Changing Patterns of Abuse Reported to Poison Centers Following Introduction of Reformulated Extended Release Oxycodone

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San Diego, California

June 18, 2013

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Disclosure

• RADARS® System is a department of the Denver Health and Hospital Authority (DHHA), the public safety net hospital for Denver, Colorado
• The System is funded by subscriptions from several pharmaceutical companies.
• All data are owned and held exclusively by DHHA.
Abuse/Tamper Resistant Strategies

• Hard coatings which resist crushing
• Polymers which turn to viscous gel when heated
• Polymers which resist dissolving
• Gel forming agents
• Nasal tissue irritants
• Agonist/Antagonist Combinations
• Novel delivery systems (patches, implants, etc.)
• Prodrugs
RADARS System Mosaic

**Entering Treatment**
- OTP
  - 73 programs
  - 33 states
- M Parrino, A Rosenblum

**Acute Events from Abuse**
- 53 Poison Centers
  - 46 States
- R Dart

**New Initiates**
- 2000 college students
  - 50 States
  - 3x each year
- R Dart

**Drug Transactions**
- Criminal Justice
  - 280 investigator
  - 50 states
- H Suratt, S Kurtz

**Illicit Market Price**
- StreetRx.com
- Users/Buyers
  - Crowdsourcing
  - 50 states
- N Dasgupta

**Entering Treatment**
- SKIP
  - 125 practices
  - 50 states
- T Cicero
RADARS® System Process
A Tale of Two Denominators

**NUMERATORS COMPILER BY EACH PROGRAM**

**POPULATION RATE** = \( \frac{\text{Counts by System}}{\text{US Population}} \)
- Disease burden on whole population
- Does not account for drug availability

**UNIQUE RECIPIENTS OF DISPENSED DRUG (URDD) RATE**
- Number of unique people filling prescription for drug (refills excluded)
Evaluating a Natural Experiment Involving Abuse Deterrent Formulations

• OxyContin and Opana ER
  – Easily-abused product without tamper-resistant characteristics
  – Replaced by another product with the same brand name, but with abuse-deterrent properties.
  – Shipment was switched entirely to the reformulated version

• Event ratios (rates) were calculated based on population (events per 100,000 persons).
  – Population-based rates estimate the overall public health burden associated with abuse or diversion of each opioid.
  – Population denominators are calculated based on the number of persons residing in the covered 3-digit Zip codes using US Census data.
Evaluating a Natural Experiment, cont.

• Differences in drug availability and prescribing practices
  – Unique Recipients of Dispensed Drug (URDD). One URDD is a single patient filling a prescription for a specific product in the reference area.

• RADARS System
  • Schedule 2: Oxycodone, oxymorphone, hydromorphone, morphine, fentanyl, methadone, tapentadol
  • Schedule 3: buprenorphine, hydrocodone + acetaminophen
  • Unscheduled: tramadol

• Other Opioids
  – All other opioids monitored by RADARS System
  – Excluding extended release oxycodone, extended release oxymorphone, and unidentified oxycodone and oxymorphone products as appropriate for the analysis.
Hypotheses

1. Decreased interest in obtaining prescriptions to diversion = fewer individuals filling prescriptions.
2. Rates of abuse and diversion of the ADF drug will be lower following introduction of the reformulation.
3. Use of these drugs through non-oral routes of abuse would decline relative to oral abuse.
Number of Individuals Filling a Prescription Decreased After Reformulation
RADARS® System Data

Population Rate
(Per 100,000 population in US Census)

Poison Center Program
Contacts Involving Intentional Abuse
OxyContin®, Opana® ER, Other Opioids

Intentional Abuse: An exposure resulting from intentional improper or incorrect use of a substance where the victim was likely attempting to gain a high, euphoric effect or some other psychotropic effect.

ORF = OxyContin ADF, CRF = Opana ER ADF
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Decrease in OxyContin Abuse is Related to Decreased Availability of Original formulation on the street
DAWN and RADARS System Poison Centers Results are Highly Correlated
Non-oral Routes of OxyContin Abuse
Poison Center Intentional Abuse

OxyContin

Opana ER
Poison Center Program
Contacts Involving Intentional Abuse
OxyContin® Tablet Size

ORF = OxyContin ADF, CRF = Opana ER ADF
Clinical Outcomes of Prescription Opioids Analgesic Abuse

[Graph showing trends and outcomes for OxyContin®, Opana® ER, and other prescription opioids over time.]

- **OxyContin®**: Pre ORF, Pre CRF, Post CRF
- **Opana® ER**: Pre ORF, Pre CRF, Post CRF
- **Other prescription opioids**: Pre ORF, Pre CRF, Post CRF

Key: No effect, Minor, Moderate, Major, Death
Methadone Deaths and Poison Center Cases are Highly Correlated, 2006-2007

Other RADARS System Programs
OxyContin®, Opana® ER, Other Opioids

Drug Diversion Program

Treatment Programs Combined (OTP+SKIP)

ORF = OxyContin ADF, CRF = Opana ER ADF
Comparison of StreetRx, RADARS System Drug Diversion and Silk Road

<table>
<thead>
<tr>
<th>Product</th>
<th>Median Price (IQR)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>OxyContin® (new OP, hard to crush)</td>
<td>$0.63 ($0.50,$1.00)</td>
<td></td>
</tr>
<tr>
<td>OxyContin® (old OC, crushable)</td>
<td>$1.00 ($0.63,$1.25)</td>
<td>0.0003</td>
</tr>
<tr>
<td>Opana® ER (new, hard to crush)</td>
<td>$1.00 ($0.40,$1.00)</td>
<td></td>
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<tr>
<td>Opana® ER (old crushable)</td>
<td>$1.38 ($1.00,$2.67)</td>
<td>0.0580</td>
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</table>

Dasgupta, Suratt, et al, manuscript submitted
RADARS System Mosaic Analysis

**Poison Center:**
- ADFs 30% - 68% decrease in abuse rate. Effect is increasing over time
- Non-oral rates of abuse are decreased
- No change in rate for other opioids

**Drug Diversion**
- ADFs: 30%-60% decreased diversion rates
- No change in abuse cases for other opioids

**StreetRx**
ADF version value 27 - 38% less in the black market

**Treatment Programs**
- ADFs: rates decreased 0 - 20%
- No change in other opioids

**College Survey**
- No difference in rates
- Very low abuse before and after ADF introduction
The End