

# TOOL KIT

## Patient Controlled Analgesia (PCA) Guidelines of Care

For the Opioid Naïve Patient

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UNIVERSITY of CALIFORNIA, SAN DIEGO  
MEDICAL CENTER

HOSPITAL ASSOCIATION  
of San Diego and Imperial Counties



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## About This Document

The purpose of this document is to provide San Diego County Acute Care settings with recommendations for the standardization of intravenous Patient Controlled Analgesia (PCA) medication administration in the care of the opioid naïve patient. These recommendations **exclude** the use of epidural PCA (PCEA), subcutaneous PCA use, the palliative care environment, and patients experiencing chronic pain.

## Intended Audience

The document is intended for the Acute Care Clinical Leader.

## Organization of This Document

The document is organized into two main sections: recommended clinical guidelines for Opioid PCA usage, and recommended plan for implementing the guidelines in your institution.

## Acknowledgement

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## Introduction

**Patient Controlled Analgesia (PCA)** is an interactive method of pain management that permits patients to manage their pain by self-administering doses of analgesics, usually opioids.<sup>1</sup>

### Current State

Patient Controlled Analgesia (PCA) can be an effective tool in reducing pain. However, IV medications in general are associated with the highest risk of harm to patients, and opioids are typically considered among the highest risk injectable medications.<sup>2</sup>

PCA is a complicated, yet highly flexible means of providing opioids, consisting of several regimen elements addressed primarily in the Ordering and Administration stages of the medication process.<sup>3</sup>

For the purpose of this document, PCA prescription elements will respect the nomenclature outlined in *Vendor Specific PCA Ordering/Programming Terms* (see Appendix A). A cross-walk also is provided for available PCA devices.

The use of PCA is a complex, high-risk treatment that is associated with harmful events and death.<sup>4</sup> Extensive variability exists within and between hospital environments. Variability in patient response, clinical staffing, equipment, physician orders, medication dosages, and concentrations all contribute to risk for error.

There is a shared need amongst hospitals to address PCA Guidelines of Care for the Opioid Naïve Patient. Every clinician and hospital environment has a PCA story<sup>5</sup>, such as is evident in the national MedMARX database of voluntarily reported medication errors:

- PCA errors represent a four-fold higher risk than other reported medication errors:
  - PCA errors account for approximately one percent of all medication errors, but 6.5 percent were harmful.
- PCA errors occur in every phase of the medication-use process.

- PCA errors involve many disciplines including nurses, pharmacists, and physicians.
- PCA process is highly error prone and represents opportunities for improvement including the need to simplify, standardize, and clarify, as follows:
  - Equipment-related issues present challenges including pump misprogramming, complexity, and confusion of PCA screens and drug selection options.

Administration is especially vulnerable, with less opportunity to intercept an error as there is no inherent redundancy in this stage. Landmark medication safety research has found only a 0-2 percent medication error interception rate in the Administration stage.<sup>6</sup>

In 1999, the Joint Commission recommended these practice changes to improve opioid safety:

- Limit the opiates and narcotics available in floor stock.
- Educate staff about HYDROMORPHONE and morphine mix-ups.
- Implement PCA protocols that include double-checking of the drug, pump setting, and dosage.

Other health care leaders also have strongly advocated for process simplification and standardization, including the Institute for Safe Medication Practice as published in their most recent safety improvement recommendations (summarized here):<sup>7</sup>

- **Assess vulnerability to serious errors.** Medication safety teams should review current practices around the use of custom concentrations.
- **Limit concentrations.** When possible, a single, standard concentration for each PCA drug should be used. If more than one concentration is deemed necessary by the organization, the number of standard concentrations should be limited to two at the most. Additionally, the use of custom concentrations should be minimized and, when possible, restricted to selected patient care areas.
- **Distinguish custom concentrations.** When a custom concentration is necessary, the container label should be very distinctive and should not look like the standard PCA syringe/bag label. Auxiliary labels (e.g., “High-Potency”) and a different color pharmacy label with specific instructions for programming the pump should be used for custom concentrations.
- **Clarify the label.** Institute for Safe Medication Practices (ISMP) usually recommends presenting the total drug concentration in the bag/syringe first, followed by the amount of drug per mL below this within the same background or border on the product label.

<sup>1</sup> Pasero C, McCaffery M. (2004). Safe use of continuous infusion with IV PCA. *J PeriAnesth Nurs.* 19(1), 42-45.

<sup>2</sup> ISMP. List of high-alert medications. (2008). [www.ismp.org/tools/highalertmedications.pdf](http://www.ismp.org/tools/highalertmedications.pdf). The Joint Commission. High-alert medications and patient safety. *Sentinel Event Alert.* Issue 11. Nov. 19, 1999.

<sup>3</sup> The Joint Commission. Standards Initiative Medication Management: Medication Management Practices stages. [www.jointcommission.org/NR/rdonlyres/B0D4CAB2-787C-4564-B408-D3EB138EDB6D/0/HAP\\_MM\\_Outline.pdf](http://www.jointcommission.org/NR/rdonlyres/B0D4CAB2-787C-4564-B408-D3EB138EDB6D/0/HAP_MM_Outline.pdf).

<sup>4</sup> Hicks RW, Sikirica V, Nelson W, Schein JR, Cousins, DD. (Mar 2008). Medication errors involving patient-controlled analgesia. *Am. J. Health Syst. Pharm.* 65, 429-440.

<sup>5</sup> Lotsch J, Dudziak R, Freynhagen R, Marschner J, Geisslinger, G. (2006). Fatal respiratory depression after multiple intravenous morphine injections. *Clin Pharmacokinet.* 45, 11. Adis Data Information BV.

<sup>6</sup> Leape L, Bates DW, Cullen DJ, et al. (1995) *JAMA.* 274(1), 35-43.

Bates DW, Cullen DJ, Laird N, et al. (1995). *JAMA.* 274(1), 29-34.

<sup>7</sup> ISMP. Misprogramming PCA concentration leads to dosing errors. August 28, 2008 issue. [www.ismp.org/d/SpecialFollowUp.pdf](http://www.ismp.org/d/SpecialFollowUp.pdf).

Depending on the PCA pump vendor, the user may be prompted to enter the concentration in a mg/mL strength. In these cases, it would be safer to indicate the concentration with the amount of drug per mL listed first, followed by the total amount of drug/total volume in the syringe/bag.

- **Match the MAR to the label.** The concentration on the Medication Administration Record (MAR) should be listed the same as the PCA label.
- **Employ an independent double-check.** The narcotics used for PCA are high-alert medications; thus, an independent double-check of the product and pump programming should be considered. When replacing an empty syringe/bag, the empty container should be compared to the new container to verify the concentration is the same.
- **Use barcoding technology.** Some infusion pumps incorporate barcoding technology. Scanning the barcode on the PCA bag would help ensure the correct concentration is entered during PCA programming.
- **Use smart pumps.** PCA pumps with Dose Error Reduction System (DERS) should be used whenever possible. Because the significance of a low concentration alert during pump programming is not fully appreciated, low concentration limits should always be set as hard limits. Additionally, clinical advisories should be in place to reinforce caution when using custom concentrations.

