CERNER PAIN MEDICATION POWER PLAN IMPLEMENTATION ANALYSIS

By

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A CAPSTONE PROJECT

Submitted to the Department of Medical Informatics and Clinical Epidemiology

and the Oregon Health & Science University

School of Medicine

in partial fulfillment of

the requirements for the degree of

Master of Science in Health and Clinical Informatics

June 2020

School of Medicine

Oregon Health & Science University

CERTIFICATE OF APPROVAL

This is to certify that the Master's Capstone Project of

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"Cerner Pain Medication Power Plan Implementation Analysis"

has been approved

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Acknowledgments

I would like to express my appreciation and gratitude to Dr. Vishnu Mohan; you have been supportive, patient, and an excellent advisor. I also would like to thank many of my colleagues at Virginia Mason, Seattle, Mani Nair, Director of Software Engineering for extracting raw data from business intelligence platform, Judith Gerstenberger, Data Scientist for helping with excel tools, Dr. Barry Aaronson, CMIO for guiding me through various stages of this project.

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Abstract

Introduction

The usability of the Electronic Medical Record (EMR) system has been a challenge since its introduction to health care. However, often, there are tools available within the existing resources to improve usability. The United States of America is dealing with an opioid epidemic. It is unclear how EMR systems can be useful in conditioning providers with evidence-based prescription habits.

Methods

A tertiary hospital with Cerner EMR replaced opiate care-sets with a power plan with hopes of improving usability and also to provide tools for providers to practice evidence-based opiate prescription guidelines. The purpose of this study is to analyze the intended success and practice changes. Three months of analgesic medication administration data were reviewed pre and post-Go-Live of the power plan. Hospitalists were surveyed for usability improvements using survey monkey platform.

Results

There was no stand-alone reduction of opiates use, but in fact, there was an overall reduction in most opiates and non-opiates analgesic medication administration. However, intravenous fentanyl administration increased, and acetaminophen administration did not change. Majority survey responders did not feel the power plan is user friendly.

Conclusion

Power plans may not have an inherent ability to bring practice changes when compared to care-sets. There are significant usability concerns with the basic structure of the Cerner power plan; unfortunately, most of them are out of scope for the local informatics team.

Introduction

EMR Usability

Electronic Medical Record (EMR) system usability has been a topic of frustration for several years, especially since the wide adoption since 2010. (1) Zhang and colleagues described EMR usability under TURF (Tasks, Users, Representations, Functions) framework as "how useful, usable, and satisfying a system is for the intended users to accomplish goals in the work domain by performing certain sequences of tasks"(2) Clinical end users have expressed frustrations at the pace which usability improvements are made (3). There has been wide variation in the functionalities with in the same EMR system across different organizations, mainly due to customization, the difference in the adopted versions, affordability, and costs issues. (4) American Medical Informatics Association Board of Directors provided recommendations on EMR design and implementation in a paper published in 2013, as noted below. (5)

- Prioritize standardized use cases.
- Develop a core set of measures for adverse events related to health IT use.
- Research and promote best practices for the safe implementation of the EMR.
- Develop a common user interface style guide for select EHR functionalities.
- Perform formal usability assessments on patient-safety sensitive EHR functionalities.

Speed, fewer clicks, must fit the workflow are the essential items usability experts focus on when improving EMR products. (6) As quoted by Ratwani and colleagues in 2018, "EHR vendors are required to use a user-centered design approach, which emphasizes the needs of the clinician end-user, during design and development, and must conduct usability testing of certain EHR

features near the end of the development process." (4) The Office of the National Coordinator (ONC) of Health Information Technology, part of the U.S. Department of Health and Human Services, has recently put requirements in place to promote usability. (7) There have been usability improvements across most vendors in the last five years; however, there is a lot of room for further improvements to increase safety, efficiency, and user satisfaction.

Opioid Crisis

Drugs that treat pain ("analgesics") are classified into opiate and non-opiate analgesics. It is now common knowledge that the USA is suffering from an opioid epidemic with numerous daily opioid-related overdoses and deaths across the country. Clinicians are expected to prescribe opioids at the lowest effective dose possible for the shortest reasonable period as advised by multiple advisory bodies. (8,9) In 2012, the Centers for Disease Control and Prevention (CDC) analyzed a commercial database and published a report on opioid and benzodiazepine prescription patterns. The study showed "prescribers wrote 82.5 opioid pain relievers and 37.6 benzodiazepine prescriptions per 100 persons". "State rates varied 2.7-fold for opioid pain relievers and 3.7-fold for benzodiazepines". So they concluded wide variation was likely related to prescribing practices and not related to the underlying health status of the patients. (10) In the past decade, death rates from heart disease and cancer have decreased, but deaths from opioid pain medications have dramatically increased. (10) As quoted in the by CDC "Opioid prescriptions per capita increased 7.3% from 2007 to 2012, with opioid prescribing rates increasing more for family practice, general practice, and internal medicine compared with other specialties".(11)

As per the CDC, “From 1999 to 2014, more than 165,000 persons died from overdose related to opioid pain medication in the United States”.(12) There have been several guidelines issued by state and federal agencies. Dosage ranges and supporting articles varied widely. In 2016, CDC published prescribing guidelines for opiates for chronic pain. (8)

CDC Guidelines

Some of the significant elements of the 2012 CDC guideline are as follows

- “Non-pharmacologic therapy and non-opioid pharmacologic therapy are preferred for chronic pain. Clinicians should consider opioid therapy only if expected benefits for both pain and function are anticipated to outweigh risks to the patient. If opioids are used, they should be combined with non-pharmacologic therapy and non-opioid pharmacologic therapy, as appropriate”(8)
- “Acute pain can often be managed without opioids. It is important to evaluate the patient for reversible causes of pain, for underlying etiologies with potentially serious sequelae, and to determine the appropriate treatment. When the diagnosis and severity of non-traumatic, nonsurgical acute pain are reasonably assumed to warrant the use of opioids, clinicians should prescribe no greater quantity than needed for the expected duration of pain severe enough to require opioids, often three days or less, unless circumstances clearly warrant additional opioid therapy. More than seven days will rarely be needed”(8)
- “Long-term opioid use often begins with the treatment of acute pain. When opioids are used for acute pain, clinicians should prescribe the lowest effective dose of immediate-release opioids and should prescribe no greater quantity than needed for the expected

duration of pain severe enough to require opioids. Three days or less will often be sufficient; more than seven days will rarely be needed"(8)

- "When opioids are started, clinicians should prescribe the lowest effective dosage. Clinicians should use caution when prescribing opioids at any dosage, should carefully reassess evidence of individual benefits and risks when considering increasing dosage to ≥50 morphine milligram equivalents (MME)/day, and should avoid increasing dosage to ≥90 MME/day or carefully justify a decision to titrate dosage to ≥90 MME/day"(8)

Washington State Agency Medical Directors' Group published guidelines on analgesics prescriptions for perioperative pain. They recommend using non-opiates as first-line analgesics in every situation possible as long it is not contraindicated. Opiates should be prescribed for pain not controlled with non-opiates only for a shorter duration and at the lowest effective strength as possible in as-needed basis. (13) Oral analgesics are always preferred over intravenous analgesics both in opiate and non-opiate categories. Exceptions are made when patients cannot tolerate oral medications, adequate pain control is not being achieved with maximum oral therapy or to address a severely painful condition that needs to be managed immediately.

Cerner Order Sets

Care-sets

Cerner has 26% of US EMR hospital market share as per the 2018 KLAS Research report(14). Cerner market share increased in 2019 as it partnered with the US Department of Veteran Affairs. (15)

Our institution was one of the early adopters of Cerner in 2005, and a robust internal informatics team has supported its customization to meet our needs. Care sets were Cerner's original method of grouping individual orders in the computerized physician order entry (CPOE) system. Care sets are order sets with multiple single orderable items bundled together for a specific diagnosis, disease pathway, symptom pathway, and placed in a folder. A care-set may contain multiple layers of folders with each folder containing different groups of orders. For example, insulin care-set houses all types of insulin, specific guidelines, correction scale insulin orders, and more. A morphine care-set would include all varieties of morphine-like intravenous, oral like the immediate release, extended-release that are available in the hospital formulary. They are grouped to achieve different goals like reducing error, improving usability, however, they do carry significant usability disadvantages (16)

Some of those disadvantages of care-sets are

- Users cannot discontinue the entire care set from the order profile at once. The user has to manually scan through the order profile and select all the orders to be stopped. Some orders of care sets get missed and remain in the order profile as active as the user may not be able to remember all the orders associated with the care-set.
- Users have to go through multiple layers of clicking to reach the core of the care-set, where the actual medication items reside.
- Users cannot modify the care-set and save as personal favorites.
- Users cannot save individual items of care set as favorites.

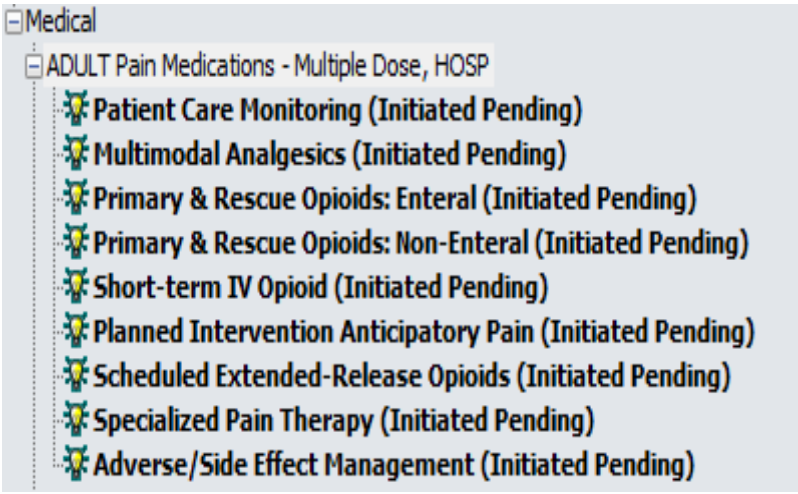
Power Plans

Several years ago, Cerner came with a new format of order sets called “Power Plan” to solve many problems associated with the care-set. Power Plans are also a group of orderable items grouped into an order set, but they have significant technical and usability advantages.

Advantages of Power Plans

- Better visibility and ease of navigation as the folders are layered as sub-phases, as shown in picture 1.
- Entire Power Plans and associated orders can be discontinued at once with far fewer clicks.
- Power Plans layout provides ample of space and user-friendly opportunities to display evidence-based texts to guide users to make appropriate choices of medications.
- It is possible to save the whole plan as favorites with some limited personal modifications.

However, Power Plans are just a basic structure, and it depends on the informatics team to build a user friendly, evidence-based plans that can function well. Our institution’s Cerner order catalog had and continues to have non-opiate analgesics available as single orderable. However, opiate analgesics were bundled into care set for many years, and opiates were not available as single orderables in the search catalog. This restriction was placed for safety.



Picture 1

Pain Medication Power Plan Project

At our institution, we used different opiate care-set (such as the morphine care set, hydromorphone care set, etc.) for many years. All of those were due for review and updates based on the latest opiate prescribing guidelines. As a part of the organizational goal in improving Cerner usability and also to incorporate the latest opiates prescription guidelines as described earlier, a decision was made to build Power Plans for analgesic medications.

Two plans were built

- Adult Pain Medication Power Plan – Multi-dose
- Adult Pain Medication Power Plan – Single-dose

A multi-dose Power Plan was built under a multi-phase structure with many sub-phases, as shown in picture 1. A single-dose Power Plan was built under a single-phase structure, which housed one time STAT analgesic orders bundled together. The informatics team met several times over several months in deciding the contents of the new power plans. Default medications, doses, frequency were built in line with the latest evidence-based guideline as discussed earlier.

There was not much flexibility in making changes to basic design like fonts, color, number of clicks due to the Cerner design, and code limitation.

Some of the features of these Power Plans are

- The lowest effective dose and frequency were chosen as the starting point (default). Users can increase or decrease it based on the individual patient and clinical situations.
- Opiate and non-opiate medications were grouped based on routes of administration.
- Acetaminophen and NSAIDs defaulted to "Scheduled" rather than "as-needed basis (PRN)," and Opiate medications defaulted to "PRN."
- All non-opiate analgesics were grouped under multimodal analgesics sub-phase.
- Reordering a completed order was possible within the design using the "Replicate" function.
- "Rescue dose" was associated with all the primary opiate medications order. Rescue doses gave nurses some time to manage the patient's pain until the provider modified the primary regimen. Rescue dose order was mandatory when ordering a primary opiate dose. Both primary and rescue dose frequency should match before ordering.
- Short-term IV opioid addressed postoperative pain on the floor. Users were able to order this as standalone phase without ordering primary or rescue opiate until patients can tolerate oral medications.
- Patients on chronic opiate medication regimen were prescribed through the "Scheduled Extended Release" phase.
- Naloxone was pre-checked while ordering all opiate medications, both PRN, Scheduled and One time orders.

Before Go-live, all the opiate care-sets were retired. Non-opiate analgesics continue to be available as single orderable in the search catalog. Pain Medication Power Plans went live in the production environment in Jan 2020 for inpatient providers. The emergency room and ambulatory location were excluded from this project. Providers and nurses received an instructional video and pdf document before Go-Live. The informatics team provided training and support for the Go-Live.

Purpose of the study

As explained above, the Power Plan project was taken up with the intention of addressing some of the care-set usability concerns and also to adhere to the latest guidelines on opiate prescription. It is a general notion among informaticians that Power Plans are builder-friendly and user-friendly than Care-sets. This study intends to analyze usability and prescription practice changes.

Methodology

Approval

This capstone project and survey were approved by the Oregon Health & Science University Institutional review board in Portland and also Virginia Mason Medical Centre (VMMC) Institutional review board in Seattle. Chief Information and Technology Officers at VMMC approved to share the contents of the Power Plans in this manuscript.

This capstone quality improvement project was carried out on data obtained from a tertiary 336-bed acute care facility in downtown Seattle. We chose to study only the hospitalist group (50 providers) as they cared for most patients in the hospital. The project has two parts

- Analyze variations in the analgesics medication administration before and after implementation of the Pain Medication Power Plan using Medication Administration Record (MAR)
- Survey hospitalist providers on usability and change in practice perception.

Medication Administration Record (MAR) data collection

We extracted a de-identified medication administration record on all the analgesics listed in the pain power plan from February-April 2019 and February-April 2020 from the inpatient acute care facility business intelligence database using SQL query. SQL query extracted only the medications administered by hospitalist providers based on a unique position assigned in Cerner for the hospitalist group. Excel files compiled the downloaded data. Pivot tables were created to analyze the data further. Raw data did not contain any protected health information or any provider information. Duplicates and documentation errors were removed. We opted to include Acetaminophen, most commonly used NSAIDs and opioids only. Other atypical pain relievers such as gabapentin, amitriptyline were also excluded from the study. Opiates administered through patient-controlled analgesia was excluded. IV acetaminophen was also excluded from the raw data as it was not available in the power plan.

Usability survey

An online survey was created and deployed using the SurveyMonkey (SVMK Inc, San Mateo, CA) software. Fifty hospitalist providers at the downtown facility received the survey in May 2020, out of which twenty-six filled out the survey. On average, it took four minutes to complete the survey. Anonymous mode was enabled on survey monkey so that responders cannot be identified. A comment section was provided with every question to express specific views. The usability survey was sent four months after the introduction of the power plan, so users had ample time to familiarize themselves with the new workflow.

Results

Medication Administration Record (MAR) data

Using various pivot tables, the total amount of analgesics administered was calculated for the most commonly used medications, as shown in table 1. A fixed drug combination such as "*Acetaminophen - Hydrocodone 325-5 mg tab"* was listed in terms of amounts of tablets administered. We were able to extract "patient days," the total number of days patients are hospitalized for all patients in the entire month from the same raw data, as shown in table 2 to use as a denominator. The hospital census has dramatically decreased in March and April of 2020 due to the COVID pandemic compared to the same time frame in 2019. The final cumulative dose of analgesics administered was the total dose administered per month divided by patient days of that month, as shown in table 3. It should be noted that opiates are available only in the Pain power plan; however, non-opiates can be ordered outside of the plan as individual orderable drugs.

