

April 2018 ~ Resource #340406

Equianalgesic Dosing of Opioids for Pain Management

*Equianalgesic doses contained in this chart are approximate, and should be used only as a guideline. Dosing must be titrated to individual response. There is often incomplete cross-tolerance among these drugs. **Therefore, many experts recommend beginning with a 25% to 50% lower dose than the published equianalgesic dose when changing drugs and then titrate to a safe/effective response.**^{2,3,4,48} Dosing adjustments for renal or hepatic insufficiency, cytochrome P450 drug interactions, genetics, and other conditions or medications that affect drug metabolism, kinetics, or response may also be necessary.^{2,3,4,48} Also consider pain control at time of switch.^{3,4,48} In general, use cautious dosing for elderly or debilitated patients, and patients with renal or hepatic impairment.^{3,4,48} Some products have specific dosing recommendations for these populations (see footnotes). See our Opioid Conversion Algorithm for instructions on converting from one opioid to another.*

A website with an equianalgesic dose calculator is available at <http://www.hopweb.org>

NA = not available. Continue to the next section for dosing of “atypical opioids” (e.g., tramadol, etc).

Drug	Equianalgesic Doses (mg) ^{1,3,4,41}		Approximate Equianalgesic 24 hr Dose (Assumes Around-the-Clock Dosing) ^g		Usual Starting Dose (Opioid-Naive Adults) (Doses NOT Equianalgesic)	
	Parenteral	Oral	Parenteral	Oral	Parenteral	Oral
Morphine (immediate-release tablet, capsule [Canada], oral solution, injection)	10	30	3-4 mg q 4 h	10 mg q 4 h	2-5 mg q 4 h (acute or chronic pain) ⁵⁰	10 mg q 4 h (can start with 15 mg, per U.S. labeling) ^{10,41,70}
Extended-release morphine (<i>MS Contin, Kadian, Morphabond ER</i> [U.S.], <i>Arymo ER</i> [U.S.], <i>M-Eslon</i> [Canada])	NA	30 See footnote e.	NA	30 mg q 12 h <i>Kadian:</i> 30 mg q 12 h or 60 mg q 24 h ^{6,21,e}	NA	U.S.: 15 mg q 12 h ⁵¹ (<i>MS Contin</i> or <i>Arymo ER</i> [U.S.] can also be given q 8 h) ^{29,53,c} Canada (<i>MS Contin, M-Elson</i>): 15-30 mg q 12 h ^{9,57,c} <i>Kadian</i> not for opioid-naive patients. ^{6,21}
Extended-release morphine/naltrexone capsule (<i>Embeda</i> , U.S.)	NA	30	NA	30 mg q 12 h or 60 mg q 24 h ¹²	NA	20/0.8 mg q 24 h ^{12,c}

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Drug	Equianalgesic Doses (mg) ^{1,3,4,41}		Approximate Equianalgesic 24 hr Dose (Assumes Around-the-Clock Dosing) ^g		Usual Starting Dose (Opioid-Naive Adults) (Doses NOT Equianalgesic)	
	Parenteral	Oral	Parenteral	Oral	Parenteral	Oral
Hydromorphone (<i>Dilaudid</i>)	1.5	6 to 7.5	0.4 mg q 4 h	2 mg q 4 h	See footnote a	2 mg q 4-6 h ⁴¹ See footnote a.
Controlled-release hydromorphone (<i>Hydromorph Contin</i> [Canada])	NA	6	NA	6 mg q 12 h	NA	3 mg q 12 h ^{30,c}
Extended-release hydromorphone (<i>Exalgo, Jurnista</i> [Canada])	NA	See footnote b.	NA	See footnote b.	NA	Not for opioid-naive patients. ^{13,19}
Oxycodone (e.g., <i>Roxybond, Roxicodone</i> [U.S.], <i>Oxy IR</i> [Canada], also in <i>Percocet</i> [U.S.], others)	NA	20	NA	5-10 mg q 4 h	NA	5-15 mg q 4-6 h (U.S.); ^{42,59} 5-10 mg q 6 h (Canada) ⁴³ (product labeling) 5-10 mg q 8-12 h ¹⁴ or 5 mg q 4-6 h ⁴¹ (chronic noncancer pain guidelines)
Extended-release oxycodone (<i>OxyContin</i> [U.S.], <i>OxyNeo</i> [Canada]), <i>Xtampza ER</i> [U.S.])	NA	20 See footnote h.	NA	20 mg q 12 h	NA	10 mg q 12 h ^{5,7} (<i>Xtampza ER</i> : 9 mg q 12 h ⁶⁶) ^c
Controlled-release oxycodone/naloxone (<i>Targin</i> [Canada])	NA	20	NA	20/10 q 12 h	NA	10/5 mg q 12 h ^{11,c}