In 2000, the Institute of Medicine’s (IOM) original landmark patient safety report, “To Err Is Human: Building a Safer Health System” concluded:

*“Patient safety programs should...incorporate well-understood safety principles, such as standardizing and simplifying equipment, supplies, and processes.”<sup>8</sup>*

The 2006 IOM report, “Preventing Medication Errors,” urges hospitals to take action to reduce the potential for errors. For all of these reasons and as part of continuing efforts to improve patient and medication safety, the San Diego Patient Safety Council was formed for community-

wide patient safety improvements. San Diego County hospitals identified PCA as a significant opportunity to reduce morbidity and mortality.

### Goal Charter

The San Diego Patient Safety Council members desired to develop county-wide, evidenced-based standards of care for safe and effective pain management using PCA in opioid naïve patients.

### Performance Improvement

The San Diego Patient Safety Council consists of representatives from county acute facilities and disciplines. Council members reviewed literature, applied process improvement tools, and obtained consensus to build a comprehensive set of recommendations to prevent potential PCA errors throughout the county. The tool kit includes tools and information to assist acute care organizations in implementing these recommendations.

Success will be achieved when a safe, effective standard of care for PCA usage is implemented across San Diego County, as evidenced by a reduction in potential and actual harmful events.

### The Pain Management Process

In order to develop a standard of care, the council began by developing a high-level process map for pain management. This process is shown in *Figure 1* and described as follows:

1. The patient is assessed by a registered nurse and a physician. The physician should determine whether the patient is opioid naïve and therefore, a candidate for standard PCA orders. A registered nurse assesses the patient’s cognitive function to determine if the patient is able to understand and participate in pain management. The nurse also reviews with the patient any education materials, including what is pain assessment and how to achieve pain relief with the PCA pump.

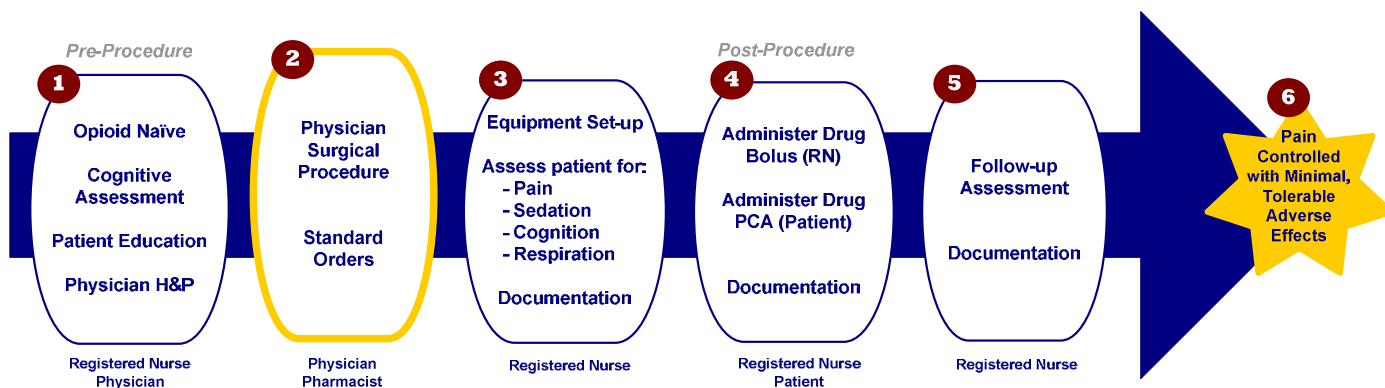


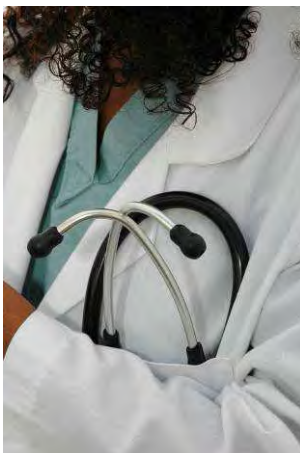
Figure 1: Pain Management Process

<sup>8</sup> Kohn KT, Corrigan JM, Donaldson MS. (2000). To err is human: building a safer health system. IOM. Washington, D.C. National Academic Press. 156.

2. The surgical procedure is performed by the physician and the physician implements the standard PCA orders. The pharmacist validates that the appropriate PCA orders are used, based on whether the patient is opioid naïve, and dispenses the standard PCA syringe. The orders are executed, as well as obtaining the appropriate supplies, drug, IV access, monitoring devices, and equipment.
3. A registered nurse assesses the following: **vital signs, pain, sedation, and rate and quality of respirations**. Additional patient education should be provided prior to starting the PCA pump. The PCA pump is set up by the registered nurse with the pump programming independently verified by another registered nurse. The pump settings are documented in the patient’s Medication Administration Record.
4. A bolus of pain medication, if ordered, is administered by the registered nurse using the PCA pump. Subsequent doses of pain medication are self-administered by the patient using the PCA pump. The medication administration and follow-up assessments are documented in the patient’s record.
5. A registered nurse performs follow-up assessments and adjustments to the PCA settings based on standard orders. At consistent intervals, the nurse determines the patient’s response to the ordered pain management approach. Assessment results are documented in the patient’s chart.
6. The result of the process is safe and effective pain control.

**Failure Modes**

As part of the current state assessment, the council conducted an analysis of potential failure modes with PCA usage. This information was valuable when the council worked through the medication administration process to problem-solve. The council attempted to address all of these failure modes in recommendations provided in this tool kit.



**Guidelines for PCA Usage**

**Starting Standard Orders**

It is strongly recommended as a best practice for healthcare professionals to use standard starting orders for PCA use to reduce the incidence of respiratory depression and improve patient safety.<sup>9</sup>

**Standard PCA Parameters for Opioid Naïve Adult Patients**

The council identified the starting parameters for PCA therapy for adults, as detailed in *Table 1*. This table provides parameters for the three most commonly used PCA drugs as a dosing conversion table. These orders are included in the complete standard order set in *Appendix B*.

*Table 1: Standard PCA Parameters for Opioid Naïve Adult Patients*

Standard PCA Parameters for Opioid Naïve Adult Patients			
	morphine	HYDROmorphine	fentaNYL
1x (single strength)	1mg/ml	0.2 mg/ml (200 mcg/ml)	10 mcg/ml
Loading Bolus	2 mg	0.4 mg (400 mcg)	20 mcg
Clinician Bolus	2 mg	0.4 mg (400 mcg)	20 mcg
Number of Clinician Boluses Per Hour	1	1	1
PCA Dose	1 mg	0.2 mg (200 mcg)	10 mcg
Lockout	10 minutes	10 minutes	10 minutes
Total Drug Over Time	Optional	Optional	Optional
Max Number of Patient Demand Doses Per Hour	Optional	Optional	Optional
Basal	Not recommended for starting PCA		

<sup>9</sup> Weber LM, Ghafoor VL, Phelps P. (2008 Jun 15). Implementation of standard order sets for patient-controlled analgesia. *Am J Health Syst Pharm.* 65(12), 1184-1191.


