# TABLE OF CONTENTS

- Post-operative Pain Assessment and Treatment ................................................................. Pages 2-3
- APPENDIX A: Comprehensive Pain Assessment ................................................................. Page 4
- APPENDIX B: Specialty Services and Consultations Guidelines ......................................... Page 5
- APPENDIX C: Non-Opioids ................................................................................................ Page 6
- APPENDIX D: Adjuvants “Co-analgesics” for Neuropathic Pain Syndromes and Chronic Pain Pages 7-8
- APPENDIX E: Opioid Dose Considerations ....................................................................... Pages 9-10
- APPENDIX F: Equianalgesic Opioid Dose Conversion ...................................................... Pages 11-12
- APPENDIX G: Fentanyl ...................................................................................................... Page 13 -14
- APPENDIX H: Patient Controlled Analgesia (PCA) .................................................... Page 15
- APPENDIX I: Opioid Side Effects – Prevention and Management ................................... Pages 16-17
- Suggested Readings ........................................................................................................ Page 18
- Development Credits ..................................................................................................... Page 19
Post-Operative Pain Management

This practice algorithm has been specifically developed for MD Anderson using a multidisciplinary approach and taking into consideration circumstances particular to MD Anderson, including the following: MD Anderson’s specific patient population; MD Anderson’s services and structure; and MD Anderson’s clinical information. Moreover, this algorithm is not intended to replace the independent medical or professional judgment of physicians or other health care providers. This algorithm should not be used to treat pregnant women.

Pre-Operative Evaluation
- Comprehensive pain assessment (see Appendix A)
- Determine category of procedure (minor, intermediate, major) and consider the following treatment modalities:
  - Minor: Local anesthetic infiltration, post-operative oral analgesics
  - Intermediate: Minor recommendations in addition to regional analgesic technique if applicable and plan for possible intravenous analgesics post-operatively
  - Major: Intermediate recommendations in addition to benefit of starting preemptive medications if appropriate.
- Determine previous exposure to narcotics or narcotic naïve (see Appendices G and H)
- Anesthesia assessment for peripheral nerve catheter (PNC) or epidural
- Consider Pain Service consult if clinically indicated

Surgical and anesthesia team determines need for pain consult post-operatively?

Yes
Request Pain consult

No
Post-Operative Evaluation
- Complications of surgery and/or anesthesia
- Assess level of pain (see Appendix A)
- Procedures performed
- Physical constraints (tight straps, bandages, excessive compression, etc.)
- Drain output/swelling
- Neurovascular assessment
- Activity restrictions/changes (ambulation, performance status, incentive spirometry, or bowel function)
- Current pain orders: PCA, epidural, PNC, or other
- Consider Pain Service consult if clinically indicated
- Consider Physical Therapy/Occupational Therapy consult if clinically indicated
- Consider Integrative Medicine consult if indicated

Yes
Provide discharge plan

No
See Page 3

Pain controlled?

Yes
- Continue monitoring
- Re-evaluate at appropriate intervals

No
See Page 3

See Page 3
Post-Operative Pain Management

TREATMENT

For patients not currently taking opioids:
- Prescribe non-opioids (see Appendix C) or if contraindicated, use weak opioids (see Appendix E), as needed for pain

For patients currently taking opioids:
- Continue current analgesic regimen, if no side effects prescribe short-acting opioids (Appendix E for dosing). Prescribe short-acting opioid at 10-20% of long-acting dose every 2 to 4 hours as needed.
- Manage opioid induced side-effects if indicated, may benefit from decrease/change opioids (see Appendix I)

For patients not currently taking opioids:
- Administer short acting opioids (see Appendix E).
  Note: Fentanyl should not be used in opioid naïve patients.

For patients currently taking opioids:
- Consider increasing scheduled opioid dose by 30-50%
  Calculate short-acting opioid dose as 10-20% of prior 24 hour opioid dose
- Manage opioid induced side-effects if indicated, may benefit from decrease/change opioids(see Appendix I)
- Consider Pain Consult

Manage both pain and psychosocial distress:
- Rapidly titrate short-acting opioids
- If significant anxiety related to pain, administer opioids prior to sedating anxiolytics
- Ongoing assessment is necessary for pain, distress and opioid side effects until patient stable
- Consider Pain Consult

Reassess pain and opioid side effects at appropriate intervals as clinically indicated

Pain controlled?

Yes
- Continue current treatment

No
- Consult Pain Service

NOTE For all Patients:
- If patient has a regional anesthetic block, notify appropriate managing service.
- Consider using appropriate adjuvants (see Appendix D), prevention and management of opioid side effects (see Appendix I) and/or Integrative Medicine Services (such as acupuncture or mind-body therapies – see Appendix B), Physical Therapy, patient education (MD Anderson Patient Education Online), and psychosocial support as appropriate.

1 See Appendix A
2 PPG: Personalized Pain Goal
3 Severe pain, new onset, or exacerbation of previously stabilized pain, accompanied by significant distress or if present for more than 24 hours.
APPENDIX A: Comprehensive Pain Assessment

