

# OPIOID DOSING AND CONVERSION CALCULATIONS

Opioids and opioid-like medications are a class of drugs that exist naturally in the opium poppy plant. They are considered mainstream for pain management. The medications are commonly used to treat acute pain, such as fractures and surgeries. Although they are often used to manage chronic pain, that practice is not supported by the Centers for Disease Control and Prevention (CDC) as first-line therapy, except in situations of active cancer treatment, palliative care, or end-of-life care.<sup>1</sup> Although opioids are typically associated with pain management, they are also used for other symptoms, such as breathlessness, cough, and diarrhea. The focus of this resource guide is to present evidence-based practice guidelines for opioid dosing and outline the conversion steps for escalation and de-escalation of opioid therapy.

## OPIOIDS AT A GLANCE

Even though the United States is experiencing an opioid epidemic, the use of these medications in palliative care and hospice is necessary<sup>2-3</sup> For advanced practice prescribers initiating opioid therapy, the benefits of symptom management should outweigh the risks to the patient. When opioids are initiated, they should be combined with nonpharmacologic as well as non-opioid pharmacologic therapy.<sup>4</sup> Designated as controlled substances under the Controlled Substances Act and regulated by the U.S. Department of Justice's Drug Enforcement Administration, opioids are placed into respective schedules based upon current accepted medical use, associated relative abuse potential, and probability of dependence when abused.<sup>5</sup>

- **Schedule 1:** no currently accepted medical use and high potential for abuse (e.g., heroin, lysergic acid diethylamide [known as LSD], ecstasy)
- **Schedule 2:** high potential for abuse with possible severe physical and psychologic dependence (e.g., fentanyl, hydromorphone, oxycodone, morphine, hydrocodone)
- **Schedule 3:** moderate to low potential for physical and psychologic dependence (e.g., codeine)
- **Schedule 4:** low potential for abuse and risk of dependence (e.g., tramadol)

Opioids bind to and activate receptors in the central nervous system ( $\mu$  [primary],  $k$ , and  $\delta$ ) and peripheral nervous system to achieve analgesic effects while potentially yielding undesired effects, such as respiratory depression, sedation, confusion, constipation, and urinary retention.<sup>6</sup> Patients' responses to opioid therapy vary due to multiple  $\mu$  subtypes, differences in hepatic metabolism, and genetic factors.<sup>7</sup> When opioids are prescribed at equianalgesic doses (same degree of analgesia) and appropriate dosing intervals, no substantial differences in potency exist.

## OPIOIDS PRESCRIBING AND DOSING

Before prescribing opioids, a practitioner should complete a thorough physical examination, mental health screening, review through the prescription drug monitoring program, and urine drug testing.<sup>8</sup> Advanced practice providers should establish goals with the patient and collect history of non-opioid and opioid use to ensure therapeutic response and reduce possible adverse outcomes. Discussing the risks and benefits of opioid therapy is essential for a well-informed patient and caregiver.

The revised World Health Organization (WHO) analgesic ladder is widely known and uses a four-step, easy-to-implement strategy for opioid therapy with a bi-directional approach.<sup>9</sup> Opioids designated as Schedule 3 or 4 medications can be initiated for moderate pain in conjunction with non-opioid analgesics, such as acetaminophen plus optimal adjuvant. Opioids designated as Schedule 2 medications should be initiated for severe pain or in cases where moderate pain has not been controlled with a Schedule 3 or 4 opioid plus non-opioid plus optimal adjuvant.

<b>Step 1</b>	Mild pain			Non-opioid	+	Optimal adjuvant
<b>Step 2</b>	Moderate pain	Schedule 3 or 4 opioids	+	Non-opioid	+	Optimal adjuvant
<b>Step 3</b>	Severe pain	Schedule 2 opioids	+	Non-opioid	+	Optimal adjuvant
<b>Step 4</b>	No pain relief	Invasive or minimally invasive treatments				

**Initiating dose:** When initiating opioid therapy, prescribe the lowest possible dose to reduce associated risks, particularly in elderly patients and those with respiratory comorbidities. In addition, prescribe immediate-release (IR) forms of opioids before extended-release (ER) or long-acting (LA) opioids. Advanced practice prescribers usually use the morphine milligram equivalent (MME) for ease of comparison and risk evaluation of the different opioids available. Conversion of an opioid dose to MME per day can be done with a morphine equivalent table, also known as an opioid conversion chart. Morphine equivalent dose calculators are available for use, though there is no universally accepted calculator and variability exists among conversion resources. Equianalgesic dose conversions are only estimates and do not account for variability in genetics and drug metabolism.<sup>10</sup>

**Escalating dose:** After careful reassessment of benefits and risks, escalation of opioid therapy may be necessary. An advanced practice prescriber should increase dosage by the smallest practical amount, continuously assessing benefits and risks, including whether the opioids are meeting treatment goals. As titration reaches > 50 MME per day, consider offering overdose-prevention education and naloxone to the patient and caregivers. Prescribers should evaluate benefits and harms within one to four weeks of escalating opioid therapy. As MME reaches > 90 MME per day, reevaluate continued use and discuss it with the patient and caregiver when appropriate.<sup>11</sup>