Pasero C. (February 2007). IV opioid range orders for acute pain management. *AJN.* 107(2), 52-59.

Gammaitoni AR, Fine P, Alvarez N, McPherson ML, Bergmark S. (2003). Clinical application of opioid equianalgesic data. *The Clinical Journal of Pain.* 19, 286-297.

### Standard PCA Starting Orders for Opioid Naïve Pediatric Patients

The council identified the starting parameters for PCA therapy for children, as detailed in *Table 2*. The same drugs used for adults are used for children, but in doses adjusted by body weight. Children should be assessed for developmental age and cognitive ability prior to initiating PCA use.

**Table 2: Standard PCA Parameters for Pediatric Patients**

Standard PCA Parameters for PEDIATRIC Patients			
	morphine	HYDROmorphone	fentaNYL
1x (single strength)	1 mg/ml	200 mcg/ml	10 mcg/ml
Loading Bolus	0.04 mg/kg (40 mcg/kg)	8 mcg/kg	0.5 mcg/kg
Clinician Bolus	0.04 mg/kg (40 mcg/kg)	8 mcg/kg	0.5 mcg/kg
Number of Clinician Boluses Per Hour	2	2	2
PCA Dose	0.01 mg/kg (10 mcg/kg)	2 mcg/kg	0.25 mcg/kg
Lockout	10 minutes	10 minutes	10 minutes
Basal / Continuous Rate of Infusion	0.005 mg/kg/hr Optional (5 mcg/kg/hr)	1 mcg/kg/hr Optional	0.25 mcg/kg/hr Optional
Total Drug Over Time	0.1 mg/kg/hr (100 mcg/kg/hr)	20 mcg/kg/hr	3 mcg/kg/hr Optional
Max Number of Patient Demand Doses Per Hour	Call if >3 in 2 hours	Call if >3 in 2 hours	Call if >3 in 2 hours

### Conversion Instruction/Table

Physicians and other healthcare professionals may be faced with switching to an alternative opioid during the course of a patient’s pain management. While PCA may be administered subcutaneously, it is most common for advanced disease or end-of-life care. Subcutaneous PCA and Epidural PCA are beyond the scope of this project.

The following conversion table is provided to assist health care professionals in determining dosing when changing from IV to PO.

**Table 3: Equianalgesic Table Conversion IV to PO<sup>10</sup>**

Equianalgesic Table Conversion IV to PO		
Opioid	Parenteral	PO
codeine	130 mg	200 mg
fentaNYL	0.1 mg (100 mcg)	—
HYDROcodone	—	30 mg
HYDROmorphone	1.5 mg	7.5 mg
morphine	10 mg	30 mg
oxymorphone	1 mg	—
oxyCODONE	—	20–30 mg

### Assessment for PCA Appropriateness

Recommendations by the council for assessments prior to and throughout the administration of opioids using PCA are as follows:

- Pre-Procedure Cognitive Assessment
- Opioid Tolerant or Opioid Naïve?
- Pain Assessment
- Sedation Assessment
- Respiratory Assessment.

Further description of each assessment is described in the following sections.

### Pre-Procedure Cognitive Assessment

PCA requires patients to be active participants in their pain relief. The purpose of the cognitive assessment is to determine if a patient is capable of participating in his/her pain management.

For this reason, it is necessary to evaluate the patient’s mental status, level of consciousness, and developmental status to be sure that PCA is an appropriate method to manage pain. This can be accomplished with a standard nursing assessment.<sup>11</sup>

<sup>10</sup> Patanwala AE, Duby J, Waters D, and Erstad BL. (2007). Opioid conversions in acute care. *The Annals of Pharmacotherapy*. 41, 255-267.

<sup>11</sup> The Joint Commission. (December 20, 2004). Patient controlled analgesia by proxy. *Sentinel Event Alert*. Issue 33.

Furthermore, it is recommended that PCA is initiated only when a patient is able to and has indicated the following:

- A willingness to use PCA for pain management
- An understanding of the relationship between pain, pressing the PCA button, and pain relief
- An understanding of the dosing interval
- A return demonstration of self-administering a PCA dose by pushing the PCA button, or simulating this action if a PCA pump is not available

### PCA Patient Education

Patient and family education is critical for safe, effective use of PCA. Education must be provided to patients prior to initiation of PCA

**Best Practice Recommendation:**  
Patient education should be done pre-operatively for post-operative use of PCA.

and must address their role in managing their pain, specific information on pump operation, safety measures, and when to alert a nurse. Education must include family members to clearly emphasize the hazards of anyone other than the patient administering a PCA dose. Serious adverse events can result when family members administer “PCA by proxy.”

Written and verbal patient education must include the following elements:

- Definition of what PCA is and the patient’s responsibility in managing pain.
- Clarification of the goal of pain management: not to completely eliminate pain, but to effectively control pain so the patient can engage in therapeutic activities.
- General pump operation and function of the PCA button.
- Safety features of the pump to prevent overdose, such as pump delay or lockout interval, limit on total dosage in a set time interval, and patient administered dosing.
- Prominent warning on dangers of PCA by proxy.
- Elements, purpose, and frequency of ongoing monitoring, so the patient understands and expects *to be awakened/to be monitored frequently* to assess level of sedation.
- Description of when to alert the nurse: inadequate pain control; side effects such as nausea, sleepiness, itching, and constipation; help with getting out of bed; and any safety concerns, such as pump operation.

Verbal instruction is essential to verify patient understanding, preferably pre-operatively for the patient undergoing surgery. A written resource or handout also is necessary to reinforce PCA information. Offering written resources in a language the patient understands should be considered.

## Opioid Tolerant or Opioid Naïve?

Critical to the pain management process is determining if the patient is opioid naïve or opioid tolerant. The following definitions should be used as guidelines when determining a patient’s opioid status:

### Definition of Opioid Tolerant

*“Patients who are considered opioid-tolerant are those who have been taking, for a week or longer, at least 60 mg of morphine daily, or at least 30 mg of oral oxycodone daily, or at least 8 mg of oral HYDRomorphone daily, or an equianalgesic dose of another opioid.” (Food and Drug Administration)*

This history must immediately precede the intended course of PCA therapy. If a wash-out period of a week or longer has occurred since the above dosages were taken, reconsider whether the patient truly meets this definition of tolerance.