<table>
<thead>
<tr>
<th>The comprehensive pain assessment should include the following:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Pain:</strong></td>
</tr>
<tr>
<td>a. For each site of pain, determine intensity level: 0-10 numeric rating scale (NRS) (No pain = 0, Mild = 1-3, moderate = 4-6, severe = 7-10).</td>
</tr>
<tr>
<td>Assess at rest and with activity, location, onset (acute, chronic, acute exacerbation of chronic pain), pathophysiology (somatic, visceral, neuropathic), temporal factors (continuous, intermittent, breakthrough, incidental), etiology (for example, tumor, non-tumor related, fracture).</td>
</tr>
<tr>
<td>b. Evaluation of medical history includes: oncologic or other significant medical illnesses, medication history, relevant imaging and laboratory studies.</td>
</tr>
<tr>
<td>c. Physical examination.</td>
</tr>
<tr>
<td>d. Assess for presence of sedation [inpatient setting, consider Richmond Agitation Sedation Scale (RASS) and common opioid side effects (Appendix H)].</td>
</tr>
<tr>
<td><strong>Function:</strong></td>
</tr>
<tr>
<td>a. Evaluate patient’s ability to ambulate, perform activities of daily living (ADL), range of motion (ROM), deep breathing, and coughing.</td>
</tr>
<tr>
<td>b. Assess restrictions related to pain.</td>
</tr>
<tr>
<td><strong>3. Psychosocial issues:</strong></td>
</tr>
<tr>
<td>a. Evaluate patient distress, family support, psychiatric history, patient/family knowledge and beliefs surrounding pain and its management, risk factors for under treatment of pain include: underreporting, prior treatment of pain and response to other pain medications, concerns about addiction to pain medications or side-effects, extremes of age, gender, cultural barriers, communication barriers, and prior history of drug abuse.</td>
</tr>
<tr>
<td><strong>4. Personalized Pain Goal (PPG):</strong></td>
</tr>
<tr>
<td>a. Determine the verbal or written goal stated by the patient describing the desired level/intensity of pain that will allow the patient to achieve comfort in physical, functional, and psychosocial domains.</td>
</tr>
</tbody>
</table>

In addition to Comprehensive Pain Assessment, rule out or treat pain related to oncologic emergencies.¹

¹ Pain related to an oncologic emergency requires assessment and treatment (for example, surgery, steroids, radiotherapy, antibiotics) along with an emergent consultation. Oncologic emergencies include:

- Bowel obstruction/perforation
- Leptomeningeal metastasis
- Epidural metastasis/spinal cord compression
- Brain metastasis
- Fracture or impending fracture of weight-bearing bone
- Pain related to infection

Department of Clinical Effectiveness V2
Approved by the Executive Committee of the Medical Staff on 11/29/2016
APPENDIX B: Post-Op Specialty Services and Consultation Guidelines

Integrative Medicine Clinic services relative to pain management include:
- Acupuncture
- Meditation/mind-body techniques
- Music therapy
- A variety of individual and group services are also available for long-term issues.

NOTE: For Integrative Medicine Center services, submit a consult order for a specific service or an evaluation of the use of integrative therapies for symptom management.

Rehabilitation Services - Physical and Occupational therapy services and programs relative to pain management:
- Education and activity modification
- DME and adaptive equipment recommendation and issue
- Modalities: thermal, ultrasound, electrical stimulation, IFC (interferential current), paraffin wax, TENS
- Positioning and Joint protection
- Exercise and activity prescription

Physical Therapy specialized inpatient and outpatient services:
- Lymphedema management, assessment and treatment, compression garment assessment and recommendation
- TENS (IFC, Biofeedback or equivalent) trial and issue
- Ergonomics assessment and training
- Low back pain programs
- Manual therapy, soft tissue mobilization and joint mobilization techniques
- Amputee programs: desensitization, mirror therapy
- Orthotics and prosthetics evaluation and recommendation
- Assistive device (walker, cane, crutches) evaluation and prescription
- Hydrotherapy and wound care

Occupational Therapy specialized inpatient and outpatient services:
- ADL, work and leisure activity modification
- Fatigue management/Energy conservation
- Upper extremity amputee programs
- Custom splinting and bracing
- Psychosocial support
- Adaptive equipment assessment and prescription
- Wheelchair evaluation and recommendation (custom or rental)
- Seat and back cushion evaluation and recommendation

MD Anderson offers three coordinated pain specialty core services, consisting of Acute Pain Medicine, Chronic Pain Medicine, and Supportive Care. Guidelines for consultation to these services are indicated below.

Specialty Service Consultation Guidelines:
A. If upon pre-op evaluation it is determined the patient will require either a peripheral nerve catheter (PNC) or epidural consult Acute Pain Medicine.
B. If upon discontinuation of PNC or epidural it is determined the patient needs further specialized management by either Acute Pain Medicine or primary team consider consulting Chronic Pain Management.
C. If at any time a post-operative patient has uncontrolled pain issues for more than 24 hours consider consulting Chronic Pain Management.
D. If a post-operative patient has uncontrolled pain accompanied by multiple symptoms consider consulting Supportive Care.
E. If a post-operative patient has uncontrolled pain in the context of cancer in the palliative stage or end of life consider consulting Supportive Care.
APPENDIX C: Non-opioids

CAUTION: All of these agents are antipyretic and may mask fever; use caution in patients on myelosuppressive chemotherapy. Non-steroidal anti-inflammatory drugs (NSAIDs) may have antiplatelet effects that can increase the risk of bleeding in patients who are thrombocytopenic or on myelosuppressive chemotherapy and likely to become thrombocytopenic. Non-acetylated salicylates (for example, salsalate, tococholine magnesium silycyle) and the COX-2 selected NSAID (Celecoxib), (see table below) may have less effects on platelets, but should still be used with caution in a patient on myelosuppressive chemotherapy.

Non-opioids include acetaminophen and nonsteroidal anti-inflammatory drugs (NSAIDs); may be used alone or in combination with opioids for pain management. NSAIDs are useful adjuvant analgesics for bone pain.

