# Cancer Pain – Pediatric (Age < 18 Years)



Disclaimer: *This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson's specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient's care. This algorithm should not be used to treat pregnant women.*

**Note:** This consensus algorithm excludes patients who are in the Pediatric Intensive Care Unit (PICU), perioperative or pre-procedural settings, or are currently receiving epidural or intrathecal analgesia.

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**Note:** This consensus algorithm excludes patients who are in the Pediatric Intensive Care Unit (PICU), perioperative or pre-procedural settings, or are currently receiving epidural or intrathecal analgesia.

Assess for pain[1] using appropriate pain scale and personalized pain goal (PPG)[2]

Mild pain and/or PPG met →

- Consider consulting Child Life and other Complementary/Integrative therapies (Appendix B)

**For patients not currently taking opioids:**

- Consider non-opioids (Appendix C and Appendix G) or if contraindicated, consider opioids (Appendix D), as needed for pain

**For patients currently taking opioids:**

- Continue current analgesic regimen or consider dose changes as clinically indicated
- If patient is currently taking a long-acting opioid, consider adding a short-acting opioid for breakthrough pain. The breakthrough dose is calculated as 10-20% of the total daily dose, given every 1 to 4 hours.
- Manage opioid induced side effects as clinically indicated (Appendix E). For patients on opioids, ensure a scheduled bowel regimen.

→ Reassess pain, PPG, and opioid side effects as indicated[2] → Pain adequately controlled?

Yes → Continue current analgesic regimen → Reassess pain, PPG, and opioid side effects as indicated[2]

No →

Moderate pain and/or PPG not met →

- Consider consulting Child Life and other Complementary/Integrative therapies (Appendix B)

**For patients not currently taking opioids:**

- Consider short-acting opioids (Appendix D) and see Box A

**For patients currently taking opioids:**

- Consider increasing scheduled opioid dose by 30-50%. If scheduled opioid is increased, recalculate the breakthrough dose as 10-20% of the total daily dose, given every 1 to 4 hours.
- Manage opioid induced side effects as clinically indicated (Appendix E). For patients on opioids, ensure a scheduled bowel regimen.
- Consider specialty consult[3]

→

- Reassess pain, PPG, and opioid side effects as indicated[2]
- If short-acting opioids given, reassess pain within 1 hour

→ Pain adequately controlled?

Yes → (Continue current analgesic regimen)

No →

- Titrate scheduled and short-acting opioids
- Consult specialty service[3]

→

- Reassess pain, PPG, and opioid side effects[2]
- If short-acting opioids given, reassess pain within 1 hour

**A**

Severe pain or pain crisis, see Page 3

**Note for all patients:**

- Consider using appropriate adjuvants (Appendix G) and/or Complementary/Integrative therapies (Appendix B), bowel regimen (Appendix E), Patient Education (Appendix H), and psychosocial support as appropriate (Appendix F)
- If frequent prn doses required and pain anticipated for greater than one day, consider patient controlled analgesia (PCA). See Appendix I.

[1] See Appendix A for Comprehensive Pain Assessment
[2] Refer to Pain Management Policy (#CLN0540)
[3] Consultation services that specialize in pain management: Acute Pain, Chronic Pain, Pediatric Palliative/ Supportive Care, PICU, and Integrative Medicine. See Appendix F for description of services.



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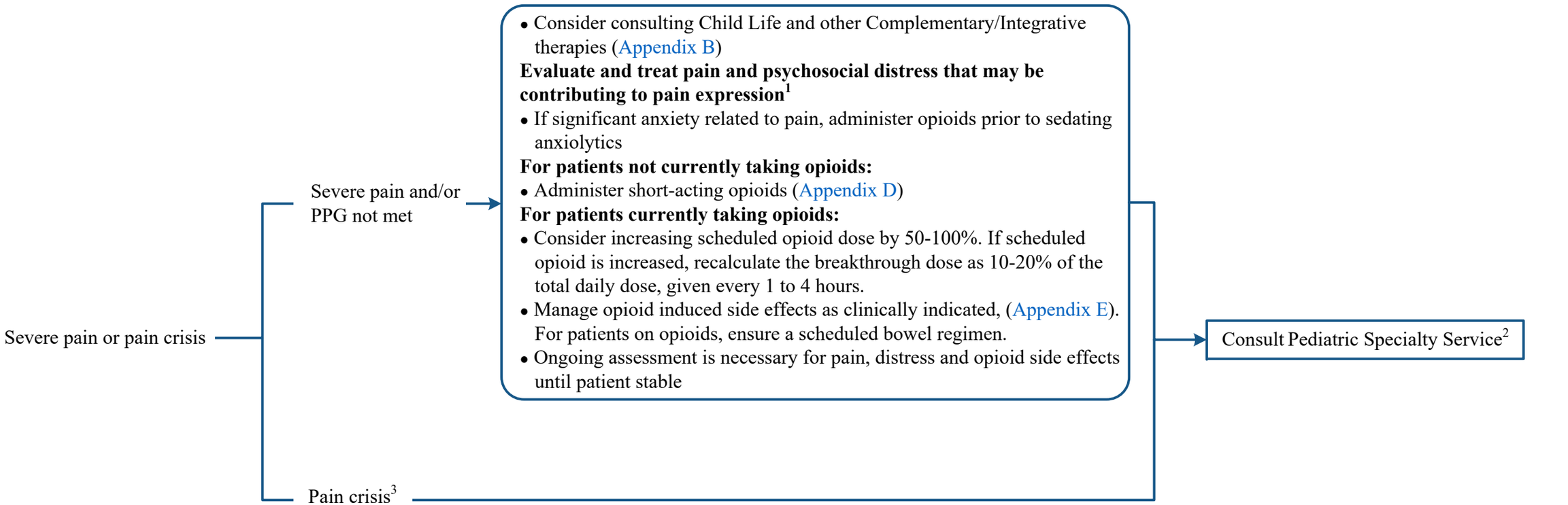
# Cancer Pain – Pediatric (Age < 18 Years) (Inpatient)





**Note:** This consensus algorithm excludes patients who are in the Pediatric Intensive Care Unit (PICU), perioperative or pre-procedural settings, or are currently receiving epidural or intrathecal analgesia.




**Note for all patients:**
- Consider using appropriate adjuvants (Appendix G) and/or Complementary/Integrative therapies (Appendix B), bowel regimen (Appendix E), Patient Education (Appendix H), and psychosocial support as appropriate (Appendix F)
- If frequent prn doses required and pain anticipated for greater than one day, consider patient controlled analgesia (PCA). See Appendix I.

PPG = personalized pain goal

[1] For additional information see the Distress Screening and Psychosocial Management algorithm

[2] Consultation services that specialize in pain management: Acute Pain, Chronic Pain, Pediatric Palliative/Supportive Care, PICU, and Integrative Medicine. See Appendix F for description of services.