**De-escalating dose:** Indications for de-escalating or discontinuing opioid therapy include no clinical improvement in symptoms, opioid dosages > 50 MME per day, patient requesting or experiencing an overdose, or other adverse outcomes. A de-escalation plan should be initiated in collaboration with the patient, starting with a reduction of 10% of the original dose.<sup>11</sup> Tapering too quickly can result in withdrawal symptoms. Patients on IR and ER or LA opioid therapy may select which opioid to taper first. Successful tapering is a slow process, requiring ongoing assessment of depression, anxiety, and insomnia.<sup>12</sup>

**Conversion Considerations and Calculations:** In the event a patient is inadequately responding to prescribed opioid therapy, it may be necessary to switch to a different opiate. Utilizing the MME, prescribers can calculate the total amount of morphine equivalent in order to transition to a stronger opioid to achieve a therapeutic response. The new opioid should not be prescribed at the equivalent dose; rather, dosing should be reduced by 25%–50% to avoid adverse effects and account for individual differences in drug metabolism. Then increase the dose gradually, with reassessment in one to four weeks.<sup>13</sup> Calculating MME is a three-step process that requires the use of an opioid conversion chart (see below).

- **Step 1:** Calculate the total daily amount (24 hours) of each opioid taken.
- **Step 2:** Convert each opioid to MME by multiplying the daily dosage for each opioid using the conversion factor.
- **Step 3:** Total all opioid MMEs together.

OPIOID CONVERSION CHART <sup>14</sup>		
Opioid (doses in mg per day except fentanyl)	Conversion Factor to MME	Oral Equianalgesic Factor (mg)
Tramadol	0.2	120
Codeine	0.15	200
Morphine	1	30
Hydrocodone	1	30
Oxycodone	1.5	20
Methadone	varies by dosage	varies by dosage
Oxymorphone	3	10
Hydromorphone	4	7.5
Fentanyl	2.4	N/A

### EVOLVING CASE CALCULATION

**Case #1:** Mr. T, age 45, has been diagnosed with lung cancer and is currently receiving radiation. He is taking ER oxycodone 40 mg BID, and pain is well controlled. What is his current daily MME?

- **Step 1:**  $40 \text{ mg} \times 2 = 80 \text{ mg oxycodone/day}$
- **Step 2:** Oxycodone conversion factor is 1.5.  
 $80 \text{ mg} \times 1.5 = 120 \text{ MME per day}$
- **Step 3:** The patient's dosage is 120 MME.

**Critical reflection:** Although the total MME is > 90 MME per day, this patient is undergoing cancer treatment. Education on overdose prevention should be recommended, and naloxone should be offered.

**Case #2:** Mr. T's pain has escalated and is no longer being managed by ER oxycodone 40 mg BID. He is requesting an increase in his ER and an addition of a short-acting dose for breakthrough pain. The provider increases the ER oxycodone to 60 mg BID and adds IR oxycodone 5 mg every four to six hours for breakthrough pain. After one week of therapy, he reports taking three tablets of oxycodone 5 mg over a 24-hour period. What is Mr. T's current daily MME?

- **Step 1:**  $60 \text{ mg} \times 2 = 120 \text{ mg oxycodone per day} + 5 \text{ mg} \times 3 = 15 \text{ mg oxycodone/day}$   
Total = 135 mg
- **Step 2:** Oxycodone conversion factor is 1.5.  
 $135 \text{ mg} \times 1.5 = 202.5 \text{ MME per day}$
- **Step 3:** The patient's dosage is 202.5 MME.

**Critical reflection:** At 202.5 MME, the patient's pain is controlled, and no adverse effects noted.

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**Case #3:** Mr. T continues to struggle with pain control, and escalation of his opioid therapy is needed. After thorough discussion and collaboration with the patient, the advanced practice provider transitions the patient to oral hydromorphone. When switching to a different opioid, the provider has the option to calculate MME and then determine the dosing of the newer therapy or to convert directly using the oral equianalgesic dosing table.

- **Step 1:**  $60 \text{ mg} \times 2 = 120 \text{ mg oxycodone per day plus } 5 \text{ mg} \times 4 = 20 \text{ mg oxycodone per day}$   
Total = 140 mg
- **Step 2:**  $140 \text{ mg current oxycodone} \times 7.5 \text{ mg equianalgesic factor of oral hydromorphone} / 20 \text{ mg equianalgesic factor of oxycodone} = 52.5 \text{ mg oral hydromorphone}$   
Reduce by 25%–50% for incomplete cross-tolerance and individual responses.  
Total = 26–39 mg per 24 hours
- **Step 3:** Prescribe 8 mg every six hours as needed for pain control (total = 32 mg).

**Critical reflection:** Ongoing assessment, within one to four weeks, is needed with opioid switching.

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