Recommended Starting Doses: The choice of non-opioid must depend on the individual risk/benefit balance for each patient. The mechanism of action and side effect profile of each option is different.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Recommended Starting Dose</th>
<th>Maximum Daily Dose</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaminophen</td>
<td>500-1000 mg PO every 6 hours as needed</td>
<td>4,000 mg</td>
<td>Available PO and per rectum. At higher doses, can cause fatal hepatotoxicity and renal damage. Does not have anti-inflammatory effect.</td>
</tr>
<tr>
<td></td>
<td>650 mg IV every 4 hours 1,000 mg IV every 6 hours</td>
<td>Single dose: 1,000 mg/dose; Daily dose: 4,000 mg daily</td>
<td>IV acetaminophen is formulary restricted.</td>
</tr>
<tr>
<td>Aspirin</td>
<td>500-1000 mg PO every 4 hours as needed</td>
<td>4,000 mg</td>
<td>Available PO and per rectum. May be difficult to tolerate at analgesic doses due to the wide range of side effects. Irreversibly inhibits platelet aggregation.</td>
</tr>
<tr>
<td>Ibuprofen</td>
<td>200-800 mg PO every 6 hours as needed</td>
<td>3,200 mg</td>
<td>Inhibits platelet aggregation, can cause gastrointestinal side effects or renal failure. Use with caution in patients at high risk.</td>
</tr>
<tr>
<td>Naproxen</td>
<td>500 mg PO initial, then 250 mg every 4 hours as needed</td>
<td>1,500 mg</td>
<td>Inhibits platelet aggregation, can cause gastrointestinal side effects or renal failure. Use with caution in patients at high risk.</td>
</tr>
<tr>
<td>Celecoxib</td>
<td>200-400 mg PO every 12 or 24 hours as needed</td>
<td>400 mg</td>
<td>Does not affect platelet aggregation; can cause renal insufficiency</td>
</tr>
<tr>
<td>Ketorolac</td>
<td>15-30 mg IV or PO every 6 hours as needed</td>
<td>120 mg</td>
<td>Limit treatment to 5 days. Reduce dose by 50% if over 65 years or weight less than 50 kg. Use is contraindicated in patients with advanced renal impairment or patients at risk for renal failure due to volume depletion. Inhibits platelet aggregation, can cause gastrointestinal side effects.</td>
</tr>
</tbody>
</table>

1 Patients at high risk of serious gastrointestinal side effects or renal damage from NSAIDs include: elderly (greater than 60 years old), smokers, previous history of peptic ulcer, currently receiving corticosteroids, anticoagulants, or presence of existing renal disease, cardiac or liver impairment.

* Manufacturers of over-the-counter acetaminophen recommend no more than 3,000 mg daily.
Post-Operative Pain Management

This practice algorithm has been specifically developed for MD Anderson using a multidisciplinary approach and taking into consideration circumstances particular to MD Anderson, including the following: MD Anderson’s specific patient population; MD Anderson’s services and structure; and MD Anderson’s clinical information. Moreover, this algorithm is not intended to replace the independent medical or professional judgment of physicians or other health care providers. This algorithm should not be used to treat pregnant women.

APPENDIX D - Adjuvants “Co-analgesics” for Neuropathic Pain Syndromes and Chronic Pain

<table>
<thead>
<tr>
<th>Drug Class and Uses</th>
<th>Medication</th>
<th>Recommended Starting Dose</th>
<th>Maximum Daily Dose</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticonvulsants</td>
<td>Gabapentin</td>
<td>100-300 mg PO daily</td>
<td>3,600 mg PO per day in 3 divided doses</td>
<td>Used in PHN and NP. May cause drowsiness, dizziness, peripheral edema. Dose adjust for renal impairment.</td>
</tr>
<tr>
<td></td>
<td>Pregabalin</td>
<td>25-75 mg PO twice daily</td>
<td>600 mg PO per day in 3 divided doses</td>
<td>Used in DN, PHN, FM, and NP. May cause drowsiness, dizziness, peripheral edema. Dose adjust for renal impairment.</td>
</tr>
<tr>
<td></td>
<td>Carbamazepine</td>
<td>100 mg PO twice daily</td>
<td>1,200 mg PO per day in 2 divided doses</td>
<td>Used in TGN and NP. Associated with aplastic anemia, agranulocytosis, bone marrow suppression, severe dermatologic reactions, hyponatremia. May cause drowsiness, dizziness, nausea. Significant drug interactions. Avoid in hepatic dysfunction.</td>
</tr>
<tr>
<td></td>
<td>Oxcarbazepine</td>
<td>150-300 mg PO daily</td>
<td>2400 mg PO per day in 2 divided doses</td>
<td>Used in TGN and NP. Associated with severe dermatologic reactions, hyponatremia. May cause drowsiness, dizziness. Dose adjust for renal impairment.</td>
</tr>
<tr>
<td></td>
<td>Topiramate</td>
<td>25-50 mg PO twice daily</td>
<td>200 mg PO twice per day</td>
<td>Used in NP. May cause acidosis, drowsiness, dizziness, nausea. Dose adjust for renal impairment and hepatic dysfunction.</td>
</tr>
<tr>
<td></td>
<td>Tiagabine</td>
<td>4 mg PO at bedtime</td>
<td>8 mg PO per day</td>
<td>Used in NP. May produce seizures in patients with prior seizure history. May cause drowsiness, dizziness, diarrhea. Use with caution if hepatic dysfunction. Higher doses resulted in increased side effects.</td>
</tr>
<tr>
<td>Tricyclic Antidepressants (TCA)</td>
<td>Amitriptyline</td>
<td>10-25 mg PO at bedtime</td>
<td>150 mg PO at bedtime</td>
<td>Consider for continuous and shooting neuropathic pain. Caution in elderly or frail, or patients with glaucoma or arrhythmias. May cause sedation, arrhythmias, dry mouth, orthostasis, urinary retention.</td>
</tr>
<tr>
<td></td>
<td>Nortriptyline</td>
<td>10-25 mg PO at bedtime</td>
<td>75 mg PO at bedtime</td>
<td>Consider duloxetine for NP, DN. Caution in patients with seizures; avoid MAOIs, other SSRIs or SNRIs due to potential for serotonin syndrome. Duloxetine may increase the risk of bleeding events. Concomitant use of aspirin, nonsteroidal anti-inflammatory drugs, warfarin, and other anti-coagulants may add to this risk. Taper slowly.</td>
</tr>
<tr>
<td></td>
<td>Desipramine</td>
<td>10-25 mg PO at bedtime</td>
<td>150 mg PO at bedtime</td>
<td></td>
</tr>
<tr>
<td>Serotonin-Norepinephrine Reuptake Inhibitors (SNRI)</td>
<td>Duloxetine</td>
<td>20-30 mg PO daily</td>
<td>60 mg PO per day</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Venlafaxine</td>
<td>37.5 mg PO daily</td>
<td>225 mg PO per day</td>
<td></td>
</tr>
</tbody>
</table>