	Feb-19	Mar-19	Apr-19	Feb-20	Mar-20	Apr-20
Enteral						
acetaminophen (mg)	1567275	1670935	1747775	1408725	1293725	1011850
diclofenac(mg)	1000	100	450	0	150	0
Ibuprofen(mg)	30800	60600	71400	64000	52000	4000
naproxen (mg)	4750	2500	5000	1500	3750	250
Tramadol (mg)	5275	6925	6575	2325	3563	700
Acetaminophen - Hydrocodone 325-5 mg tab	49	93	100	31	131	34
Acetaminophen - Hydrocodone 325-10 mg tab	1	11	7	8	15	0
Acetaminophen - Oxycodone 325-5 mg tab	22	40	58	2	0	29
Buprenorphine- naloxone 2-0.5mg tab SL	8	19	0	165	0	0
Buprenorphine- naloxone 8-2mg tab SL	0	30	14	10	12	0
Oxycodone (mg)	21502	14148	12800	11850	10728	10200
Oxycodone ER (mg)	2230	1340	60	1790	780	360
Hydromorphone (mg)	1067	1466	1823	1619	1053	540
Morphine (mg)	1191	2626	4083	654	1263	73
Morphine ER (mg)	2670	1485	8765	495	1265	45
Non Enteral						
Ketorolac IV (mg)	1830	2475	1455	1065	1260	360
Fentanyl Patch 25mcg	15	11	42	14	26	7
Fentanyl IV(mcg)	700	3063	3475	825	1050	9638
Morphine IV (mg)	388	397	396	475	215	156
Hydromorphone IV(mg)	766	743	885	534	231	201
Naloxone IV (mg)	0.9	0.9	0.6	0.1	0.5	0.5

Table 1

MonthVal	PatientDays
Feb-19	4109
Mar-19	4491
Apr-19	3895
Feb-20	3679
Mar-20	3377
Apr-20	2676

Table 2

Admin/Patient Day	Feb-19	Mar-19	Apr-19	Feb-20	Mar-20	Apr-20
Enteral						
acetaminophen (mg)	381.4249	372.0630	448.7227	382.9098	383.0989	378.1203
diclofenac(mg)	0.2434	0.0223	0.1155	0.0000	0.0444	0.0000
Ibuprofen(mg)	7.4957	13.4937	18.3312	17.3960	15.3983	1.4948
Ketorolac(mg)	0.4454	0.5511	0.3736	0.2895	0.3731	0.1345
naproxen (mg)	1.1560	0.5567	1.2837	0.4077	1.1105	0.0934
Tramadol (mg)	1.2838	1.5420	1.6881	0.6320	1.0551	0.2616
Acetaminophen - Hydrocodone 325-5 mg tab	0.0119	0.0207	0.0257	0.0084	0.0388	0.0127
Acetaminophen - Hydrocodone 325-10 mg tab	0.0002	0.0024	0.0018	0.0022	0.0044	0.0000
Acetaminophen - Oxycodone 325-5 mg tab	0.0054	0.0089	0.0149	0.0005	0.0000	0.0108
Buprenorphine- naloxone 2-0.5mg tab SL	0.0019	0.0042	0.0000	0.0448	0.0000	0.0000
Buprenorphine- naloxone 8-2mg tab SL	0.0000	0.0067	0.0036	0.0027	0.0036	0.0000
Oxycodone (mg)	5.2329	3.1503	3.2863	3.2210	3.1768	3.8117
Oxycodone ER (mg)	0.5427	0.2984	0.0154	0.4865	0.2310	0.1345
Hydromorphone (mg)	0.2597	0.3264	0.4680	0.4401	0.3118	0.2018
Morphine (mg)	0.2899	0.5847	1.0483	0.1778	0.3740	0.0273
Morphine ER (mg)	0.6498	0.3307	2.2503	0.1345	0.3746	0.0168
Non Enteral						
Fentanyl Patch 25mcg	0.0037	0.0024	0.0108	0.0038	0.0077	0.0026
Fentanyl IV(mcg)	0.1704	0.6820	0.8922	0.2242	0.3109	3.6016
Morphine IV (mg)	0.0944	0.0884	0.1017	0.1291	0.0637	0.0583
Hydromorphone IV(mg)	0.1864	0.1654	0.2272	0.1451	0.0684	0.0751
Naloxone IV (mg)	0.0002	0.0002	0.0002	0.0000	0.0001	0.0002

Table 3

Survey results

A total of 26 out of 50 hospitalists responded to the survey.

1. Usability results

Less than 30% of responders found it easier to find the drug they are looking for, order, and discontinue them. 35% found it easier to know the status of the ordered drug. Only 11% of responders felt it takes less time to order or discontinue drugs. Around 50% felt it takes more clicks to get through. Around 65% felt it is challenging to re-order a drug. However, more than 50% felt they are satisfied with the power plan.

2. **Go-Live and Content review**

On a positive note, only less than 8% felt, Go-Live training was inadequate. More than 75% agreed that the default starting dose and frequency were appropriate. Only, less than 20% and less than 12% felt that it was inappropriate to default NSAIDs and Acetaminophen respectively to scheduled (fixed time of administration) rather than PRN dosing. More than 60% felt a single dose power plan made it easier to order one time doses.

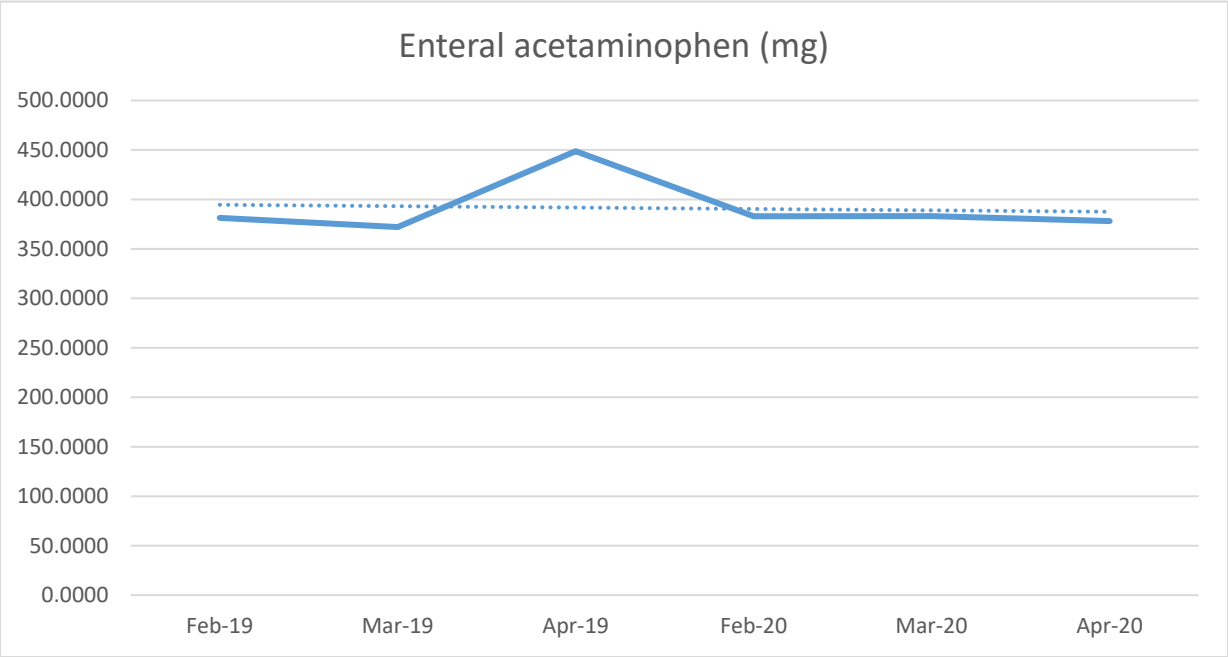
3. Practice changes

80% of responders did not feel this power plan has changed the amount of opiate orders they wrote. Close to 70% responders felt this had not made any difference in the frequency of opiate adverse drug events. Only 25% of responders felt better control over pain had been achieved, and 20% felt pain medication-related pages had gone down after the implementation. Around 43% agreed that it improved their workflow, but 46% felt it did not. Close to 39% reported they would prefer using the power plan.

Discussion

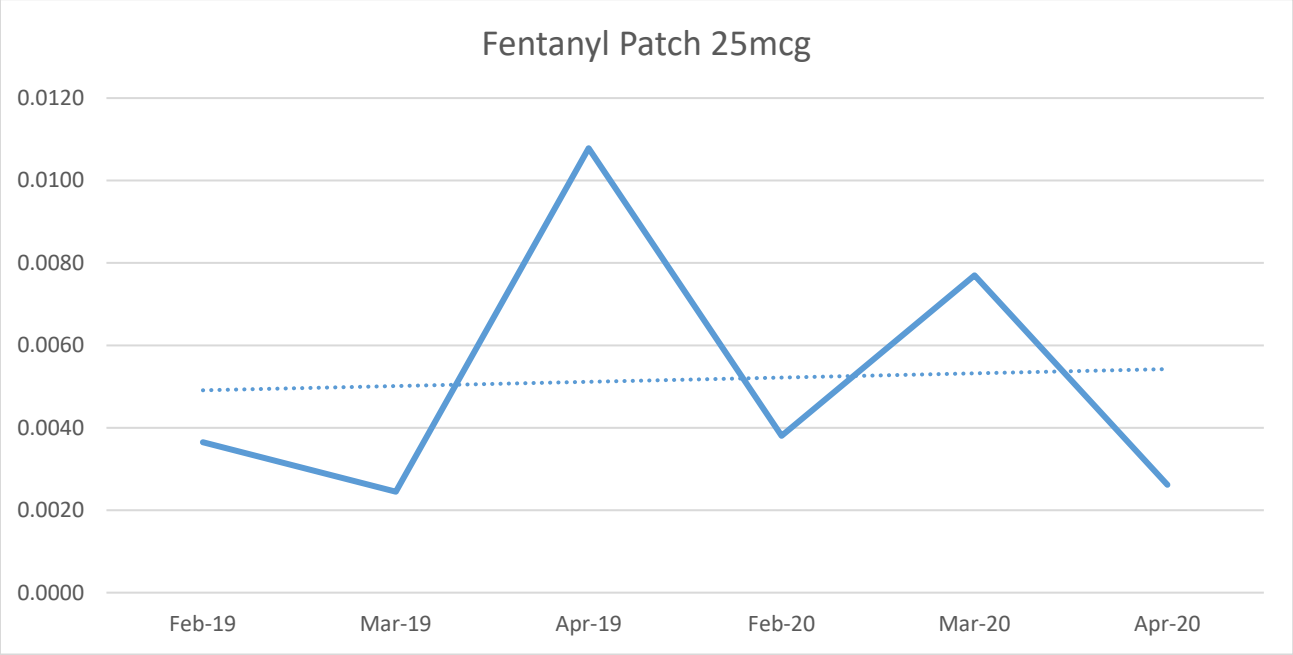
MAR data

MAR patient days adjusted data shows unexpected trends. There was a hope that the power plan would be able to drive down opiate administration and increase the use of non-opiate pain medications to treat pain among patients admitted to the hospital. Acetaminophen, a drug whose volume of administration is significantly large compared to other pain relievers, did not see any change in the amounts of administration over the 6month review period, as shown in graph 1. Positive responses in the survey supported appropriateness of defaulting acetaminophen drug order to scheduled administration, and the appropriateness of the starting dose. However, it is quite intriguing that acetaminophen administration did not increase after the power plan implementation. The use of IV acetaminophen has been restricted to specific situations and requires providers to call the pharmacy to place the order; hence it was excluded from this review.



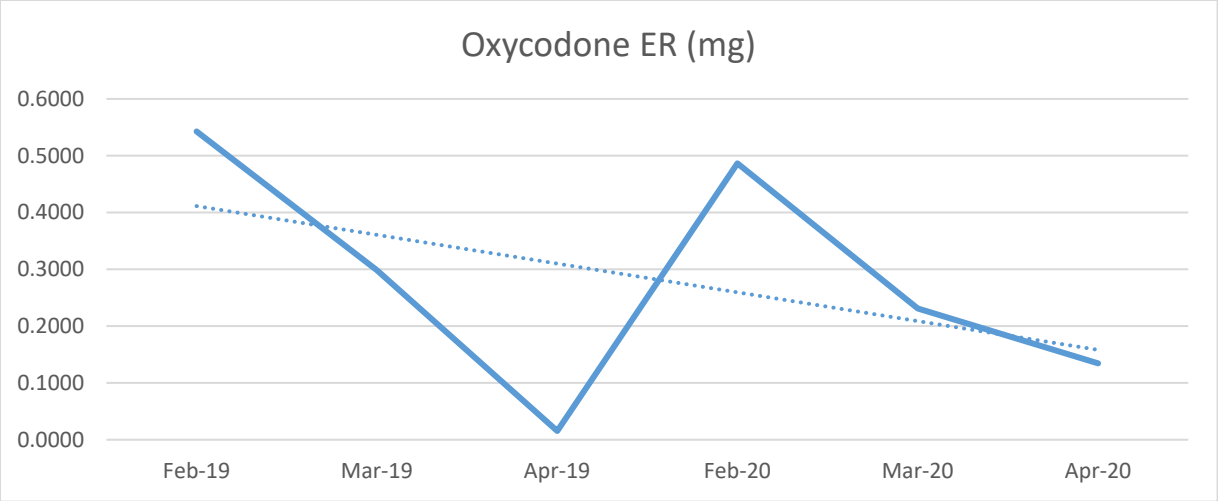
Graph 1

Fentanyl patch did not show a change in the volume of administration, as shown in graph 2.

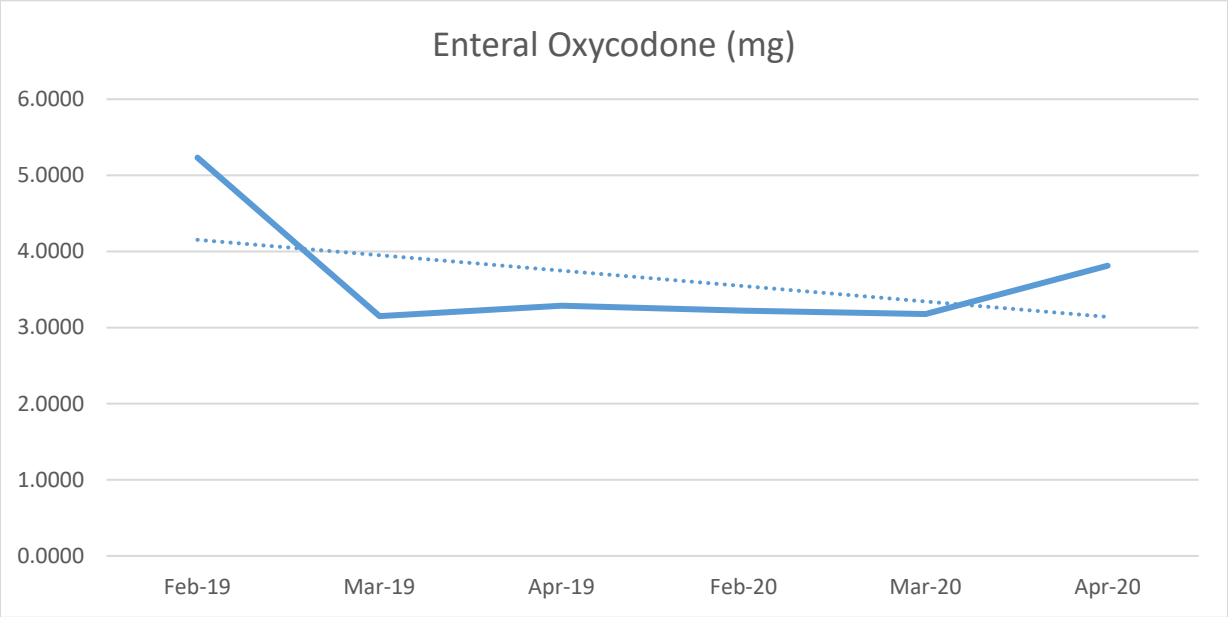


Graph 2

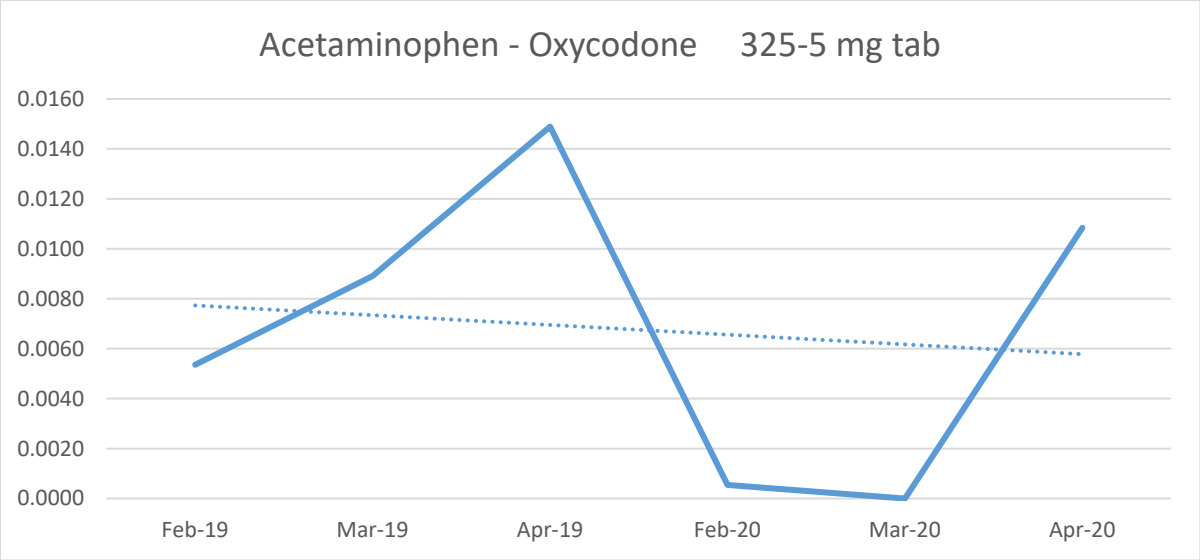
Enteral medications such as Oxycodone ER, Oxycodone, Acetaminophen-Oxycodone 325-5mg, Tramadol, Morphine, Morphine ER, Hydromorphone, Buprenorphine-naloxone 8-2mg SL, and intravenous Hydromorphone and Morphine are showing a down-trending slope in the six month review period as shown graphs 3-12. These trends are encouraging and align with the goals of power plan implementation. Interestingly 80% of survey responders did not feel this power plan has changed the amount of opiate orders they wrote.



