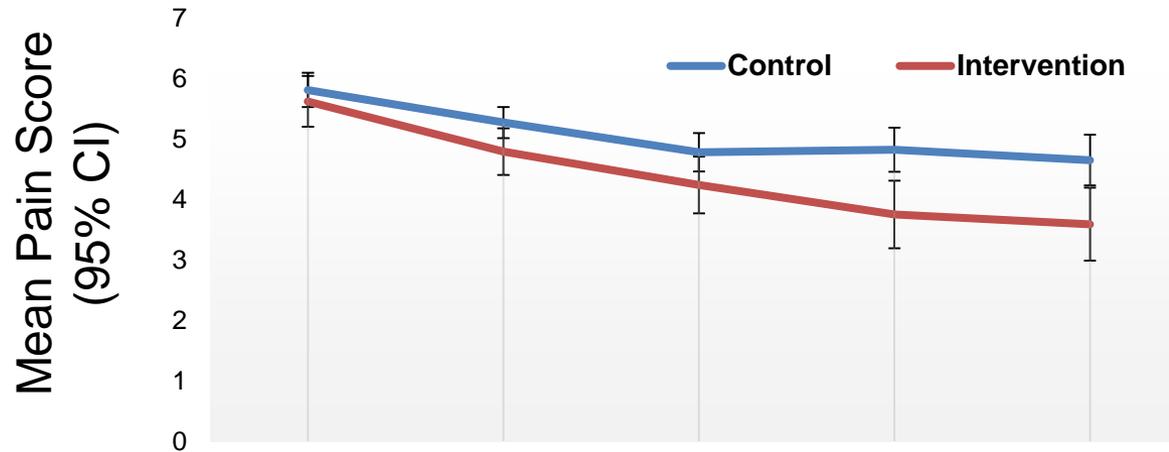
# Results

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84% reduction in number of IV doses administered per patient day

# Results



	Day 1	Day 2	Day 3	Day 4	Day 5
P-value	0.62	0.07	0.09	0.004	0.009



Research

JAMA Internal Medicine | [Original Investigation](#)

# Association of an Opioid Standard of Practice Intervention With Intravenous Opioid Exposure in Hospitalized Patients

Adam L. Ackerman, MD; Patrick G. O'Connor, MD, MPH; Deirdre L. Doyle, MSN, MHA; Sheyla M. Marranta, MS; Carolyn L. Haight, BSN; Christine E. Day, BS; Robert L. Fogerty, MD, MPH

# **Rational Opioid Prescribing Project**

## Phase II: Hospitalist Service Expansion

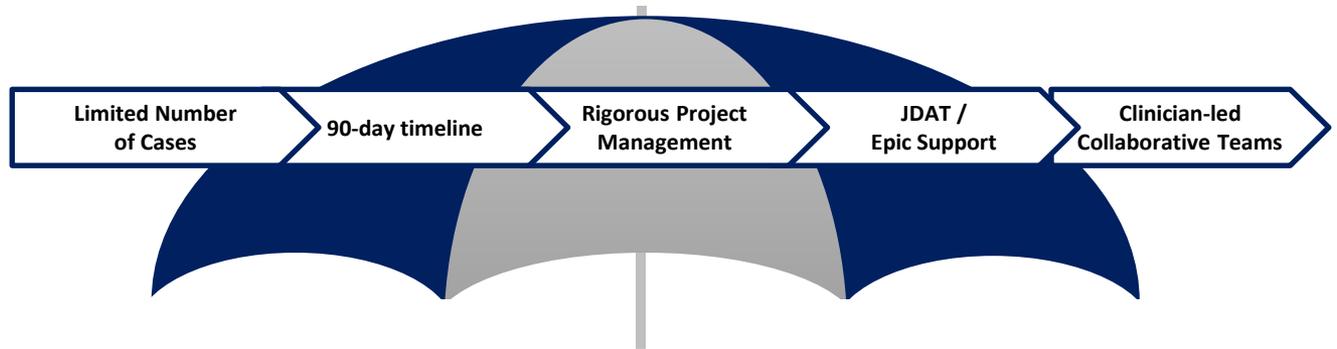
# Rational Opioid Prescribing Project

## Phase III: System-wide Expansion

# Clinical Redesign Collaboration

## Revised Approach to Clinical Redesign

*We have developed and fine-tuned a methodology to drive rapid-cycle projects to completion. We continually look to ensure that we have the ten elements of success for each clinical redesign case*



### Ten Elements of Success

- 1) Dedicated, motivated, and engaged leadership from respected clinicians
- 2) Full clinical team engagement
- 3) Administrative support from senior-level hospital leaders
- 4) Risks to case success identified early and mitigated throughout the case lifecycle
- 5) Defined scope with clear end-points and deliverables
- 6) Evidence—based and/or patient/family centered case goals
- 7) Clinically relevant data regularly delivered to units and providers
- 8) Competition accelerates achievement of goals
- 9) Physician pain points specifically addressed
- 10) Clear education and communication to create visibility of case goals