Key: DN: diabetic neuropathy  NP: neuropathic pain  SSRIs: Selective serotonin reuptake inhibitors;  TCAs: tricyclic antidepressants  MAOIs: Monoamine oxidase inhibitors  SNRIs: Serotonin-norepinephrine reuptake inhibitors  TGN: trigeminal neuropathy

Department of Clinical Effectiveness V2
Approved by the Executive Committee of the Medical Staff on 11/29/2016
APPENDIX D – continued

Adjuvants “Co-analgesics” for Neuropathic Pain Syndromes and Chronic Pain

<table>
<thead>
<tr>
<th>Drug Class and Uses</th>
<th>Medication</th>
<th>Recommended Starting Dose</th>
<th>Maximum Daily Dose</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Muscle relaxants</strong> (muscle pain, spasm)</td>
<td>Baclofen(^1)</td>
<td>5 mg PO twice daily</td>
<td>80 mg PO per day in 3 to 4 divided doses</td>
<td>Caution in patients with seizures, cardiovascular disease, glaucoma, myasthenia gravis, renal or hepatic impairment, patients on tricyclic antidepressants or MAOIs, the elderly. May cause anticholinergic effects and significant drowsiness.</td>
</tr>
<tr>
<td></td>
<td>Cyclobenzaprine</td>
<td>5 mg PO three times daily</td>
<td>30 mg PO per day in 3 divided doses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Metaxalone</td>
<td>400 mg PO three times daily</td>
<td>3,200 mg PO per day in 3 to 4 divided doses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Methocarbamol</td>
<td>500 mg PO four times daily 1,000 mg IV every 8 hours</td>
<td>4,000 mg per day in 3 to 6 divided doses; IV for 3 days maximum if PO not possible</td>
<td>Methocarbamol: may repeat course after drug free interval of 48 hours.</td>
</tr>
<tr>
<td></td>
<td>Tizanidine</td>
<td>2-4 mg PO at bedtime</td>
<td>36 mg per day in 2 to 3 divided doses</td>
<td></td>
</tr>
<tr>
<td><strong>Corticosteroids</strong> (inflammation, nerve compression)</td>
<td>Dexamethasone</td>
<td>Varies by clinical situation (IV or PO) Standard dose 4 -16 mg/day</td>
<td>Varies by clinical situation</td>
<td>May cause impaired healing, infection, thrush, hyperglycemia, weight gain, myopathy, stomach upset, psychosis, emotional instability.</td>
</tr>
</tbody>
</table>

**Key:** MAOI: Monoamine oxidase inhibitors  
TCAs: tricyclic antidepressants

\(^1\) Intradiscal formulation not on MD Anderson cancer Center Formulary
This practice algorithm has been specifically developed for MD Anderson using a multidisciplinary approach and taking into consideration circumstances particular to MD Anderson, including the following: MD Anderson’s specific patient population; MD Anderson’s services and structure; and MD Anderson’s clinical information. Moreover, this algorithm is not intended to replace the independent medical or professional judgment of physicians or other health care providers. This algorithm should not be used to treat pregnant women.

### APPENDIX E: Opioid Dose Considerations

(Weaker medications are listed at the beginning of Appendix E)

<table>
<thead>
<tr>
<th>Opioid</th>
<th>Initial short-acting dose in an opioid naïve patient</th>
<th>Onset (minutes)</th>
<th>Peak effect (hours)</th>
<th>Duration (hours)</th>
<th>Initial scheduled dosing in opioid naïve patients</th>
<th>Available oral dose formulations</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Route</td>
<td>Dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Codeine</td>
<td>PO</td>
<td>30-60 mg</td>
<td>N/A</td>
<td>30-60</td>
<td>1-1.5</td>
<td>4-8</td>
<td>Short-acting: 30-60 mg every 6 hours Long-acting: N/A</td>
</tr>
<tr>
<td>Tramadol</td>
<td>PO</td>
<td>25-50 mg</td>
<td>N/A</td>
<td>30-60</td>
<td>1.5</td>
<td>3-7</td>
<td>Short-acting: 25 mg PO every 6 hours Long-acting: 100 mg ER daily</td>
</tr>
<tr>
<td>Hydrocodone</td>
<td>PO</td>
<td>5-10 mg</td>
<td>N/A</td>
<td>10-20</td>
<td>1-3</td>
<td>4-8</td>
<td>Short-acting: 5-10 mg PO every 6 hours Long acting: N/A</td>
</tr>
<tr>
<td>Tapentadol</td>
<td>PO</td>
<td>50-100 mg</td>
<td>less than 60</td>
<td>1.25-1.5</td>
<td>4-6</td>
<td>Short-acting: PO every 4-6 hours Long-acting: PO every 12 hours</td>
<td>Short-acting: 50, 75, 100 mg tablets Long-acting: 50, 100, 150, 200, 250 mg tablets</td>
</tr>
</tbody>
</table>

¹NOTE: Must consider all forms of acetaminophen or ibuprofen medications (combination and individual) when determining total daily dosing. Manufacturers of over-the-counter acetaminophen recommend no more than 3,000 mg daily.
This practice algorithm has been specifically developed for MD Anderson using a multidisciplinary approach and taking into consideration circumstances particular to MD Anderson, including the following: MD Anderson’s specific patient population; MD Anderson’s services and structure; and MD Anderson’s clinical information. Moreover, this algorithm is not intended to replace the independent medical or professional judgment of physicians or other health care providers. This algorithm should not be used to treat pregnant women.