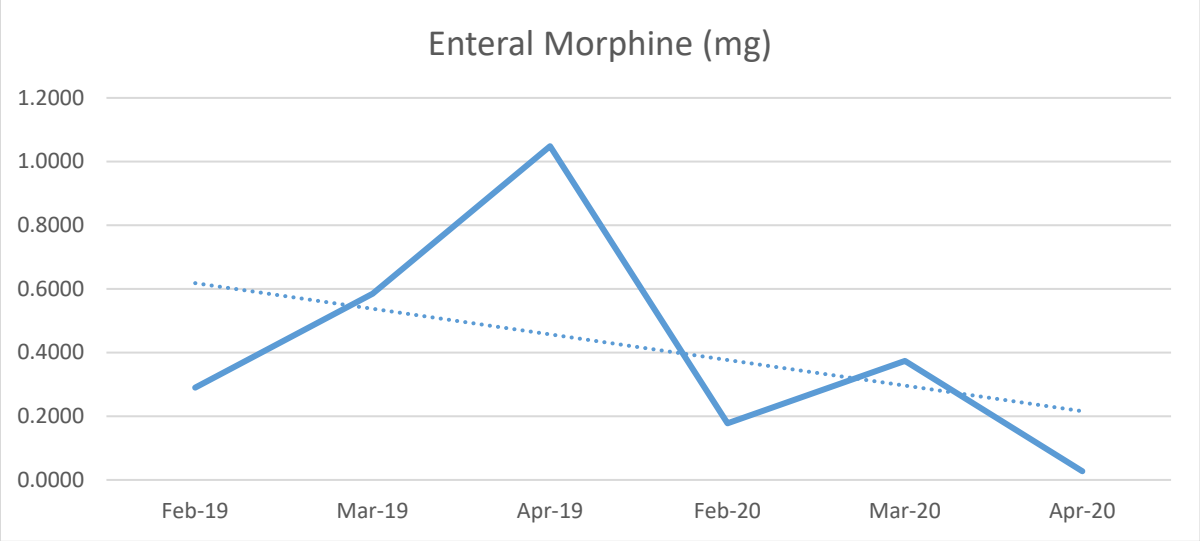
Graph 3



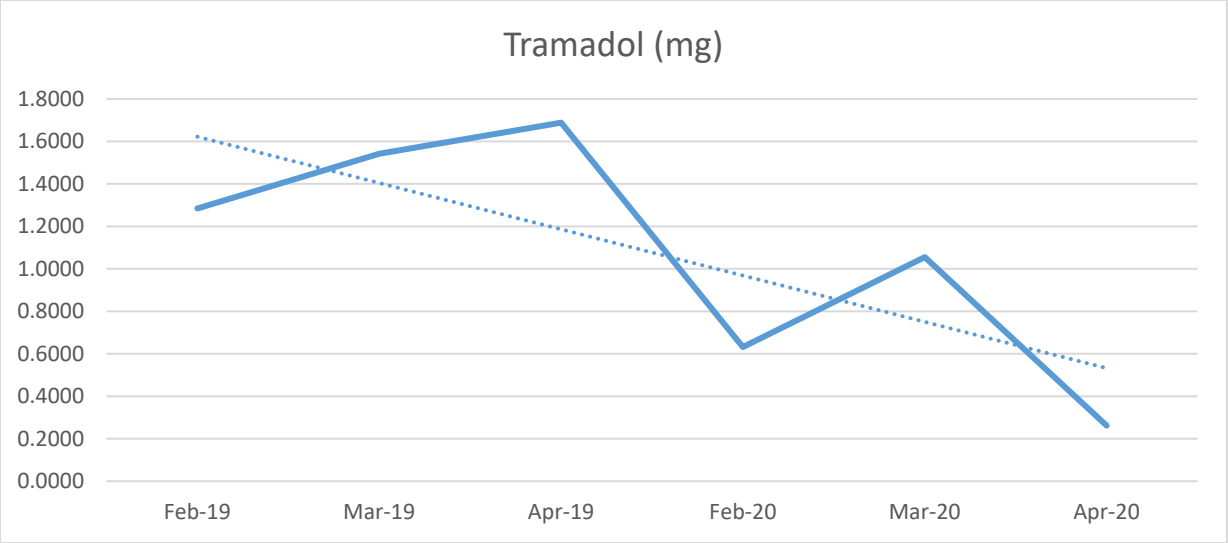
Graph 4



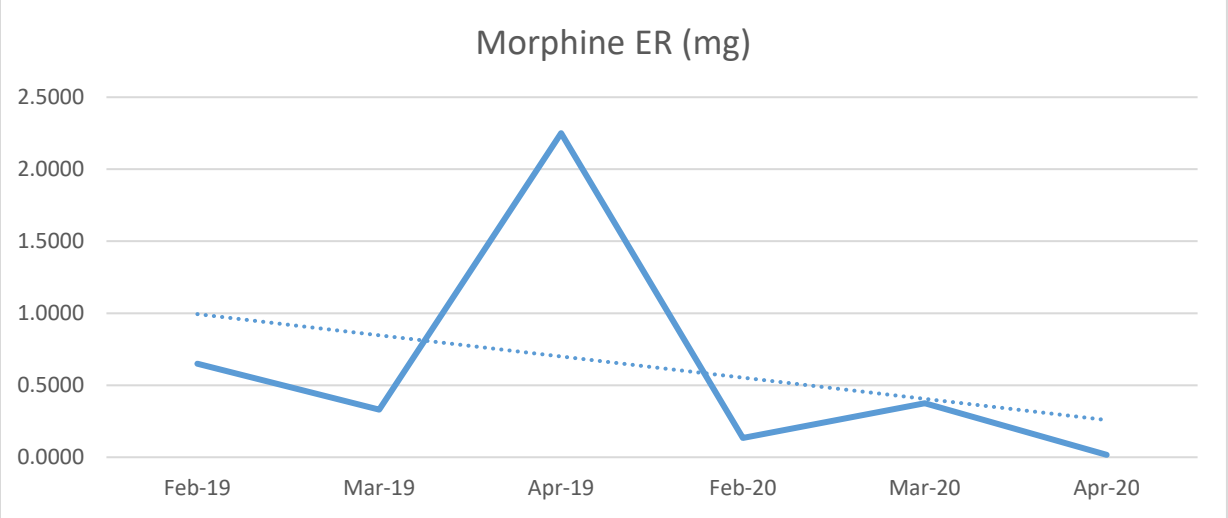
Graph 5



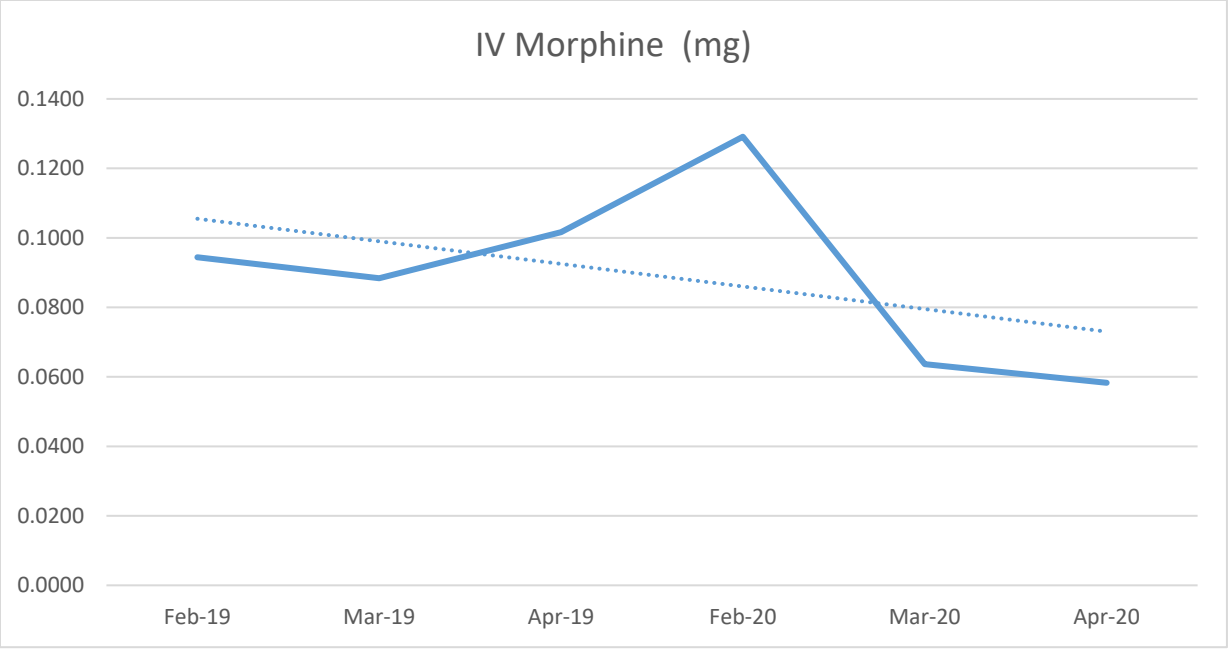
Graph 6



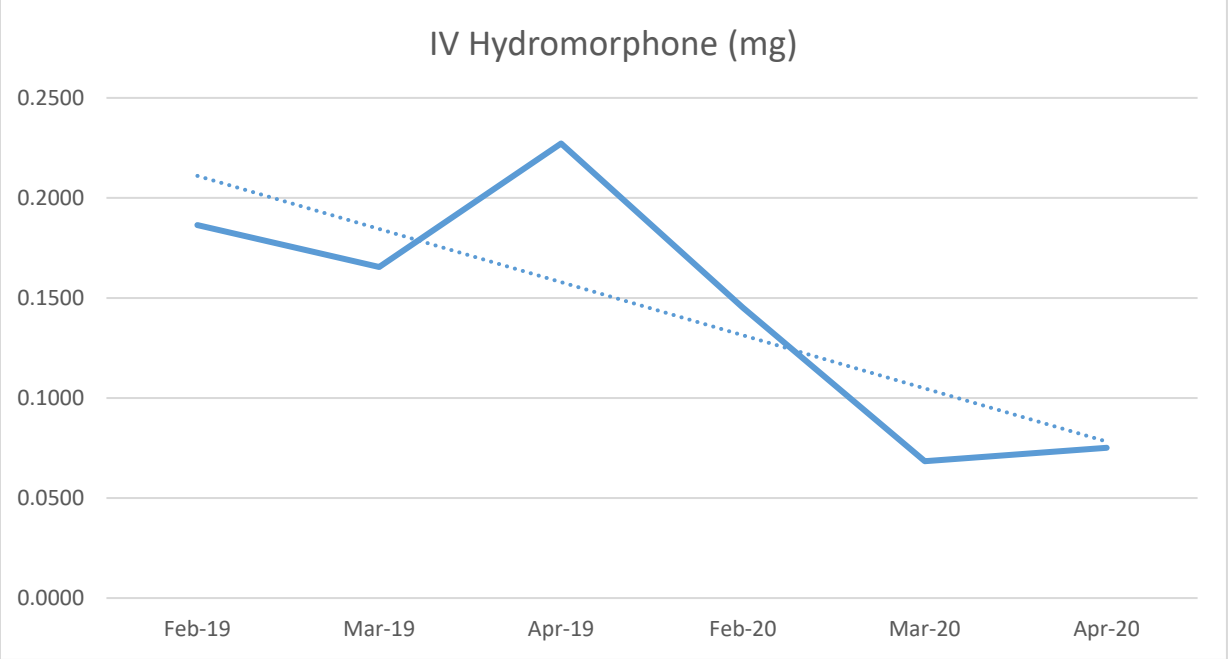
Graph 7



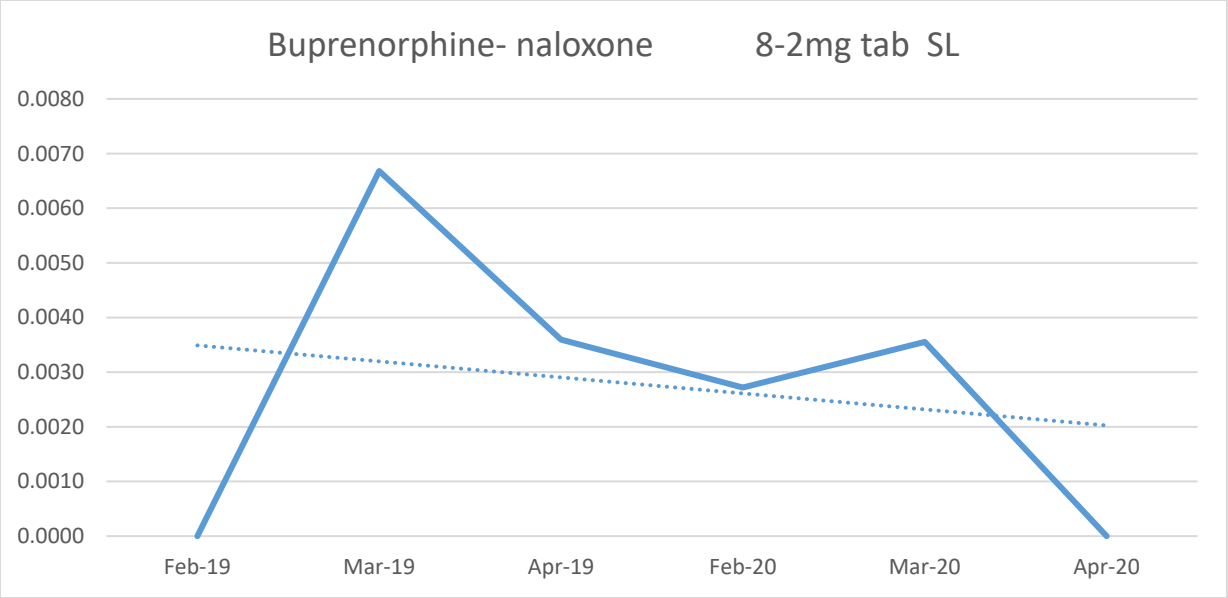
Graph 8



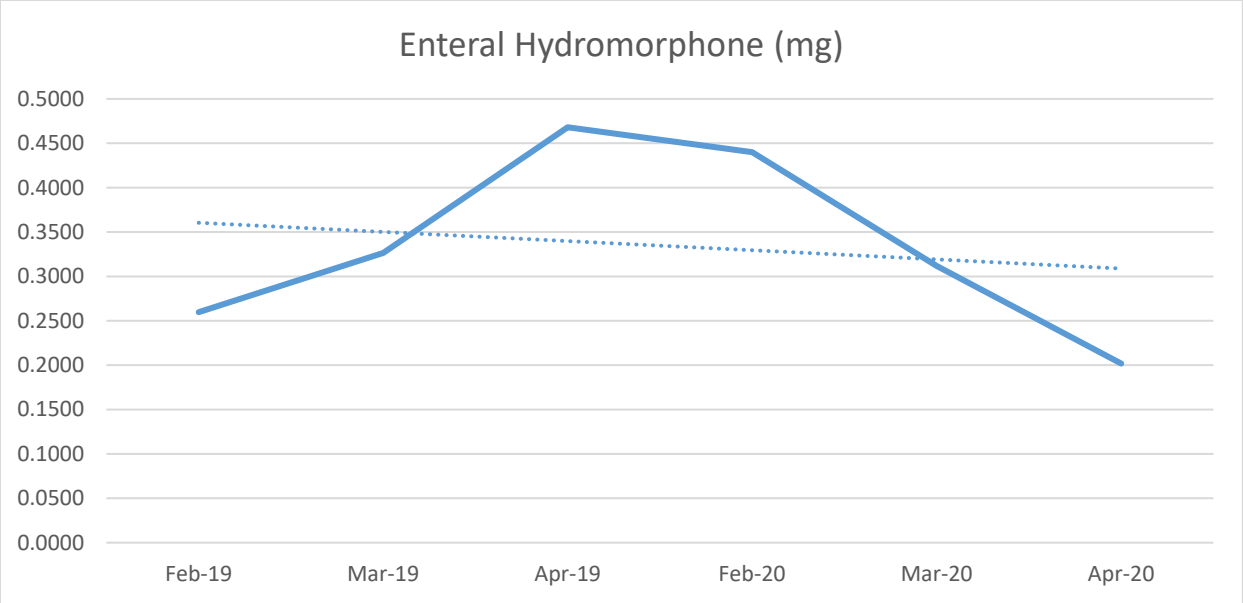
Graph 9



Graph 10



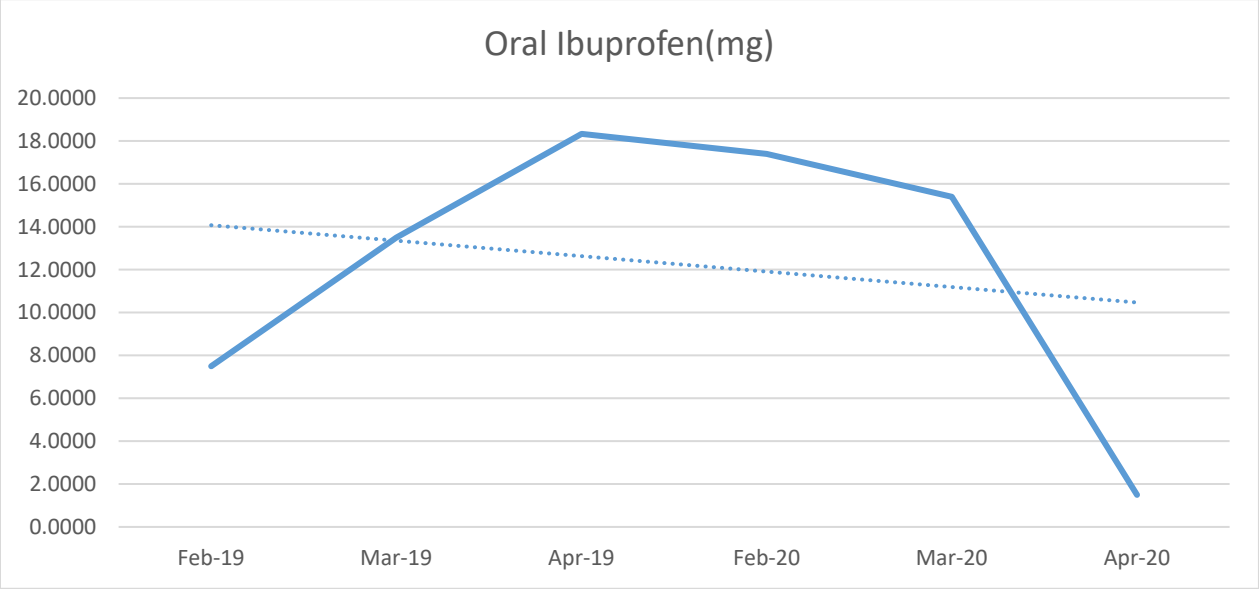
Graph 11



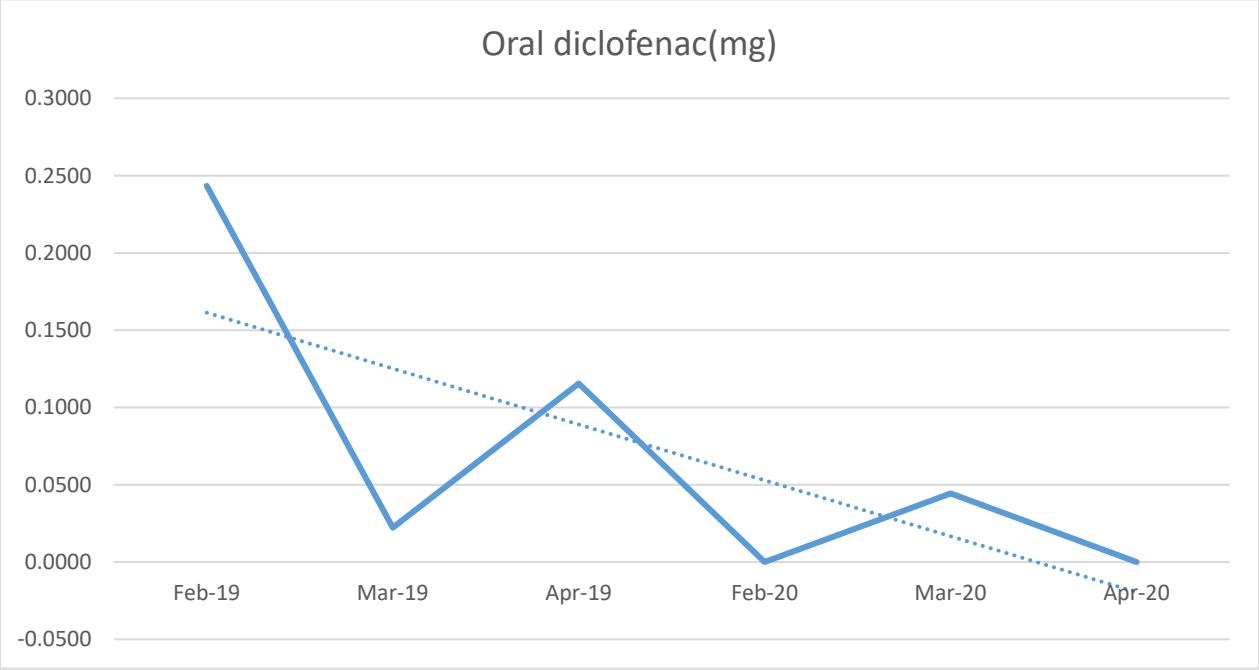
Graphs 12

NSAIDs such as ibuprofen, diclofenac, ketorolac, and naproxen also showed similar down-trending slopes in the six month review period, as shown in the graphs 13-16. The expectation was power plan implementation would increase Acetaminophen and NSAIDs administration.