### Key Clinical Redesign Team Members

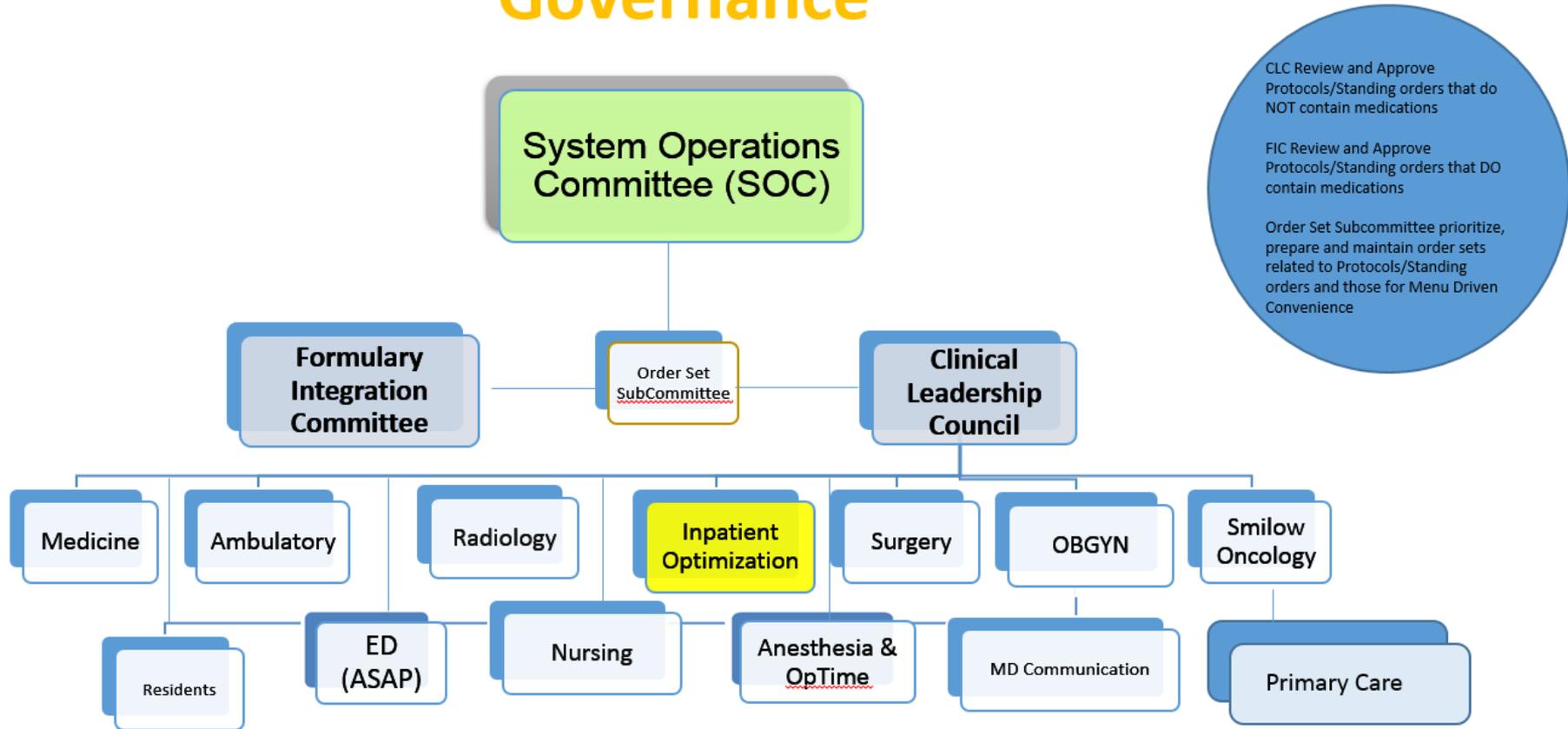
- Physicians: System CMOs, section heads, medical directors, attendings, fellows, and residents
- Nursing: System CNOs, leadership, management, floor nurses, educators, etc.
- Administrative leaders & service line coordinators across the system
- Epic / JDAT leadership, management, and analysts
- Clinical services: respiratory therapy, physical therapy, dieticians, pharmacy, laboratory medicine, radiology, clinical engineering

# Clinical Redesign Decision Matrix

250		102		123			
PM Resources	PM Effort	MD Resources	MD Effort	JDAT Resources	JDAT Effort	Project Leader	Physician Leader
	173		64		111	Anesta Willians	Scott Sussman

Relative Importance -->								6	9	6	5	4	100			0		
Sort								Clinical Impact	Financial Impact	# Patients Affected	Ease of Implementation	Political	Continuation, Must Do, Local Resource	Total Score	PM Effort (hrs/week)	MD Effort (hrs/week)	JDAT Effort (hrs/week)	Unique Effort Identifier
Project																		
Opioid Optimization								9	6	9	3	5	9	41	12	3	6	

# Governance





Research

JAMA Surgery | **Original Investigation**

# Association of Lowering Default Pill Counts in Electronic Medical Record Systems With Postoperative Opioid Prescribing

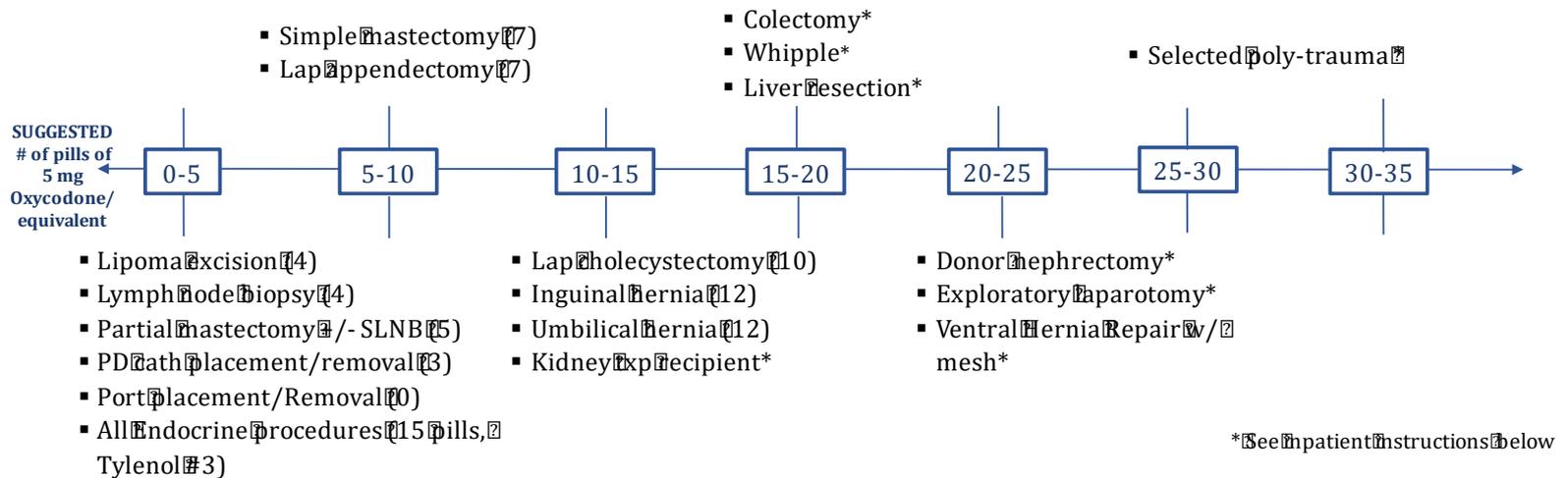
Alexander S. Chiu, MD; Raymond A. Jean, MD; Jessica R. Hoag, PhD; Mollie Freedman-Weiss, MD; James M. Healy, MD; Kevin Y. Pei, MD

# Postoperative Pain Management

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- Develop a multi-faceted program aimed at decreasing the amount of opioid prescribed postoperatively
- Maintain the same level of patient care and analgesia
- Create sustainable outcomes over time

# Postoperative Pain Management



## Overview of guidelines

### 1.) Tylenol and NSAIDs

- Take acetaminophen and NSAIDs\*\*\*, unless contraindicated, through POD #4 and while still using opioids
- 650-1000mg acetaminophen q6h alternating with an NSAID (i.e. Ibuprofen 600mg q6h) while awake

### 2.) For POD #0 or POD #1 discharges:

- After uncomplicated procedures, use above procedure-specific guidelines\*\* for suggestions on discharge prescription.

### 3.) For POD #2 or later discharges:

- Base your discharge prescription on the prior day's opioid use
  - If 0 pills taken the day prior to discharge → prescribe 0 pills
  - If 1-3 pills were taken → prescribe 1-2 pills
  - If 2-4 pills were taken → prescribe 2-3 pills

\*\* All are recommendations, Rx's and instructions should be patient specific  
 \*\*\* Check with surgeon regarding NSAID use; Do not give with aspirin.