[3] Pain crisis or emergency is defined as severe pain, new onset, or exacerbation of previously stabilized pain, accompanied by significant distress or if present for > 24 hours

# Cancer Pain – Pediatric (Age < 18 Years) (Outpatient)





**Note:** This consensus algorithm excludes patients who are in the Pediatric Intensive Care Unit (PICU), perioperative or pre-procedural settings, or are currently receiving epidural or intrathecal analgesia.

Assess for pain[1] using appropriate pain scale and personalized pain goal (PPG)[2]

**Mild pain and/or PPG met**

- Consider consulting Child Life and other Complementary/Integrative therapies (Appendix B)

**For patients not currently taking opioids:**

- Consider non-opioids (Appendix C and Appendix G) or if contraindicated, consider opioids (Appendix D), as needed for pain

**For patients currently taking opioids:**

- Continue current analgesic regimen or consider dose changes as clinically indicated
- If patient is currently taking a long-acting opioid, consider adding a short-acting opioid for breakthrough pain. The breakthrough dose is calculated as 10-20% of the total daily dose, given every 1 to 4 hours.
- Manage opioid induced side-effects as clinically indicated (Appendix E). For patients on opioids, ensure a scheduled bowel regimen.

**Moderate pain and/or PPG not met**

- Consider consulting Child Life and other Complementary/Integrative therapies (Appendix B)

**For patients not currently taking opioids:**

- Consider short-acting opioids (Appendix D) and see Box B

**For patients currently taking opioids:**

- Consider increasing scheduled opioid dose by 30-50%. If scheduled opioid is increased, recalculate the breakthrough dose as 10-20% of the total daily dose, given every 1 to 4 hours.
- Manage opioid induced side effects as clinically indicated (Appendix E). For patients on opioids, ensure a scheduled bowel regimen.
- If opioid induced neurotoxicity (OIN)[3], consider hospitalization and evaluation in the Pediatric Acute Cancer Care Center, opioid rotation (Appendix J), and/or specialty consultation[4]
- Consider specialty consult[4]

**Severe pain or Pain crisis[5]** → Consider evaluation in Pediatric Acute Cancer Care Center, hospitalization, or specialty consultation[4]

Reassess pain, PPG, and opioid side effects (if using opioids)

Pain adequately controlled?

- Yes → Continue analgesic and bowel regimen, education and psychosocial support as appropriate
- No → Moderate pain and/or PPG not met

Reassess pain, PPG, and opioid side effects (if using opioids) as clinically indicated

Pain adequately controlled?

- Yes → Continue analgesic and bowel regimen, education and psychosocial support as appropriate
- No → Consider specialty consultation[4] for uncontrolled pain and/or side effect management

## B

**Note for all patients:**

- Consider using appropriate adjuvants (Appendix G) and/or Complementary/Integrative therapies (Appendix B), bowel regimen (Appendix E), Patient Education (Appendix H), and psychosocial support as appropriate (Appendix F)
- If frequent prn doses required and pain anticipated for greater than one day, consider patient controlled analgesia (PCA). See Appendix I.

[1] See Appendix A for Comprehensive Pain Assessment

[2] Refer to Pain Management Policy (#CLN0540)

[3] Opioid induced neurotoxicity (OIN) can include drowsiness, cognitive impairment, confusion, hallucinations, and myoclonic jerks (Appendix E)

[4] Consultation services that specialize in pain management: Acute Pain, Chronic Pain, Pediatric Palliative/Supportive Care, PICU, and Integrative Medicine. See Appendix F for description of services.

[5] Pain crisis or emergency is defined as severe pain, new onset, or exacerbation of previously stabilized pain, accompanied by significant distress or if present for > 24 hours



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# Cancer Pain – Pediatric (Age < 18 Years)





**Note:** This consensus algorithm excludes patients who are in the Pediatric Intensive Care Unit (PICU), perioperative or pre-procedural settings, or are currently receiving epidural or intrathecal analgesia.

