HIMSS Davies Award Presentation

Rational Opioid Prescribing Project

Adam Ackerman, MD
Alex Chiu, MD
Michelle DeWitt, RN
Greg Jaszczur, Pharm D
Scott Sussman, MD
Background

- 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\(^1\)
- Patient satisfaction does not correlate with opioid prescriptions\(^2\)

Background

- Opioid exposure rapidly changes the brain
  - fMRI study\(^1\) 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.”\(^2\)


Subcutaneous administration of opioids

- Decades of proven efficacy of pain control in postoperative settings
  - Cardiac surgery\(^1\)
  - Caesarean section\(^2\)
  - Pediatric surgery\(^3\)
- *Palliative Medicine* systematic review\(^4\) 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.”

\(^1\)Munro, A., Long, G., Sleigh, J. Nurse-administered subcutaneous morphine is a satisfactory alternative to intravenous patient-controlled analgesia morphine after cardiac surgery. *Anesthesia Analgesia* 1998;87:11-5.


Avoid opioid IV route; reduce risk

<table>
<thead>
<tr>
<th>Route</th>
<th>Nausea or vomiting</th>
<th>Systolic BP &lt; 90 mmHg</th>
<th>O₂ Saturation &lt; 92%</th>
<th>Major adverse events</th>
<th>Global adverse events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Subcutaneous</td>
<td>2.44 (1.81–3.30)</td>
<td>2.56 (1.43–4.58)</td>
<td>1.90 (1.28–2.83)</td>
<td>2.07 (1.48–2.89)</td>
<td>2.23 (1.77–2.81)</td>
</tr>
<tr>
<td>Intravenous</td>
<td>4.21 (3.12–5.67)</td>
<td>3.39 (1.90–6.06)</td>
<td>7.30 (5.04–10.58)</td>
<td>6.10 (4.43–8.39)</td>
<td>5.18 (4.13–6.49)</td>
</tr>
</tbody>
</table>

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

- 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

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**

- 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

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

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

<table>
<thead>
<tr>
<th></th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
<th>Day 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P-value</strong></td>
<td>0.62</td>
<td>0.07</td>
<td>0.09</td>
<td>0.004</td>
<td>0.009</td>
</tr>
</tbody>
</table>

Mean Pain Score (95% CI)

Control

Intervention
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. Marranca, 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
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

<table>
<thead>
<tr>
<th>250</th>
<th>102</th>
<th>123</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM Resources</td>
<td>PM Effort</td>
<td>MD Resources</td>
</tr>
<tr>
<td>173</td>
<td>64</td>
<td>111</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relative Importance</th>
<th>6</th>
<th>9</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>100</th>
<th>PM Effort (hrs/week)</th>
<th>MD Effort (hrs/week)</th>
<th>JDAT Effort (hrs/week)</th>
<th>Unique Effort Identifier</th>
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<tbody>
<tr>
<td>Sort</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Clinical Impact</td>
<td>Financial Impact</td>
<td># Patients Affected</td>
<td>Ease of Implementation</td>
</tr>
<tr>
<td>Opioid Optimization</td>
<td>9</td>
<td>6</td>
<td>9</td>
<td>3</td>
<td>5</td>
<td>9</td>
<td>41</td>
<td>12</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

Yale New Haven Health
CLC Review and Approve Protocols/Standing orders that do NOT contain medications

FIC Review and Approve Protocols/Standing orders that DO contain medications

Order Set Subcommittee prioritize, prepare and maintain order sets related to Protocols/Standing orders and those for Menu Driven Convenience
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

- 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

<table>
<thead>
<tr>
<th>Simple mastectomy (7)</th>
<th>Colectomy*</th>
<th>Selected poly-trauma*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lap appendectomy (7)</td>
<td>Whipple*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Liver resection*</td>
<td></td>
</tr>
</tbody>
</table>

### Suggested

<table>
<thead>
<tr>
<th># of pills of 5 mg Oxycodeone/ equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
</tr>
<tr>
<td>5-10</td>
</tr>
<tr>
<td>10-15</td>
</tr>
<tr>
<td>15-20</td>
</tr>
<tr>
<td>20-25</td>
</tr>
<tr>
<td>25-30</td>
</tr>
<tr>
<td>30-35</td>
</tr>
</tbody>
</table>

