

1. ***Addressing the Opioid Crisis with Standardized Pain Management Orders in the Electronic Medical Record System at UC Davis Health***

Sautter Awards for Innovation in Information Technology – Application

2. **Submitted by:**

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4. **Summary Statement:**

Standard modules for pain management were developed in the Electronic Medical Record to improve safe inpatient ordering and administration of opioids, address diverse clinical needs, and reinforce pain management best practices.

5. **Project Narrative:**

Background

Why standardize inpatient pain management at UC Davis Health (UCDH)? We sought to improve pain management, target appropriate opioid use, and reduce opioid related adverse events, utilizing new build functionality in our Electronic Medical Record (EMR). We can first provide some background on how medication orders are utilized at UCDH, with additional detail on the unique challenges associated with pain medication ordering. We will then describe our innovative solutions.

Ordering Via the Electronic Medical Record (EMR): UCDH uses an EMR in place of a paper patient chart. The EMR is a software system called Epic that can be configured to support clinical workflows used at UCDH. Physicians use the EMR to order medications for hospital patients (inpatients). Medications can be ordered individually by choosing from a list of available medications, or they can be ordered from an order set – a group of orders put together to manage a specific condition (ex. a post-partum order set is used to treat patients that have just given birth).

A Multimodal Approach: Pain medications are often ordered for hospital patients. These include non-opioid medications such as acetaminophen and ibuprofen, and opioid medications such as oxycodone and morphine. Best practices for pain management involve layering pain medications to take advantage of synergistic effects. Non-opioid medications should be tried first and, if needed, opioid medications are added. Ideally, opioids should not be ordered for hospital patients without an adjunct non-opioid medication. Adding in non-drug treatments like heat and ice packs creates a multimodal approach, where less opioids are needed to achieve pain control. Using the lowest effective opioid dose to control pain is a goal because there are risks for adverse events such as respiratory depression and dependence. Without predefined multimodal order sets, busy clinicians and clinical learners can miss opportunities to use these best practices.

Hazards Identified: Previously, opioids were ordered at UCDH in the EMR through greater than 170 individual order sets, or individually from hospital lists. Opioids ordered individually are often missing adjunct orders for non-opioids, safety and monitoring, and side effect management. In both order sets and “a la cart” individual ordering there was much variation in medication choice, dosage (including use of range doses), and emergency instructions (for assessment and action in case of overdose). Intravenous (IV) opioid medications were often ordered when oral opioid medications would be adequate. IV opioids carry greater risk of adverse effects and can lengthen a patient’s hospital stay. Range orders (ex. oxycodone 5 to 15 mg, as needed for mild to severe pain) are problematic in the hospital setting. They can be popular with physicians as a one size fits all type of order, but they create an opportunity for excess opioid administration. Range opioid orders have been associated with adverse events in the hospital, and regulatory agencies (i.e. Joint Commission) discourage them due to challenges with consistent operational use.

In addition to the wide variation in opioid ordering, clinical conditions further complicate opioid use:

- Renal (kidney) function – this affects how the body eliminates some medications; patients with poor renal function need lowered doses of these medications
- Patients with conditions affecting medication administration – some patients can take nothing by mouth and need intravenous medications; some patients have a feeding tube and require liquid formulations.

In the above situations, clinicians conducted multiple phone calls and pages with nurses and pharmacists to change pain management orders.

We undertook developing standardized pain orders to optimize safety, encourage multimodal techniques, prescribe minimum effective opioid dosing, and apply these standard orders in the EMR universally across the medical management teams at UC Davis Health.

Project Development and Timeline

With UC Davis Health Executive sponsorship, we secured additional resources to launch this project. An Inpatient Pain Task Force was established to plan and implement a standard pain management solution. Membership in the task force included the Physician Champion Chair, Executive Director of Patient Care Services, Opioid Steward Pharmacists, Electronic Health Record Director, EMR Pharmacists, Quality & Safety Manager, and multidisciplinary staff members including physicians, nurses, and pharmacists.