## Quick Pediatric Reference Guide

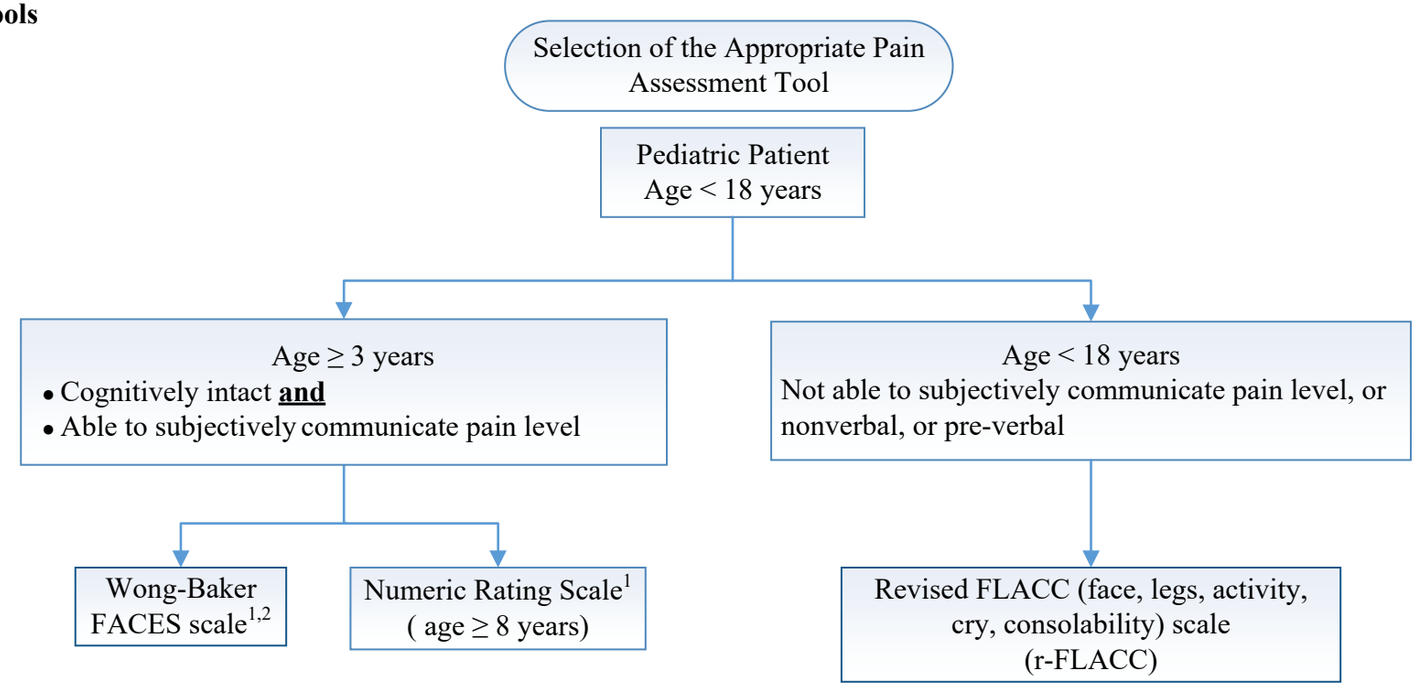
- **Opioid naïve**: Includes patients who are not chronically receiving opioid analgesic on a daily basis and therefore have not developed significant opioid tolerance
- **Opioid tolerant**: Patients who are chronically receiving opioid analgesics on a daily basis. The FDA identifies this group as those receiving at least 60 mg of morphine daily, 30 mg of oral oxycodone daily, 8 mg of oral hydromorphone daily, 60 mg of oral hydrocodone, 25 mg of oral oxymorphone, 25 mcg per hour of transdermal fentanyl or an equianalgesic dose of another opioid for a week or longer for adult patients. The pharmaceutical industry's definition of opioid tolerant for pediatric patients is generally a patient receiving the equivalent of 1 mg/kg per day of oral morphine for 1 week or longer.
- **Incomplete cross-tolerance**: Reduce dose of new opioid by 30 to 50% when switching from one opioid to another to account for tolerance to a currently administered opioid that does not extend completely to other opioids. Consequently, this phenomenon tends to lower the required dose of the new opioid.
- **Dose titration**: Adjusting the dose of an opioid should be individualized for each patient. Refer to Pages 2 to 4 of this algorithm for titration recommendations.
- **Dosing frequency**: For long-acting opioids, dosing frequency is typically every 12 hours to 24 hours depending on the agent. Refer to Appendix D for Opioid Dose Considerations.
- **Breakthrough pain**: Doses of short-acting opioids for breakthrough pain should be 10 to 20% of the total daily dose given every 1 to 4 hours as needed. Breakthrough opioids can be given as frequently as every 1 hour for oral doses or every 15 minutes if IV (assuming normal renal/hepatic function).
- **Organ dysfunction**: Use additional caution when converting opioids in patients with hepatic, renal, or pulmonary dysfunction. Morphine, hydromorphone, and oxycodone should be used with caution in patients with decreased renal function.
- **Opioids NOT recommended for cancer pain**: Meperidine and mixed agonist-antagonists (pentazocine, nalbuphine, butorphanol, dexocine) should be avoided
- **Withdrawal symptoms**: Nausea, vomiting, diarrhea, anxiety, and shivering are common symptoms of opioid withdrawal. A gradual taper is recommended when discontinuing opioids.
- **Overdose:** Symptoms may include respiratory depression, constricted pupils, and decreased responsiveness. Naloxone is used to reverse the effects of an opioid. To administer, dilute naloxone 0.4 mg/mL (1 mL) ampule into 9 mL of normal saline for total volume of 10 mL to achieve a 0.04 mg/mL concentration. Give 0.04 mg (1 mL) via slow IV push every 30 to 60 seconds until symptom improvement. DO NOT administer undiluted naloxone due to risk of precipitating rapid withdrawal, which may cause severe pain or seizures.
- **Chemotherapy-related, intermittent pain**: This type of pain may be managed with acetaminophen or oxycodone. See Appendix D for Opioid Dose Considerations, or refer to a drug information reference for additional information.
- **Constipation** is a common side effect with opioid use. Consider starting a bowel regimen in all patients taking opioids. Refer to Appendix E.
- **Duration of drug effect**: Any residual drug in the patient's system must be accounted for and an assessment of any residual effects from discontinued long-acting opioids must be made before any new opioid is started. For example, fentanyl will continue to be released from the skin 12 to 36 hours after transdermal patch removal.
- **The Texas Prescription Monitoring Program (PMP)** is an electronic database that tracks controlled substance prescriptions. It can help identify patients who may be misusing prescription opioids or other prescription medications and who may be at risk for overdose. Clinicians should review the Texas PMP prior to every opioid prescribed and at every visit in which pain is diagnosed or addressed. The program is now available through OneConnect and can also be accessed directly at https://texas.pmpaware.net/login. Personal profiles should be reviewed and updated routinely to ensure all states are included.

## APPENDIX A: Comprehensive Pediatric Pain Assessment

**The comprehensive pain assessment should include the following:**

1. **Pain**:
   a. For each site of pain, determine intensity level using the appropriate pain assessment tool (see below). Tools using 0 to 10 point scales can be categorized as follows: 0 = no pain, 1-3 = mild pain, 4-6 = moderate pain, 7-10 = severe pain
   b. Assess the following at rest and with activity: location and orientation, type (acute, chronic, acute exacerbation of chronic pain), onset, pathophysiology (somatic, visceral, neuropathic), frequency (continuous, intermittent, breakthrough, incidental), temporal factors such as aggravating and alleviating factors, duration, and etiology (*e.g.,* tumor, non-tumor related, fracture)
   c. Evaluation of medical history includes: oncologic or other significant medical illnesses, medication history, relevant imaging and laboratory studies
   d. Physical examination
   e. Assess for presence of sedation and other opioid side effects (Appendix E)

**Pediatric Pain Assessment Tools**




[1] For the pediatric patient, the selection between WBF and NRS for patients age ≥ 8 years will be dependent on patient preference and nursing clinical assessment
[2] WBF is the preferred pain scale for Pediatric Early Recovery Program

*Continued on next page*

## APPENDIX A: Comprehensive Pain Assessment - continued

2. **Function**:
   a. Evaluate patient's ability to ambulate, perform activities of daily living (ADL), range of motion (ROM), deep breathing, and coughing
   b. Assess restrictions related to pain
   c. Document patient's functional ability
3. **Psychosocial issues**:
   a. Evaluate patient distress, family support, psychiatric history, patient/family knowledge and beliefs surrounding pain and its management, and risk factors for under treatment of pain including underreporting, prior treatment of pain and response to other pain medications, concerns about misuse of pain medications or side effects, extremes of age, gender, cultural barriers, communication barriers, and prior history of drug abuse
   b. Document patient's assessment of psychological distress
4. **Personalized Pain Goal (PPG):**
   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

**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 (*e.g.,* surgery, steroids, radiotherapy, antibiotics) along with an emergent consultation.
Examples of oncologic emergencies include:

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

## APPENDIX B: Complementary and Integrative Therapy

**Pediatric Integrative Medicine Program and Integrative Medicine Center**
Integrative Medicine refers to an evidence-informed approach to bringing these complementary approaches into conventional medical care. Complementary approaches may be provided safely by individuals with proper training. Such approaches can provide support to patients and their caregivers. Benefits can include relief for symptoms such as: pain, nausea, and anxiety. Complementary approaches may also offer opportunities for increased socialization, motivation, and improving coping skills.