### 4.) Bowel regimen: Prescribe a bowel regimen to be taken while using opioids

# Hardwiring Best Practices

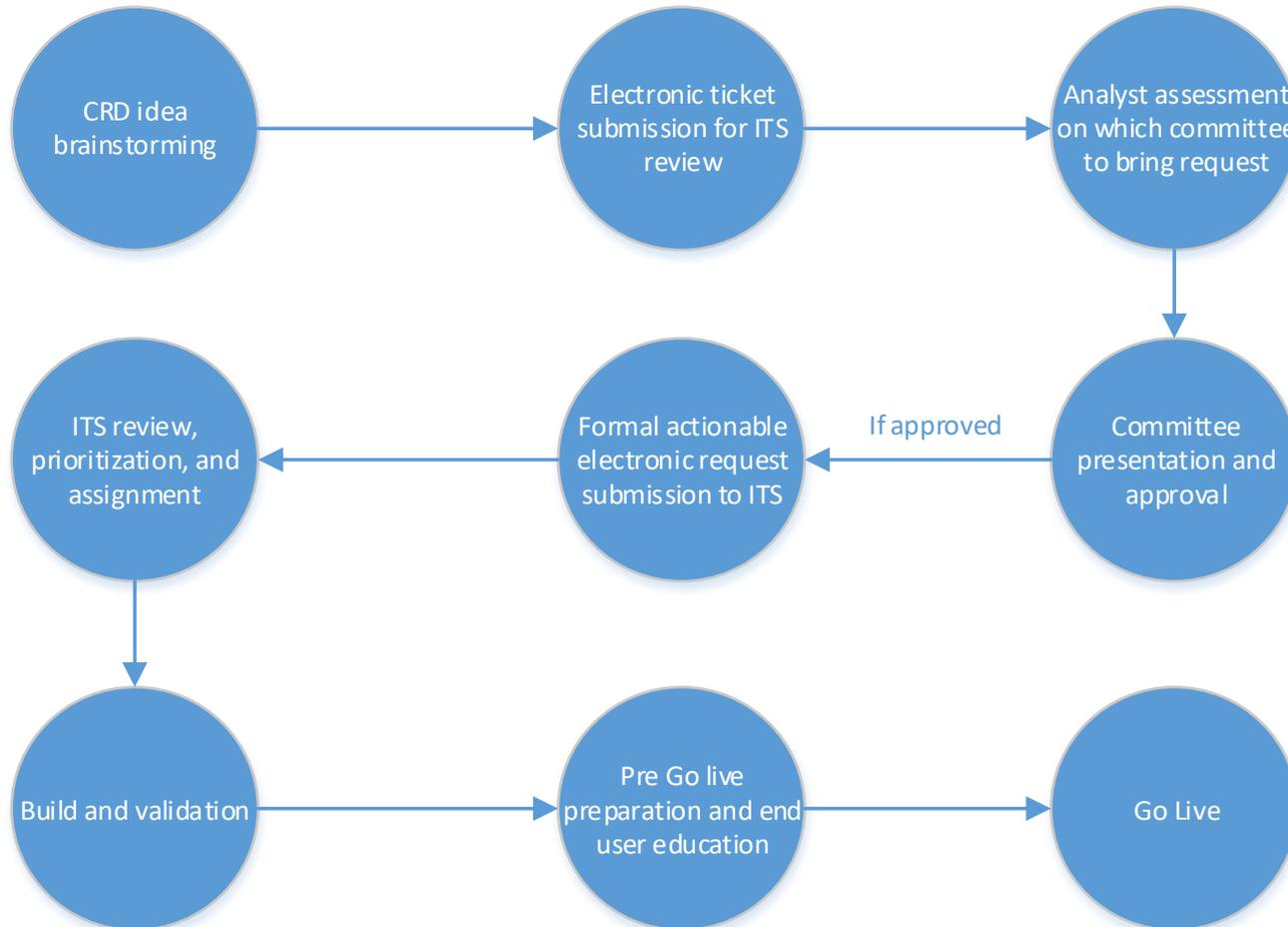
# Identified changes needed in Epic

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- Opioid Order Composer changes
  - Route of administration
    - Sequence
    - Defaults
  - Frequency
    - Number of days default
  - Dispense Quantity
  - Order Set Changes
  - Provide Common Opioid Dosing Guidance

# IT and Clinical Redesign Partnership

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# Multimodal Orderset Modifications - BEFORE

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## **Analgesia (Oral)**

- |  |                       |
|--|-----------------------|
| + <a href="#">Analgesia (Mild Pain, Oral) (210190)</a>     | Released on 8/21/2017 |
| + <a href="#">Analgesia (Moderate Pain, Oral) (210191)</a> | Released on 2/28/2018 |
| + <a href="#">Analgesia (Severe Pain, Oral) (210192)</a>   | Released on 2/28/2018 |

## **Analgesia (Parenteral)**

- |  |                       |
|--|-----------------------|
| + <a href="#">Mild Pain (Frail, Elderly, COPD, OSA, ESRD) (210193)</a>     | Released on 9/23/2014 |
| + <a href="#">Mild Pain (210194)</a>                                       | Released on 9/23/2014 |
| + <a href="#">Mild Pain (Opiate Experienced Patients) (210195)</a>         | Released on 9/23/2014 |
| + <a href="#">Moderate Pain (Frail, Elderly, COPD, OSA, ESRD) (210196)</a> | Released on 9/23/2014 |
| + <a href="#">Moderate Pain (210197)</a>                                   | Released on 12/7/2016 |
| + <a href="#">Moderate Pain (Opiate Experienced Patients) (210198)</a>     | Released on 9/23/2014 |
| + <a href="#">Severe Pain (Frail, Elderly, COPD, OSA, ESRD) (210199)</a>   | Released on 12/7/2016 |
| + <a href="#">Severe Pain (210200)</a>                                     | Released on 9/23/2014 |
| + <a href="#">Severe Pain (Opiate Experienced Patients) (210201)</a>       | Released on 9/23/2014 |

# Multimodal Orderset Modifications - BEFORE

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## Analgisia (Oral)

⊕ <a href="#">Analgisia (Mild Pain, Oral) (210190)</a>	Released on 8/21/2017
⊖ <a href="#">Analgisia (Moderate Pain, Oral) (210191)</a>	Released on 2/28/2018
<b>IP Order:</b> acetaminophen-codeine (TYLENOL #3) 300-30 mg per tablet	1 tablet, Oral, EVERY 4 HOURS PRN, Moderate Pain (PIS 4-6)
<b>IP Order:</b> acetaminophen-codeine (TYLENOL w/CODEINE) 300-30 mg/12.5 mL	12.5 mL, Oral, EVERY 4 HOURS PRN, Moderate Pain (PIS 4-6)
<b>IP Order:</b> HYDROcodone-acetaminophen (NORCO) tablet 5-325 mg	1 tablet, Oral, EVERY 4 HOURS PRN, Moderate Pain (PIS 4-6)
<b>IP Order:</b> HYDROcodone-acetaminophen (HYCET) solution 2.5-108 mg/5mL	10 mL, Oral, EVERY 4 HOURS PRN, Moderate Pain (PIS 4-6)
<b>IP Order:</b> oxyCODONE-acetaminophen (PERCOCET) 5-325 mg	1 tablet, Oral, EVERY 4 HOURS PRN, Moderate Pain (PIS 4-6)
<b>IP Order:</b> oxyCODONE (ROXICODONE) immediate release tablet	5 mg, Oral, EVERY 4 HOURS PRN, Moderate Pain (PIS 4-6)
⊕ <a href="#">Analgisia (Severe Pain, Oral) (210192)</a>	Released on 2/28/2018