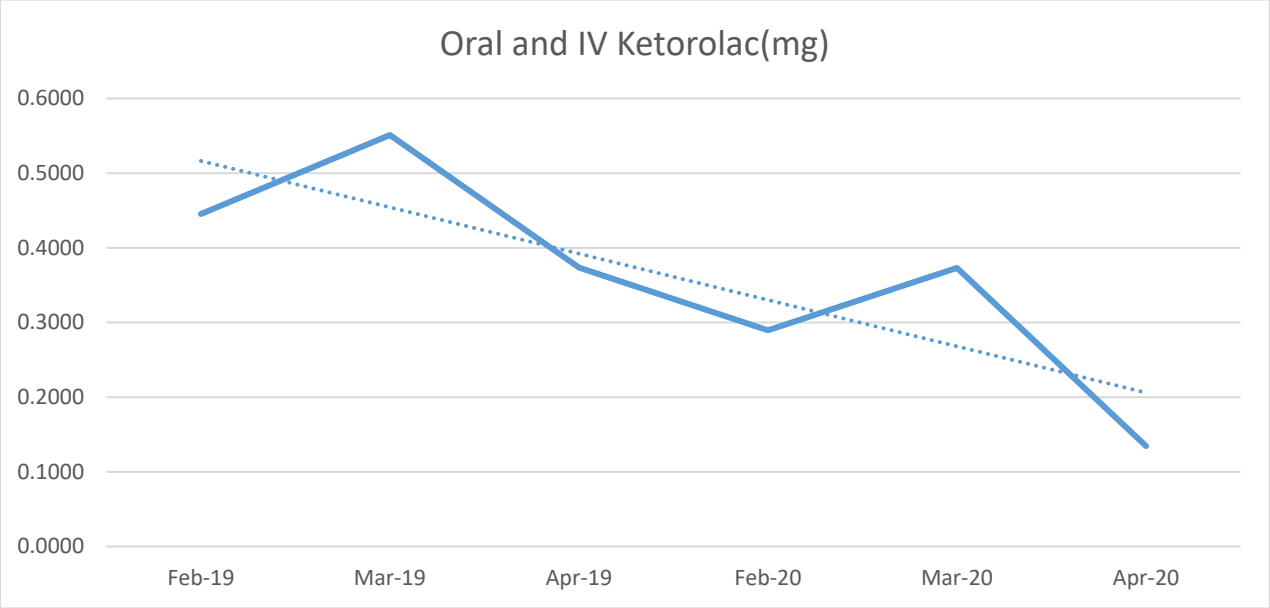
However, it did not happen. It is unclear why there is a downward trend even before the implementation of the power plan.



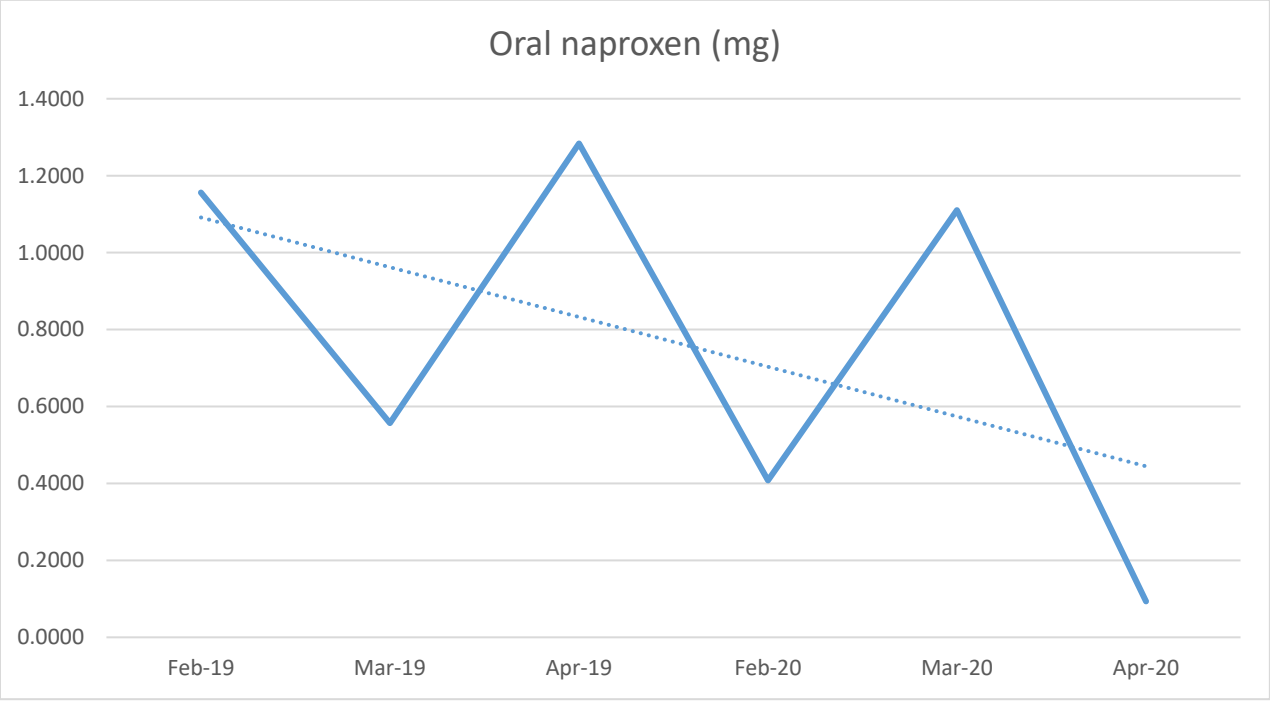
Graph 13



Graph 14

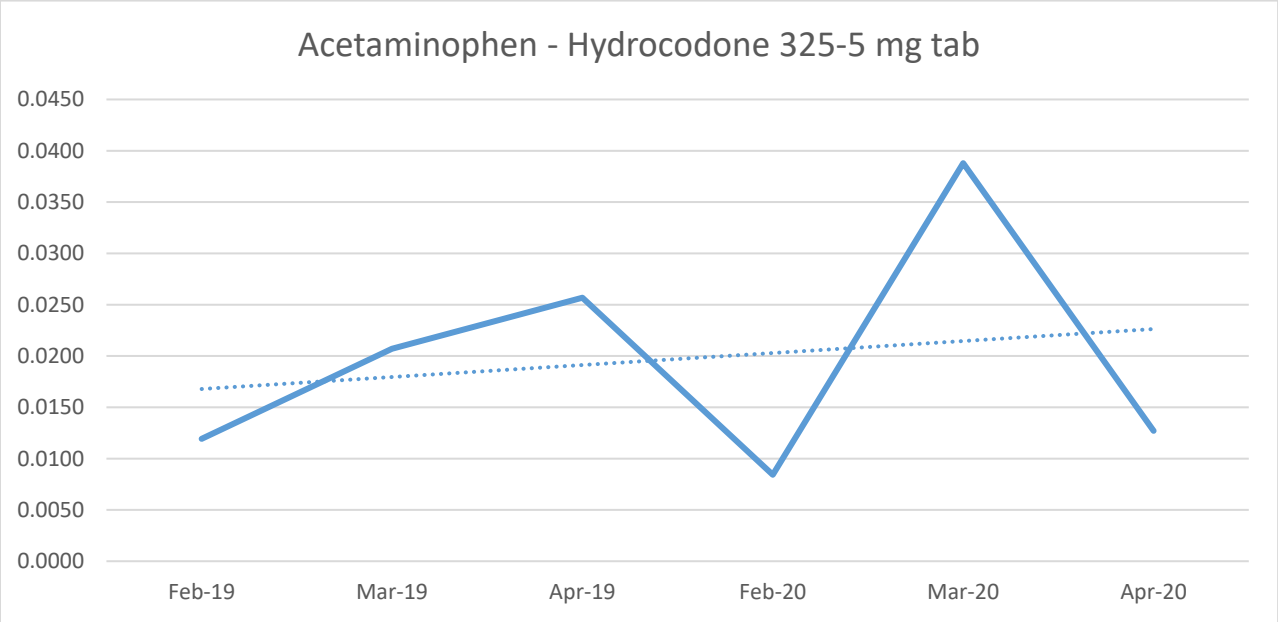


Graph 15

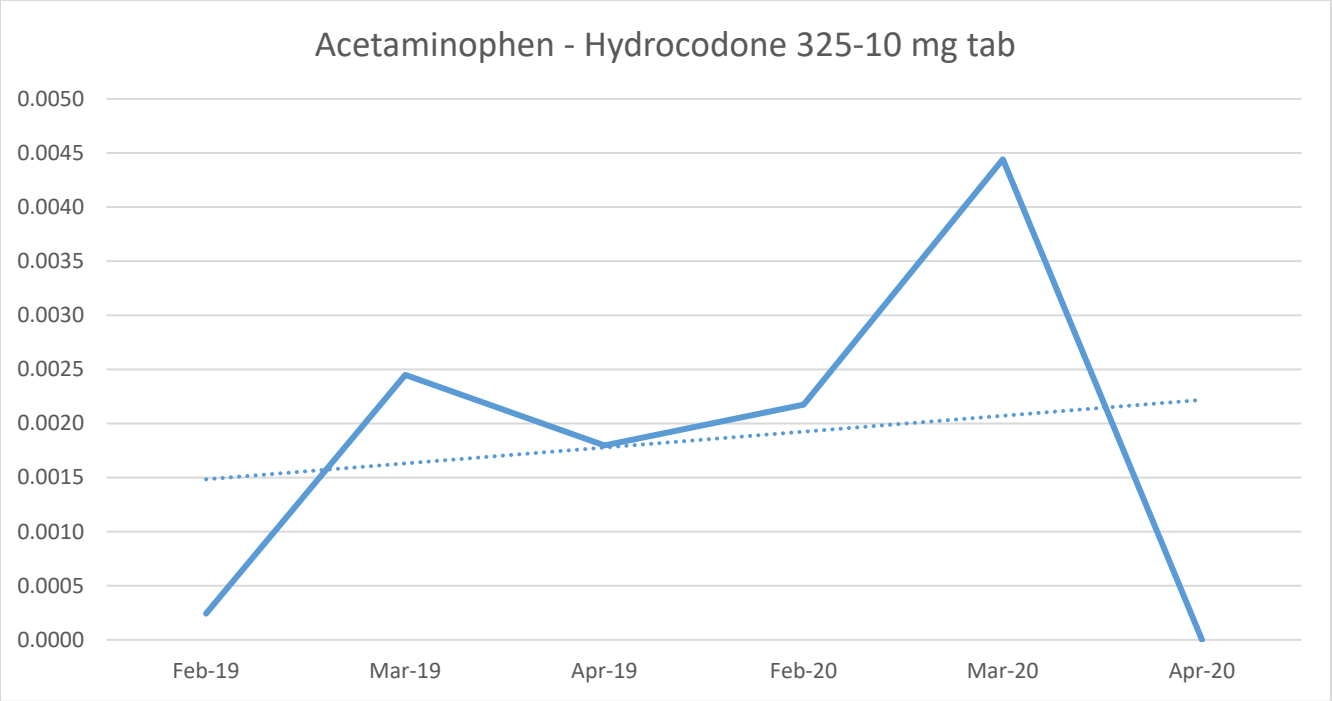


Graphs 16

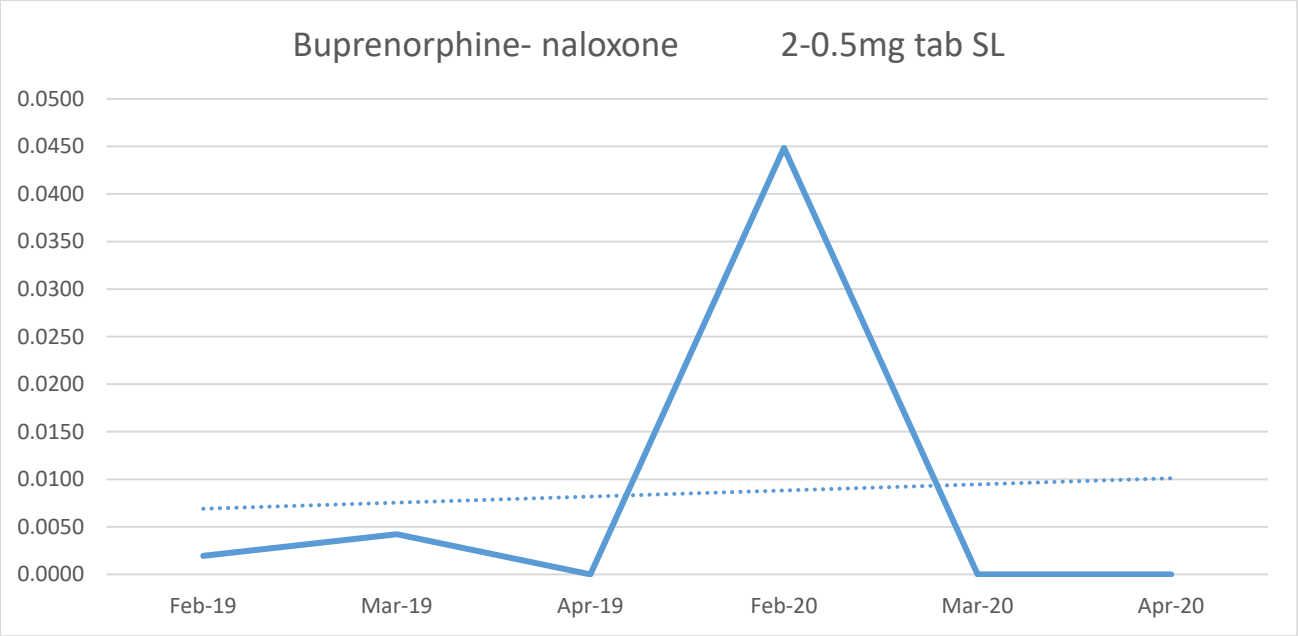
Acetaminophen-Hydrocodone tab, IV fentanyl, Buprenorphine-naloxone 2-0.5mg tab SL volume of administration has increased over six month period as shown in graphs 17-20. It is entirely unexpected to see this trend. On reviewing the MAR raw data, it is evident that the administration of these medications increased after power plan implementation.