- Lipoma excision (4)
- Lymph node biopsy (4)
- Partial mastectomy +/- SLNB (5)
- PD cath placement/removal (3)
- Port placement/Removal (0)
- All Endocrine procedures (15 pills, TYLENOL #3)
- Lap cholecystectomy (10)
- Inguinal hernia (12)
- Umbilical hernia (12)
- Kidney txp recipient*
- Donor nephrectomy*
- Exploratory laparotomy*
- Ventral Hernia Repair w/ mesh*

* See inpatient instructions below

### Overview of guidelines

1. **Tylenol and NSAIDs**
   - Take acetaminophen and NSAIDs***, unless contraindicated, through POD #4 and while still using opioids
   - 650-1000 mg acetaminophen q8h alternating with an NSAID (i.e. ibuprofen 600 mg 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 12 pills
     - If ≥4 pills were taken ➔ prescribe 20-30 pills

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

** All are recommendations, Rx’s and instructions should be patient specific
*** Check with surgeon regarding NSAID use;
Do not give with aspirin.
Hardwiring Best Practices
Identified changes needed in Epic

- 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

1. CRD idea brainstorming
2. Electronic ticket submission for ITS review
3. Analyst assessment on which committee to bring request
4. ITS review, prioritization, and assignment
5. Formal actionable electronic request submission to ITS
6. If approved
7. Committee presentation and approval
8. Build and validation
9. Pre Go live preparation and end user education
10. Go Live

If approved
Multimodal Orderset Modifications - BEFORE

<table>
<thead>
<tr>
<th>Analgesia (Oral)</th>
<th>Released on 8/21/2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Analgesia (Mild Pain, Oral) (210190)</td>
<td></td>
</tr>
<tr>
<td>+ Analgesia (Moderate Pain, Oral) (210191)</td>
<td></td>
</tr>
<tr>
<td>+ Analgesia (Severe Pain, Oral) (210192)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analgesia (Parenteral)</th>
<th>Released on 9/23/2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Mild Pain (Frail, Elderly, COPD, OSA, ESRD) (210193)</td>
<td></td>
</tr>
<tr>
<td>+ Mild Pain (210194)</td>
<td></td>
</tr>
<tr>
<td>+ Mild Pain (Opiate Experienced Patients) (210195)</td>
<td></td>
</tr>
<tr>
<td>+ Moderate Pain (Frail, Elderly, COPD, OSA, ESRD) (210196)</td>
<td></td>
</tr>
<tr>
<td>+ Moderate Pain (210197)</td>
<td></td>
</tr>
<tr>
<td>+ Moderate Pain (Opiate Experienced Patients) (210198)</td>
<td></td>
</tr>
<tr>
<td>+ Severe Pain (Frail, Elderly, COPD, OSA, ESRD) (210199)</td>
<td></td>
</tr>
<tr>
<td>+ Severe Pain (210200)</td>
<td></td>
</tr>
<tr>
<td>+ Severe Pain (Opiate Experienced Patients) (210201)</td>
<td></td>
</tr>
<tr>
<td>+ Severe Pain (210202)</td>
<td></td>
</tr>
</tbody>
</table>
# Multimodal Orderset Modifications - BEFORE