- Both the Integrative Medicine Center and The Pediatric Integrative Medicine Program provide treatments for patients such as yoga therapy, music therapy, and nutrition counseling
- The Integrative Medicine Center additionally provides acupuncture, oncology massage, and group classes for adolescents and young adults (AYA) and older adults
- Inpatient and outpatient services are available

**Child Life, Adolescent and Young Adult Life Program**
The Child, Adolescent and Young Adult Life Program assists in reducing the impact of cancer, painful procedures and hospital stays through relationship building, diagnosis education, procedural support, special events and activities, and opportunities for emotional expression. Services can be accessed via consults or informal referrals. The On-Call calendar denotes provider and contact information if the unit specialist is not readily available.
- Nicole Rosburg, M.S., CCLS – Manger **Email:** nmrosburg@mdanderson.org

**Pediatric Compassionate High Alert Team**
The Pediatric Compassionate High Alert Team (PCHAT) is a specialized interdisciplinary team that addresses aberrant opioid-related behavior in cancer patients. The team can be accessed by consulting Palliative/Supportive Care or Integrative Medicine.

**Arts in Medicine Program**
The Arts in Medicine program connects pediatric patients and their families to visual arts, music, theater, and dance through community collaborations, large-scale projects, and one-on-one experiences. Music Therapy services are provided to pediatric patients which can help reduce stress and anxiety, build confidence, decrease pain and provide patients with positive social experiences. Services are rendered via an informal referral process for patients and families
- Zachary E. Gresham, MA, M.Ed. – Program Manager **Email:** zegresham@mdanderson.org

**Pediatric School**
Education program offers art class daily, one day utilizing a pottery wheel, Google expeditions, cooking classes, and writers in the schools.
- Keyana Williams – Manager **Email:** krwilliams4@mdanderson.org

**Pediatric Clinical Psychology Services**
Pediatric clinical psychology services are initiated by consultation. The Pediatric On-Call Schedule denotes provider and contact information. Psychological interventions can be provided to patients who are struggling through acute or chronic pain.

# Cancer Pain – Pediatric (Age < 18 Years)





## APPENDIX C: Non-opioids for Pediatric Pain Management[1]

**CAUTION:** All of these agents are antipyretic and may mask fever; use caution in patients receiving myelosuppressive chemotherapy. Non-steroidal anit-inflammatory drugs (NSAIDs) may have antiplatelet effects that can increase the risk of bleeding in patients who are thrombocytopenic or receiving myelosuppressive chemotherapy and likely to become thrombocytopenic. Non-acetylated salicylates (*e.g.*, salsalate, choline magnesium salicylate) and the COX-2 selected NSAID (celecoxib) may have less effects on platelets, but should still be used with caution in a patient receiving myelosuppressive chemotherapy.

**Non-opioids include:** acetaminophen and NSAIDs. Non-opioids 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.

| Drug | Recommended Starting Dose | Maximum Daily Dose | Comments |
|---|---|---|---|
| **Acetaminophen** | 10 – 15 mg/kg (maximum 1,000 mg) PO every 4-6 hours | • Age < 2 years: 60 mg/kg/day<br>• Age ≥ 2 years **and** weight < 50 kg: 75 mg/kg/day; not to exceed 3,750 mg daily<br>• Age ≥ 2 years **and** weight ≥ 50 kg: 75 mg/kg/day; not to exceed 4,000 mg[2] daily | Available PO, IV or per rectum[3]. At higher doses, can cause fatal hepatotoxicity and renal damage. Avoid use in hepatic dysfunction. Does not have anti-inflammatory effect. |
| | 12.5 mg/kg (maximum 650 mg) IV every 4 hours<br>**or**<br>15 mg/kg (maximum 1,000 mg) IV every 6 hours | | IV acetaminophen is formulary restricted |
| **Ibuprofen** | 4 – 10 mg/kg (maximum 800 mg) PO every 6 - 8 hours | • Age < 12 years: 40 mg/kg<br>• Age ≥ 12 years: 3,200 mg[4] | Inhibits platelet aggregation and can cause gastrointestinal side effects or renal failure. Use with caution in patients at high risk[5]. |
| **Celecoxib** | 10 – 25 kg: 50 mg twice daily<br>> 25 kg: 100 mg twice daily | 400 mg | May not affect platelet aggregation. Can cause renal insufficiency. |
| **Ketorolac** | Single-dose treatment: 0.5 mg/kg (maximum 15 mg) IV once<br>Multiple-dose treatment: 0.5 mg/kg (maximum 30 mg) IV every 6 hours | 120 mg<br>Maximum 5 days | Evaluate after 8 doses and limit treatment to 5 days. 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. |
| **Meloxicam** | Suspension[6] (age ≥ 2 years) 0.125 mg/kg PO daily<br>Tablet (weight ≥ 60 kg) 7.5 mg PO daily | PO suspension[6]: 7.5 mg<br>Tablet: 7.5 mg | Inhibits platelet aggregation, can cause gastrointestinal side effects or renal failure. Use with caution in patients at high risk[5].<br>Suspension and tablets do not have equivalent systemic exposure and are not interchangeable, even if the total milligram strength is the same; do not substitute similar dose strengths of other meloxicam products. |

[1] The following medications are not approved in children: aspirin and naproxen
[2] Manufacturers of over-the-counter acetaminophen recommend no more than 3,000 mg daily
[3] Rectal route is contraindicated in neutropenic patients
[4] Due to increased adverse effects with higher doses, recommended maximum daily dose for chronic use is 2,400 mg
[5] Patients at high risk of serious gastrointestinal side effects or renal damage from NSAIDs include: smokers, previous history of peptic ulcer, currently receiving corticosteroids, anticoagulants, or presence of existing renal disease, cardiac or liver impairment
[6] Not on MD Anderson Cancer Center Formulary