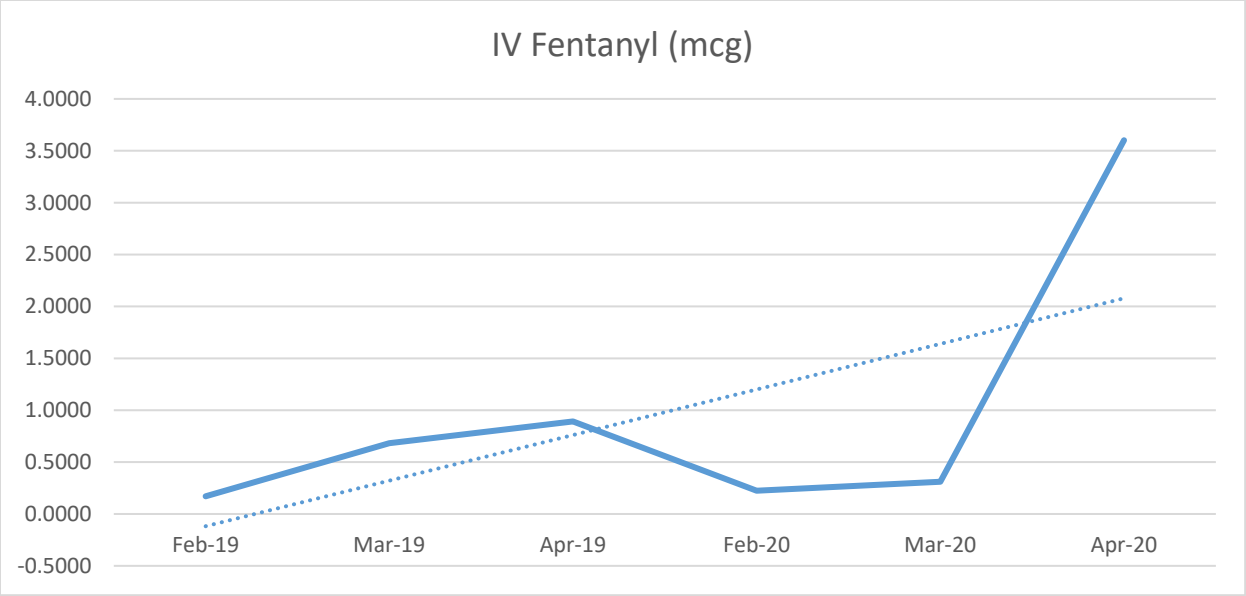
Graph 17



Graphs 18

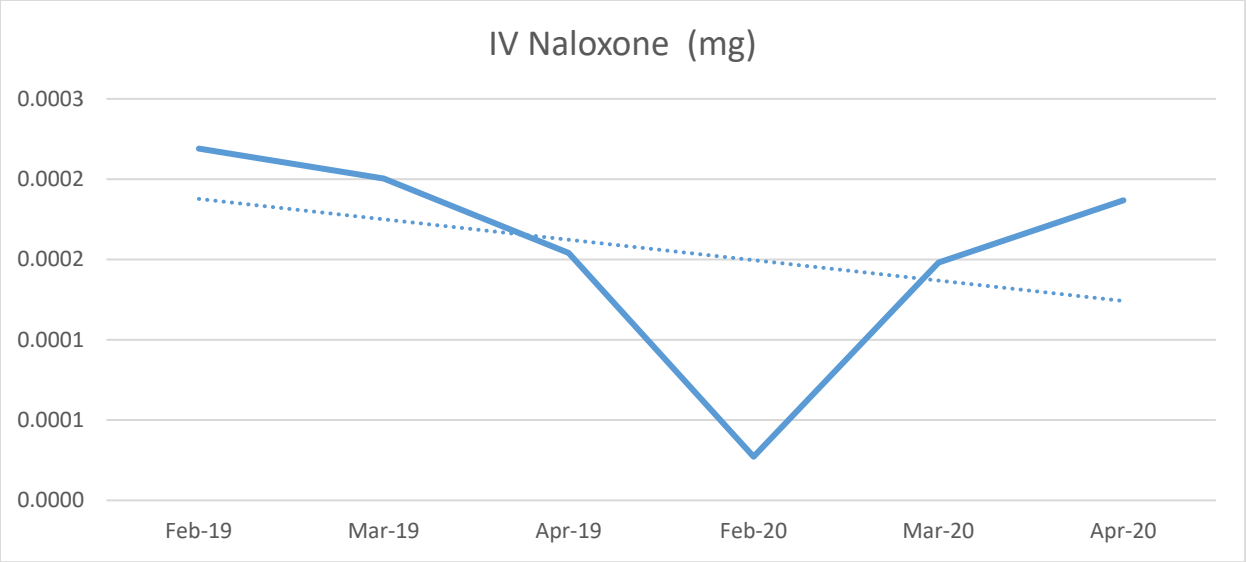


Graph 19



Graph 20

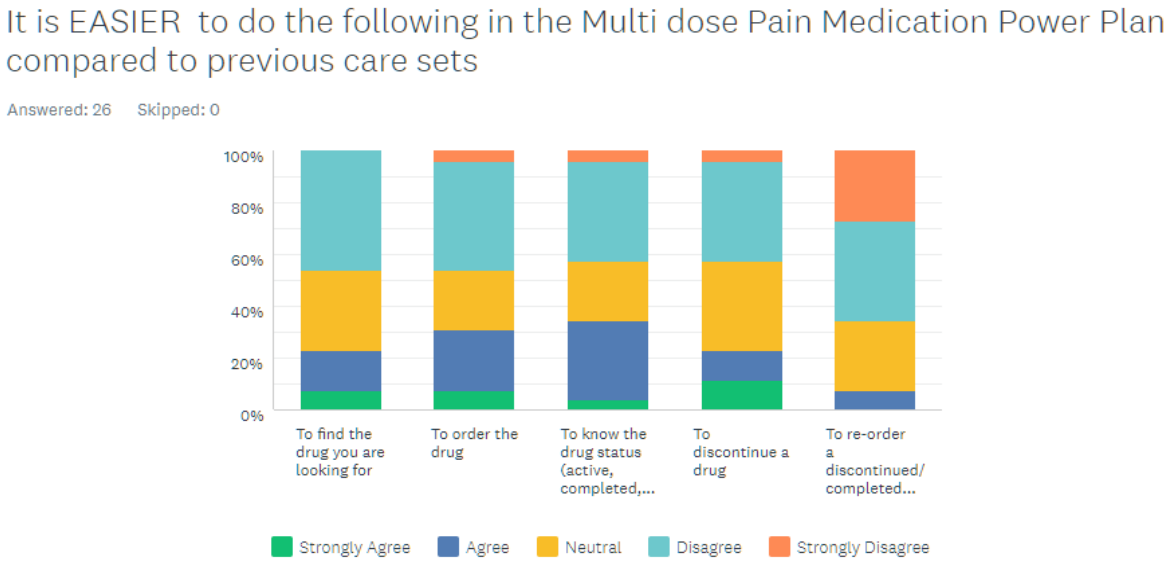
Naloxone, which is given to reverse an opiate overdose, showed a downward slope over six months as seen in graph 21. However, 70% of survey responders felt the power plan had not made any difference in the frequency of opiate adverse drug events. The actual aggregate doses administered are quite low, the highest being 0.9mg in Feb 2019, so it is difficult to derive any safety opinion based on this trend.



Graph 21

Survey results

The intention of the survey was to assess three critical aspects of the project, which are usability, practice change, content review. It is a generally accepted assumption in operational informatics amongst Cerner customers that users prefer power plans over care-sets when dealing with an order set in Cerner. So questions were framed to assess user-friendliness of this particular pain power plan. Bar charts 1, 2, pie chart 1, 2 shows responses to usability questions. The majority of the users responded that they are not able to find the drugs they are looking for. Most say it takes more time to order and discontinue them. Close to 39% prefer to use the power plan, and 50% felt they are satisfied with the power plan.

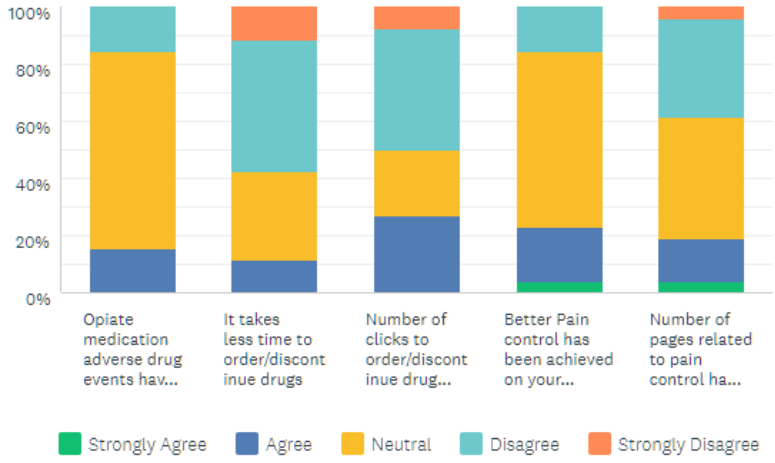


	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE	TOTAL	WEIGHTED AVERAGE
To find the drug you are looking for	7.69% 2	15.38% 4	30.77% 8	46.15% 12	0.00% 0	26	3.15
To order the drug	7.69% 2	23.08% 6	23.08% 6	42.31% 11	3.85% 1	26	3.12
To know the drug status (active, completed, discontinued)	3.85% 1	30.77% 8	23.08% 6	38.46% 10	3.85% 1	26	3.08
To discontinue a drug	11.54% 3	11.54% 3	34.62% 9	38.46% 10	3.85% 1	26	3.12
To re-order a discontinued/completed drug	0.00% 0	7.69% 2	26.92% 7	38.46% 10	26.92% 7	26	3.85

Bar chart 1

After the introduction of Multi dose Pain Medication Power Plan, you feel

Answered: 26 Skipped: 0

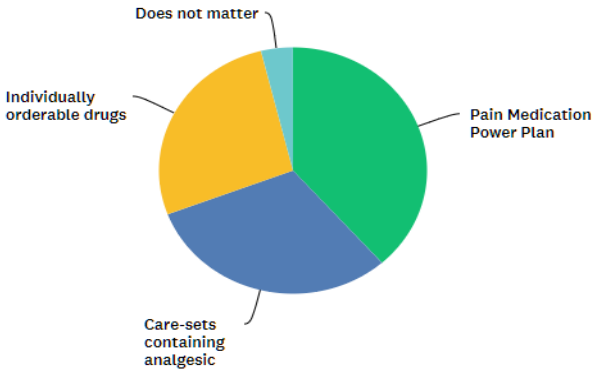


	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE	TOTAL	WEIGHTED AVERAGE
Opiate medication adverse drug events have decreased	0.00% 0	15.38% 4	69.23% 18	15.38% 4	0.00% 0	26	3.00
It takes less time to order/discontinue drugs	0.00% 0	11.54% 3	30.77% 8	46.15% 12	11.54% 3	26	3.58
Number of clicks to order/discontinue drugs have decreased	0.00% 0	26.92% 7	23.08% 6	42.31% 11	7.69% 2	26	3.31
Better Pain control has been achieved on your patients	3.85% 1	19.23% 5	61.54% 16	15.38% 4	0.00% 0	26	2.88
Number of pages related to pain control have decreased	3.85% 1	15.38% 4	42.31% 11	34.62% 9	3.85% 1	26	3.19

Bar chart 2

If you had a choice on how to order analgesic medications, what would be your preference

Answered: 26 Skipped: 0

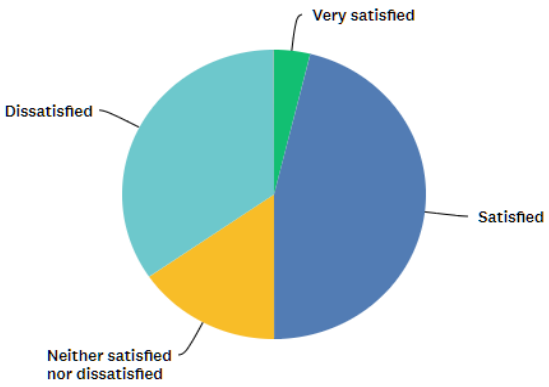


ANSWER CHOICES	RESPONSES	
Pain Medication Power Plan	38.46%	10
Care-sets containing analgesic medications	30.77%	8
Individually orderable drugs	26.92%	7
Does not matter	3.85%	1
TOTAL		26

Pie chart 1

With the Pain Medication Power Plan, you are

Answered: 26 Skipped: 0



ANSWER CHOICES	RESPONSES	
Very satisfied	3.85%	1
Satisfied	46.15%	12
Neither satisfied nor dissatisfied	15.38%	4
Dissatisfied	34.62%	9
Very dissatisfied	0.00%	0
TOTAL		26

Pie chart 2

There are several Cerner-specific limitations (”hard-coded” limitations) of the power plan, which makes it difficult to use. The font size of texts in a power plan is generally around Calibri 6 point, which is quite challenging to read, especially when the screen is busy.

The checkboxes to select the drugs in a power plan are dangerously close to each other. It takes quite an effort to make sure users have checked the intended box before proceeding. It is not uncommon for users to inadvertently check the wrong drug. Most users do realize the mistake before signing the order as there will be additional fields to complete. At that point, it is quite cumbersome to cancel everything and start all over again. Checking the wrong box is a significant safety design issue. Checkboxes or radio buttons should be placed at safe distances. Similar principles apply to drop-down menus. Every medication order screen has additional fields to complete like frequency, dose, route, start time, stop time. Depending on the drugs and monitor size, sometimes, the location of these fields changes which makes the user experience error-prone.

Overall survey comments illustrated the poor usability of power plans. A survey comment supporting this said *“too dense, difficult to find medication looking for, overwhelming”*

Users found it difficult to know the status of the drug/power plans. It is likely because critical aspects of the default screen are hidden, and it takes users to move around the partitions to reveal critical information. It is a user interface design flaw, and wherein there is an expectation from the user to unhide important information on a medication. Unfortunately, this problem is inherent to all our Cerner power plans.. Only 39% said they would prefer a power plan to order analgesic medications. Hospitalists concerns on the font, text overload likley applies to many other existing power plans given most of this are due to Cerner hardcode limitations.

A survey comment supporting this said,

"the interface for prescribing power plans (of all kinds) is visually overwhelming, and it's difficult to tell what exactly I'm prescribing."

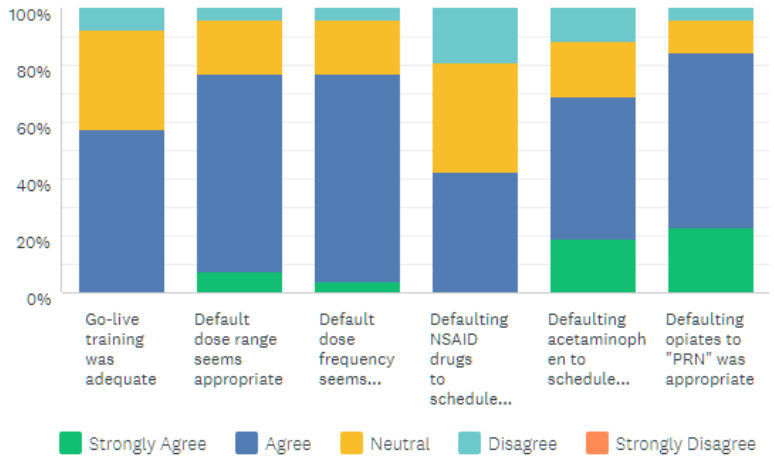
Many responders feel the pain power plan is quite lengthy. Some suggest breaking it into a few smaller plans. Given that the power plan has multiple phases, if the user tries to find a drug by scrolling, it would take considerable time to find one. However, if we use the subphase components, it might be easy. Such subtle understanding comes with practice and can be included in the follow-up training material. A survey comment supporting this said, "*Perhaps split up the categories, so there is not this huge power plan to try to navigate each time." Im not sure because it feels like im wading through lots of unwanted things to get the one thing i want."*

Regarding content feedback, some comments support the lengthy all in one pain power plan. Users are presented with NSAID options every time they seek to prescribe an opiate in the power plan. There is a hope that this might act as a reminder for other options available. However, MAR data review did not show an increase in NSAID volume of administration after power plan implementation. Physicians generally decide what to prescribe and then try to find those in order catalog rather than another way around, so presenting other options may not yield results as expected. The majority of the responders felt Go-Live training was adequate, and also the content of the plan, such as starting dose, frequency, default sentences were appropriate, as shown in the below bar chart 3. An experienced in house informatics team, clinical pharmacist, and clinicians led team optimized the contents using care-set contents as the starting point. The majority of the users felt they had not modified their practice, as shown in pie chart 3. However,

earlier MAR data showed volumes of administration of many opiates had gone down, and some have gone up. More than 60% felt single dose power plan made it easier to order one time doses as shown in pie chart 4.