### Definition of Opioid Naïve

Patients who do not meet the definition of opioid tolerant, who have not had narcotics doses at least as much as those listed above for a week or more, are considered to be opioid naïve.

If the patient is opioid tolerant and in need of chronic pain management, it is recommended that experts for pain management are consulted. If the patient is opioid naïve and needs postoperative pain management, the orders contained within this tool kit are suggested.

## Pain Assessment

Consistent pain assessment is essential to support appropriate continued monitoring and evaluation of a treatment’s effectiveness. Standard pain assessment is useful for eliciting a patient’s response or description of discomfort, as well as ensuring clear communication. It is useful to show the patient each of these scales to see which they feel best helps them describe the pain.

Council members’ recommended tool for pain assessment is the 0-10 Pain Faces Scale (Wong-Baker Faces Scale), *Figure 3*. This scale combines facial expressions, textual description, and numeric values ascribed to pain level. This scale was originally developed in the pediatric environment, and then extended to adults as the cartoon faces proved to avoid gender, age, and racial bias. This scale is recommended for patients three years to adult.

Figure 3: Wong-Baker Faces Scale



From Wong D L., Hockenberry-Eaton M., Wilson D., Winkelstein M L., Schwartz P. Wong's Essentials of Pediatric Nursing, 6th, St Louis, 2001, p. 1301. Copyrighted by Mosby, Inc. Reprinted by permission.

## Sedation Assessment

Sedation precedes respiratory depression as less opioid is required to produce it. Therefore, the most effective monitoring of the patient receiving opioids is the systematic ongoing assessment for sedation. For patient’s using PCA, sedation assessment is critical.

The council conducted a thorough literature review of Pasero, Ramsey, and RASS sedation scales.<sup>11 12</sup> Council members also discussed thoroughly which sedation scale to select. RASS is the top choice because it is concise, simple to use, and combines sedation and agitation into one scale.

Some members of the council have elected to use the Pasero scale in their organization specifically for opioid-induced sedation. *While there was not a consensus on a specific scale, the council recommends using a consistent scale across the organization for sedation assessment.* It also is recommended that sedation assessment scales use patient behavioral descriptors as scale reference points. RASS and Pasero scales have been included in this tool kit for reference (Tables 4 and 5).

**Best Practice Recommendation:**  
It is recommended that a healthcare organization use one sedation assessment scale for PCA opioid use.

Table 4: Richmond Agitation Sedation Scale (RASS)<sup>12</sup>

Richmond Agitation Sedation Scale (RASS)	
Score	Term – Description
<b>+4</b>	<b>Combative</b> Overtly combative, violent, immediate danger to staff
<b>+3</b>	<b>Very Agitated</b> Pulls or removes tube(s) or catheter(s), aggressive
<b>+2</b>	<b>Agitated</b> Frequent non-purposeful movement, fights ventilator
<b>+1</b>	<b>Restless</b> Anxious but movements not aggressive, vigorous
<b>0</b>	<b>Alert and Calm</b>
<b>-1</b>	<b>Drowsy</b> Not fully alert, but has sustained awakening (>10 seconds) (eye-opening/eye contact) to voice
<b>-2</b>	<b>Light Sedation</b> Briefly awakens with eye contact to voice (<10 seconds)
<b>-3</b>	<b>Moderate Sedation</b> Movement or eye opening to voice (but no eye contact)
<b>-4</b>	<b>Deep Sedation</b> No response to voice, but movement or eye opening to physical stimulation
<b>-5</b>	<b>Unarousable</b> No response to voice or physical stimulation

<sup>12</sup> Sessler CN, Gosnell M, Grap MJ, Brophy GT, O’Neal PV, Keane KA, et al. (2002). The Richmond Agitation-Sedation Scale: validity and reliability in adult intensive care patients. *Am J Respir Crit Care Med.* 166, 1338-1344.

Ely EW, Truman B, Shintani A, Thomason JWW, Wheeler AP, Gordon S, et al. (2003). Monitoring sedation status over time in ICU patients: the reliability and validity of the Richmond Agitation Sedation Scale (RASS). *JAMA.* 289, 2983-2991.

Table 5: Opioid-induced Sedation Scale<sup>13</sup>

Pasero Opioid-induced Sedation Scale
<b>S</b> = Sleep, easy to arouse
<b>1</b> = Awake and alert
<b>2</b> = Slightly drowsy, easily aroused
<b>3</b> = Frequently drowsy, arousable, drifts off to sleep during conversation
<b>4</b> = Somnolent, minimal or no response to physical stimulation

### Procedure for RASS Assessment

The basis of the RASS assessment is to see what amount of stimulation is necessary to evoke a response and evaluate sedation.

It is recommended to conduct the RASS assessment prior to PCA use, perform the assessment at regular intervals with other assessments, and use the assessment to drive clinical decisions (e.g., continue PCA use, escalate treatment, or reduce or reverse opioid treatment).

The recommended procedure for conducting a RASS assessment and target are:

- 1) **Observe patient.**
  - a) Patient is alert, restless, or agitated. **(Score 0 to +4)**
- 2) **If not alert, state patient’s name and say “open eyes and look at (speaker).”**
  - a) Patient awakens with sustained eye opening and eye contact. **(Score –1)**
  - b) Patient awakens with eye opening and eye contact, but not sustained. **(Score –2)**
  - c) Patient has any movement in response to voice but no eye contact. **(Score –3)**
- 3) **When no response to verbal stimulation, physically stimulate patient by shaking shoulder and/or rubbing sternum.**
  - a) Patient has any movement to physical stimulation. **(Score –4)**
  - b) Patient has no response to any stimulation. **(Score –5)**

**Target:** (or 2 on Pasero)

**RASS Level 1:** With adequate spontaneous respiration.

**If RASS Level 2:** (or 3 on Pasero)

Monitoring should be increased and PCA doses adjusted downward.

**At or below** (or 4 on Pasero)

**RASS Level 3:** The narcotic should be stopped, physician notified, and continuous monitoring conducted. Airway, breathing, and oxygen support should be provided as needed, as well as Naloxone, if indicated.

<sup>13</sup> Pasero C, McCaffery M. (2004). Safe use of continuous infusion with IV PCA. *J PeriAnesth Nurs.* 19(1), 42-45. Pasero C, McCaffery M. Monitoring sedation. (February 2002). *AJN.* 102(2).

## Respiratory Assessment

Monitoring of a patient's respiratory status with ongoing sedation assessment is critical to detecting respiratory depression in opioid-sedated patients on PCA.<sup>14 15</sup>

The council recommends respiratory rate and quality of respirations should be included in a respiratory assessment, as follows:

**Respiratory Rate:** Should be counted for 30 seconds and if respiratory rate is less than 12/minute, then it should be counted for a full minute. Respiratory rates vary a great deal, and normal has quite a wide range.