# Multimodal Orderset Modifications - OPTIMIZED

## Multimodal Analgesia

☐ <a href="#">Acetaminophen (559004)</a>	Released on 7/13/2018
<b>IP Order:</b> acetaminophen (TYLENOL) tablet	650 mg, Oral
<b>IP Order:</b> acetaminophen (TYLENOL) solution	650 mg, Oral
☐ <a href="#">NSAID- Scheduled (559005)</a>	Released on 7/31/2018
<b>IP Order:</b> ibuprofen (ADVIL,MOTRIN) tablet	600 mg, Every 6 Hours Scheduled
☐ <a href="#">Gabapentin (559007)</a>	Released on 1/21/2018
<b>IP Order:</b> gabapentin (NEURONTIN) - CrCl > 60 mL/min	300 mg, Oral, Every 8 Hours Scheduled
<b>IP Order:</b> gabapentin (NEURONTIN) - CrCl 30 - 60 mL/min	200 mg, Oral, 2 Times Daily Scheduled
☐ <a href="#">Alternative Analgesics- Scheduled (559008)</a>	Released on 11/12/2018
<b>IP Order:</b> DULoxetine (CYMBALTA) DR capsule	30 mg, Oral, Daily
<b>IP Order:</b> amitriptyline (ELAVIL) tablet	25 mg, Oral, Nightly
<b>IP Order:</b> LIDOCAINE PATCH ORDERABLE	1 patch, Transdermal, Daily

## Opioid Analgesia- Oral Administration PRN

⊕ <a href="#">Mild Pain (559009)</a>	Released on 1/21/2018
⊕ <a href="#">Moderate Pain (559010)</a>	Released on 7/13/2018
⊕ <a href="#">Severe Pain (559011)</a>	Released on 7/13/2018

## Injectable Medications- PRN

⊕ <a href="#">Mild Pain (559014)</a>	Released on 2/2/2018
⊕ <a href="#">Moderate Pain (559012)</a>	Released on 7/13/2018
⊕ <a href="#">Severe Pain (559013)</a>	Released on 7/13/2018

# Multimodal Orderset Modifications - OPTIMIZED

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## Opioid Analgesia- Oral Administration PRN

<input checked="" type="checkbox"/> <a href="#">Mild Pain (559009)</a>	Released on 1/21/2018
<input type="checkbox"/> <a href="#">Moderate Pain (559010)</a>	Released on 7/13/2018
<b>IP Order:</b> oxyCODONE (ROXICODONE) immediate release tablet	5 mg, Oral, EVERY 4 HOURS PRN, Moderate Pain (PIS 4-6)
<b>IP Order:</b> traMADol (ULTRAM) tablet	50 mg, Oral, EVERY 6 HOURS PRN, Moderate Pain (PIS 4-6)
<b>IP Order:</b> Morphine (MSIR) oral	7.5 mg, Oral, EVERY 6 HOURS PRN, Moderate Pain (PIS 4-6)
<b>IP Order:</b> HYDROmorphone (DILAUDID) tablet	2 mg, Oral, EVERY 4 HOURS PRN, Moderate Pain (PIS 4-6)
<input checked="" type="checkbox"/> <a href="#">Severe Pain (559011)</a>	Released on 7/13/2018





# Optimized Morphine Order with Decision Support

morphine syringe

Equivalences of Common Opioid Doses			
	Morphine	Hydromorphone	Oxycodone
Oxycodone 5mg PO	7.5mg PO, NG, or NJ 2.5mg IV or SC	2mg PO, NG, or NJ 0.4mg IV or SC	5mg PO, NG, or NJ
Morphine 5mg IV	15mg PO, NG, or NJ 5mg IV or SC	4mg PO, NG, or NJ 0.8mg IV or SC	10mg PO, NG, or NJ
Hydromorphone 0.75 mg IV	15mg PO, NG, or NJ 5mg IV or SC	4mg PO, NG, or NJ 0.75mg IV or SC	10mg PO, NG, or NJ

PO= by mouth, NG= nasogastric, NJ= nasojejunal, IV= intravenous, SC= subcutaneous

**Dose:**  0.5 mg 1 mg 2 mg 4 mg 8 mg 10 mg 15 mg

Weight Type: **Recorded** Ideal Adjusted Dosing Order-Specific

Weight: 119.6 kg 54.7 kg 80.7 kg

Recorded weight: 119.6 kg (recorded 4 days 8 hours ago)

**Route:**  Subcutaneous IV Push Intramuscular

**Frequency:**  Q2H PRN Q3H PRN Q4H PRN Q6H PRN

For:  7 Doses Hours **Days**

Starting:  5/14/2019 **Today** Tomorrow

First Dose:  Include Now As Scheduled

First Dose: **Today 1646**

*There are no scheduled times based on the current order parameters.*

Admin. Inst.:  Insert SmartText

Common Side Effects: Confusion, nausea, vomiting, drowsiness, constipation, breathing problems.