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Drug	Equianalgesic Doses (mg) ^{1,3,4,41}		Approximate Equianalgesic 24 hr Dose (Assumes Around-the-Clock Dosing) ^g		Usual Starting Dose (Opioid-Naive Adults) (Doses NOT Equianalgesic)	
	Parenteral	Oral	Parenteral	Oral	Parenteral	Oral
Oxymorphone (<i>Opana</i> [U.S.])	1	10	0.3-0.4 mg q 4 h	5 mg q 6 h	0.5 mg q 4-6 h ⁷²	10-20 mg q 4-6 h (acute pain) ^{44,d} 5-10 mg q 8-12 h ¹⁴ or 5-10 mg q 4-6 h ⁴¹ (chronic noncancer pain guidelines)
Extended-release oxymorphone (<i>Opana ER</i> [U.S.]) ⁱ	NA	10	NA	10 mg q 12 h	NA	5 mg q 12 h ^{73,c}
Extended-release hydrocodone bitartrate (<i>Zohydro ER</i> [U.S.], <i>Hysingla ER</i> [U.S.])	NA	See footnote f.	NA	See footnote f.	NA	<i>Zohydro ER</i> : 10 mg q 12 h (chronic pain) ^{58,c} <i>Hysingla ER</i> : 20 mg q 24 h (chronic pain) ^{62,c}
Hydrocodone bitartrate/acetaminophen (e.g., <i>Norco</i> [U.S.], others)	NA	30	NA	10 mg q 4 h	NA	5-10 mg q 4-6 h (product labeling) ⁴⁵ 5-10 mg q 4-12 h (chronic noncancer pain guidelines) ^{14,41}
Benzhydrocodone/acetaminophen (<i>Apadaz</i>)	NA	25 ⁷¹ See footnote f.	NA	6.12 mg q 4 h	NA	6.12-12.24 mg q 4-6 h (acute pain only [up to 14 days' use]) ⁷¹

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Drug	Equianalgesic Doses (mg) ^{1,3,4,41}		Approximate Equianalgesic 24 hr Dose (Assumes Around-the-Clock Dosing) ⁸		Usual Starting Dose (Opioid-Naive Adults) (Doses NOT Equianalgesic)	
	Parenteral	Oral	Parenteral	Oral	Parenteral	Oral
Codeine A weak opioid. ¹ Analgesic efficacy limited by a dose ceiling. ⁴⁶ Patients on codeine may have little or no opioid tolerance. ¹⁴	100-120	200	30 mg q 4 h	60 mg q 4 h	10 mg q 3-4 h ⁵²	15-60 mg q 4 h (product labeling) ⁴⁶ 30 mg q 4-6 h (chronic noncancer pain guidelines) ⁴¹
Controlled-release codeine (<i>Codeine Contin</i> [Canada]) Reduce dose by 25% when switching from oral codeine phosphate due to phosphate content of tablet. ⁴⁹ A weak opioid. ¹ Analgesic efficacy limited by a dose ceiling. ⁴⁹ Patients on codeine may have little or no opioid tolerance. ¹⁴	NA	200	NA	200 mg q 12 h	NA	50 mg q 12 h ^{49,c}
Methadone (<i>Dolophine</i> [U.S.], <i>Metadol</i> [Canada]) Relatively safe choice in renal or liver insufficiency. ^{54,55}	Variable	Variable	For opioid-tolerant patients only. ^{14,35} The conversion ratio of methadone is highly variable depending on factors such as patient tolerance, opioid dose, and length of dosing (short-term versus chronic dosing). Some experts recommend that only those with substantial experience with its use should prescribe methadone. ^{39,55} For more information of safe methadone use, including dosing and conversion methods, see our chart, <i>Methadone for Pain: Focus on Safety</i> .			
Meperidine (<i>Demerol</i>)	75-100	300	Avoid due to poor efficacy and neurotoxicity, including seizures, myoclonus, tremors, anxiety, delirium, and confusion, especially in patients with renal or liver dysfunction or the elderly, due to accumulation of the metabolite normeperidine. ^{1,4,16-18}			