### APPENDIX E: Opioid Dose Considerations – continued

(Weaker medications are listed at the beginning of Appendix E)

<table>
<thead>
<tr>
<th>Opioid</th>
<th>Initial short-acting dose in an opioid naïve patient</th>
<th>Onset (minutes)</th>
<th>Peak Effect (hours)</th>
<th>Duration (hours)</th>
<th>Initial scheduled dosing in opioid naïve patients</th>
<th>Available oral dose formulations</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine</td>
<td>PO 5-15mg, IV/SC 2-3 mg</td>
<td>30</td>
<td>0.5-1</td>
<td>3-6</td>
<td>Short-acting: PO: 5-10 mg every 4 hours; IV: 2-4 mg every 4 hours Long-acting: 15 mg PO every 12 hours, or 20 or 30 mg PO once daily</td>
<td>Short-acting: 15, 30 mg tablets; 10 mg/5 mL, 20 mg/5 mL, 20 mg/mL liquid Long-acting: 15, 30, 60, 100 mg tablets</td>
<td>Available as tablet or liquid preparation. Short-acting preparations can be given via PEG tube.</td>
</tr>
<tr>
<td></td>
<td>PO 5-10mg, IV/SC N/A</td>
<td>10-15</td>
<td>0.5-1</td>
<td>3-6</td>
<td>Short-acting: 5 mg PO every 4 hours. Long-acting: 10 mg PO every 12 hours</td>
<td>Short-acting: 5, 15, 30 mg tablets; 5 mg/5 mL, 20 mg/ml liquid Long-acting: 10, 20, 40, 80 mg tablets</td>
<td>Available alone or in combination with acetaminophen. For example, oxycodone 5 mg with acetaminophen 500 (Tylox®) or 325 mg (Percocet®).1</td>
</tr>
<tr>
<td>Oxycodone</td>
<td>PO 5-10 mg, IV/SC N/A</td>
<td>no data</td>
<td>0.5-1</td>
<td>3-6</td>
<td>Short-acting: 5 mg PO every 4 hours. Long-acting: 5 mg PO every 12 hours</td>
<td>Short-acting: 5, 10 mg tablets Long-acting: 5, 10, 20, 40 mg tablets</td>
<td>Poor bioavailability - must be taken on empty stomach.</td>
</tr>
<tr>
<td></td>
<td>PO 1-3 mg, IV/SC 0.5-1.5 mg</td>
<td>15-30</td>
<td>0.5-1</td>
<td>3-5</td>
<td>Short-acting: 2 mg PO every 4 hours IV/SC: 0.5-1 mg every 4 hours Long-acting: 8 mg PO every 24 hours</td>
<td>Short-acting: 2, 4, 8 mg tablets; 1mg/mL liquid Long-acting: 8, 12, 16, 32 mg tablets</td>
<td></td>
</tr>
</tbody>
</table>

**Key:** MAOI, Monoamine oxidase inhibitors  SSRIs, Selective serotonin reuptake inhibitors  SNRIs Serotonin-norepinephrine reuptake inhibitor

1 NOTE: Must consider all forms of acetaminophen or ibuprofen medications (combination and individual) when determining total daily dosing. Manufacturers of over-the-counter acetaminophen recommend no more than 3,000 mg daily.

---

Department of Clinical Effectiveness V2
Approved by the Executive Committee of the Medical Staff on 11/29/2016
APPENDIX F: Equianalgesic Opioid Dose Conversion

Note: The equianalgesic doses (oral and parenteral) can be affected by interpatient variability, type of pain (for example, acute versus chronic), chronic administration, and tolerance. The following table should serve only as a guide when switching from one opioid to another. It is recommended to reduce the dose of the new opioid by 30 to 50% to account for incomplete cross tolerance, and to periodically monitor for efficacy and adverse reactions and the dose adjusted accordingly.

<table>
<thead>
<tr>
<th>Opioid</th>
<th>Oral Dose (PO)</th>
<th>Parenteral Dose (IV/SC)</th>
<th>Conversion Factor for changing parenteral opioid to oral opioid</th>
<th>Conversion Factor for changing oral opioid to oral morphine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine</td>
<td>15 mg</td>
<td>6 mg</td>
<td>2.5</td>
<td>1</td>
</tr>
<tr>
<td>Oxycodone</td>
<td>10 mg</td>
<td>N/A</td>
<td>N/A</td>
<td>1.5</td>
</tr>
<tr>
<td>Hydrocodone¹</td>
<td>20 mg</td>
<td>N/A</td>
<td>N/A</td>
<td>0.75</td>
</tr>
<tr>
<td>Oxymorphone</td>
<td>5 mg</td>
<td>0.5 mg</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Hydromorphone</td>
<td>3 mg</td>
<td>1.5 mg</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Fentanyl²</td>
<td>N/A</td>
<td>60 mcg</td>
<td>N/A</td>
<td>Should be managed by clinicians experienced in pain management.</td>
</tr>
</tbody>
</table>

¹ Methadone and Buprenorphine should only be initiated and managed by clinicians experienced in pain management. Consider consult to pain specialist if needed. See Appendix B for details.

² Based on clinical experience, 6-8 tablets (Hydrocodone 5 mg and acetaminophen 325 mg) may be changed to morphine ER 15 mg every 12 hours.

² See Appendix G for transdermal conversion.
APPENDIX F: Equianalgesic Opioid Dose Conversion - continued

Steps for Opioid Rotation:
1. Stop current opioid regimen.
2. Calculate total dose of current opioid (scheduled and PRN doses) used in the previous 24 hour period.
3. Calculate the dose of the new opioid using the equianalgesic dose conversion table (from previous page) and conversion equation (below).

\[
\text{Equianalgesic dose per route of CURRENT opioid} = \text{Equianalgesic dose per route of NEW opioid} \\
\frac{24 \text{ hour dose per route of CURRENT opioid}}{24 \text{ hour dose per route of NEW opioid}}
\]
4. Calculate for incomplete cross-tolerance between opioids. Decrease the target dose from step 3 by 30-50% to obtain the new opioid dose.
5. Calculate scheduled pain dose. Divide the new opioid dose (from step 4) by number of doses to be given over 24 hours and administer as scheduled doses.
6. Calculate breakthrough pain dose as 10-20% of calculated new opioid dose to administer PRN every 1 hour.
7. Titrate new opioid regimen until adequate analgesia is achieved.