## APPENDIX D: Pediatric Opioid Dose Considerations[1]

**Note: For age < 6 months, reduce initial dose by 50%**

| Opioid | Initial Short-Acting Dose in an Opioid Naïve Patient | | Onset (minutes) | Peak Effect (hours) | Duration (hours) | Available Oral Dose Formulations and Frequency | Comments |
|---|---|---|---|---|---|---|---|
| | Route | Dose | | | | | |
| **Morphine** | PO | 0.2 – 0.5 mg/kg, typically 0.3 mg/kg (maximum 5-15 mg) | 30 | 0.5 – 1 | 3 – 6 | Short-acting[2]:<br>15, 30 mg tablets;<br>10 mg/5 mL, 20 mg/5 mL, 20 mg/mL liquid<br>Frequency: every 4 hours | Oral formulations available as tablet or liquid preparation.<br>Avoid use in renal dysfunction.<br>Use with caution in liver dysfunction |
| | IV/SC | 0.05 – 1 mg/kg (maximum 2-3 mg) | 5-10 | N/A | N/A | | |
| **Oxycodone** | PO | 0.1 – 0.2 mg/kg, typically 0.1 mg/kg (maximum 5-10 mg) | 10 – 15 | 0.5 – 1 | 3 – 6 | Short-acting[2]:<br>5, 10, 15, 30 mg tablets;<br>5 mg/5 mL and 20 mg/mL liquid<br>Frequency: every 4 hours | Oral formulations available as tablet or liquid preparation.<br>Use with caution in renal and/or liver dysfunction. |
| **Hydromorphone** | PO | 0.03 – 0.06 mg/kg, typically 0.05 mg/kg (maximum 1-3 mg) | 15 – 30 | 0.5 – 1 | 3 – 5 | Short-acting[2]:<br>2, 4, 8 mg tablets;<br>1 mg/mL liquid<br>Frequency: every 4 hours | Oral formulations available as tablet or liquid preparation.<br>Use with caution in renal and/or liver dysfunction. |
| | IV/SC | 0.01 – 0.015 mg/kg (maximum 0.5-1.5 mg) | 15 – 30 | N/A | 4 – 5 | | |

[1] The following drugs are not approved in children: tapentadol and oxymorphone
[2] Short acting formulations may be given via enteral tubes (*e.g.*, nasogastric tube, percutaneous endoscopic gastrostomy (PEG) tube, gastric tube)

## APPENDIX E: Pediatric Opioid Side Effects – Prevention and Management

| Side Effect | Prevention | Management |
|---|---|---|
| Sedation<br>Inpatient setting: Assess sedation using the Richmond Agitation Sedation Scale (RASS) as indicated | • Discontinue other sedating medications if appropriate<br>• Educate all patients receiving opioids that drowsiness may occur for a few days following initiation or increase in opioid regimen | • Consider opioid rotation (see Appendix J) or dose reduction of opioid if sedation persists<br>• Consider psychostimulant:<br>1. Methylphenidate 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.<br>**or**<br>2. Modafinil 100 mg once or twice daily. Consider as second line for children age > 6 years. |
| Opioid Induced Neurotoxicity<br>Risk factors:<br>• High opioid dose<br>• Dehydration<br>• Renal failure<br>• Preexisting borderline cognition and/or delirium<br>• Use of other psychoactive drugs | Eliminate nonessential CNS activating or depressing drugs (*e.g.*, benzodiazepines) | • Evaluate for reversible causes such as metabolic disorders, liver or renal dysfunction, dehydration, hypercalcemia, organic brain disease; treat as appropriate.<br>• Consider one or more of the following:<br>1. Opioid rotation (see Appendix J)<br>2. Opioid dose reduction or discontinuation<br>3. Discontinue other offending drugs (benzodiazepines)<br>4. Hydration<br>5. Refer to Assessment and Management of Delirium in Pediatric Patients algorithm<br>• 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<br>• Titrate opioids cautiously<br>• Consider dose reduction or opioid rotation if patient has excessive sedation | • Call primary team, HOLD opioids, and provide supplemental oxygen<br>• If patient minimally responsive or unresponsive and respiratory rate ≤ 6 bpm, administer naloxone. Recommended dose: naloxone 0.4 mg diluted in 9 mL saline, 1 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.)*<br>• If patient is actively dying, DNR (do not resuscitate) and receiving comfort care, naloxone administration may not be appropriate |

*Continued on next page*

# Cancer Pain – Pediatric (Age < 18 Years)





## APPENDIX E: Pediatric Opioid Side Effects – Prevention and Management - continued

| Side Effect | Prevention | Management |
|---|---|---|
| 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<br><br>1. Polyethylene glycol (Miralax®) 0.7 – 1.5 g/kg (maximum 17 g/dose) in 4-8 ounce beverage daily<br>2. Ensure adequate fluids, dietary fiber and exercise if feasible<br>3. Prune juice followed by warm beverage may be considered | 1. Evaluate for potential causes of constipation (such as recent opioid dose increase, use of other constipating medications, new bowel obstruction)<br>2. Continue or initiate polyethylene glycol (Miralax®) and add one or both of the following:<br>• Senna: Start with daily dosing and if no results, increase to twice daily. If still no results, increase dose.<br>◦ Age 2 to < 6 years: 4.3 mg nightly (maximum 8.6 mg twice daily)<br>◦ Age 6 to < 12 years: 8.6 mg nightly (maximum 17.2 mg twice daily)<br>◦ Age ≥ 12 years: 17.2 mg nightly (maximum 34.4 mg twice daily)<br>• If NPO, metoclopramide 0.1 – 0.2 mg/kg IV or SC every 6 hours (maximum 5 mg for age ≤ 15 years; 10 mg for age > 15 years)<br>3. If no response to above, increase polyethylene glycol (Miralax®) to twice daily<br>4. 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**<br>• If impacted: Disimpact manually if stool is soft. If not, soften with mineral oil fleet enema before disimpaction. Follow up with fleet enema per rectum (refer to dosing recommendations below) until clear with no formed stools.<br>• Consider use of short-acting analgesics before disimpaction<br>• If not impacted on rectal examination, patient may still have higher level impaction. Consider abdominal imaging and/or one of the following:<br>◦ Glycerin suppository per rectum<br>- Age < 6 years: 1 pediatric suppository per rectum daily as needed<br>- Age ≥ 6 years: 1 adult suppository per rectum daily as needed<br>◦ Bisacodyl suppository<br>- Age 6 to ≤ 10 years: one half per rectum daily as needed<br>- Age > 10 years: one half to 1 adult suppository per rectum daily as needed<br>◦ Fleet enema<br>- Age 2 to < 5 years: one half pediatric enema per rectum once<br>- Age 5 to < 12 years: one pediatric enema per rectum once<br>- Age ≥ 12 years: one adult enema per rectum once<br>◦ Milk and molasses enema<br>- Age 2 - 12 years: one half bottle per rectum once<br>- Age ≥ 12 years: 1 bottle per rectum once<br>5. Methylnaltrexone or naloxone may be given to patients who meet the following criteria:<br>• Patient experiencing opioid-induced constipation<br>• Patient has not demonstrated an adequate response to other laxative therapy<br>• Patient does not have a known or suspected mechanical gastrointestinal obstruction |



*Continued on next page*

## APPENDIX E: Pediatric Opioid Side Effects – Prevention and Management - continued

| Side Effect | Prevention | Management |
|---|---|---|
| Nausea, Vomiting | • Titrate opioid dose slowly and steadily<br>• Provide antiemetics available with opioid prescription<br>• Ondanestron 0.15 mg/kg (maximum 8 mg) PO every 8 hours as needed<br>• If high risk of nausea, consider scheduled antiemetics for 5 days and then adjust as needed | 1. Assess for other causes of nausea (e.g., constipation, bowel obstruction, chemotherapy or other medications) and treat per guidelines. Initiate scheduled antiemetics, if indicated.<br>2. Add or increase non-opioid or adjuvant medications for additional pain relief so opioid dose can be reduced<br>3. If analgesia is satisfactory, reduce opioid dose by 25%<br>4. Consider opioid rotation if nausea remains refractory (see Appendix J) |