## Analgesia (Oral)

<table>
<thead>
<tr>
<th>Drug</th>
<th>IP Order</th>
<th>Dosage Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analgesia (Mild Pain, Oral) (210190)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analgesia (Moderate Pain, Oral) (210191)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>IP Order:</strong> acetaminophen-codeine (TYLENOL #3)</td>
<td>1 tablet, Oral, EVERY 4 HOURS PRN, Moderate Pain (PIS 4-6)</td>
<td>300-30 mg per tablet</td>
</tr>
<tr>
<td><strong>IP Order:</strong> acetaminophen-codeine (TYLENOL w/CODEINE) 300-30 mg/12.5 mL</td>
<td>12.5 mL, Oral, EVERY 4 HOURS PRN, Moderate Pain (PIS 4-6)</td>
<td></td>
</tr>
<tr>
<td><strong>IP Order:</strong> HYDROcodone-acetaminophen (NORCO) tablet 5-325 mg</td>
<td>1 tablet, Oral, EVERY 4 HOURS PRN, Moderate Pain (PIS 4-6)</td>
<td></td>
</tr>
<tr>
<td><strong>IP Order:</strong> HYDROcodone-acetaminophen (HYCET) solution 2.5-108 mg/5mL</td>
<td>10 mL, Oral, EVERY 4 HOURS PRN, Moderate Pain (PIS 4-6)</td>
<td></td>
</tr>
<tr>
<td><strong>IP Order:</strong> oxyCODONE-acetaminophen (PERCOCET) 5-325 mg</td>
<td>1 tablet, Oral, EVERY 4 HOURS PRN, Moderate Pain (PIS 4-6)</td>
<td></td>
</tr>
<tr>
<td><strong>IP Order:</strong> oxyCODONE (ROXICODONE) immediate release tablet</td>
<td>5 mg, Oral, EVERY 4 HOURS PRN, Moderate Pain (PIS 4-6)</td>
<td></td>
</tr>
<tr>
<td>Analgesia (Severe Pain, Oral) (210192)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Published and Released Dates:**

- Released on 8/21/2017
- Released on 2/28/2018
## Multimodal Orderset Modifications - OPTIMIZED

### Multimodal Analgesia

**Acetaminophen (559004)**
- **IP Order:** acetaminophen (TYLENOL) tablet 650 mg, Oral
- **IP Order:** acetaminophen (TYLENOL) solution 650 mg, Oral

**NSAID- Scheduled (559005)**
- **IP Order:** ibuprofen (ADVIL, MOTRIN) tablet 600 mg, Every 6 Hours Scheduled

**Gabapentin (559007)**
- **IP Order:** gabapentin (NEURONTIN) - CrCl > 60 mL/min 300 mg, Oral, Every 8 Hours Scheduled
- **IP Order:** gabapentin (NEURONTIN) - CrCl 30 - 60 mL/min 200 mg, Oral, 2 Times Daily Scheduled

**Alternative Analgesics- Scheduled (559008)**
- **IP Order:** DULoxetine (CYMBALTA) DR capsule 30 mg, Oral, Daily
- **IP Order:** amitriptyline (ELAVIL) tablet 25 mg, Oral, Nightly
- **IP Order:** LIDOCAINE PATCH ORDERABLE 1 patch, Transdermal, Daily

### Opioid Analgesia- Oral Administration PRN

**Mild Pain (559009)**
- Released on 1/21/2018

**Moderate Pain (559010)**
- Released on 7/13/2018

**Severe Pain (559011)**
- Released on 7/13/2018

### Injectable Medications- PRN

**Mild Pain (559014)**
- Released on 2/2/2018

**Moderate Pain (559012)**
- Released on 7/13/2018

**Severe Pain (559013)**
- Released on 7/13/2018
# Multimodal Orderset Modifications - OPTIMIZED

<table>
<thead>
<tr>
<th>Opioid Analgesia - Oral Administration PRN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td>---</td>
</tr>
<tr>
<td><strong>+</strong></td>
</tr>
<tr>
<td><strong>-</strong></td>
</tr>
<tr>
<td><strong>IP Order:</strong> oxyCODONE (ROXICODONE) immediate 5 mg, Oral, EVERY 4 HOURS PRN, Moderate Pain (PIS 4-6)</td>
</tr>
<tr>
<td><strong>IP Order:</strong> traMADol (ULTRAM) tablet</td>
</tr>
<tr>
<td><strong>IP Order:</strong> Morphine (MSIR) oral</td>
</tr>
<tr>
<td><strong>IP Order:</strong> HYDROmorphine (DILAUDID) tablet</td>
</tr>
<tr>
<td><strong>+</strong></td>
</tr>
</tbody>
</table>

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*Yale NewHaven Health*
Historic Parenteral Morphine Order

Dose: 0.5 mg
Route: IV Push
Frequency: EVERY 4 HOURS PRN
PRN reasons: Mild Pain (PIS 1-3), Moderate Pain (PIS 4-6), Severe Pain (PIS 7-10)
PRN comment:
For: 7
Starting: 8/31/2017
Ending: Thu 9/7 1022