Opioid Rotation Example: Rotation from morphine PCA (total daily dose of 120 mg IV) to oral oxycodone.
1. Stop current opioid regimen.
2. Calculate dose of current opioid (scheduled and PRN doses) used in the previous 24 hours which equals 120 mg IV morphine.
3. Calculate the dose of the new opioid using the equianalgesic dose conversion table and conversion equation (below).

a. Calculate IV morphine to PO morphine based on conversion table and conversion equation:

\[
\frac{6 \text{ mg IV morphine}}{120 \text{ mg IV morphine over 24 hours}} = \frac{15 \text{ mg PO morphine}}{X \text{ mg PO morphine over 24 hours}}
\]

\[
X = 300 \text{ mg PO morphine}
\]

b. Calculate PO morphine to PO oxycodone based on conversion table:

\[
\frac{300 \text{ mg PO morphine}}{X \text{ mg PO oxycodone}} = \frac{15 \text{ mg PO morphine}}{10 \text{ mg PO oxycodone}}
\]

\[
X = 200 \text{ mg PO oxycodone}
\]
4. Calculate for incomplete cross-tolerance. After a 30-50% dose reduction, the oxycodone dose calculated above should be between 100 and 140 mg per day.
5. Calculate scheduled pain dose. Extended release (ER) oxycodone is dosed every 12 hours; recommend ER oxycodone 60 mg every 12 hours (based on tablet availability).
6. Calculate breakthrough pain dose as 10-20% of 120 mg oxycodone dose and administer PRN every 1 hour.
   Immediate release (IR) oxycodone is between 12 and 24 mg per dose and may be administered every 1 to 4 hours; Based on tablet availability recommend IR oxycodone 10 to 20 mg every 1 to 4 hours as needed for breakthrough pain.
7. Titrate new opioid regimen until adequate analgesia is achieved.
This practice algorithm has been specifically developed for MD Anderson using a multidisciplinary approach and taking into consideration circumstances particular to MD Anderson, including the following: MD Anderson’s specific patient population; MD Anderson’s services and structure; and MD Anderson’s clinical information. Moreover, this algorithm is not intended to replace the independent medical or professional judgment of physicians or other health care providers. This algorithm should not be used to treat pregnant women.

**Post-Operative Pain Management**

**NOTE:** This consensus algorithm excludes patients who are in the ICU, perioperative or pre-procedural settings, or are currently receiving epidural or intrathecal analgesia.

**APPENDIX G: Fentanyl**

<table>
<thead>
<tr>
<th>Dosage Forms</th>
<th>Onset</th>
<th>Peak</th>
<th>Duration</th>
<th>Doses Available per Formulary</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parenteral (IV/Subcutaneous)</td>
<td>Almost immediate</td>
<td>Several minutes</td>
<td>0.5-1 hour</td>
<td>0.05 mg/mL (5 mL vial for injection) PCA syringe supplied as 2500 mcg/50 mL</td>
<td></td>
</tr>
<tr>
<td>Transdermal patch</td>
<td>12-24 hours</td>
<td>24-72 hours</td>
<td>48-72 hours</td>
<td>12 (delivers 12.5), 25, 50, 75, 100 mcg/hour</td>
<td>Bioavailability 90%; Do not cut patch, apply heat, or use in patients who develop fever – results in faster onset, shorter duration, and possible overdose.</td>
</tr>
<tr>
<td>Transmucosal lozenge (Actiq&lt;sup&gt;4&lt;/sup&gt;)</td>
<td>5-15 minutes</td>
<td>20-40 minutes</td>
<td>Related to blood level</td>
<td>200, 400, 600 mcg</td>
<td>Bioavailability: 50%</td>
</tr>
<tr>
<td>Sublingual Tablet (Abstral&lt;sup&gt;5&lt;/sup&gt;)</td>
<td>5-15 minutes</td>
<td>30-60 minutes</td>
<td>2 hours</td>
<td>100, 200, 300, 400, 600, 800 mcg</td>
<td>Bioavailability: 54%</td>
</tr>
</tbody>
</table>

**Drug specific characteristics:**

- Fentanyl is 80 to 100 times more potent than morphine. Fentanyl is not recommended for initial use in opioid-naive patients. Use in non-opioid tolerant patients may lead to fatal respiratory depression.
- Transdermal fentanyl should only be used in patients with stable opioid requirements. Due to its long half-life of 17 hours, the dose may be difficult to titrate if pain is not well-controlled.
- When initiating transdermal fentanyl, patients should use short-acting opioids as needed until efficacy is obtained (peak effect 24-72 hours).
- Titrate patients on transdermal fentanyl no more frequently than every 3 days after initial dose, and then every 6 days thereafter. Initial evaluation of maximum analgesic effect should not be made before 24 hours.
- Caution with CYP450 3A4 inhibitors, which can increase fentanyl plasma concentrations.
- Prior to processing initial prescriptions for rapid onset fentanyl, the prescriber must register with the TIRF REMS Access Program and complete a Prescriber and Patient agreement.

**Morphine to Fentanyl conversion: 1 mg of IV morphine or 2.5 mg of oral morphine = 10 micrograms of IV fentanyl**

Example: Conversion from oral morphine ER 90 mg every 12 hours to IV Fentanyl for IV.

1. 24 hour morphine dose is 90 + 90 = 180 mg
2. Decrease 180 mg by 30% for incomplete tolerance = 126 mg
3. 1 mg IV morphine = 2.5 mg oral morphine = 10 micrograms IV fentanyl, then 24 hour morphine dose of 126 mg = 24 hour IV fentanyl dose of 504 micrograms
4. Divide 24 hour fentanyl dose calculated by 24 hours = 21 micrograms/hour

Thus an appropriate starting dose for IV fentanyl/hour (as basal rate in PCA) is 20 micrograms/hour.