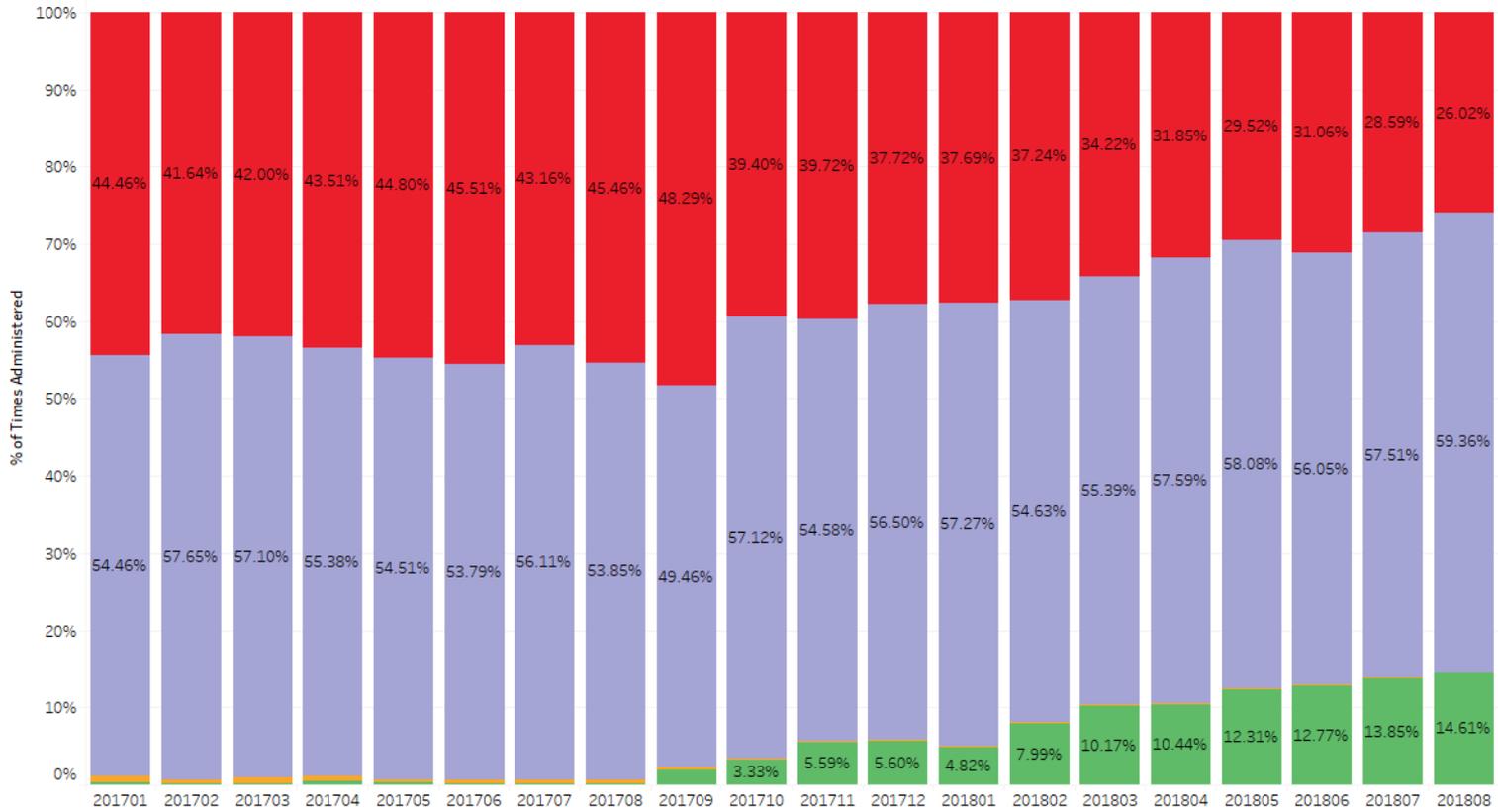
# Common Opioid Dosing Matrix (Sidebar report)

morphine (MSIR) tablet 15 mg

Equivalences of Common Opioid Doses			
	Morphine	Hydromorphone	Oxycodone
Oxycodone 5mg PO	7.5mg PO, NG, or NJ  2.5mg IV or SC	2mg PO, NG, or NJ  0.4mg IV or SC	5mg PO, NG, or NJ
Morphine 5mg IV	15mg PO, NG, or NJ  5mg IV or SC	4mg PO, NG, or NJ  0.8mg IV or SC	10mg PO, NG, or NJ
Hydromorphone 0.75 mg IV	15mg PO, NG, or NJ  5mg IV or SC	4mg PO, NG, or NJ  0.75mg IV or SC	10mg PO, NG, or NJ
PO= by mouth, NG= nasogastric, NJ= nasojejunal, IV= intravenous, SC= subcutaneous			

Route Administration by Month  
Bridgeport Hospital

Year Month



- Delivery Network
- Bridgeport Hospital
  - Greenwich Hospital
  - Lawrence and Memorial ..
  - Saint Raphael Campus
  - Westerly Hospital
  - Yale New Haven Hospital

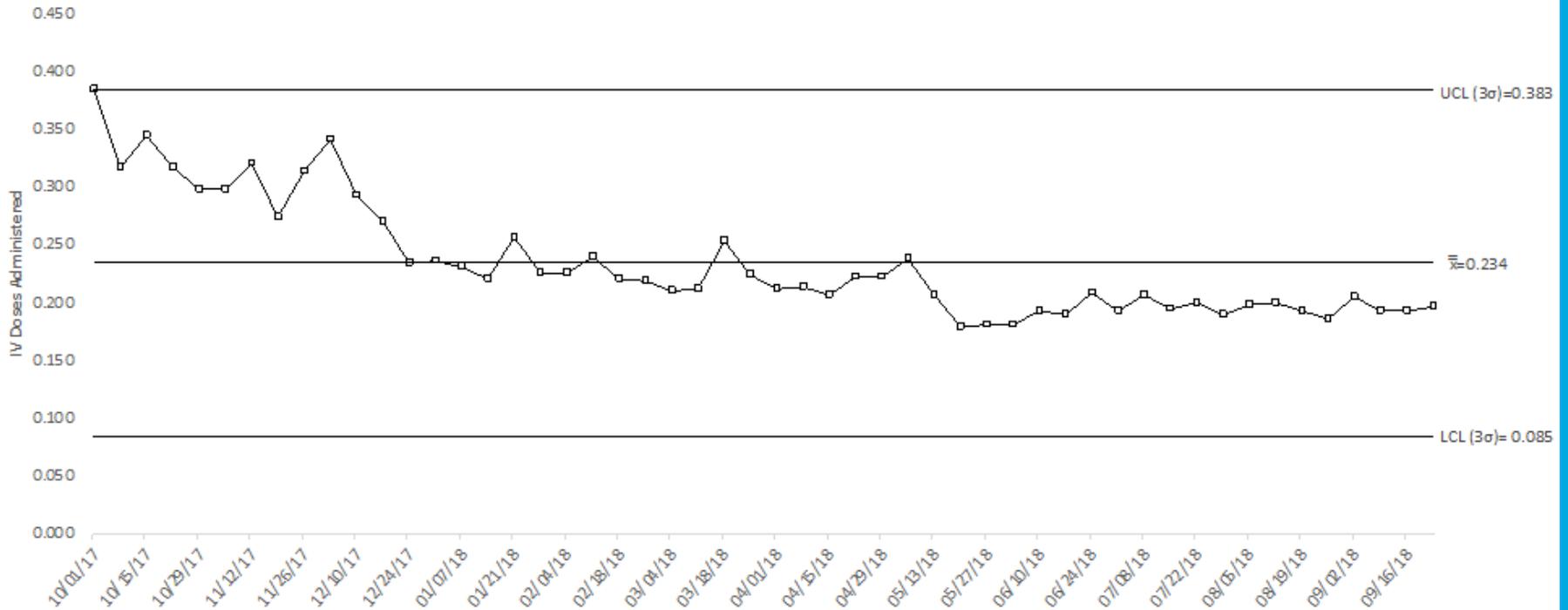
- Route
- IV
  - Oral
  - Intramuscular
  - Subcutaneous