## APPENDIX F: Pediatric Specialty Services Consultation Guidelines

MD Anderson offers several coordinated pain specialty core services, consisting of Acute Pain, Chronic Pain, Pediatric Palliative/Supportive Care, Pediatric Intensive Care Unit (PICU), and Integrative Medicine. Guidelines for consultation to these services include the following:

Consult to one of the specialty core services should be considered for *any* patient whose pain remains uncontrolled for > 24 hours. Special patient populations in which pain assessment and management may be especially challenging include the following:

- Substance use disorders - except tobacco (current or past history)
- Emotional, behavioral, and mental disorders
- Cognitive disorders
- Communicative disorders
- Developmental disabilities
- Vision and hearing impairments and disabilities
- Refractory symptoms and dying patient

| Type of Pain | Specialty Services Consultation |
|---|---|
| Postoperative and perioperative pain | Acute Pain, Pediatric/Adult Integrative Medicine[1], and Pediatric Palliative/Supportive Care |
| Acute pain in inpatients | Chronic Pain in cases of pre-existing chronic pain and Pediatric Palliative/Supportive Care |
| Chronic pain and no evidence of active cancer | Chronic Pain, Pediatric/Adult Integrative Medicine[1], Pediatric Palliative/Supportive Care, and Physical Medicine & Rehabilitation |
| Evidence of active cancer with pain as the sole or predominant symptom | Chronic Pain or Pediatric Palliative/Supportive Care Service; consider Pediatric/Adult Integrative Medicine[1] |
| Evidence of active cancer and pain accompanied by multiple symptoms | Pediatric Palliative/Supportive Care; consider Pediatric/Adult Integrative Medicine[1] |
| Pain in the context of cancer in the palliative stage or end of life | |
| Need for continuous infusions of medications when other measures have failed and pain is therefore intractable | PICU and Pediatric Palliative/Supportive Care |
| Suspected substance use disorder | Request a consult to one of the specialty core services for a referral to a treatment program.<br>See Appendix L for Substance Use Disorder Treatment Services. |

[1] Adult/ Pediatric Integrative Medicine Program:
- Integrative Medicine Center provides an integrative approach to patients of all ages with treatments such as nutrition counseling, acupuncture, yoga therapy, and oncology massage. Outpatient consultations and group classes are available for adolescents and young adults (AYA) and older adults.
- The Pediatric Integrative Medicine Program provides an integrative approach to cancer treatment including mind-body treatments and nutritional counseling to children, adolescents and young adults cared for in the Child and Adolescent Center

# Cancer Pain – Pediatric (Age < 18 Years)





## APPENDIX G: Adjuvant "Co-analgesics" for Pediatric Neuropathic Pain Syndromes and Chronic Pain[1]

| Drug Class and Uses | Medication | Recommended Starting Dose | Maximum Daily Dose | Comments |
|---|---|---|---|---|
| **Anticonvulsants** (various NP types) | Gabapentin | **Day 1:** 5 mg/kg (maximum 300 mg) PO at bedtime<br>**Day 2:** 5 mg/kg (maximum 300 mg) PO twice a day<br>May escalate to three times daily after one week based on tolerability and response | Dose may be further titrated to a maximum of 3,600 mg/day or 35 mg/kg/day | Used in PHN and NP. May cause drowsiness, dizziness, and peripheral edema. Dose adjust for renal impairment. |
| | Pregabalin | 1 mg/kg (maximum 50 mg) for 3 days,<br>then 1 mg/kg twice daily.<br>May escalate dose and frequency based on tolerability and response. | Dose may be further titrated to a maximum of 6 mg/kg/dose or 600 mg/day | Used in DN, PHN, FM, and NP. May cause drowsiness, dizziness, peripheral edema. Dose adjust for renal impairment. |
| | Topiramate | 6-12 years (weight ≥ 20 kg):<br>15 mg PO daily for 7 days, then 15 mg PO twice a day<br><br>Age ≥ 12 years: 25 mg PO at bedtime for 7 days, then<br>25 mg PO twice a day and titrate up to 50 mg PO twice a day | 200 mg | Used in NP, cluster headaches, and migraine prevention. May cause acidosis, drowsiness, dizziness, and nausea. Dose adjust for renal and/or hepatic impairment. |
| **Tricyclic Antidepressants** (TCA) | Amitriptyline | 0.1 mg/kg PO at bedtime; titrate as tolerated over 3 weeks to 0.5 – 2 mg/kg PO at bedtime | 25 mg | Consider for continuous and shooting neuropathic pain. Caution use in frail patients, or those with glaucoma or arrhythmias. May cause sedation, arrhythmias, dry mouth, orthostasis, and urinary retention. |

DN = diabetic neuropathy
FM = fibromyalgia
TGN = trigeminal neuralgia
NP = neuropathic pain
PHN = post herpetic neuralgia
SSRIs = selective serotonin reuptake inhibitors
MAOI = monoamine oxidase inhibitors

[1] The following medications are not approved in children: pregabalin, carbamazepine, oxcarbazepine, tiagabine, nortriptyline, desipramine, duloxetine, venlafaxine and tizanidine

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# Cancer Pain – Pediatric (Age < 18 Years)