Task Force and Learning from Prior Work: The multidisciplinary group started meeting in April 2018 referencing work from a similar project at UCSD Medical Center as a launching point and proof of concept. UCSD uses the same EMR software as UCDH (Epic) and is a health system of similar size and complexity to UCDH. At UCSD, opioid range orders were replaced by regimens containing opioid orders for: moderate pain, severe pain, and rescue doses. A rescue dose enables a nurse to administer up to 3 additional opioid doses in 24 hours for pain not relieved by the doses for moderate or severe pain. The rescue doses are a strategy to eliminate the need to write orders with range doses and provide additional intermittent pain control when needed. Nurses have the ability to use the combination of as needed and rescue dose orders to provide pain management without having to page the physician for a one-time order or a dose change. Non-opioid medications and a naloxone order (used for opioid reversal in case of overdose) were presented alongside the opioid regimens.

Innovations: Building on UCSD’s ideas we added support for patients with renal impairment, and additional route/ formulation options (i.e. liquid medication forms, support for patients on feeding tubes). We developed functionality to provide physicians with clinical decision support within their ordering workflow to guide them to the correct pain orders (i.e. current renal data display, decision trees for renal function and administration route). For nursing, the new pain orders provide safeguards against over administering opioids by linking the orders electronically such that only one order in a group can be given within a time window. The panel of orders provides clear options for all levels of patient pain assessed, as pain needs change dynamically

throughout the hospitalization. We also provided related supportive medications to minimize opioid adverse effects (ex. nausea, constipation, respiratory depression). We expanded and encouraged the multimodal aspect of the pain regimens by including orders for non-medication pain management (ex. Ice, heat, repositioning, relaxation techniques). We also added patient monitoring orders for opioid overdose conditions and patient opioid education provided during the inpatient stay and on discharge.

User Engagement: The multidisciplinary task force created standalone pain order sets (infant & pediatric, and adult) and embedded them as modular elements into departmental admission order sets. The modular design is an innovation that will allow us to easily modify the pain orders across the entire hospital to respond to drug shortages or guideline changes. To begin modifying departmental order sets, we identified and engaged with over 40 admitting physician groups. The in-person meetings were critical for the success of our project, allowing us to demonstrate new and streamlined EMR functionality and address concerns in real-time. They provided opportunities for prescribers to share their day-to-day challenges and barriers. To reach an audience beyond meeting participants, we conducted user acceptance testing (UAT) and invited medical attendings and residents to test drive the new pain orders in the EMR. Nurse leaders and educators worked closely with us to align policy and patient care standards to include new safety assessments and patient education. A new pain policy was created, and a pain guideline document was authored to serve as a multidisciplinary (physician, nurse, and pharmacist) resource.

Changing the Culture: We launched our pain policy and new pain management modules/standalone order sets hospital wide in July 2020. A multidisciplinary e-learning module was developed with our IT Education department and was assigned to physicians, nurses and pharmacists two weeks before go-live to socialize shared terminology, demonstrate EMR functionality, and provide each component of the interprofessional team a glimpse of the other's workflows. By August 2020, the module was completed by 960 physicians, 1915 nurses (90%) and 68 pharmacists (85%).

Project Impact and Successes

Overall, we identified and engaged over 40 admitting physician groups and conducted over 60 meetings in six months. In total we reviewed over 170 order sets. Of this group, we embedded the new standard pain modules or otherwise modified 114 order sets, retired 30 outdated order sets, and excluded 23 order sets (used in clinical areas where the standard pain orders would not be applicable).

Following the launch, the percentage of opioids ordered with range doses was reduced from almost 50% to less than 10% over 6 months. The reduction in range dose ordering enabled us to add logic into our EMR to completely prevent ordering range doses for oral opioids. Remaining range orders for IV opioids are appropriate and necessary in highly monitored settings such as the intensive care unit and operating room.