Begin Date  
1/1/2017

End Date  
8/1/2018

System-wide Rollout →

### IV Opioid Doses Administered per Patient Day

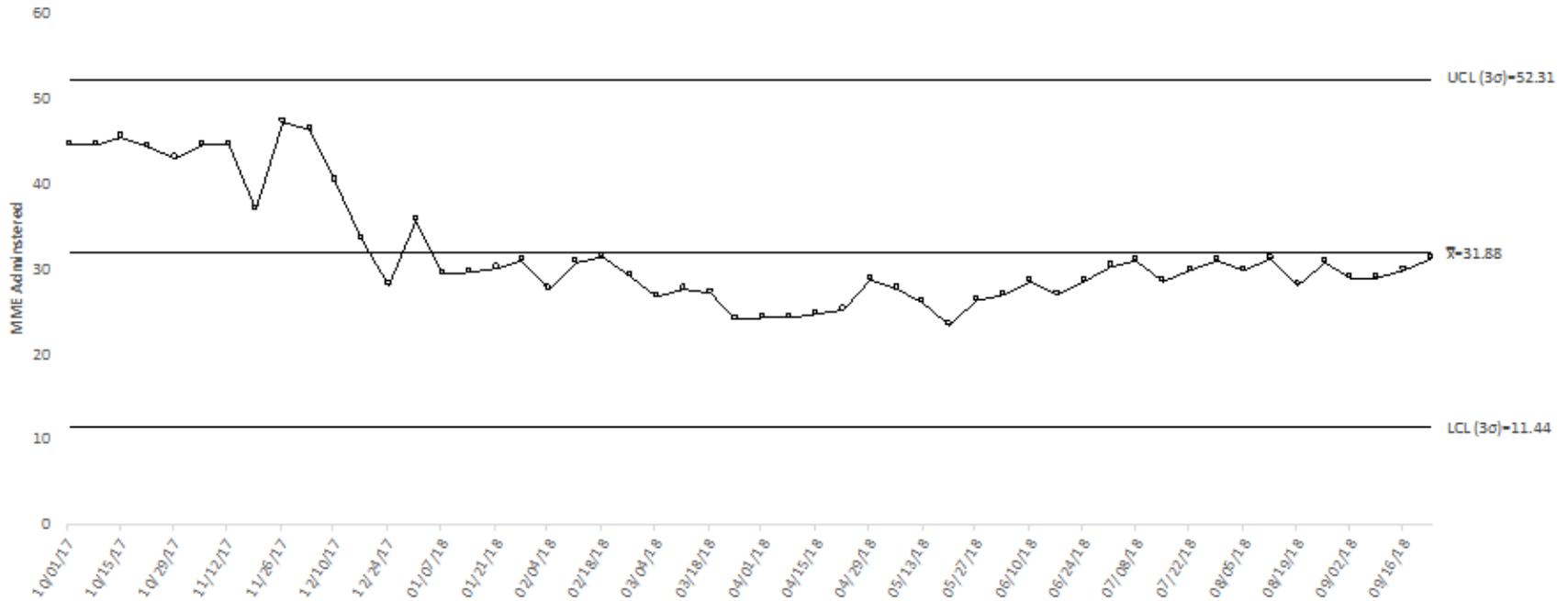


Difference of Means:

28% Decrease from baseline period (M = 0.234 [95% CI 0.220-0.248] vs. M=0.320 [95% CI 0.307-0.332], P <1.92E-15)

**28% reduction from FY17 to FY18**

## Average Morphine Milligram Equivalents (MME) Administered per Patient Day All Routes

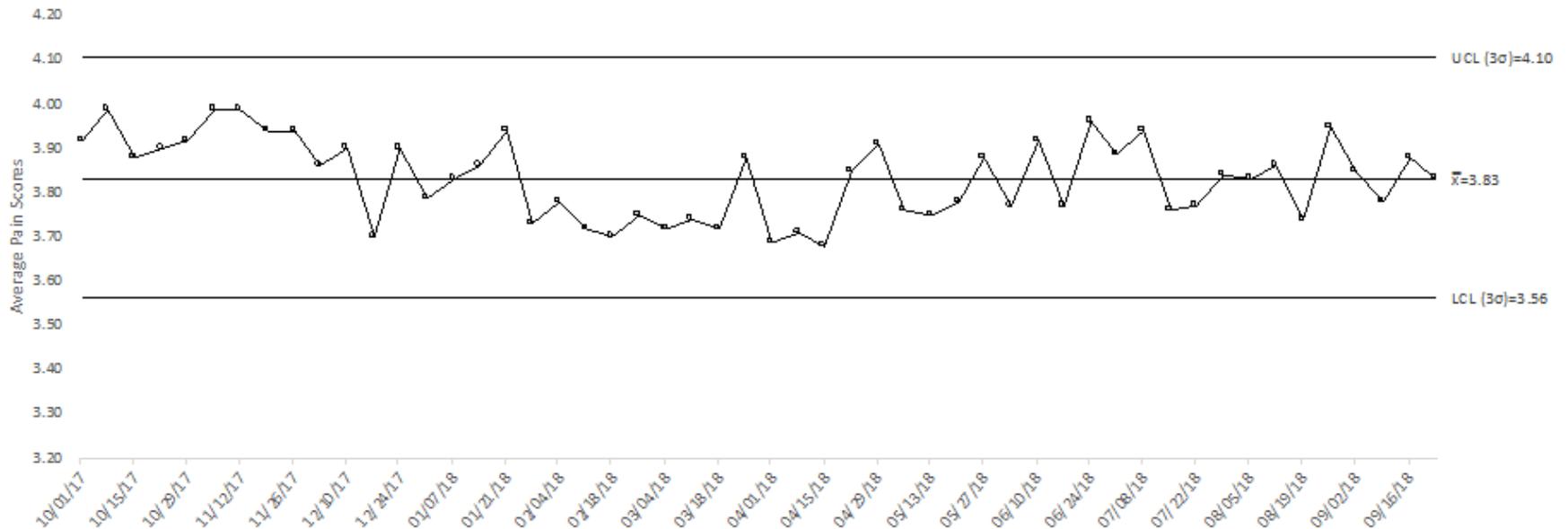


**Difference of Means:**

15% Decrease from baseline period (M =31.88 [95% CI 29.98-33.77] vs. M =37.71 [95% CI 36.31-39.11], P <1.39E-06)

**15% reduction from FY17 to FY18**

### Average Daily Pain Score



**Difference of Means**

18% Decrease from baseline period (M =3.83 [95% CI 3.82-3.84] vs. M =4.71 [95% CI 4.65-4.78], P <2.11E-45 )

**18% reduction from FY17 to FY18**

# Discharge Opioid prescription - BEFORE

**Discharge** ? Resize Close X

Reconcile Problem List for Discharge Review Orders for Discharge New Orders for Discharge  
Review and Sign