## APPENDIX G: Adjuvant "Co-analgesics" for Pediatric Neuropathic Pain Syndromes and Chronic Pain[1]- continued

| Drug Class and Uses | Medication | Recommended Starting Dose | Maximum Daily Dose | Comments |
|---|---|---|---|---|
| **Muscle Relaxants** (muscle pain, spasm) | Baclofen[2] | **Age < 2 years:** 2.5 – 5 mg PO every 8 hours; titrate dose every 3 days to maximum daily dose<br>**Age 2–7 years:** 7.5 – 10 mg PO every 8 hours; titrate dose every 3 days in increments of 5 – 15 mg/day to maximum daily dose<br>**Age ≥ 8 years:** 10 – 15 mg PO every 8 hours; titrate dose every 3 days in increments of 5 – 15 mg/day to maximum daily dose | **Age < 2 years:** 40 mg<br>**Age 2–7 years:** 60 mg<br>**Age ≥ 8 years:** 80 mg | Caution use in patients with seizures, cardiovascular disease, glaucoma, myasthenia gravis, renal or hepatic impairment, patients on TCAs or MAOIs. May cause anticholinergic effects and significant drowsiness.<br><br>Methocarbamol IV: may repeat course after drug free interval of 48 hours. **Note:** IV route is contraindicated in patients with renal dysfunction due to presence of polyethylene glycol. |
| | Cyclobenzaprine | **Age ≥ 15 years:** 5 mg PO three times daily | 30 mg | |
| | Methocarbamol | **Age ≥ 16 years:** 500 mg PO four times daily<br>10 mg/kg IV every 8 hours | 3,000 mg IV for 3 days maximum if PO not possible | |
| **Corticosteroids** (inflammation, nerve compression) | Dexamethasone | 0.25 mg/kg IV or PO every 6 hours<br>Standard dose 4 – 16 mg/day | 16 mg | May cause impaired healing, infection, thrush, hyperglycemia, weight gain, myopathy, stomach upset, psychosis, emotional instability.<br>Perineal burning/itching may occur with IV. |
| **Serotonin-norepinephrine reuptake inhibitors** (SNRI) | Duloxetine (Cymbalta®) | **Age ≥ 7 years:** 30 mg at bedtime; titrate dose every 1-2 weeks to maximum daily dose of 60 mg twice daily | 120 mg | Consider duloxetine for NP or DN. Caution use in patients with seizures; avoid MAOIs, other SSRIs or SNRIs due to potential for serotonin syndrome. Taper dose down slowly when no longer needed to avoid discontinuation syndrome. Antidepressants increase the risk of suicidal thinking and behavior in children, adolescents, and young adults (ages 18 – 24 years) with major depressive disorder and other psychiatric disorders. Consider risk prior to prescribing. May increase risk for bleeding through platelet inhibition. Monitor for orthostatic hypotension. Avoid use if creatinine clearance < 30 mL/minute. |

MAOI = monoamine oxidase inhibitors TCAs = tricyclic antidepressants DN = diabetic neuropathy NP = neuropathic pain

[1] The following medications are not approved in children: pregabalin, carbamazepine, oxcarbazepine, tiagabine, nortriptyline, desipramine, duloxetine, venlafaxine and tizanidine

[2] Intrathecal formulation not on MD Anderson formulary

## APPENDIX H: Pain Management Education for Pediatric Patients and Family Prior to Discharge

Management of cancer pain is an integral component of cancer care. Patient education in the following areas should be provided to patients.

**1. General Pain Education:** Specific teaching information is available in Patient Education-On Line. Education should include the following:

A. Relief of pain is important and there is no benefit to suffering with pain
B. Expect optimal treatment for pain and side effects
C. Pain can usually be well controlled with oral medications. There are many options available to control pain.
D. Communication with the healthcare team is critical to pain management and avoiding serious side effects. Communication should include:
   - Patient/Family understanding about how to rate their pain type, severity/intensity, and personalized pain goals (PPG). An age specific, physiologic condition appropriate pain scale should be provided with explanation.
   - Potential problems or side effects of pain medications
   - Concerns about difficulty in obtaining medications (such as cost or inadequate quantity of tablets)

**2. Specific information related to Opioid Use** (such as morphine and related medications). Specific teaching information is available in Patient Education-On Line.

A. Morphine and morphine-like medications are often used to relieve pain
B. When opioids are used to treat cancer pain, addiction is rarely a problem
C. Taking opioids now will not alter later effectiveness
D. Discuss potential side effects of opioids, and their prevention and management
E. Prevention of constipation will be needed by most patients
F. Opioids are controlled substances that need to be properly safeguarded in the home
G. Opioids must be used with caution, and should not be mixed with alcohol or illicit substances

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## APPENDIX H: Pain Management Education for Pediatric Patients and Family Prior to Discharge - continued

**3. Pain Education Discharge/Resource Checklist:**

A. A written plan for pain medications, listing all medications to be used with dosage and frequency. Provide patient with print out of updated medication reconciliation.

B. Written information on who to call (provider, service, phone number) for pain issues and plan for follow up care. Instruct patient/caregiver to call if:

- Problems in obtaining prescriptions or taking the medication
- New pain, change in pain, or pain not relieved with medication
- Nausea and vomiting that prevents eating for 1 day
- No bowel movements for 3 days
- Difficulty arousing the patient from sleep easily during daytime
- Confusion

C. MD Anderson has multiple resources and programs related to pain management

- For a list of Support Programs and services provided, please refer to Support Programs
- For further information and a complete list of resources, please refer to Welcome to the University of Texas MD Anderson Children's Cancer Hospital
- The Law and Levit Learning Center(s) provide the latest information about health, cancer, and cancer prevention. Available resources include:
  - Journals, consumer health magazines and newsletters
  - Online journals, electronic books and databases
  - Free booklets
  - Topic-specific binders
  - Books, audios and videos
  - DVDs and videotapes

Law Learning Center: Main Building, 4th floor, near elevator A (Room R4.1100). 713-745-8063
Levit Learning Center: Mays Building, 2nd floor, near elevator T (ACB.2.1120). 713-563-8010

## APPENDIX I: Pediatric 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. Refer to Patient Controlled Analgesia (PCA) Administration Procedure (#ATT1857) for assessment and monitoring guidelines.

### 1. Opioid naïve patients

| Opioid | Demand (PCA) Dose (Dose Range) | Lock-out Interval (Minutes) | Continuous Dose (Basal) | Nurse Bolus as needed for pain | Nurse Bolus Interval (Hours) |
|---|---|---|---|---|---|
| **Morphine** (milligrams) | 0.01 – 0.03 mg/kg | 10 – 30 minutes | See below | Twice the dose of demand (PCA) dose | 2 – 4 hours |
| **Hydromorphone** (milligrams) | 0.003 – 0.004 mg/kg | 10 – 30 minutes | See below | Twice the dose of demand (PCA) dose | 2 – 4 hours |
| **Fentanyl** (micrograms) | 0.5 – 1 mcg/kg | 10 – 30 minutes | See below | Twice the dose of demand (PCA) dose | 2 – 4 hours |

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, Chronic Pain, Pediatric Palliative/Supportive Care, PICU, and Integrative Medicine (Appendix F 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 20/12 = 1.7 mg/hour then 1.7 X 0.3 (30%) = 0.5 mg/hour basal rate.
c. Nurse bolus as needed for pain; nurse bolus interval (hours) per physician discretion

### 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, Chronic Pain, Pediatric Palliative/Supportive Care (see Appendix F for description of services) for PCA ordering.
a. Calculate total dose of opioid (scheduled and breakthrough doses) used in the previous 24 hour period
b. Use equianalgesic opioid dose conversion table (Appendix J) 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 as needed every hour for breakthrough pain