<sup>1</sup> After Transdermal patch removal, continued absorption of fentanyl occurs from the skin. Delayed administration of another long-acting opioid should be considered due to persistent serum levels of fentanyl. Due to differences in bioavailability, fentanyl products are not interchangeable on a mcg to mcg basis.
APPENDIX G: Fentanyl - continued

Transdermal Fentanyl (TDF) Dosing:

Option 1: 2 mg oral morphine approximately 1 mcg per hour transdermal fentanyl
Example: Total daily dose of morphine 100 mg translates to: approximately 50 mcg transdermal patch, to be applied every 72 hours

Option 2: calculate the total daily dose of morphine and then use the following table to select the appropriate patch strength

<table>
<thead>
<tr>
<th>Oral Morphine (mg/day)</th>
<th>Transdermal Fentanyl (mcg/hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 to 90</td>
<td>25</td>
</tr>
<tr>
<td>91 to 150</td>
<td>50</td>
</tr>
<tr>
<td>151 to 210</td>
<td>75</td>
</tr>
<tr>
<td>211 to 270</td>
<td>100</td>
</tr>
<tr>
<td>Each additional 60 mg/day</td>
<td>An additional 25 mcg/hour</td>
</tr>
</tbody>
</table>

- NOTE: this table should NOT be used to convert from TDF to other therapies because this conversion to TDF is conservative. Use of this table for conversion to other analgesic therapies can overestimate the dose of the new agent.
- To convert patients to another opioid, remove the transdermal fentanyl patch and titrate the dose of the new analgesic based upon the patient's report of pain until adequate analgesia has been attained. Upon system removal, 17 hours or more are required for a 50% decrease in serum fentanyl concentrations.
- Must prescribe short-acting opioid for breakthrough pain.
APPENDIX H: Patient Controlled Analgesia (PCA)

Suggested initial PCA settings: All opioid doses must be individualized. (Use the institutional order set for all new PCA orders and dose changes.)

1. Opioid naïve patients

<table>
<thead>
<tr>
<th>Opioid</th>
<th>Demand (PCA) dose (dose range)</th>
<th>Lock out interval (minutes)</th>
<th>1-hour dose limit (optional)</th>
<th>Continuous dose (Basal)</th>
<th>Nurse bolus prn pain</th>
<th>Nurse bolus interval (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine (milligrams)</td>
<td>1 mg (0.5-2.5)</td>
<td>10-30 min</td>
<td>4 mg</td>
<td>See below</td>
<td>2-4 mg</td>
<td>2</td>
</tr>
<tr>
<td>Hydromorphone (milligrams)</td>
<td>0.2 mg (0.1-0.5)</td>
<td>10-30 min</td>
<td>0.8 mg</td>
<td>See below</td>
<td>0.5-1 mg</td>
<td>2</td>
</tr>
<tr>
<td>Fentanyl (micrograms)</td>
<td>10 mcg (5-25)</td>
<td>10-30 min</td>
<td>40 mcg</td>
<td>See below</td>
<td>25 mcg</td>
<td>2</td>
</tr>
</tbody>
</table>

a. Patient should be alert and demonstrate ability to administer demand dose for pain. If concerns about cognitive failure or significant anxiety, consider Specialty Consultation: Acute Pain, Cancer Pain, Palliative/Supportive Care (see Appendix B for description of services).
b. Carefully consider adding continuous (basal) dose after 12-24 hours if using frequent demand doses or if pain not controlled. Suggested basal dose is 30-50% of average hourly dose.

Example: The 12 hour total morphine demand dose is 20 mg, calculate continuous dose as

\[
\frac{20}{12} \times 1.7 \text{ mg/hour then } 1.7 \times 0.3 (30\%) = 0.5 \text{ mg/hour basal rate.}
\]

2. Opioid tolerant patients (currently receiving opioid therapy).

PCA orders should take into account the patient’s current opioid regimen, clinical situation (severity and etiology of the pain, side-effects from opioids, baseline drowsiness, need for opioid rotation). If there are significant side effects, drowsiness, confusion, respiratory or central nervous system concerns, it is recommended to call for Specialty Consultation: Acute Pain, Cancer Pain, Palliative/Supportive Care (see Appendix B for description of services) for PCA ordering.
a. Calculate total dose of opioid (scheduled and PRN doses) used in the previous 24 hour period.
b. Use equianalgesic opioid dose conversion table (Appendix F) to calculate dose of IV opioid being considered for PCA. Decrease dose by 30-50% to adjust for lack of complete cross tolerance to obtain new IV dose.
c. Divide new IV dose (from above step) by 24 hours, to obtain hourly (basal) dose.
d. Calculate demand (PCA) dose as 10-20% of new IV opioid dose to use PRN every hour.


Post-Operative Pain Management

This practice algorithm has been specifically developed for MD Anderson using a multidisciplinary approach and taking into consideration circumstances particular to MD Anderson, including the following: MD Anderson’s specific patient population; MD Anderson’s services and structure; and MD Anderson’s clinical information. Moreover, this algorithm is not intended to replace the independent medical or professional judgment of physicians or other health care providers. This algorithm should not be used to treat pregnant women.

APPENDIX I: Opioid Side Effects – Prevention and Management

<table>
<thead>
<tr>
<th>Side Effect</th>
<th>Prevention</th>
<th>Management</th>
</tr>
</thead>
</table>
| Sedation    | - Discontinue other sedating medications if appropriate  
              - Educate all patients receiving opioids drowsiness may result for a few days following initiation or increase in opioid regimen. | - Consider rotation or dose reduction of opioid if sedation persists  
                                                                  - Consider psychostimulant:  
                                                                              1. Methylphenidate (Ritalin®) 2.5-5 mg PO once or twice daily (last dose no later than 4 pm to avoid insomnia). Suggested time 8 am and 12 noon daily. Needs controlled substance (CII) prescription.  
                                                                              2. Consider Modafinil 100 mg once or twice daily. |
| Opioid Induced Neurotoxicity | Eliminate nonessential CNS activating or depressing drugs (for example: benzodiazepines) | - Consider reversible causes such as metabolic disorders, liver or renal dysfunction, dehydration, hypercalcemia, organic brain disease; treat as appropriate.  
                                                                  - Consider one or more of the following:  
                                                                              1. Opioid Rotation (see Appendix E)  
                                                                              2. Opioid dose reduction or discontinuation  
                                                                              3. Discontinue other offending drugs (benzodiazepines)  
                                                                              4. Hydration  
                                                                              5. Symptomatic treatment with haloperidol 1-5 mg PO, IV, or SC every 4 hours PRN  
                                                                  - Avoid using naloxone even if delirium is thought to be due to opioid use |
| Respiratory depression | - Monitor sedation and respiratory status (respiratory rate and oxygen saturation) during the first 24 hours in opioid naïve patients.  
                          - Titrate opioids cautiously.  
                          - Consider dose reduction or opioid rotation if patient has excessive sedation. | - Call M.D, HOLD opioids, provide supplemental oxygen.  
                                                                  - If patient minimally responsive or unresponsive and respiratory rate less than or equal to 6, administer naloxone. Recommended dose: Naloxone 0.4 mg diluted in 10 mL saline, 0.5 mL IV push, repeat 1-2 minutes until patient more awake and respiratory status improves. (Half life of Naloxone is short and patient may need naloxone infusion for long acting opioids. If no change with Naloxone, rule out other causes for the respiratory depression.)  
                                                                  - If patient is actively dying, DNR (do not resuscitate) and receiving comfort care, naloxone administration may not be appropriate. |