**oxyCODONE (OXY-IR) 5 mg capsule** ✓ Accept ✗ Cancel Remove

Product: **OXYCODONE 5 MG CAPSULE**  
Sig: Specify Dose, Route, Frequency Use Free Text  
Method:   
Dose: 5 mg 5 mg 10 mg  
Prescribed Dose: 5 mg  
Prescribed Amount: 1 capsule  
Route: Oral Oral  
Frequency: EVERY 4 HOURS PRN Q4H PRN Q6H PRN  
PRN comment:   
Duration: 10 Doses Days  
Starting: 12/11/2016 Ending: 12/21/2016 First Fill:   
Mark long-term:  OXYCODONE HCL  
Patient Sig: Take 1 capsule (5 mg total) by mouth every 4 (four) hours as needed.  
+ Add additional information to the patient sig  
Dispense: 30 capsule Refill: 0  
Days/Fill: Full (10 Days) 30 Days 90 Days  
 Dispense As Written  
Class: Print Normal Print Phone In No Print Historical Med  
Note to Pharmacy (F6): [Click to add text](#)

**New on Discharge**  
Discharge Patient  
oxyCODONE (OXY-IR)  
5 mg capsule

# Discharge Opioid prescription - OPTIMIZED

**Discharge** ? Resize Close X

Reconcile Problem List for Discharge Review Orders for Discharge New Orders for Discharge

Review and Sign

**oxyCODONE (OXY-IR) 5 mg capsule** ✓ Accept ✗ Cancel Remove

Product: **OXYCODONE 5 MG CAPSULE**

Sig: Specify Dose, Route, Frequency Use Free Text

Method: **5** mg **5 mg** 10 mg

Dose: Prescribed Dose: **5 mg**  
Prescribed Amount: **1 capsule**

Route: Oral Oral

Frequency: EVERY 4 HOURS PRN Q4H PRN Q6H PRN

PRN comment:

7  Doses  Days

Starting: 12/11/2016 Ending: 12/21/2016 First Fill:

Mark long-term:  OXYCODONE HCL

Patient Sig: **Take 1 capsule (5 mg total) by mouth every 4 (four) hours as needed.**  
+ Add additional information to the patient sig

12 capsule Refill: 0

Days/Fill: Full (10 Days) 30 Days 90 Days

Dispense As Written

Class: Print Normal Print Phone In No Print Historical Med

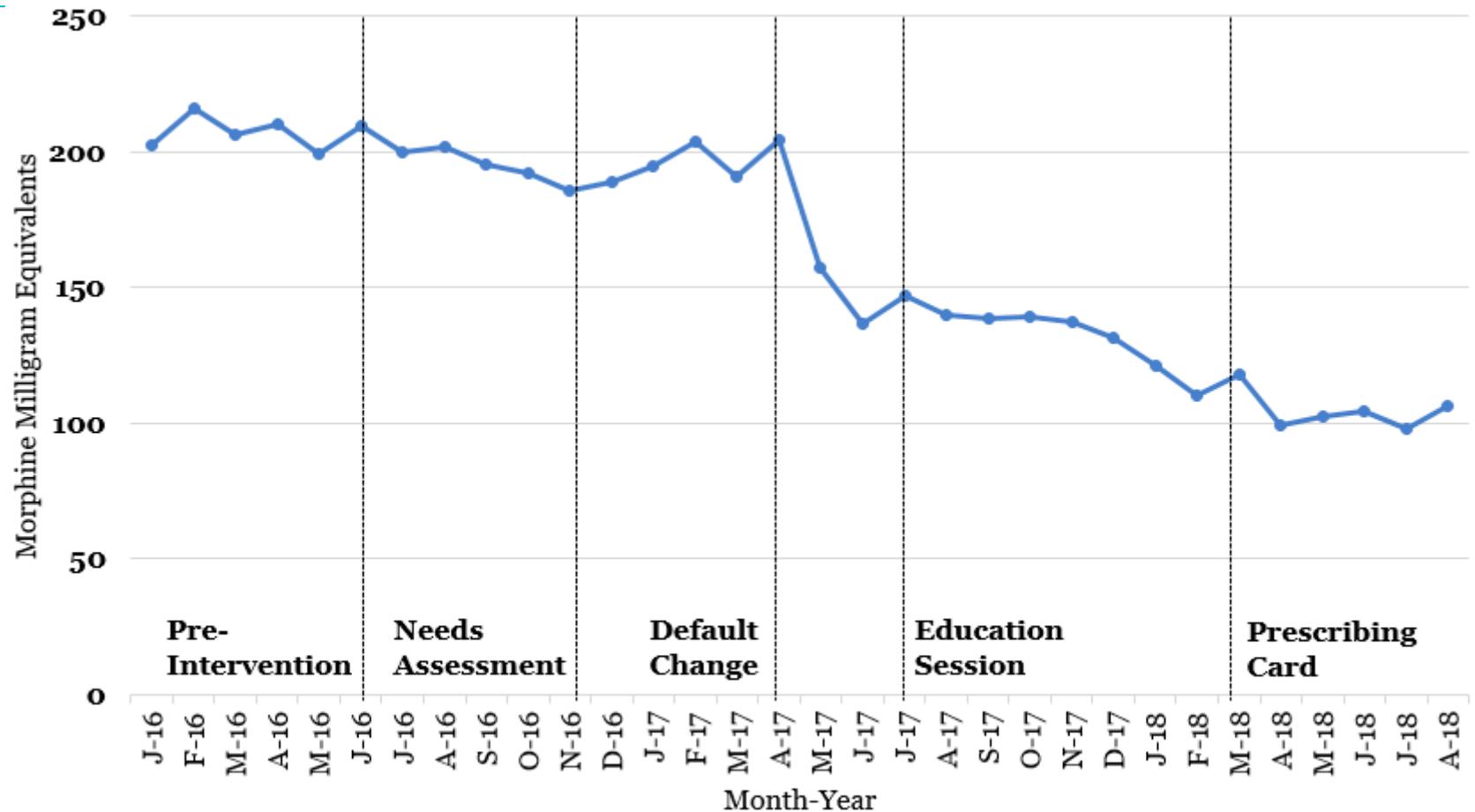
Note to Pharmacy (F6): [Click to add text](#)