## APPENDIX J: Equianalgesic Opioid Dose Conversion[1]

**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 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.

| Opioid | Oral Dose (PO) | Parenteral Dose (IV/SC) | Conversion Factor: Parenteral to Oral Opioid | Conversion Factor: Oral Opioid to Oral Morphine |
|---|---|---|---|---|
| **Morphine** | 30 mg | 10 mg | 3 | 1 |
| **Oxycodone** | 20 mg | N/A | N/A | 1.5 |
| **Hydrocodone** | 30 mg | N/A | N/A | 1 |
| **Oxymorphone** | 10 mg | 1 mg | 10 | 3 |
| **Hydromorphone** | 7.5 mg | 1.5 mg | 5 | 4-7 |
| **Fentanyl**[2] | N/A | 120 mcg | N/A | Should be managed by clinicians experienced in pain management |
| **Methadone and buprenorphine should only be initiated and managed by clinicians experienced in pain management. Consider consult to pain specialists if needed.** | | | | |

[1] This Equianalgesic Opioid Dose Conversion chart is based on the Centers for Disease Control and Prevention (CDC) recommendations (https://www.cdc.gov/drugoverdose/resources/data.html)
[2] See Appendix K for transdermal fentanyl conversion

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# Cancer Pain – Pediatric (Age < 18 Years)





## APPENDIX J: Equianalgesic Opioid Dose Conversion - continued

**Steps for Opioid Rotation:**

1. Stop current opioid regimen.
2. Calculate total dose of current opioid (scheduled and breakthrough doses) used in the previous 24 hour period.
3. Calculate the dose of the new opioid using the equianalagesic dose conversion table (from previous page) and conversion equation (below).

$$\frac{\text{Equianalgesic dose per route of CURRENT opioid}}{\text{24 hour dose per route of CURRENT opioid}} = \frac{\text{Equianalgesic dose per route of NEW opioid}}{\text{24 hour dose per route of NEW opioid}}$$

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 as needed 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 breakthrough doses) used in the previous 24 hours which equals 120 mg IV morphine.
3. Calculate the dose of the new opioid using the equianalagesic dose conversion table and conversion equation (below).

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

$$\frac{\text{10 mg IV morphine}}{\text{120 mg IV morphine over 24 hours}} = \frac{\text{30 mg PO morphine}}{\text{X mg PO morphine over 24 hours}} \qquad X = 360 \text{ mg PO morphine}$$

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

$$\frac{\text{30 mg PO morphine}}{\text{360 mg PO morphine}} = \frac{\text{20 mg PO oxycodone}}{\text{X mg PO oxycodone}} \qquad X = 240 \text{ mg PO oxycodone}$$

4. Calculate for incomplete cross-tolerance. After a 30-50% dose reduction, the oxycodone dose calculated above should be between 120 and 168 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 as needed 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

## APPENDIX K: Fentanyl

| Dosage Forms | Onset | Peak | Duration | Doses Available per Formulary | Comments |
|---|---|---|---|---|---|
| Parenteral (IV/Subcutaneous) | Almost immediate | Several minutes | 0.5-1 hour | 50 mcg/mL (5 mL vial for injection)<br>PCA syringe supplied as 2,750 mcg/55 mL | |
| Transdermal patch[1] | 12-24 hours | 24-72 hours | 48-72 hours | 12 (delivers 12.5), 25, 50, 75, 100 mcg/hour | Bioavailability 90%; Do *not* cut patch, apply heat, or use in patients who develop fever – results in faster onset, shorter duration, and possible overdose. 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 microgram-to-microgram basis. |

**Drug specific characteristics:**

- Fentanyl is 80-100 times more potent than morphine. Fentanyl is not recommended for initial use in opioid naïve patients since its use may lead to fatal respiratory depression.
- Transdermal fentanyl should only be used in patients with stable opioid requirements. Due to the long systemic 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 use with CYP450 3A4 inhibitors, which can increase fentanyl plasma concentrations
- May be used in patients with renal dysfunction

[1]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.

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## APPENDIX K: Fentanyl - continued

### IV Fentanyl Dosing:

**Morphine to IV fentanyl conversion: 1 mg of IV morphine or 3 mg of oral morphine = 10 micrograms of IV fentanyl**

Example: Conversion from oral morphine ER 90 mg every 12 hours to IV fentanyl

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 = 3 mg oral morphine = 10 micrograms IV fentanyl, then new 24 hour morphine dose of 126 mg = 24 hour IV fentanyl dose of 420 micrograms
4. Divide 24 hour fentanyl dose calculated by 24 hours = 17.5 micrograms/hour

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

### Transdermal Fentanyl (TDF) Dosing:

***Option 1:*** 2 mg oral morphine is 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

| Oral Morphine (mg/day) | Transdermal Fentanyl (mcg/hour) |
|---|---|
| 25 | 12 |
| 50 | 25 |
| 75 | 37 |
| 100 | 50 |
| 125 | 62 |
| Each additional 25 mg/day | An additional 12 mcg/hour |

**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 L: Substance Use Disorder Treatment Services

Note: Most treatment facilities require insurance coverage or sufficient money to cover treatment. If patient has insurance, call the customer service number to find a facility in-network to avoid a large out-of-pocket debt. Refer to Case Management for assistance.

- Bay Area Recovery Center
  1807 FM 517
  East Dickinson, Texas 77539
  (281) 957-9201
  Accepts age 17 years with parent's consent; does not accept insurance.
- The Council on Recovery
  Houston, Texas
  www.councilonrecovery.org
- Clearinghouse for treatment, education, and recovery groups, *etc.*
  303 Jackson Hill St.
  Houston, Texas 77007
  (713) 914-0556, (281) 866-7557
- The Adolescent Substance Use Disorder (ASUD) Program
  1941 East Rd.
  Houston, Texas 77054
  (713) 486-2045 (Accepts age 12 - 18 years)
- Hazelden Betty Ford
  Multiple locations around the country
  1-(866) 831-5700
  hazeldenbettyford.org
- West Oaks Hospital (Dr. George Santos)
  https://westoakshospital.com/programs-services/adolescents/
  6500 Hornwood
  Houston, Texas 77074
  (713) 995-0909
- UT Health Harris County Psychiatric Center (HCPC)
  2800 South MacGregor Way
  Houston, TX 77021
  (713) 741-5000
- Substance Abuse and Mental Health Services Administration (SAMHSA)
  Behavioral Health Treatment Services Locator: https://www.samhsa.gov/find-treatment
  Enter patient's address and zip code on website
  1-(800) 622-4357
- The Menninger Clinic
  12301 S. Main St.
  Houston, Texas 77035-6207
  (713) 275-5000 (Accepts ages 12 - 17 years; does not accept insurance)

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MD Anderson Institutional Policy Attachment #ATT1857 - Patient Controlled Analgesia (PCA) Administration Procedure

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## DEVELOPMENT CREDITS

This practice consensus statement is based on majority opinion of the Pediatric Pain experts at the University of Texas MD Anderson Cancer Center for the patient population. These experts included:

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Evidence regarding specific clinical outcomes associated with the use of this or similar pain algorithms applied in comprehensive cancer centers is sparse. Other algorithms or approaches may produce similar or better outcomes.

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