Regarding PCA use, a respiratory rate below 8/minute should concern anyone. A rate below 9/minute is probably where most clinicians would draw the line, but many policies use 10/minute as a cut-off where opioids would be discontinued. The rate of respiration assessment should be made in context with sedation and pain assessments.

**Quality of Respirations:** The quality of respirations is usually determined by the depth and pattern of respirations, the level of effort, and adventitious sounds. The following terms can be used to describe the quality of respirations (*normal in italics*):

- **Depth:**

Normal: *Chest or abdomen moves average depth with each breath not using accessory muscles*

Shallow: Slight movement of chest or abdomen

Deep: Increased movement of chest or abdomen

- **Ventilatory Effort:**

Effortless/ Comfortable: *Appears relaxed, very little work to breathe*

Labored: Patient has to work hard to move air in and out; use of accessory muscles; nasal flaring; retractions (especially in infants and children)

- **Sound:**

Clear: *Breathy sound when breathing in or out*

Blocked: Obstructed, stuffed sound when attempting to breathe in or out

Noisy: Partially blocked sounds when breathing in or out

Snoring: Partially blocked sounds when breathing in or out

Gurgling: Fluids in the airway sounds when breathing in or out

Stridor: Noisy harsh sound when breathing in or out

<sup>14</sup> Seidel HM, Ball JW, Dains JE, Benedict GW. (2006). *Mosby's guide to physical examination* (ed. 6). St. Louis, MO: Elsevier.

<sup>15</sup> Urden, L. D., Stacy, K. M., & Lough, M. E. (2006). *TheLAN's critical care nursing* (ed. 5). St. Louis, MO: Elsevier.

## Monitoring

### Complete Respiratory Assessment

As opioids depress respiratory effort through central nervous system depression, evaluation of ventilatory status is essential. Using a method that would provide earlier warnings for respiratory problems could improve patient outcomes especially in those patients with known and/or unrecognized respiratory disease. The council examined the limits and benefits of available monitoring devices.<sup>16</sup>

**Best Practice Recommendation:**

*Respiratory assessment should be performed by a registered nurse, and not be a delegated task.*

### Pulse Oximetry (SpO<sub>2</sub>) Monitoring Recommendations

Oxygen saturation is a prudent supplemental assessment measure in patients on PCA therapy, especially those with the following:

- History of sleep apnea
- Obesity
- Conditions that decrease ventilatory capacity
- Over 65 years

Pulse oximetry is primarily useful for assessing changes in oxygenation; it is a late indicator of ventilatory depression.<sup>17</sup> SpO<sub>2</sub> readings may remain normal or near normal for minutes after a patient stops breathing. While it is not an early indicator of ventilatory failure, it eventually falls as the patient stops breathing. Its ubiquitous presence in hospitals, simple measurement, and relatively low expense make it the monitor of choice.

It is recommended that at a minimum the health care professional monitor with pulse oximetry, yet be mindful of the limits to this useful device.

### Supplemental Oxygen Therapy

*Supplemental Oxygen Therapy obscures the effectiveness of using SpO<sub>2</sub> for a respiratory assessment. SpO<sub>2</sub> assessment should be done on room air. For patients on PCA with supplemental oxygen therapy, there is no evidence that routine monitoring of oxygen saturation provides an additional measure of safety. It may provide a false sense of security, since decreased oxygen saturation is a very late sign of respiratory depression in these patients.*

<sup>16</sup> Overdyk FJ, Carter R, Maddox RR, Callura J, Herrin AE, Henriquez C. (2007). Continuous oximetry/capnometry monitoring reveals frequent desaturation and bradypnea during patient-controlled analgesia. Respiratory depression during PCA. *Anesthesia & Analgesia*. 105(2), 412-418.

<sup>17</sup> Hutchison R, Rodriguez L. (2008). Pain control capnography and respiratory depression. *AJN*. 108(2), 35-39.

### Capnography (ETCO2) Monitoring Recommendations

ETCO2 should be considered for assessing ventilation. Capnography measures ventilation continuously and is a more sensitive indicator of hypercapnia. Early studies indicate that capnography is more effective than pulse oximetry in providing early warning of respiratory depression in patients receiving supplemental oxygen. While more research is required, early research shows that patients with the highest risk need additional monitoring – specifically ETCO2 monitoring for opioid-induced sedation.<sup>18</sup>

Capnography is capable of significantly clarifying the respiratory picture with regard to over-sedation, and when used in conjunction with oxygen saturation can dramatically enhance the overall picture of the patient’s respiratory status. Adding capnography to monitoring efforts can optimize patient safety. Although it is expensive and requires training, it is especially useful in patients on supplemental oxygen.

- Document total amount of opioid used at the end of each shift. For those patients who have uncontrolled pain, knowing the amount of opioids used each shift will help facilitate an easier transition to other routes of administration.



### Frequency and Elements of Monitoring

Appropriate assessment drives clinical decision-making. The essential elements of a good assessment are evaluating the right indicators at the right intervals. Table 6 presents the council’s recommendations for PCA monitoring by registered nurses.

Minimal recommended times for a nurse to evaluate pain, sedation, and respiratory assessment also are provided in Table 6. These critical times for evaluation are summarized as follows:

- **Baseline** – prior to initiating the opioid
- **Initiation** of the opioid – especially just after surgery as the patient likely still has opioids circulating from anesthesia
- Any **Change in Drug Supply**:
  - Change of syringe
  - Change of settings
  - Dose change or bolus
- **Event or Deterioration** – such as over-sedation (i.e., RASS scale of -2)
- At any time there is a **“Hand-off”** of care:
  - *Transfer of care* – recommend whenever there is a change in the patient’s care provider.
  - *At shift change* – recommend that the person assuming care of the patient does an independent check of the pump settings, and the off-going care provider and the on-coming care provider conduct the assessment together.

Table 6: Nursing Assessment Event & Frequency Guidelines for PCA Monitoring

Cognitive Opioid Tolerance	Pain	Sedation	Respiratory			
			Rate	Quality	SPO2	ETCO2
Baseline	X	X	X	X	X	X
Initiation OR Change in Drug <sup>†</sup>	X	X	X	X	X	X
Q15 min x 1 hr						
Q1 hr x 4 hrs						
Then Q2hrs						
Dose Change OR Bolus	X	X	X	X	X	X
Q1 hr x 4 hrs						
Then Q2hrs						
Event OR Deterioration	X	X	X	X	X	X
Q15 min x 1 hr						
Q1 hr x 4 hrs						
Then Q2hrs						
Hand-offs/Shift change <sup>*</sup>	X	X	X	X	X	X

<sup>\*</sup> Independent check

<sup>18</sup> McCarter, T; Shaik Z, Scarfo K, Thompson LJ. (2008). Capnography monitoring enhances safety of postoperative patient-controlled analgesia. *American Health & Drug Benefits*. 28-35. Available from <http://www.AHDBonline.com>.