The hospital wide average number of IV opioid doses dispensed per month decreased by 21.3% and the average number of oral opioid doses dispensed increased by 1.7% despite hospital census increasing by 5.1%. We attribute the decrease in IV opioid use to steering physicians toward safer oral pain regimens. We did not limit physicians' ability to order opioids. Instead we provided efficient workflows and cognitive nudges designed into the standard orders such as bundling opioids within multimodal pain regimens that include non-medication treatment and non-opioid medications.

Further Work and Collaborations

The successful implementation of the standard pain management orders prompted further discussions with departments taking care of patients with specific pain management needs.

The geriatrics department requested a standardized module appropriate for geriatric patients. This patient population can be more sensitive to opioids and some of the other adjunct medications, requiring lower doses. We created a module with logic to check the patients age, and if age is greater than 65 years old, the module displays lower dose options. This change went live December 2020.

The internal medicine department worked with us to develop standard orders to manage patients with chronic pain. Patients with chronic pain have different pain management needs, often requiring higher doses and long acting pain medications. We worked with two physician subject matter experts to develop a standard module for chronic pain. The complex pain module uses the same pain concepts as our standard pain orders – there are pain rescue doses, multimodal pain adjuncts, and standard safety orders. This complex pain module went live April 2021.

During our go-live in July 2020, UCLA was implementing its own standard pain management project. As UCSD had shared their ideas and build with us, we shared our ideas and build with UCLA's project team in a series of virtual meetings/demonstrations.

System Screenshots and Results

Standalone Pain Management Order Set. Physicians are shown renal data and formulation/administration options.

Pain Management with Rescue - Adult [Manage User Versions](#)

- IT Education/E-learning

▼ PAIN MANAGEMENT ORDERS

▼ Pain Management - PO/IV

CrCl cannot be calculated (Patient's most recent lab result is older than the maximum 30 days allowed.).

Lab Name	Value	Date/Time
CREATININE BLOOD	1.0	07/07/2020 0000
E-GFR, AFRICAN AMERICAN	>60	11/21/2019 1014
E-GFR, NON-AFRICAN AMERICAN	>60	11/21/2019 1014

☐ Normal Renal Function
☐ Moderate Renal Impairment (CrCl 30 to 60 mL/min)
☐ Severe Renal Impairment (CrCl less than 30 mL/min) or Acute Kidney Injury

▶ Pain Management - PO/IV with NG Option [Click for more](#)
 ▶ Pain Management - PO (liquid formulation)/IV [Click for more](#)
 ▶ Pain Management - NG (liquid formulation)/IV [Click for more](#)
 ▶ Pain Management - G-Tube (liquid formulation)/IV [Click for more](#)
 ▶ Pain Management - J-Tube (liquid formulation)/IV [Click for more](#)

Multimodal Pain Regimen Selection (patients with normal renal function). Physicians can easily build a pain regimen consisting of non-drug, non-opioid and opioid medications. Adjunct orders for side effect management and safety options are presented.

☒ Normal Renal Function

☒ NON-PHARMACOLOGIC PAIN TREATMENT OPTIONS

☐ ELEVATE LEG
 Elevate affected lower extremity, toes above the level of the heart
☐ ELEVATE ARM
 Elevate affected upper extremity, fingers above the level of the heart.
☐ ICE PACK
 Apply ice pack to affected area for 20 minutes, remove ice for 20 minutes. Repeat cycle while awake for 3 days.
☐ HEATING PAD
 CONTINUOUS, Apply heat to affected area for 20 minutes, remove heat for 20 minutes. Repeat cycle while awake for 3 days.

☒ NON OPIOID MEDICATIONS SCHEDULED OR PRN FOR MILD PAIN

☐ Acetaminophen
☐ Non-Steroidal Anti-Inflammatory
☐ Gabapentin Oral
☐ Lidocaine (LIDODERM) 5% Patch

☒ OPIOID REGIMEN FOR MODERATE PAIN, SEVERE PAIN, AND RESCUE

Doses may be changed, but opioid range doses are NOT permitted.
 Avoid ordering hydrocodone/acetaminophen (NORCO) if patient is to receive scheduled acetaminophen. Starting doses are designed for opioid naive patients. Opioid tolerant patients may require higher doses.