Regarding Pain Medication Power Plan

Answered: 26 Skipped: 0

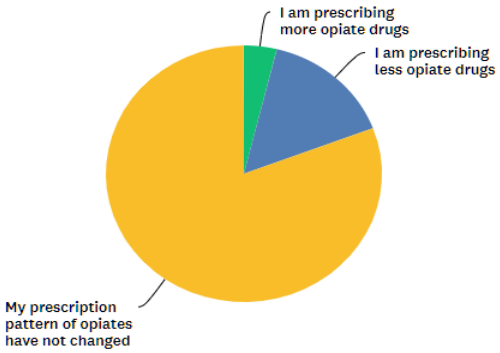


	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE	TOTAL	WEIGHTED AVERAGE
Go-live training was adequate	0.00% 0	57.69% 15	34.62% 9	7.69% 2	0.00% 0	26	2.50
Default dose range seems appropriate	7.69% 2	69.23% 18	19.23% 5	3.85% 1	0.00% 0	26	2.19
Default dose frequency seems appropriate	3.85% 1	73.08% 19	19.23% 5	3.85% 1	0.00% 0	26	2.23
Defaulting NSAID drugs to scheduled instead of PRN was appropriate	0.00% 0	42.31% 11	38.46% 10	19.23% 5	0.00% 0	26	2.77
Defaulting acetaminophen to scheduled instead of PRN was appropriate	19.23% 5	50.00% 13	19.23% 5	11.54% 3	0.00% 0	26	2.23
Defaulting opiates to "PRN" was appropriate	23.08% 6	61.54% 16	11.54% 3	3.85% 1	0.00% 0	26	1.96

Bar chart 3

With the new Pain Medication Power Plan, compared to the previous opiate care-set

Answered: 26 Skipped: 0

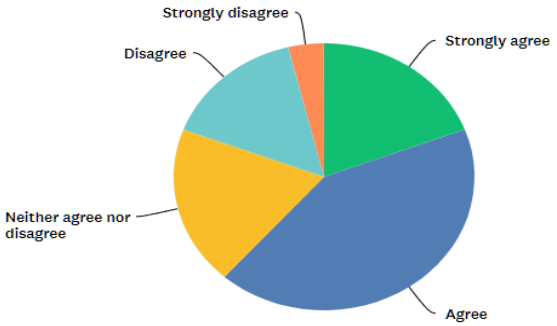


ANSWER CHOICES	RESPONSES	
I am prescribing more opiate drugs	3.85%	1
I am prescribing less opiate drugs	15.38%	4
My prescription pattern of opiates have not changed	80.77%	21
TOTAL		26

Pie chart 3

Single dose Pain Power plan has made it easier to order one time analgesic dose

Answered: 26 Skipped: 0



ANSWER CHOICES	RESPONSES	
Strongly agree	19.23%	5
Agree	42.31%	11
Neither agree nor disagree	19.23%	5
Disagree	15.38%	4
Strongly disagree	3.85%	1
TOTAL		26

Pie chart 4

Limitations

Conclusion is based on a limited amount of data spanning three months from February to April 2020 right after implementation in Jan 2020. Informatics projects may reveal promising results when analyzed several months after implementation. We may see a difference when a similar study is conducted in a year from now. This study did not include atypical analgesics like gabapentin, amitriptyline that were present in the power plan. COVID-19 pandemic has changed many dynamics in the hospital workflow that are hard to capture.

Conclusion

Hospitals are a high-stress environment, so it is critical for vendors to account for the "environment of use" when designing a user interface. Hospitalist physicians spend more time with the EMR than any other physician group in the hospital due to the nature of their work. They place hundreds of orders every day. Critical users like hospitalists should be given priority on content decision making unless it violates safety and evidence-based guidelines. It is critical for EMR vendors to follow basic usability principles while designing a CPOE interface. In reality, the internal informatics team has minimal control over the user interface aspect of most EMR modules. In organizations that tend to build and maintain custom order sets, the informatics team is responsible for the mostly the contents and clinical decision support alerts. Thus significant responsibly falls on the vendor's shoulders to continue to optimize user interfaces. There is significant room for improvement for the vendors to change the basic structure and design of the power plan. Regarding MAR data, not seeing a standalone reduction in opiate administration comes as a surprise. With the data reviewed, moving from care-sets to power plan did not bring the intended practice and prescription changes. Physicians get updated with the latest guidelines through many other channels of communication and education.

Organizations can focus on additional avenues like incentivizing practicing evidence-based medicine, encouraging continuous medical education, creating a culture of constructive feedback to bring practice changes. Cerner clients need to involve Cerner representatives in sharing such end-users feedback for usability improvements. Pain power plan survey results can be used to improve future designs both by Cerner and also local informatics team to improve future products.

References:

1. Johnson CM, Johnson TR, Zhang J. A user-centered framework for redesigning health care interfaces. J Biomed Inform. 2005 Feb 1;38(1):75–87.

2. Zhang J, Walji MF. TURF: Toward a unified framework of EHR usability. J Biomed Inform. 2011 Dec 1;44(6):1056–67.

3. Howe JL, Adams KT, Hettinger AZ, Ratwani RM. Electronic Health Record Usability Issues and Potential Contribution to Patient Harm. JAMA. 2018 Mar 27;319(12):1276–8.

4. Ratwani RM, Savage E, Will A, Arnold R, Khairat S, Miller K, et al. A usability and safety analysis of electronic health records: a multi-center study. J Am Med Inform Assoc. 2018 Sep 1;25(9):1197–201.

5. Middleton B, Bloomrosen M, Dente MA, Hashmat B, Koppel R, Overhage JM, et al. Enhancing patient safety and quality of care by improving the usability of electronic health record systems: recommendations from AMIA. J Am Med Inform Assoc JAMIA. 2013 Jun;20(e1):e2-8.

6. Considerations for Cerner Model Order Sets [Internet]. Optimum Healthcare IT. 2018 [cited 2020 May 31]. Available from: https://www.optimumhit.com/insights/blog/ehr-implementation/guiding-principles-cerner-model-order-sets/

7. Health IT Policy Committee: Recommendations to the National Coordinator for Health IT | HealthIT.gov [Internet]. [cited 2020 May 31]. Available from: https://www.healthit.gov/topic/federal-advisory-committees/health-it-policy-committee-recommendations-national-coordinator

8. CDC Guideline for Prescribing Opioids for Chronic Pain — United States, 2016. MMWR Recomm Rep [Internet]. 2016 [cited 2020 May 31];65. Available from: https://www.cdc.gov/mmwr/volumes/65/rr/rr6501e1.htm

9. Javaher and Mai - Interagency Guideline on Prescribing Opioids for P.pdf [Internet]. [cited 2020 May 31]. Available from: http://www.agencymeddirectors.wa.gov/Files/2015AMDGOpioidGuideline.pdf

10. Paulozzi LJ, Mack KA, Hockenberry JM, Division of Unintentional Injury Prevention, National Center for Injury Prevention and Control, CDC. Vital signs: variation among States in prescribing of opioid pain relievers and benzodiazepines - United States, 2012. MMWR Morb Mortal Wkly Rep. 2014 Jul 4;63(26):563–8.

11. Levy B, Paulozzi L, Mack KA, Jones CM. Trends in Opioid Analgesic–Prescribing Rates by Specialty, U.S., 2007–2012. Am J Prev Med. 2015 Sep 1;49(3):409–13.

12. Multiple Cause of Death Data on CDC WONDER [Internet]. [cited 2020 May 31]. Available from: https://wonder.cdc.gov/mcd.html

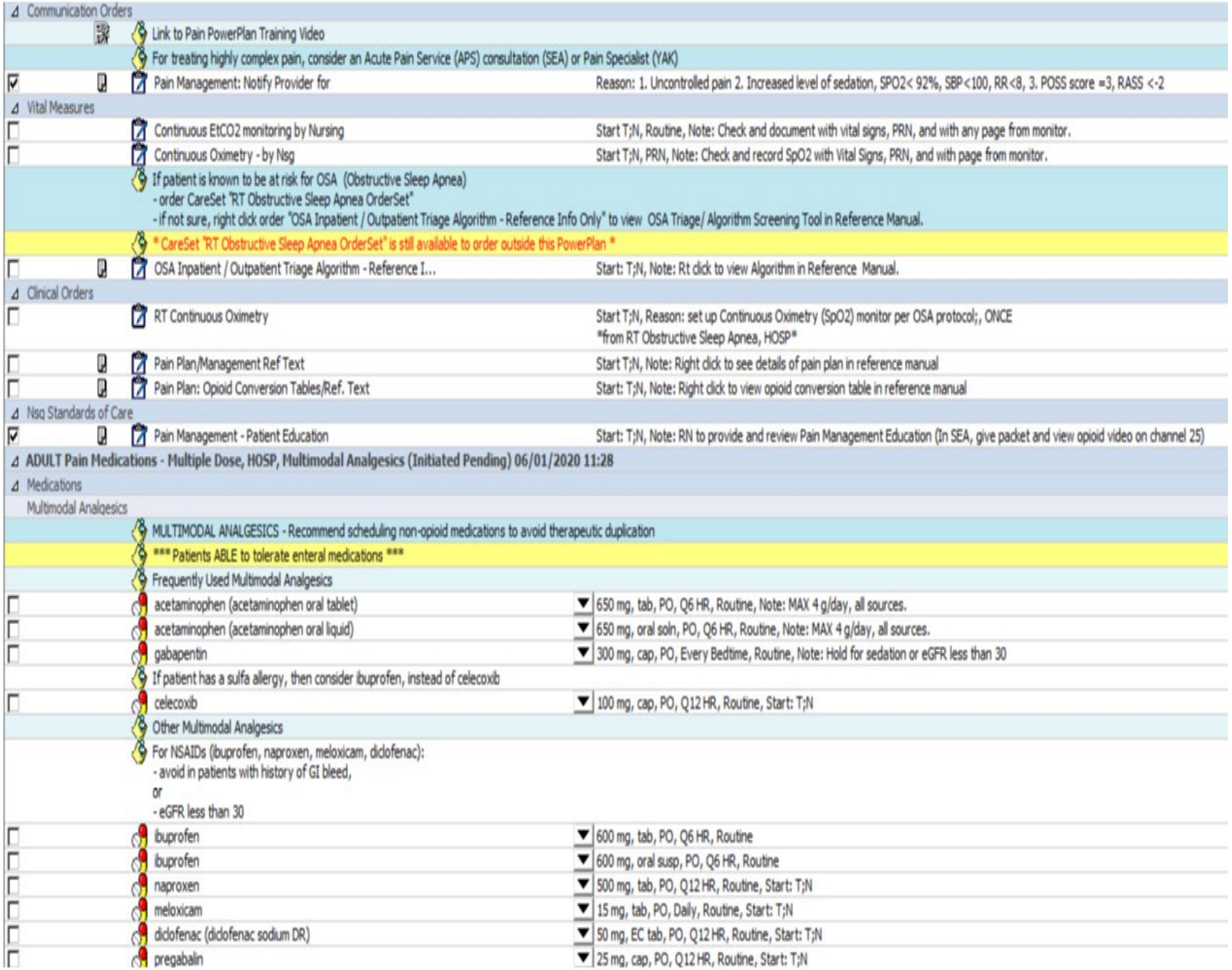
13. FY19217SummaryOpioidPrescPerioperativePain.pdf [Internet]. [cited 2020 May 31]. Available from: http://www.agencymeddirectors.wa.gov/Files/FY19217SummaryOpioidPrescPerioperativePain.pdf

14. US Hospital EMR Market Share 2019 Significant Movement in Every Market Sector - KLAS Report [Internet]. [cited 2020 May 30]. Available from: https://klasresearch.com/report/us-hospital-emr-market-share-2019/1454

15. Federal Government | Cerner [Internet]. [cited 2020 May 30]. Available from: https://www.cerner.com/solutions/federal-government

16. cpoesuperuserreferencemanual09_26_08.pdf [Internet]. [cited 2020 May 31]. Available from: https://paws.gru.edu/pub/cis/training/documents/pdfs/manuals/cpoesuperuserreferencemanual09_26_08.pdf

Appendix 1: Cerner Pain Medication Power Plan



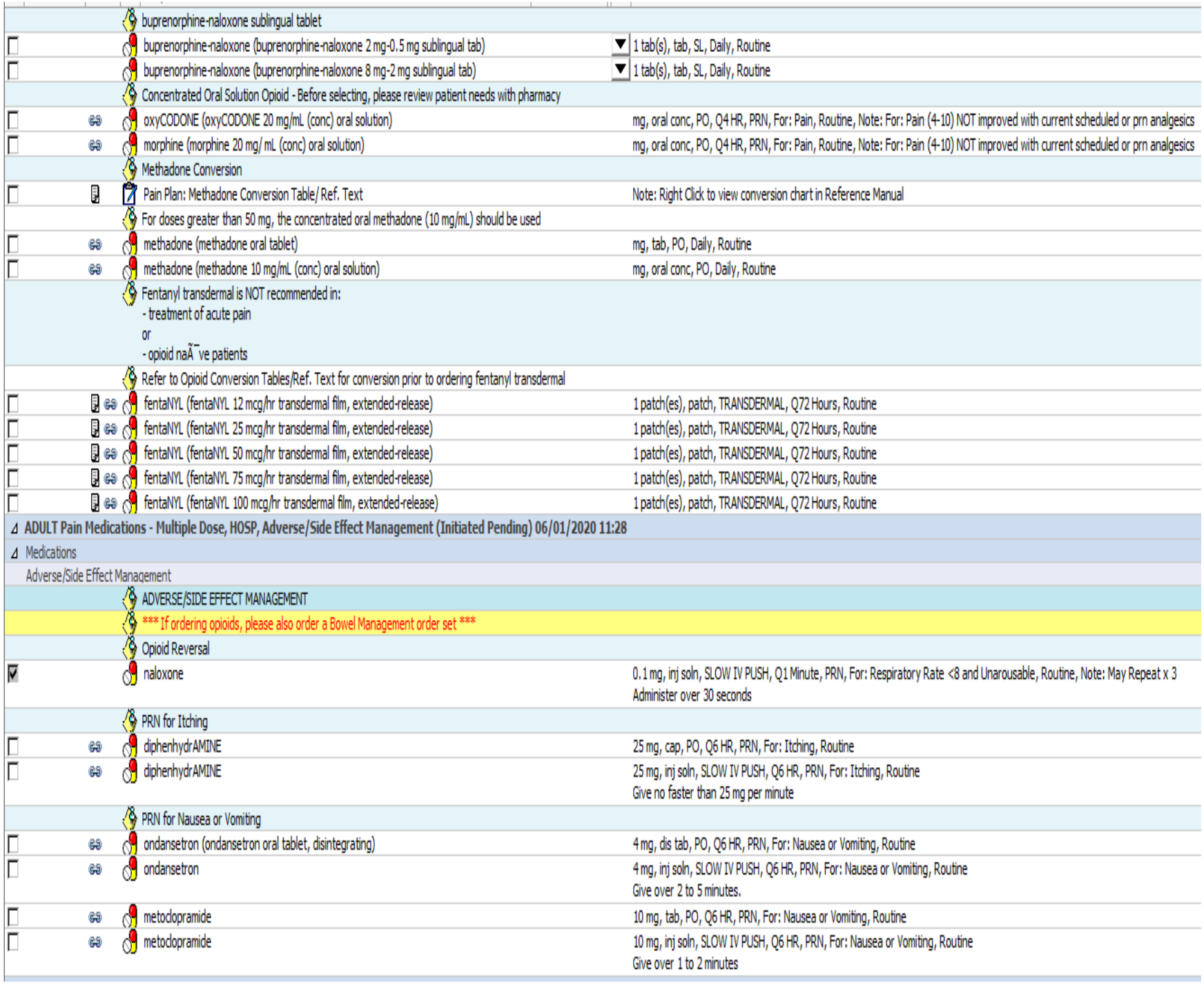
▲ Communication Orders		
	Link to Pain PowerPlan Training Video	
	For treating highly complex pain, consider an Acute Pain Service (APS) consultation (SEA) or Pain Specialist (YAK)	
☑	Pain Management: Notify Provider for	Reason: 1. Uncontrolled pain 2. Increased level of sedation, SPO2< 92%, SBP<100, RR<8, 3. POSS score =3, RASS <-2
▲ Vital Measures		
☐	Continuous EtCO2 monitoring by Nursing	Start T;N, Routine, Note: Check and document with vital signs, PRN, and with any page from monitor.
☐	Continuous Oximetry - by Nsg	Start T;N, PRN, Note: Check and record SpO2 with Vital Signs, PRN, and with page from monitor.
	If patient is known to be at risk for OSA (Obstructive Sleep Apnea) - order CareSet "RT Obstructive Sleep Apnea OrderSet" - if not sure, right click order "OSA Inpatient / Outpatient Triage Algorithm - Reference Info Only" to view OSA Triage/ Algorithm Screening Tool in Reference Manual.	
	* CareSet "RT Obstructive Sleep Apnea OrderSet" is still available to order outside this PowerPlan *	
☐	OSA Inpatient / Outpatient Triage Algorithm - Reference I...	Start: T;N, Note: Rt click to view Algorithm in Reference Manual.
▲ Clinical Orders		
☐	RT Continuous Oximetry	Start T;N, Reason: set up Continuous Oximetry (SpO2) monitor per OSA protocol;, ONCE *from RT Obstructive Sleep Apnea, HOSP*
☐	Pain Plan/Management Ref Text	Start T;N, Note: Right click to see details of pain plan in reference manual
☐	Pain Plan: Opioid Conversion Tables/Ref. Text	Start: T;N, Note: Right click to view opioid conversion table in reference manual
▲ Nsg Standards of Care		
☑	Pain Management - Patient Education	Start: T;N, Note: RN to provide and review Pain Management Education (In SEA, give packet and view opioid video on channel 25)
▲ **ADULT Pain Medications - Multiple Dose, HOSP, Multimodal Analgesics (Initiated Pending) 06/01/2020 11:28**		
▲ Medications		
Multimodal Analgesics		
	MULTIMODAL ANALGESICS - Recommend scheduling non-opioid medications to avoid therapeutic duplication	
	*** Patients ABLE to tolerate enteral medications ***	
	Frequently Used Multimodal Analgesics	
☐	acetaminophen (acetaminophen oral tablet)	650 mg, tab, PO, Q6 HR, Routine, Note: MAX 4 g/day, all sources.
☐	acetaminophen (acetaminophen oral liquid)	650 mg, oral soln, PO, Q6 HR, Routine, Note: MAX 4 g/day, all sources.
☐	gabapentin	300 mg, cap, PO, Every Bedtime, Routine, Note: Hold for sedation or eGFR less than 30
	If patient has a sulfa allergy, then consider ibuprofen, instead of celecoxib	
☐	celecoxib	100 mg, cap, PO, Q12 HR, Routine, Start: T;N
	Other Multimodal Analgesics	
	For NSAIDs (ibuprofen, naproxen, meloxicam, diclofenac): - avoid in patients with history of GI bleed, or - eGFR less than 30	
☐	ibuprofen	600 mg, tab, PO, Q6 HR, Routine
☐	ibuprofen	600 mg, oral susp, PO, Q6 HR, Routine
☐	naproxen	500 mg, tab, PO, Q12 HR, Routine, Start: T;N
☐	meloxicam	15 mg, tab, PO, Daily, Routine, Start: T;N
☐	diclofenac (diclofenac sodium DR)	50 mg, EC tab, PO, Q12 HR, Routine, Start: T;N
☐	pregabalin	25 mg, cap, PO, Q12 HR, Routine, Start: T;N