## Adjuvant Therapies

Nausea, vomiting, constipation, and itching are common opioid-induced side effects experienced by patients. Evidenced-based recommendations for treatments to relieve or treat these side effects are discussed in this section. The council strongly recommends that any order set for opioid-naïve PCA use includes treatment for these conditions.

## Constipation Prevention and Treatment

Individuals are considered constipated if bowel movement frequency is less than three times per week.<sup>19</sup> Determining the baseline bowel habits for a patient is recommended as part of the nursing assessment.

The use of opioids for sedation puts each patient at risk for constipation. To address this side effect, the council conducted a review of literature to recommend a treatment.<sup>20</sup> In addition to this treatment, it is important to adjust the patient's diet, activity, and fluid intake, as appropriate, to promote normal bowel habits. Recommendations for therapy dosage for opioid-induced constipation in adults and children are provided in *Table 7*.

**Table 7: Recommended Therapy for Opioid-Induced Constipation**

Recommended Therapy for Opioid-Induced Constipation		
Therapy	Adult	Pediatric
<b>1.) Start treatment with following therapy:</b>		
Senna-S or Senna Plus Docusate	2 tablets PO every morning	Docusate 50 mg/ Sennoside 8.6 mg/tablet PO BID 2-5 yrs – ½ tablet 6-12 yrs – 1 tablet Over 12 yrs – 2 tablets
<b>2.) If the above therapy is ineffective, try the following therapies:</b>		
MOM	30 ml PO q6hrs PRN	-
Miralax	-	17 gm/packet ½-1 packet per age/weight
Bisacodyl suppository	1 suppository PR q6hrs PRN	Less than 2 yrs – 5 mg/day single dose PRN 2-11 yrs – 5-10 mg/day single dose PRN
<b>3.) If none of the above therapies are effective, try the following:</b>		
Fleets	Enema, PRN	Pediatric Fleets, PRN

<sup>19</sup> University of Iowa Gerontological Nursing Interventions Research Center, Research Translation and Dissemination Core. Management of Constipation Evidenced-Based Guideline. Written 1996, Revised 6/98, Reviewed 03/01.

<sup>20</sup> Bisanz A, Woolery M, Lyons HF, Gaido L, Yenulevich MC, Fulton S. What interventions are effective for preventing and treating constipation in patient with cancer? ONS putting evidence into practice: constipation detailed PEP card. Literature search completed through September 2006. *Oncology Nursing Society*. Retrieved from <http://www.ons.org>.


## Nausea/Vomiting

Recommendations for therapy dosage for opioid-induced nausea and vomiting in adults and children are provided in *Table 8* and *Table 9*.<sup>21</sup>

**Table 8: Recommended Therapy Dosage for Opioid-Induced Nausea/Vomiting (Adults)**

Recommended Therapy Dosage for Opioid-Induced Nausea/Vomiting	
Therapy	Adult
Metoclopramide (Reglan)	10 mg IV q6hrs PRN nausea/vomiting (this agent is possibly advantageous over others if poor GI motility is considered the cause of Nausea/Vomiting)
Promethazine (Phenergan)	6.25 mg IV q6hrs PRN for nausea/vomiting <b>Safety precautions:</b> Dilute in 10 ml NS – assure IV patency before giving; give slowly; if patient complains of pain, stop!; use a large vein or preferably a central line if available; may repeat x1 if ineffective in 15 minutes
Ondansetron (Zofran)	4 mg IV q12hrs PRN nausea/vomiting if no relief in 30-60 minutes following administration of metoclopramide

**Table 9: Recommended Therapy Dosage for Opioid-Induced Nausea/Vomiting (Pediatrics)**

Recommended Therapy Dosage for Opioid-Induced Nausea/Vomiting	
Therapy	Pediatrics
	
Metoclopramide (Reglan)	0.15-0.25 mg/kg/dose IV q6hrs PRN (max 10 mg/dose) May be alternated with (Ondansetron (Zofran) for severe nausea and vomiting)
Promethazine (Phenergan)	<b>NO</b> (Not to be used for children in general; FDA prohibits use in < 2 year olds)
Ondansetron (Zofran)	0.15 mg/kg/dose dose IV q6hrs PRN (max of 4 mg/dose) If the above is ineffective, then Metoclopramide (Reglan)

<sup>21</sup> Gan TJ, Meyer T, Apfel CC, Chung F, Davis PJ, Eubanks S, Kovac A, Philip BK, Sessler DI, Temo J, Tramer MR, Watcha M. (2003). Consensus guidelines for managing postoperative nausea and vomiting. *Anesth & Analg*. 97, 62-71.

## Itching

Itching is a common opioid-induced side effect experienced by patients, and it can be severe. For this reason, the council strongly recommends careful attention to itching and modifying treatment, as needed.

Recommendations for therapy for opioid-induced itching in adults and children are:

### 1.) Start treatment with the following therapy:

- Benadryl (diphenhydramine)

### 2.) If the above therapy is ineffective, try the following agents:

- Atarax (hydrOXYzine)
- Nubain (nalbuphine)
- Zantac (ranitidine)
- Claritin (loratadine)
- Zofran (ondansetron)

### 3.) If none of the above therapies are effective, try the following:

- Switch opioid usage for PCA to fentaNYL

## Complementary Therapies

There are other treatments that may be used to help manage pain in addition to opioid therapy. Complementary therapies and multimodal pain management provide an approach to managing pain at different pain pathways. These therapies should target reducing pain by 25 percent, which may reduce the amount of opioid needed. The net result may be fewer side effects of opioid therapy.

Consider around-the-clock use of agents, such as:

1. Acetaminophen
2. Neurontin (gabapetin)
3. Non-steroidal anti-inflammatory drugs:
  - Ketorolac (toradol)
  - Celebrex (celecoxib)



## Guidelines for Implementing PCA Care

This section provides a description of the methodology used by the council to develop the guidelines in this tool kit. It is recommended that this same methodology is used to implement PCA guidelines at a healthcare facility.

### Mobilize Commitment

To start, form a council and manage resistance by identifying the organization stakeholders:

- Critical Care Nurses
- Acute Care Nurses
- Clinical Pharmacists
- Pharmacy Leadership
- Pharmacy Buyers/Wholesaler Supplier
- Process Improvement Department
- IS/IT Pharm-IT Department
- CNO/Nursing Leadership
- Pain Service
- Intensivists
- Ob-Gyn Nurses
- Ob-Gyn Physicians
- Anesthesia
- Pharmacy and Therapeutics Committee
- Policy and Procedure Committee
- Those responsible for standard order sets
- CNS/Educators
- Others, as needed

### Define and Evaluate the Current State

The current state must be identified to effectively target change. The council needs to gather the data in preparation for implementing these recommendations. It is important to work with all stakeholders to obtain agreement on suggested standards for the organization. Recommended information would include:

- Summarize PCA incidents or other quality indicators in the organization(s).
- Identify the PCA equipment used.
- Perform an area wide inventory of opioid medication concentrations and dosage units.
- Perform an area wide inventory of assessment tools, practices, policies, and procedures.
- Determine where variations exist in current practice.