Continued on Next Page
## APPENDIX I: Opioid Side Effects – Prevention and Management - continued

<table>
<thead>
<tr>
<th>Side Effect</th>
<th>Prevention</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nausea, Vomiting</td>
<td>- Titrate opioid dose slowly and steadily.</td>
<td>1. Investigate for other causes of nausea (for example, constipation, bowel obstruction, chemotherapy or other medications) and treat per guidelines. Initiate scheduled antiemetics. Example: Metoclopramide 5 to 10 mg PO, IV, or SC every 6 hours.</td>
</tr>
<tr>
<td></td>
<td>- Provide antiemetics available with opioid prescription.</td>
<td>2. Add or increase non-opioid or adjuvant medications for additional pain relief so opioid dose can be reduced.</td>
</tr>
<tr>
<td></td>
<td>- Metoclopramide 10 mg PO</td>
<td>3. If analgesia is satisfactory, reduce opioid dose by 25%.</td>
</tr>
<tr>
<td></td>
<td>- Patients at high risk of nausea consider scheduled antiemetics for 5 days and then change to PRN.</td>
<td>4. Consider opioid rotation if nausea remains refractory.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. If nausea remains refractory, consider opioid rotation. (See also Post-Op Nausea and Vomiting Management Algorithm).</td>
</tr>
</tbody>
</table>

**Constipation**

Unless alterations in bowel patterns such as bowel obstruction or diarrhea exist, all patients receiving opioids should be started on laxative bowel regimen and receive education for bowel management.

1. Stimulant laxative plus stool softener:  
   For example: Senokot-S (Senna 8.6 plus Docusate 50 mg), 2 tablets/day and titrate up maximum 9 tablets /day.  
2. Ensure adequate fluids, dietary fiber and exercise if feasible.  
3. Prune juice followed by warm beverage may be considered.

<table>
<thead>
<tr>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Assess potential causes of constipation (such as recent opioid dose increase, use of other constipating medications, new bowel obstruction)</td>
</tr>
<tr>
<td>2. Increase Senokot-S (or Senna and docusate tablets if using separate) and add 1 or both of the following:</td>
</tr>
<tr>
<td>a. Milk of Magnesia oral concentrate (1170/5 mL) 10 mL PO every 2-4 times daily.</td>
</tr>
<tr>
<td>b. Polyethylene glycol (Miralax) 17 grams in 8 ounce beverage daily.</td>
</tr>
<tr>
<td>3. If no response to above, perform digital rectal exam (DRE) to rule out low impaction (do not perform if neutropenic, thrombocytopenic, or post-operative bowel surgery). Continue above steps AND</td>
</tr>
<tr>
<td>- If impacted: Disimpact manually if stool is soft. If not, soften with mineral oil fleet enema before disimpaction. Follow up with milk of molasses enemas until clear with no formed stools.</td>
</tr>
<tr>
<td>- Consider use of short-acting analgesics before disimpaction.</td>
</tr>
<tr>
<td>- If not impacted on rectal examination, patient may still have higher level impaction. Consider abdominal imaging and/or administer milk of molasses enema along with 8 ounces of PO magnesium citrate.</td>
</tr>
<tr>
<td>- See Bowel Management order sets.</td>
</tr>
<tr>
<td>4. Methylnaltrexone (Relistor®) may be given to patients who meet the following criteria:</td>
</tr>
<tr>
<td>- Patient experiencing opioid-induced constipation</td>
</tr>
<tr>
<td>- Patient has not demonstrated an adequate response to other laxative therapy</td>
</tr>
<tr>
<td>- Patient does not have a known or suspected mechanical gastrointestinal obstruction</td>
</tr>
</tbody>
</table>
This practice algorithm has been specifically developed for MD Anderson using a multidisciplinary approach and taking into consideration circumstances particular to MD Anderson, including the following: MD Anderson’s specific patient population; MD Anderson’s services and structure; and MD Anderson’s clinical information. Moreover, this algorithm is not intended to replace the independent medical or professional judgment of physicians or other health care providers. This algorithm should not be used to treat pregnant women.

SUGGESTED READINGS


DEVELOPMENT CREDITS

This practice consensus algorithm is based on majority expert opinion of the Post-Operative Pain work group. Faculty at the University of Texas MD Anderson Cancer Center. It was developed using a multidisciplinary approach that included input from the following medical, radiation and surgical oncologists.

Carla M. Baker, ACNP, RN
Justin Bird, MD
Katherine Cain, PharmD
Larry C. Driver, MD
M. Kay Garcia, CNS, RN
Wendy Garcia, BS
Bryan Moon, MD
Craig S. Roorda, PAC
Mark S. Pilarczyk, PAC
Keyuri Popat, MD
Kimberly A. Turner, PAC
Marie J. Waletich-Flemming, PharmD

† Core Team Lead
* Clinical Effectiveness Development Team