$	Component	Status	Dose ...	Details
	meloxicam			15 mg, tab, PO, Daily, Routine, Start: T;N
	diclofenac (diclofenac sodium DR)			50 mg, EC tab, PO, Q12 HR, Routine, Start: T;N
	pregabalin			25 mg, cap, PO, Q12 HR, Routine, Start: T;N
	DULoxetine			30 mg, EC cap, PO, Daily, Routine, Start: T;N
	nortriptyline			10 mg, cap, PO, Every Bedtime, Routine
	amitriptyline			25 mg, tab, PO, Every Bedtime, Routine
	methocarbamol			750 mg, tab, PO, Q6 HR, PRN, For: Spasm, Routine
	baclofen			5 mg, tab, PO, Q8 HR, PRN, For: Spasm, Routine
	tiZANidine			2 mg, tab, PO, Q8 HR, PRN, For: Spasm, Routine
	cyclobenzaprine			5 mg, tab, PO, Q8 HR, PRN, For: Spasm, Routine
	*** Patients UNABLE to tolerate enteral medications ***			
	Avoid ketorolac in patients with history of GI bleed. Use with caution in patients: - greater than or equal to 65 years old, - SCr greater than 1.2 mg/dL or eGFR less than 30, - less than 60 kg, or - history of peptic ulcer disease			
	ketorolac			15 mg, inj soln, IV, Q8 HR, Routine, Start: T;N, for 3 day(s), Note: Hold for patients tolerating diet
	methocarbamol			750 mg, inj soln, IV, Q8 HR, PRN, For: Spasm, Routine
	lidocaine topical (lidocaine 4% topical film)			1 patch(es), patch, TRANSDERMAL, Daily, Routine, Note: Patch ON 0900-2100. RN to remove after 12 hours (Patch OFF 2100-0900).
	dexamethasone			4 mg, inj soln, SLOW IV PUSH, Q12 HR, Routine, Start: T;N, for 2 dose(s) Give over 3-5 minutes
	acetaminophen (acetaminophen rectal suppository)			650 mg, supp, RECTAL, Q6 HR, Routine, Note: MAX 4 g/day, all sources.
	For IV acetaminophen: Contact APS (SEA) or Pharmacy (YAK) about ordering if patient is unable to use PO or PR formulations			
ADULT Pain Medications - Multiple Dose, HOSP, Primary & Rescue Opioids: Enteral (Initiated Pending) 06/01/2020 11:28				
Medications				
	*** To order ONE-TIME OPIOID doses, use PowerPlan: ADULT Pain Medications - Single Dose, HOSP ***			
Primary & Rescue Opioids				
	PRIMARY OPIOID - For Moderate to Severe (4-10) or Anticipatory Pain Recommend starting with low doses and titrating slowly			
	RESCUE OPIOID (Optional) - for pain not relieved by Primary Opioid. If needed more than 3x in a 24 hour period contact provider to consider titrating PRIMARY OPIOID. Use drop-down options for rescue doses. Maintain same opioid and same frequency as Primary Opioid. If higher dose than drop-down required, recommend APS (SEA) or Pain Specialist (YAK).			
	*** Patients ABLE to tolerate enteral medications ***			
	PRIMARY & RESCUE - oxyCODONE oral tablet			
	oxyCODONE (oxyCODONE oral tablet)			5 mg, tab, PO, Q4 HR, PRN, For: Mod-Severe (4-10) OR Anticipatory Pain, Routine, Note: PRIMARY OPIOID * PRIMARY OPIOID *
	oxyCODONE (oxyCODONE oral tablet)			5 mg, tab, PO, Q4 HR, PRN, For: RESCUE DOSE for Pain, Routine, Note: May only be given for pain not relieved after primary opioid peak effect, within 30-90 mins. If administered more than 3x in ... * RESCUE OPIOID *
	PRIMARY & RESCUE - oxyCODONE oral solution			
	oxyCODONE (oxyCODONE 5 mg/5 mL oral solution)			5 mg, oral soln, PO, Q4 HR, PRN, For: Mod-Severe (4-10) OR Anticipatory Pain, Routine, Note: PRIMARY OPIOID * PRIMARY OPIOID *
	oxyCODONE (oxyCODONE 5 mg/5 mL oral solution)			5 mg, oral soln, PO, Q4 HR, PRN, For: RESCUE DOSE for Pain, Routine, Note: May only be given for pain not relieved after primary opioid peak effect, within 30-90 mins. If administered more than 3... * RESCUE OPIOID *

$		Component	Status	Dose ...	Details
		PRIMARY & RESCUE - HYDROmorphone oral tablet			
		HYDROmorphone (HYDROmorphone oral tablet)			2 mg, tab, PO, Q4 HR, PRN, For: Mod-Severe (4-10) OR Anticipatory Pain, Routine, Note: PRIMARY OPIOID * PRIMARY OPIOID *
		HYDROmorphone (HYDROmorphone oral tablet)			2 mg, tab, PO, Q4 HR, PRN, For: RESCUE DOSE for Pain, Routine, Note: May only be given for pain not relieved after primary opioid peak effect, within 30-90 mins. If administered more than 3x in ... * RESCUE OPIOID *
		PRIMARY & RESCUE - morphine oral tablet			
		morphine (morphine oral tablet)			7.5 mg, tab, PO, Q4 HR, PRN, For: Mod-Severe (4-10) OR Anticipatory Pain, Routine, Note: PRIMARY OPIOID * PRIMARY OPIOID *
		morphine (morphine oral tablet)			7.5 mg, tab, PO, Q4 HR, PRN, For: RESCUE DOSE for Pain, Routine, Note: May only be given for pain not relieved after primary opioid peak effect, within 30-90 mins. If administered more than 3x i... * RESCUE OPIOID *
		PRIMARY & RESCUE - morphine oral solution			
		morphine (morphine 2 mg/mL oral solution)			10 mg, oral soln, PO, Q4 HR, PRN, For: Mod-Severe (4-10) OR Anticipatory Pain, Routine, Note: PRIMARY OPIOID * PRIMARY OPIOID *
		morphine (morphine 2 mg/mL oral solution)			10 mg, oral soln, PO, Q4 HR, PRN, For: RESCUE DOSE for Pain, Routine, Note: May only be given for pain not relieved after primary opioid peak effect, within 30-90 mins. If administered more than ... * RESCUE OPIOID *
		PRIMARY & RESCUE - acetaminophen-HYDROcodone 325 mg-5 mg oral tablet			
		acetaminophen-HYDROcodone (acetaminophen-HYDROcodone 325 mg-5 mg tablet)			1 tab(s), tab, PO, Q6 HR, PRN, For: Mod-Severe (4-10) OR Anticipatory Pain, Routine, Note: PRIMARY OPIOID * PRIMARY OPIOID *
		acetaminophen-HYDROcodone (acetaminophen-HYDROcodone 325 mg-5 mg tablet)			1 tab(s), tab, PO, Q6 HR, PRN, For: RESCUE DOSE for Pain, Routine, Note: May only be given for pain not relieved after primary opioid peak effect, within 30-90 mins. If administered more than 3x ... * RESCUE OPIOID *
		PRIMARY - acetaminophen-HYDROcodone 325 mg-10 mg oral tablet RESCUE - acetaminophen-HYDROcodone 325 mg-5 mg oral tablet			
		acetaminophen-HYDROcodone (acetaminophen-HYDROcodone 325 mg-10 mg tablet)			1 tab(s), tab, PO, Q6 HR, PRN, For: Mod-Severe (4-10) OR Anticipatory Pain, Routine, Note: PRIMARY OPIOID * PRIMARY OPIOID *
		acetaminophen-HYDROcodone (acetaminophen-HYDROcodone 325 mg-5 mg tablet)			1 tab(s), tab, PO, Q6 HR, PRN, For: RESCUE DOSE for Pain, Routine, Note: May only be given for pain not relieved after primary opioid peak effect, within 30-90 mins. If administered more than 3x ... * RESCUE OPIOID *
		PRIMARY & RESCUE - acetaminophen-HYDROcodone 325mg-7.5 mg/15 mL oral solution (YAK only)			
		acetaminophen-HYDROcodone (acetaminophen-HYDROcodone 325mg-7.5 mg/15 mL oral ...			10 mL, oral soln, PO, Q6 HR, PRN, For: Mod-Severe (4-10) OR Anticipatory Pain, Routine, Note: PRIMARY OPIOID * PRIMARY OPIOID *
		acetaminophen-HYDROcodone (acetaminophen-HYDROcodone 325mg-7.5 mg/15 mL oral ...			10 mL, oral soln, PO, Q6 HR, PRN, For: RESCUE DOSE for Pain, Routine, Note: May only be given for pain not relieved after primary opioid peak effect, within 30-90 mins. If administered more than ... * RESCUE OPIOID *
		PRIMARY & RESCUE - acetaminophen-oxyCODONE 325 mg-5 mg oral tablet			
		acetaminophen-oxyCODONE (acetaminophen-oxyCODONE 325 mg-5 mg)			1 tab(s), tab, PO, Q6 HR, PRN, For: Mod-Severe (4-10) OR Anticipatory Pain, Routine, Note: PRIMARY OPIOID * PRIMARY OPIOID *
		acetaminophen-oxyCODONE (acetaminophen-oxyCODONE 325 mg-5 mg)			1 tab(s), tab, PO, Q6 HR, PRN, For: RESCUE DOSE for Pain, Routine, Note: May only be given for pain not relieved after primary opioid peak effect, within 30-90 mins. If administered more than 3x ... * RESCUE OPIOID *
		PRIMARY & RESCUE - acetaminophen-codeine 300 mg-30 mg oral tablet			
		acetaminophen-codeine (acetaminophen-codeine 300 mg-30 mg)			1 tab(s), tab, PO, Q6 HR, PRN, For: Mod-Severe (4-10) OR Anticipatory Pain, Routine, Note: PRIMARY OPIOID * PRIMARY OPIOID *
		acetaminophen-codeine (acetaminophen-codeine 300 mg-30 mg)			1 tab(s), tab, PO, Q6 HR, PRN, For: RESCUE DOSE for Pain, Routine, Note: May only be given for pain not relieved after primary opioid peak effect, within 30-90 mins. If administered more than 3x ... * RESCUE OPIOID *

$		Component	Status	Dose ...	Details
		PRIMARY & RESCUE - acetaminophen-codeine 120 mg-12 mg/5 mL oral solution			
☐		acetaminophen-codeine (acetaminophen-codeine 120 mg-12 mg/5 mL)			12.5 mL, oral soln, PO, Q6 HR, PRN, For: Mod-Severe (4-10) OR Anticipatory Pain, Routine, Note: PRIMARY OPIOID * PRIMARY OPIOID *
☐		acetaminophen-codeine (acetaminophen-codeine 120 mg-12 mg/5 mL)			12.5 mL, oral soln, PO, Q6 HR, PRN, For: RESCUE DOSE for Pain, Routine, Note: May only be given for pain not relieved after primary opioid peak effect, within 30-90 mins. If administered more tha... * RESCUE OPIOID *
		PRIMARY & RESCUE - codeine oral tablet (SEA only)			
		PRIMARY & RESCUE - traMADol oral tablet			
☐		traMADol			25 mg, tab, PO, Q6 HR, PRN, For: Mod-Severe (4-10) OR Anticipatory Pain, Routine, Note: PRIMARY OPIOID * PRIMARY OPIOID *
☐		traMADol			25 mg, tab, PO, Q6 HR, PRN, For: RESCUE DOSE for Pain, Routine, Note: May only be given for pain not relieved after primary opioid peak effect, within 30-90 mins. If administered more than 3x in... * RESCUE OPIOID *
▲		**ADULT Pain Medications - Multiple Dose, HOSP, Primary & Rescue Opioids: Non-Enteral (Initiated Pending) 06/01/2020 11:28**			
▲		Medications			
		*** To order ONE-TIME OPIOID doses, use PowerPlan: ADULT Pain Medications - Single Dose, HOSP ***			
		Primary & Rescue Opioids			
		PRIMARY OPIOID - For Moderate to Severe (4-10) or Anticipatory Pain Recommend starting with low doses and titrating slowly			
		RESCUE OPIOID (Optional) - for pain not relieved by Primary Opioid. If needed more than 3x in a 24 hour period contact provider to consider titrating PRIMARY OPIOID. Use drop-down options for rescue doses. Maintain same opioid and same frequency as Primary Opioid. If higher dose than drop-down required, recommend APS (SEA) or Pain Specialist (YAK).			
		*** Patients UNABLE to tolerate enteral medications ***			
		Intravenous			
		PRIMARY & RESCUE - HYDROmorphone injectable solution			
☐		HYDROmorphone (HYDROmorphone injectable solution)			0.5 mg, inj soln, SLOW IV PUSH, Q4 HR, PRN, For: Mod-Severe (4-10) OR Anticipatory Pain, Routine, Note: PRIMARY OPIOID * PRIMARY OPIOID * Give over 2 to 3 minutes
☐		HYDROmorphone (HYDROmorphone injectable solution)			0.5 mg, inj soln, SLOW IV PUSH, Q4 HR, PRN, For: RESCUE DOSE for Pain, Routine, Note: May only be given for pain not relieved after primary opioid peak effect, within the following timeframes (PO... * RESCUE OPIOID * Give over 2 to 3 minutes
		PRIMARY & RESCUE - morphine injectable solution			
☐		morphine (morphine injectable solution)			2 mg, inj soln, SLOW IV PUSH, Q4 HR, PRN, For: Mod-Severe (4-10) OR Anticipatory Pain, Routine, Note: PRIMARY OPIOID * PRIMARY OPIOID * Give over 4 to 5 minutes
☐		morphine (morphine injectable solution)			2 mg, inj soln, SLOW IV PUSH, Q4 HR, PRN, For: RESCUE DOSE for Pain, Routine, Note: May only be given for pain not relieved after primary opioid peak effect, within the following timeframes (PO=... * RESCUE OPIOID * Give over 4 to 5 minutes
		PRIMARY & RESCUE - fentaNYL injectable solution			
☐		fentaNYL (fentaNYL injectable solution)			12.5 mcg, inj soln, SLOW IV PUSH, Q2 HR, PRN, For: Mod-Severe (4-10) OR Anticipatory Pain, Routine, Note: PRIMARY OPIOID * PRIMARY OPIOID * Give over 2 minutes
☐		fentaNYL (fentaNYL injectable solution)			12.5 mcg, inj soln, SLOW IV PUSH, Q2 HR, PRN, For: RESCUE DOSE for Pain, Routine, Note: May only be given for pain not relieved after primary opioid peak effect, within the following timeframes (... * RESCUE OPIOID * Give over 2 minutes
		Rectal			
		PRIMARY & RESCUE - HYDROmorphone rectal suppository			
☐		HYDROmorphone (HYDROmorphone rectal suppository)			3 mg, supp, RECTAL, Q4 HR, PRN, For: Mod-Severe (4-10) OR Anticipatory Pain, Routine, Note: PRIMARY OPIOID * PRIMARY OPIOID *
☐		HYDROmorphone (HYDROmorphone rectal suppository)			3 mg, supp, RECTAL, Q4 HR, PRN, For: RESCUE DOSE for Pain, Routine, Note: May only be given for pain not relieved after primary opioid peak effect, within 30-90 mins. If administered more than... * RESCUE OPIOID *