### Create a Shared Need

The case for standardization must be based on research, literature reviews, etc. Additionally, facilitation should be encouraged to allow for discussion and clarification on the front-end to be sure that the group is in full alignment on what is included and excluded in the project. The outcome should be a concise description of the case for standardization.

## Elevator Speech

An “Elevator Speech” can be used to quickly convey key elements of the campaign to staff, such as:

- **What:** The goal of this project is to implement an evidence-based standard of care for safe and effective pain management using PCA within (identify time span) months.
- **Why:** This is important because PCA use is a complex, high-risk treatment associated with harmful events and death.
- **Success:** We will have achieved success with this project when we have implemented a safe, effective standard of care in PCA usage across our organization, as evidenced by a reduction in harmful events. (Identify the frequency of evaluation after implementation.)
- **Need:** We need your support and commitment in developing and adopting these standards in your organization and imparting this change across all applicable areas and individuals.

## Standardize, Simplify, and Clarify

A standard approach to PCA administration across healthcare facilities within a region should extend beyond assessments, drug concentrations, and dosing units. It is recommended that policies and procedures, documentation, standard orders, product, supply and storage, packaging, and equipment are standardized to simply and clarify PCA administration for improved patient safety.

## Policies, Procedures, and Process

Standard policies, procedures, and work processes are effective methods that provide a margin of safety in minimizing variance in PCA practice.

## Documentation

It is recommended that a comprehensive and careful analysis of documentation should be conducted to identify documentation forms, both paper and computerized, that need to be changed and standardized. For example, Nursing Assessment, MAR, and Input and Output documentation need to be updated with new assessment guidelines, adjunctive therapies, and dosage units.

A sample standard Initial Pain Screening and Assessment Tool is available online at Cardinal Health, Sharp HealthCare, and many council members’ web sites.

## Establish Standard Order Sets

Standard order sets ensure consistent and accurate product ordering, delivery, and use, thereby reducing potential medication errors. The council recommends that each hospital establishes standard order sets for PCA drug orders.

Appendix B provides the key elements the council recommends for a standard order set for PCA drug orders.

- Assure there is physician participation in changes needed for a standard approach.
- Pharmacy and Therapeutics Committees should be kept apprised of planned changes in medication use.

## Standardized Product

Errors in initiating PCA infusions can occur at any point in the programming process. By using a limited number of standard concentrations, standardizing order forms, implementing smart PCA pumps with DERS, and requiring an independent double-check of the PCA programming, hospitals have put in place effective tools to help reduce PCA dosing errors.<sup>22</sup>

- Identify drugs that need to be changed and consolidate the data to eliminate unnecessary variability.
- Develop an agreed-upon list of standardized orders, drugs, and concentrations for common PCA infused opioid medications.

## PCA Safety Software Limits

If you have smart pump or alert settings on the PCA pump, the council **strongly recommends** enabling a hard stop for the **low concentration alarm setting**. This alarm identifies data entry errors where the concentration has been incorrectly entered.

For example, a 60 mL syringe with a standard concentration of 1 mg/mL was inadvertently programmed as containing a 1 mg/60 mL concentration. This resulted in a programmed concentration that was 1/60th of the actual concentration, and a single patient request for a 1 mg dose delivered all 60 mgs (60 mL) of narcotic in the syringe.



<sup>22</sup> ISMP. Misprogramming PCA concentration leads to dosing errors. *Sentinel Event Alerts*. August 28, 2008 issue. Retrieved from <http://www.ismp.org/d/SpecialFollowUp.pdf>.

### Labeling Guidelines Recommendations

To clarify PCA syringe product labeling, the council recommends the following to reduce potential patient safety mistakes:

- Use Tall Man lettering on all PCA syringe product labels (e.g., HYDR**O**morphine).
- Use Dose per mL in large font and Total dose per syringe in small font to communicate dosage information (e.g., **1 mg/mL**, 50 mg/50 mL).
- Ensure PCA syringe/bag label is consistent with programming settings on the PCA pump.
- If custom concentrations must be used, change the container label to a different color to distinguish the concentration from the standard PCA syringe/bag label.
- Implement technology such as barcoding to program the PCA pump. This would eliminate concentration keystroke errors during programming of the PCA.

Other suggestions to make the process safer can be found in the August 25, 2008 ISMP Alert. Some of these recommendations are summarized below, along with recommendations from the San Diego Patient Safety Council:

- Try to consistently use standard concentration and products.
- Make the information on the label match how the nurse will program the pump.
- Make the formatting of the order set match the programming elements, nomenclature (e.g., “PCA Dose”, etc.), and their sequence within the pump.
- Distinguish custom concentrations using a different label and/or use auxiliary labels so the labels are distinctly different.

### Product Supply and Storage

It is recommended that **standard** doses of medications reside in unit medication dispensing cabinets. Any concentrated doses other than the single, standard concentration for PCA drugs should be sequestered in the pharmacy and dispensed on a per case basis.

### Equipment

It is recommended that **one type/one model of PCA pump** is used throughout the organization to reduce PCA medication errors.

## Appendices

### Appendix A. Vendor Specific PCA Ordering/Programming Terms

There is a high rate of turnover in nursing staff within San Diego County, with many nurses working in multiple settings and transferring between area hospitals. Some staff members are more successful than others in translating the different terms between equipment and clinical practice from one environment to another. Aligning the terminology across area hospitals will help clarify and translate this information, as well as reduce the variability.

The following table provides a cross-walk of terms between PCA pumps.

Vendor Specific PCA Ordering/Programming Terms							
	Alaris	Baxter	B Braun Curlin Pain Pump	Hospira Lifecare	Hospira Gemstar	Sigma (2008)	CADD Legacy
<b>Single Dose At Initiation of Tx</b>	Loading Dose	Loading Dose	Load Dose	Loading Dose	Loading Dose	Load Dose	
<b>Clinician Boluses PRN During Tx</b>	Bolus Dose	Clinician Bolus	Clinician Dose	Clinician Activated Loading Dose	Clinician Activated Loading Dose	Clinician Dose	Clinician Bolus
<b>Number of such Clinician Boluses allowed per hour</b>	N/A (defined in orders)	N/A (defined in orders)	N/A (defined in orders)	N/A (defined in orders)	N/A (defined in orders)	N/A (defined in orders)	N/A (defined in orders)
<b>Amount Delivered When Patient Presses DOSE Key or Remote Dose Button</b>	PCA Dose	PCA Dose	Bolus	PCA	Bolus Dose	Patient Dose	Demand Dose
<b>Amount of Time That Must Elapse Between such Demand Doses</b> <i>(Appears if Demand Dose Is Programmed)</i>	Lockout Interval	Lockout	Bolus Interval	Lockout Interval	Bolus Lockout Interval	Drug Lockout	Demand Dose Lockout
<b>Continuous Rate of Infusion (MI/Hr, Mg/Hr, Mcg/Hr)</b>	Cont. Dose	Basal	Basal	Continuous	Continuous	Basal Rate	Continuous Rate
<b>Total Drug Over Time</b>	Max Limit	Cumulative Dose	(use log)	(use log)	(use log)	Drug Given (use log)	
<b>Maximum Number Of (Patient) Demand Doses Allowed In Any One Hour Period</b> <i>(Appears if Demand Dose is Programmed and Demand Dose Lockout is Less Than One Hour)</i>						Maximum Patient Dose	Doses Per Hour