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

Yale New Haven Health
Optimized Parenteral Morphine Order

Dose: 8 mg

Weight Type: Recorded
Weight: 119.6 kg

Route: Subcutaneous

Frequency: Q6H PRN

For: 7 Doses

Starting: 5/14/2019

First Dose: Today 1646

Common Side Effects: Confusion, nausea, vomiting, drowsiness, constipation, breathing problems.
# Optimized Morphine Order with Decision Support

## Equivalences of Common Opioid Doses

<table>
<thead>
<tr>
<th></th>
<th>Morphine</th>
<th>Hydromorphone</th>
<th>Oxycodone</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Oxycodone 5mg PO</strong></td>
<td>7.5mg PO, NG, or NJ</td>
<td>2mg PO, NG, or NJ</td>
<td>5mg PO, NG, or NJ</td>
</tr>
<tr>
<td></td>
<td>2.5mg IV or SC</td>
<td>0.4mg IV or SC</td>
<td></td>
</tr>
<tr>
<td><strong>Morphine 5mg IV</strong></td>
<td>15mg PO, NG, or NJ</td>
<td>4mg PO, NG, or NJ</td>
<td>10mg PO, NG, or NJ</td>
</tr>
<tr>
<td></td>
<td>5mg IV or SC</td>
<td>0.8mg IV or SC</td>
<td></td>
</tr>
<tr>
<td><strong>Hydromorphone 0.75 mg IV</strong></td>
<td>15mg PO, NG, or NJ</td>
<td>4mg PO, NG, or NJ</td>
<td>10mg PO, NG, or NJ</td>
</tr>
<tr>
<td></td>
<td>5mg IV or SC</td>
<td>0.75mg IV or SC</td>
<td></td>
</tr>
</tbody>
</table>

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

## Decision Support Interface

**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:**
- Today 1646

**Admin. Inst.:**
- Common Side Effects: Confusion, nausea, vomiting, drowsiness, constipation, breathing problems.
## Common Opioid Dosing Matrix (Sidebar report)

<table>
<thead>
<tr>
<th></th>
<th>Morphine</th>
<th>Hydromorphone</th>
<th>Oxycodone</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Oxycodone 5mg PO</strong></td>
<td>7.5mg PO, NG, or NJ</td>
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<td>5mg PO, NG, or NJ</td>
</tr>
<tr>
<td></td>
<td>2.5mg IV or SC</td>
<td>0.4mg IV or SC</td>
<td></td>
</tr>
<tr>
<td><strong>Morphine 5mg IV</strong></td>
<td>15mg PO, NG, or NJ</td>
<td>4mg PO, NG, or NJ</td>
<td>10mg PO, NG, or NJ</td>
</tr>
<tr>
<td></td>
<td>5mg IV or SC</td>
<td>0.8mg IV or SC</td>
<td></td>
</tr>
<tr>
<td><strong>Hydromorphone 0.75 mg IV</strong></td>
<td>15mg PO, NG, or NJ</td>
<td>4mg PO, NG, or NJ</td>
<td>10mg PO, NG, or NJ</td>
</tr>
<tr>
<td></td>
<td>5mg IV or SC</td>
<td>0.75mg IV or SC</td>
<td></td>
</tr>
</tbody>
</table>

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

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**Legend:**

- **MSIR** (Morphine Sustained-Release) tablet 15 mg

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**Source:** New Haven Health
System-wide Rollout
28% reduction from FY17 to FY18
15% reduction from FY17 to FY18
18% reduction from FY17 to FY18
Discharge Opioid prescription - BEFORE
Discharge Opioid prescription - OPTIMIZED
Average Opioid Prescribed Per Prescription
Average Opioid Prescribed Per Prescription

Morphine Milligram Equivalents

Pre-Intervention  Needs Assessment  Default Change  Education Session  Post-Intervention

Month-Year

0  50  100  150  200  250

207.4 MME

104.6 MME
Results

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

Equivalents of 5mg Pills of Oxycodone (11,644)
Questions?

Thank you