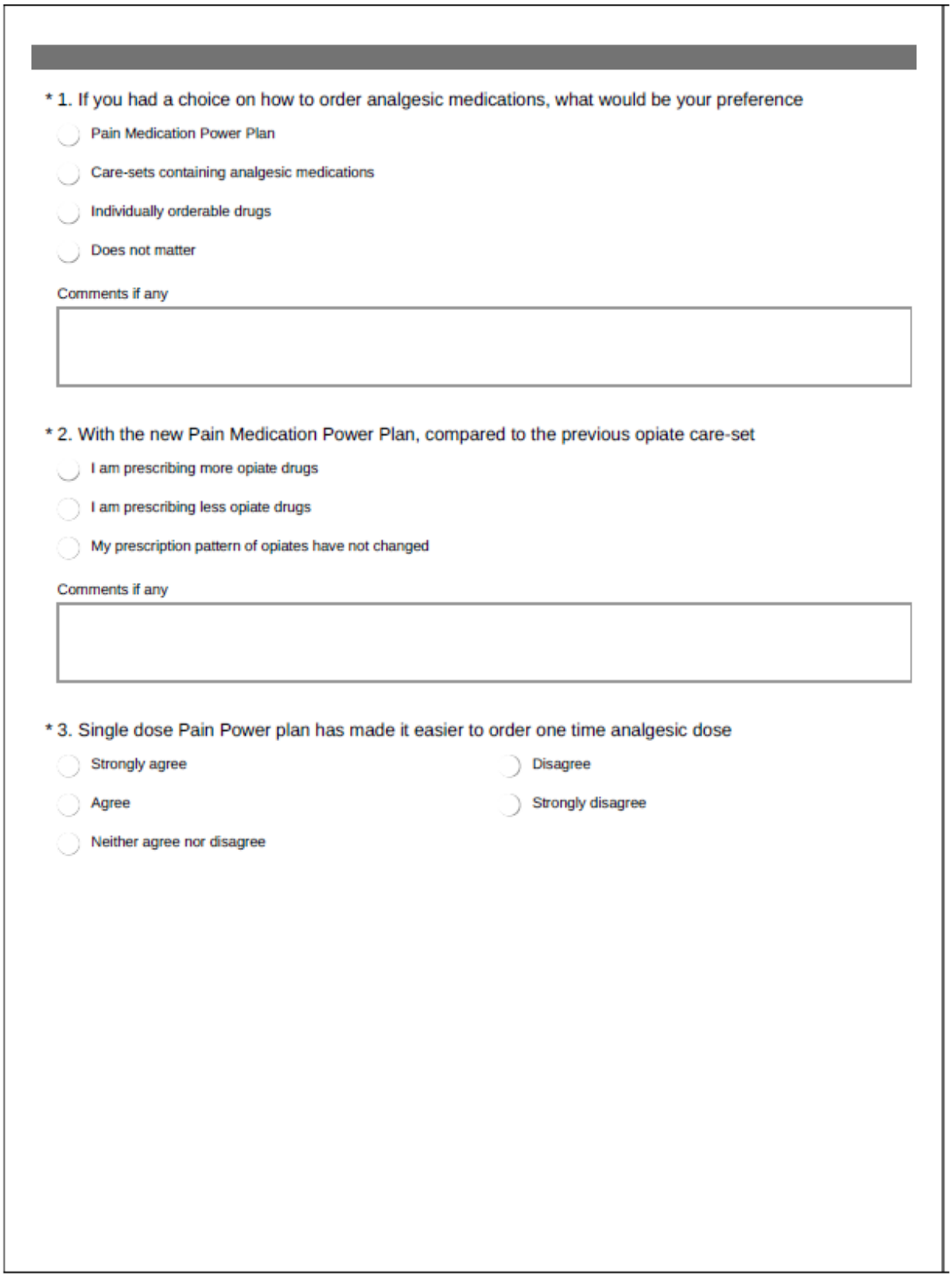
$		Component	Status	Details
Other Indication Opioids				
		Short-term IV Opioid - if unable to tolerate enteral medications, OR immediate onset pain relief indicated To only be used in conjunction with ORAL primary/rescue opioids. Do NOT use in conjunction with IV primary/rescue opioids		
☐		HYDROmorphone (HYDROmorphone injectable solution)		0.5 mg, inj soln, SLOW IV PUSH, Q4 HR, PRN, For: Moderate (4-6) to Severe Pain (7-10), Routine, for 12 hr, Note: Use only if unable to tolerate enteral medications, OR immediate ... * Use only if unable to tolerate enteral medications, OR immediate onset pain relief indicated * Give over 2 to 3 minutes
☐		morphine (morphine injectable solution)		2 mg, inj soln, SLOW IV PUSH, Q4 HR, PRN, For: Moderate (4-6) to Severe Pain (7-10), Routine, for 12 hr, Note: Use only if unable to tolerate enteral medications, OR immediate o... * Use only if unable to tolerate enteral medications, OR immediate onset pain relief indicated * Give over 4 to 5 minutes
ADULT Pain Medications - Multiple Dose, HOSP, Planned Intervention Anticipatory Pain (Initiated Pending) 06/01/2020 11:28				
Medications				
Other Indication Opioids				
		PLANNED INTERVENTIONS - Use drop-down options for selecting order to indicate specific reason for use (ex. "For Dressing Changes only" or "For Radiation Therapy only")		
		For Dressing Changes only		
☐		HYDROmorphone (HYDROmorphone injectable solution)		0.5 mg, inj soln, SLOW IV PUSH, Daily, PRN, For: ANTICIPATORY PAIN FOR SPECIFIED REASON, Routine, Note: For dressing changes only, if immediate onset indicated. * ANTICIPATORY PAIN FOR SPECIFIED REASON * Give over 2 to 3 minutes
☐		morphine (morphine injectable solution)		2 mg, inj soln, SLOW IV PUSH, Daily, PRN, For: ANTICIPATORY PAIN FOR SPECIFIED REASON, Routine, Note: For dressing changes only, if immediate onset indicated. * ANTICIPATORY PAIN FOR SPECIFIED REASON * Give over 4 to 5 minutes
☐		fentaNYL (fentaNYL injectable solution)		12.5 mcg, inj soln, SLOW IV PUSH, Daily, PRN, For: ANTICIPATORY PAIN FOR SPECIFIED REASON, Routine, Note: For dressing changes only, if immediate onset indicated * ANTICIPATORY PAIN FOR SPECIFIED REASON * Give over 2 minutes
		For Radiation Therapy only		
☐		HYDROmorphone (HYDROmorphone injectable solution)		0.5 mg, inj soln, SLOW IV PUSH, Daily, PRN, For: ANTICIPATORY PAIN FOR SPECIFIED REASON, Routine, Note: For radiation therapy only, if immediate onset indicated. * ANTICIPATORY PAIN FOR SPECIFIED REASON * Give over 2 to 3 minutes
☐		morphine (morphine injectable solution)		2 mg, inj soln, SLOW IV PUSH, Daily, PRN, For: ANTICIPATORY PAIN FOR SPECIFIED REASON, Routine, Note: For radiation therapy only, if immediate onset indicated. * ANTICIPATORY PAIN FOR SPECIFIED REASON * Give over 4 to 5 minutes
☐		fentaNYL (fentaNYL injectable solution)		12.5 mcg, inj soln, SLOW IV PUSH, Daily, PRN, For: ANTICIPATORY PAIN FOR SPECIFIED REASON, Routine, Note: For radiation therapy, if immediate onset indicated * ANTICIPATORY PAIN FOR SPECIFIED REASON * Give over 2 minutes
ADULT Pain Medications - Multiple Dose, HOSP, Scheduled Extended-Release Opioids (Initiated Pending) 06/01/2020 11:28				
Medications				
Scheduled Extended-Release Opioids				
		SCHEDULED EXTENDED-RELEASE OPIOIDS - Initiation of extended-release opioids in the hospital setting is generally limited to cancer pain management; strongly consider an Acute Pain Service (APS) consultation (SEA) or Pain Specialist (YAK) for use in other limited clinical scenarios. A consultation is NOT required if continuing the patient's home medication regimen.		
		Extended release tablets are only available in the listed strengths and cannot be split.		
☐		morphine (morphine extended release)		15 mg, ER tab, PO, Q12 HR, Routine, Start: T;N
☐		oxyCODONE (oxyCODONE extended release)		10 mg, ER tab, PO, Q12 HR, Routine, Start: T;N
ADULT Pain Medications - Multiple Dose, HOSP, Specialized Pain Therapy (Initiated Pending) 06/01/2020 11:28				
Medications				
Specialized Pain Therapy				
		SPECIALIZED PAIN THERAPY - If initiating, recommend APS (SEA) or Pain Specialist (YAK) Consult. Not recommended for acute pain or opioid naÃ¯ve patients.		
		buprenorphine-naloxone sublingual tablet		
☐		buprenorphine-naloxone (buprenorphine-naloxone 2 mg-0.5 mg sublingual tab)		1 tab(s), tab, SL, Daily, Routine
☐		buprenorphine-naloxone (buprenorphine-naloxone 8 mg-2 mg sublingual tab)		1 tab(s), tab, SL, Daily, Routine



buprenorphine-naloxone sublingual tablet	
buprenorphine-naloxone (buprenorphine-naloxone 2 mg-0.5 mg sublingual tab)	1 tab(s), tab, SL, Daily, Routine
buprenorphine-naloxone (buprenorphine-naloxone 8 mg-2 mg sublingual tab)	1 tab(s), tab, SL, Daily, Routine
Concentrated Oral Solution Opioid - Before selecting, please review patient needs with pharmacy	
oxyCODONE (oxyCODONE 20 mg/mL (conc) oral solution)	mg, oral conc, PO, Q4 HR, PRN, For: Pain, Routine, Note: For: Pain (4-10) NOT improved with current scheduled or prn analgesics
morphine (morphine 20 mg/ mL (conc) oral solution)	mg, oral conc, PO, Q4 HR, PRN, For: Pain, Routine, Note: For: Pain (4-10) NOT improved with current scheduled or prn analgesics
Methadone Conversion	
Pain Plan: Methadone Conversion Table/ Ref. Text	Note: Right Click to view conversion chart in Reference Manual
For doses greater than 50 mg, the concentrated oral methadone (10 mg/mL) should be used	
methadone (methadone oral tablet)	mg, tab, PO, Daily, Routine
methadone (methadone 10 mg/mL (conc) oral solution)	mg, oral conc, PO, Daily, Routine
Fentanyl transdermal is NOT recommended in: - treatment of acute pain or - opioid naÃ¯ve patients	
Refer to Opioid Conversion Tables/Ref. Text for conversion prior to ordering fentanyl transdermal	
fentaNYL (fentaNYL 12 mcg/hr transdermal film, extended-release)	1 patch(es), patch, TRANSDERMAL, Q72 Hours, Routine
fentaNYL (fentaNYL 25 mcg/hr transdermal film, extended-release)	1 patch(es), patch, TRANSDERMAL, Q72 Hours, Routine
fentaNYL (fentaNYL 50 mcg/hr transdermal film, extended-release)	1 patch(es), patch, TRANSDERMAL, Q72 Hours, Routine
fentaNYL (fentaNYL 75 mcg/hr transdermal film, extended-release)	1 patch(es), patch, TRANSDERMAL, Q72 Hours, Routine
fentaNYL (fentaNYL 100 mcg/hr transdermal film, extended-release)	1 patch(es), patch, TRANSDERMAL, Q72 Hours, Routine
ADULT Pain Medications - Multiple Dose, HOSP, Adverse/Side Effect Management (Initiated Pending) 06/01/2020 11:28	
Medications	
Adverse/Side Effect Management	
ADVERSE/SIDE EFFECT MANAGEMENT	
*** If ordering opioids, please also order a Bowel Management order set ***	
Opioid Reversal	
naloxone	0.1 mg, inj soln, SLOW IV PUSH, Q1 Minute, PRN, For: Respiratory Rate <8 and Unarousable, Routine, Note: May Repeat x 3 Administer over 30 seconds
PRN for Itching	
diphenhydrAMINE	25 mg, cap, PO, Q6 HR, PRN, For: Itching, Routine
diphenhydrAMINE	25 mg, inj soln, SLOW IV PUSH, Q6 HR, PRN, For: Itching, Routine Give no faster than 25 mg per minute
PRN for Nausea or Vomiting	
ondansetron (ondansetron oral tablet, disintegrating)	4 mg, dis tab, PO, Q6 HR, PRN, For: Nausea or Vomiting, Routine
ondansetron	4 mg, inj soln, SLOW IV PUSH, Q6 HR, PRN, For: Nausea or Vomiting, Routine Give over 2 to 5 minutes.
metoclopramide	10 mg, tab, PO, Q6 HR, PRN, For: Nausea or Vomiting, Routine
metoclopramide	10 mg, inj soln, SLOW IV PUSH, Q6 HR, PRN, For: Nausea or Vomiting, Routine Give over 1 to 2 minutes

	*** Patients ABLE to tolerate enteral medications ***	
☐	oxyCODONE (oxyCODONE oral tablet)	5 mg, tab, PO, ONCE, STAT
☐	oxyCODONE (oxyCODONE 5 mg/5 mL oral solution)	5 mg, oral soln, PO, ONCE, STAT
☐	HYDROmorphone (HYDROmorphone oral tablet)	2 mg, tab, PO, ONCE, STAT
☐	morphine (morphine oral tablet)	7.5 mg, tab, PO, ONCE, STAT
☐	morphine (morphine 2 mg/ mL oral solution)	7.5 mg, oral soln, PO, ONCE, STAT
☐	acetaminophen-HYDROcodone (acetaminophen-HYDROcodone 325 mg-5 mg tablet)	1 tab(s), tab, PO, ONCE, STAT
☐	acetaminophen-HYDROcodone (acetaminophen-HYDROcodone 325 mg-10 mg tablet)	1 tab(s), tab, PO, ONCE, STAT
☐	acetaminophen-HYDROcodone (acetaminophen-HYDROcodone 325mg-7.5 mg/15 mL oral soln)	10 mL, oral soln, PO, ONCE, STAT
☐	acetaminophen-oxyCODONE (acetaminophen-oxyCODONE 325 mg-5 mg)	1 tab(s), tab, PO, ONCE, STAT
☐	acetaminophen-codeine (acetaminophen-codeine 300 mg-30 mg)	1 tab(s), tab, PO, ONCE, STAT
☐	acetaminophen-codeine (acetaminophen-codeine 120 mg-12 mg/5 mL)	12.5 mL, oral soln, PO, ONCE, STAT
☐	traMADol	25 mg, tab, PO, ONCE, STAT
	*** Patients UNABLE to tolerate enteral medications ***	
	Intravenous	
☐	HYDROmorphone (HYDROmorphone injectable solution)	0.5 mg, inj soln, SLOW IV PUSH, ONCE, STAT * USE ONLY IF UNABLE TO TOLERATE ENTERAL MEDICATIONS * Give over 2 to 3 minutes
☐	morphine (morphine injectable solution)	2 mg, inj soln, SLOW IV PUSH, ONCE, STAT * USE ONLY IF UNABLE TO TOLERATE ENTERAL MEDICATIONS * Give over 4 to 5 minutes
☐	fentaNYL (fentaNYL injectable solution)	12.5 mcg, inj soln, SLOW IV PUSH, ONCE, STAT * USE ONLY IF UNABLE TO TOLERATE ENTERAL MEDICATIONS * Give over 2 minutes
	Rectal	
☐	HYDROmorphone (HYDROmorphone rectal suppository)	3 mg, supp, RECTAL, ONCE, STAT * USE ONLY IF UNABLE TO TOLERATE ENTERAL MEDICATIONS *
Specialized Pain Therapy		
	SPECIALIZED PAIN THERAPY - If initiating, recommend APS (SEA) or Pain Specialist (YAK) Consult. Not recommended for acute pain or opioid naÃ¯ve patients.	
	buprenorphine-naloxone sublingual tablet	
☐	buprenorphine-naloxone (buprenorphine-naloxone 2 mg-0.5 mg sublingual tab)	1 tab(s), tab, SL, ONCE, STAT
☐	buprenorphine-naloxone (buprenorphine-naloxone 8 mg-2 mg sublingual tab)	1 tab(s), tab, SL, ONCE, STAT
	Concentrated Oral Solution Opioid - Before selecting, please review patient needs with pharmacy	
☐	oxyCODONE (oxyCODONE 20 mg/mL (conc) oral solution)	mg, oral conc, PO, ONCE, STAT
☐	morphine (morphine 20 mg/ mL (conc) oral solution)	mg, oral conc, PO, ONCE, STAT
	Methadone Conversion	
☐	Pain Plan: Methadone Conversion Table/ Ref. Text	Note: Right click to review conversion chart in reference manual
☐	methadone (methadone oral tablet)	mg, tab, PO, ONCE, STAT
Adverse/Side Effect Management		
	Opioid Reversal	
☑	naloxone	0.1 mg, inj soln, SLOW IV PUSH, Q1 Minute, PRN, For: Respiratory Rate <8 and Unarousable, Routine, for 2 hr, Note: May Repeat x 3 Administer over 30 seconds

Survey Monkey Survey



* 1. If you had a choice on how to order analgesic medications, what would be your preference

- Pain Medication Power Plan
- Care-sets containing analgesic medications
- Individually orderable drugs
- Does not matter

Comments if any

* 2. With the new Pain Medication Power Plan, compared to the previous opiate care-set

- I am prescribing more opiate drugs
- I am prescribing less opiate drugs
- My prescription pattern of opiates have not changed

Comments if any

* 3. Single dose Pain Power plan has made it easier to order one time analgesic dose

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

* 4. It is EASIER to do the following in the Multi dose Pain Medication Power Plan compared to previous care sets

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
To find the drug you are looking for					
To order the drug					
To know the drug status (active, completed, discontinued)					
To discontinue a drug					
To re-order a discontinued/completed drug					

Comments if any

* 5. After the introduction of Multi dose Pain Medication Power Plan, you feel

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Opiate medication adverse drug events have decreased					
It takes less time to order/discontinue drugs					
Number of clicks to order/discontinue drugs have decreased					
Better Pain control has been achieved on your patients					
Number of pages related to pain control have decreased					

Comments if any

* 6. Regarding Pain Medication Power Plan

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Go-live training was adequate	○	○	○	○	○
Default dose range seems appropriate	○	○	○	○	○
Default dose frequency seems appropriate	○	○	○	○	○
Defaulting NSAID drugs to scheduled instead of PRN was appropriate	○	○	○	○	○
Defaulting acetaminophen to scheduled instead of PRN was appropriate	○	○	○	○	○
Defaulting opiates to "PRN" was appropriate	○	○	○	○	○

Comments if any

* 7. With the Pain Medication Power Plan, you are

- ○ Very satisfied
- ○ Satisfied
- ○ Neither satisfied nor dissatisfied
- ○ Dissatisfied
- ○ Very dissatisfied

Comments if any

* 8. Pain Medication Power plan has improved your workflow around Pain control

- ○ Strongly agree
- ○ Agree
- ○ Neither agree nor disagree
- ○ Disagree
- ○ Strongly disagree

Comments if any

* 9. COVID-19 Pandemic has altered the way you use Pain Medication Power Plan

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

Comments if any

10. How can we improve the Pain Medication Power plan design?