**New on Discharge**

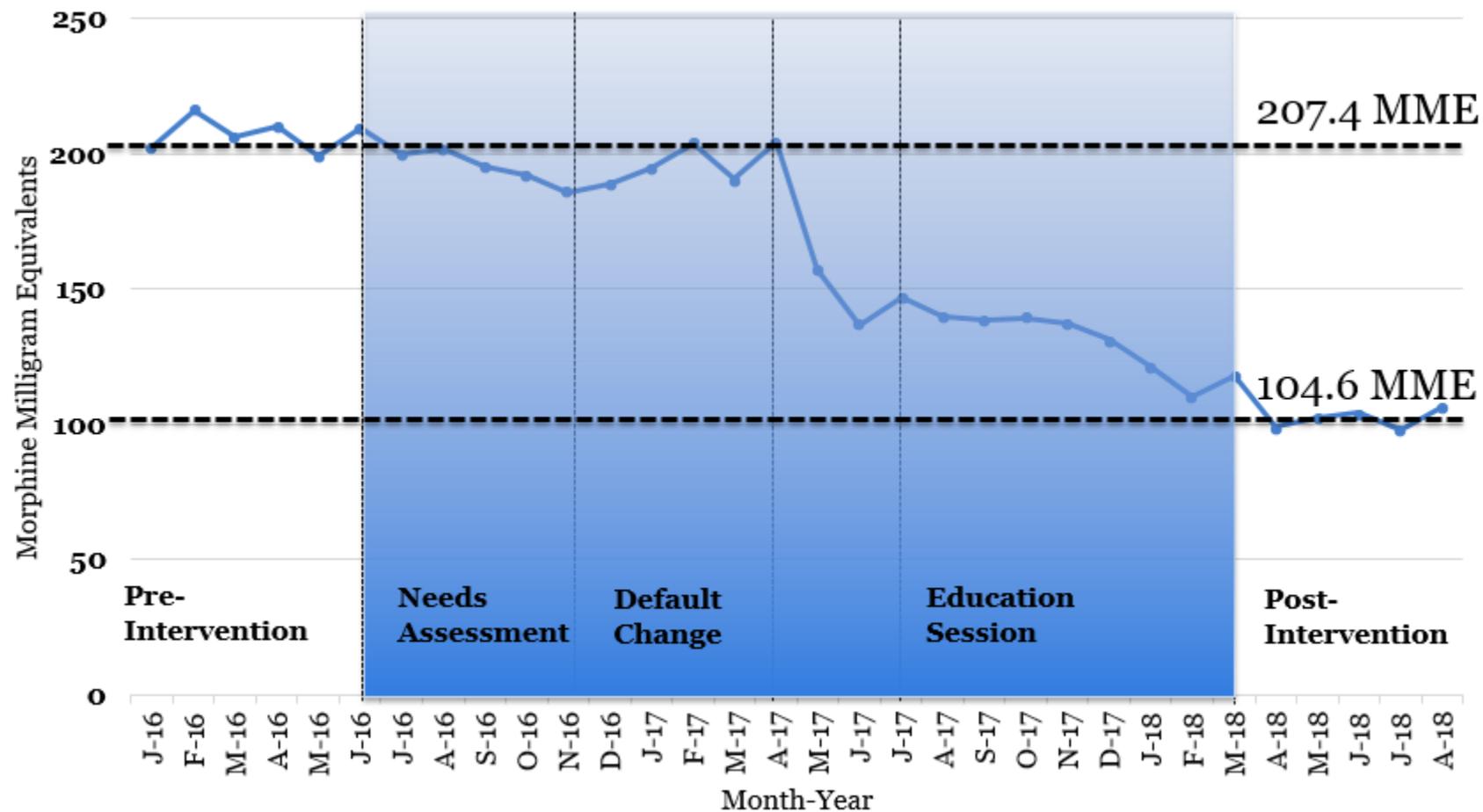
Discharge Patient

oxyCODONE (OXY-IR)  
5 mg capsule

# Average Opioid Prescribed Per Prescription

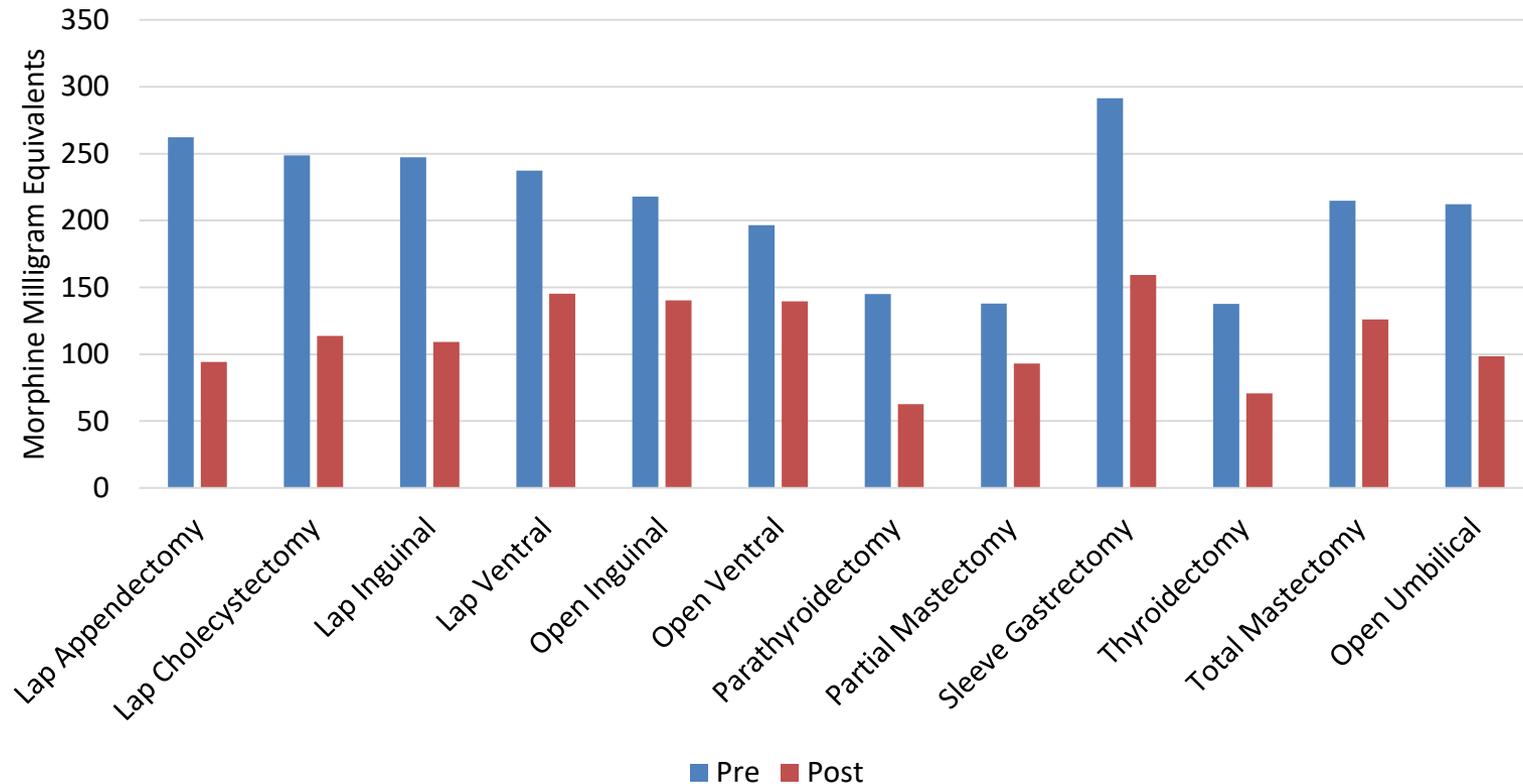


# Average Opioid Prescribed Per Prescription



# Results

- Decrease in average prescription by 49.5%
  - 207.1 MME to 104.6 MME ( $p < .01$ )





# Questions?

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Thank you