☐ Oral Oxycodone PRN + RESCUE [Oral Oxycodone +/- IV] - PREFERRED
☐ Oral Hydrocodone/Acetaminophen (NORCO) PRN + RESCUE [Oral Hydrocodone/Acetaminophen (NORCO) +/- IV]
☐ IV Morphine while NPO - Oxycodone PO if tolerating PO - PRN + RESCUE
☐ IV Morphine PRN + RESCUE [IV Morphine]
☐ IV Hydromorphone PRN + RESCUE [IV Hydromorphone]
☐ Custom Regimen

☒ SUPPORTIVE CARE MEDICATIONS FOR OPIOID THERAPY

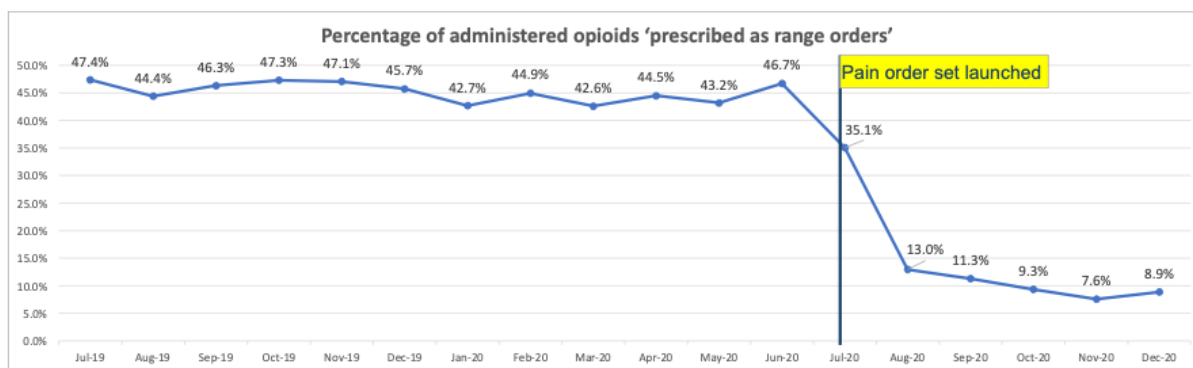
Consider duplicate supportive care orders that may be selected in other order set sections.

☐ Bowel Care - RECOMMENDED
☐ Cetirizine (ZYRTEC) Tablet for Itching
 10 mg, ORAL, EVERY 24 HOURS IF NEEDED, itching
☐ Ondansetron (ZOFRAN) IV
 4 mg, IV, EVERY 8 HOURS IF NEEDED, nausea/vomiting

Opioid Range Order Reduction. Range doses decreased from 46.7% to 13% soon after the new standard pain order set was launched.

Range Orders (Administered Opioids)

Range Orders	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
No	1411	1952	1722	1958	1930	2065	2062	1882	1910	1673	2216	1891	2556	3491	3342	4116	3527	3692
Yes	1270	1559	1486	1758	1715	1740	1535	1535	1418	1341	1685	1658	1380	520	425	424	289	360
% of Range orders	47.4%	44.4%	46.3%	47.3%	47.1%	45.7%	42.7%	44.9%	42.6%	44.5%	43.2%	46.7%	35.1%	13.0%	11.3%	9.3%	7.6%	8.9%



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Oct 2020: Implemented hard-stop for oral range orders 28

IV and Oral Opioid Usage Reduction – Standard pain management order went live in July 2020. IV opioid use (orange line and average) decreased, while oral opioid use (blue line and average) increased slightly (expected due to steering providers to use safer oral regimens vs IV regimens).

IV & Oral Hospital-wide Utilization -Monthly 7/2019 – 1/2021