## Appendix B. Sample Standard IV PCA Order Set for Opioid Naïve ADULT Patients

1. D/C All previous opioid pain medications, including removal of FentaNYL patches.				
2. Start PCA: ASAP or <input type="checkbox"/> at _____		3. Educate family: PCA by proxy is <u>NOT</u> allowed		
4. PCA settings (Single strength standards)	<input type="checkbox"/> Morphine (1 mg/ml)	<input type="checkbox"/> HYDROmorphine (DILAUDID®) 0.2 mg/ml	<input type="checkbox"/> FentaNYL (SUB-LIMAZE®) 10 mcg/ml	<input type="checkbox"/> Other: _____
Loading Bolus	<input type="checkbox"/> 2 mg <input type="checkbox"/> ___ mg	<input type="checkbox"/> 0.4 mg <input type="checkbox"/> ___mg	<input type="checkbox"/> 20 mcg <input type="checkbox"/> ___ mcg	<input type="checkbox"/> ___mg
PCA Dose	<input type="checkbox"/> 1 mg <input type="checkbox"/> ___ mg	<input type="checkbox"/> 0.2 mg <input type="checkbox"/> ___mg	<input type="checkbox"/> 10 mcg <input type="checkbox"/> ___ mcg	<input type="checkbox"/> ___mg
Lockout Interval	<input type="checkbox"/> 10 min <input type="checkbox"/> ___ min	<input type="checkbox"/> 10 min <input type="checkbox"/> ___ min	<input type="checkbox"/> 10 min <input type="checkbox"/> ___ min	<input type="checkbox"/> ___ min
<i>Optional</i> Basal/Continuous Dose (Hold if RR < 12, O <sub>2</sub> saturation <90% or not easily aroused)	_____ mg/hr (If required: usual 0.5-1 mg/hr)	_____ mg/hr (If required: usual 0.1-0.2 mg/hr)	_____ mcg/hr (If required: usual 5-10 mcg/hr)	_____ mcg/hr
<i>Optional</i> Max limit (1 hr) (PCA & Basal combined)	<input type="checkbox"/> ___mg/hr	<input type="checkbox"/> ___mg/hr	<input type="checkbox"/> ___mcg/hr	<input type="checkbox"/> ___mg/hr
Bolus by RN PRN Breakthrough Pain (Hold if: RR < 12, O <sub>2</sub> saturation < 90% or not easily aroused)	<input type="checkbox"/> 2 mg <input type="checkbox"/> ___ mg IV q _____ hrs prn	<input type="checkbox"/> 0.4 mg <input type="checkbox"/> ___mg IV q _____ hrs prn	<input type="checkbox"/> 20 mcg <input type="checkbox"/> ___ mcg IV q _____ hrs prn	<input type="checkbox"/> ___ mg IV q _____ hrs prn
<b>5. PCA DOSE (ONLY) ADJUSTMENTS:</b> <input type="checkbox"/> Nurse may increase or decrease PCA DOSE (ONLY) if acceptable level of pain not met with next assessment. Increase by: <input type="checkbox"/> morphine 0.2 mg <input type="checkbox"/> HYDROmorphine 0.04 mg <input type="checkbox"/> fentaNYL 2 mcg The maximum total number of PCA DOSE INCREASES allowed before calling the prescriber are _____ <input type="checkbox"/> Call prescriber for any dosage adjustment		<b>7. TREATMENT AND PREVENTION OF OTHER SIDE EFFECTS:</b> <input type="checkbox"/> Constipation: - Senna-S or Senna Plus Docusate - 2 tabs PO every morning - MOM - 30 ml PO q6hrs PRN, or if NPO, Bisacodyl (DULCOLAX®) - 1 suppository PR q6hr PRN - If above therapies not effective: Fleets - Enema, PRN <input type="checkbox"/> Nausea/Vomiting: Administer in the sequence below unless ordered otherwise: - Promethazine (Phenergan) - 6.25 mg IV q6hrs PRN for nausea/vomiting <b>(Safety precautions: Dilute in 10 ml NS – assure IV patency before giving; give slowly; if patient complains of pain, stop! Use a large vein or preferably a central line if available; may repeat x1 if ineffective in 15 min.)</b> - Ondansetron (Zofran) - 4 mg IV q12hrs PRN nausea/vomiting if no relief in 30-60 minutes following administration of promethazine - Metoclopramide (Reglan) - 10 mg IV q6hrs PRN nausea/vomiting (possibly advantageous over others if poor GI motility is considered the cause of N/V) <input type="checkbox"/> Itching: - Diphenhydramine (Benadryl) 25 mg IV q6hr PRN; MR x1 at 15 minutes if ineffective. - If Diphenhydramine 50 mg is ineffective, contact prescriber to consider alternative therapies or opioids (e.g., change morphine to HYDROmorphine or to fentanyl).		
<b>6. RESPIRATORY DEPRESSION:</b> <input type="checkbox"/> If RR < 10/min, very shallow and ineffective, or if patient is unarousable or difficult to arouse (RASS -3): - Stop PCA, maintain IV and NOTIFY MD STAT - Naloxone (Narcan®) 0.1 mg STAT IV (SC if IV not possible; do not give IM) & q 2 min until RR ≥ 10/min and arouses easily. - Apply O <sub>2</sub> PRN, maintain airway				

**8. MONITORING:**

**Before initiation of PCA:** Baseline vital signs and assess PAIN, SEDATION, RESPIRATORY RATE and QUALITY.

**Initiation of PCA or Change in Drug:** Monitor PAIN, SEDATION, RESPIRATORY RATE and QUALITY – q15 min x 1 hr, q1 hr x 4 hrs, then q2 hrs; Nursing to start PCA flow sheet, document total dose and number of attempts at end of shift

\_\_\_\_ VO/TO Readback  
initials

**Dose Change (Bolus):** Monitor PAIN, SEDATION, RESPIRATORY RATE and QUALITY – q1 hr x 4 hrs, then q2 hrs

**Event or Deterioration:** Monitor PAIN, SEDATION, RESPIRATORY RATE and QUALITY – q15 min x 1 hr, q1 hr x 4 hrs, then q2 hrs  
 IV required to maintain access; Call prescriber if IV cannot be maintained