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Drug	Equianalgesic Doses (mg) ^{1,3,4,41}		Approximate Equianalgesic 24 hr Dose (Assumes Around-the-Clock Dosing) ⁸		Usual Starting Dose (Opioid-Naive Adults) (Doses NOT Equianalgesic)	
	Parenteral	Oral	Parenteral	Oral	Parenteral	Oral
<p>Fentanyl</p> <p>Relatively safe choice in renal insufficiency or cirrhosis.^{4,55} Clearance reduced by uremia.⁵⁴ Do not start patch in renal failure, and avoid patch in advanced liver disease.⁵⁴ Watch for delayed toxicity.^{54,55}</p>	0.1	NA	<p>All noninjectable fentanyl products are for opioid-tolerant patients only (i.e., taking 60 mg or more of morphine or its equivalent daily for at least 1 week). Do not convert mcg for mcg among fentanyl products (i.e., patch, transmucosal lozenge [<i>Actiq</i> (U.S.)], buccal tablet [<i>Fentora</i>], nasal spray [<i>Lazanda</i> (U.S.)], sublingual tablet [<i>Abstral</i>]), sublingual spray [<i>Subsys</i>]. See specific product labeling (U.S.: Drugs@FDA; Canada: Health Canada Drug Product Database) for dosing.</p> <p>Patch product labeling recommendations (e.g., switch patients from oral morphine 60 to 134 mg daily or its equivalent to fentanyl 25 mcg/hr patch) are conservative.^{63,64} Therefore, the use of this conversion from the patch to another opioid can lead to overdose, and should not be done.^{63,64} Some experts use a conversion factor of oral morphine 60 mg = fentanyl patch 25 mcg/hr in patients with chronic cancer pain, and round up or down based on patient factors, available patch sizes, and clinical judgement.⁵⁶ In the U.S. “intermediate” patch strengths not studied in clinical trials (37.5 mcg/hr, 62.5 mcg/hr, 87.5 mcg/hr) are available for use during conversion or titration for patients who would normally be converted/stepped up to the 50 mcg/hr, 75 mcg/hr, or 100 mcg/hr patch, but for whom these doses might be too high.⁶⁵</p>			

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Atypical Opioids: analgesics with mixed receptor effects and dose ceilings	
Buprenorphine: partial mu receptor agonist/kappa receptor antagonist ⁴⁰	<p>Butrans (transdermal patch): initial dose for patients taking less than 30 mg of oral morphine or equivalent per day (including opioid-naive) is a 5 mcg/hr patch applied once weekly (Canada: start with 5 mcg/hr patch in opioid-naive patients, and 5-10 mcg/hr patch in patients taking up to 80 mg oral morphine equivalents per day).^{47,60} U.S.: When converting from 30 to 80 mg of oral morphine equivalents daily dose, first taper to 30 mg oral morphine equivalent per day (to reduce risk of precipitated withdrawal), then start with the 10 mcg/hr patch.⁶⁰ The maximum dose is one 20 mcg/hr patch once weekly.^{47,60}</p> <p>Belbuca (buccal film): initial dose for opioid-naive patients is 75 mcg once daily or q 12 h. For patients taking opioids, first taper the dose to 30 mg oral morphine equivalent per day (to reduce risk of precipitated withdrawal), then choose a <i>Belbuca</i> dose based on the previous opioid dose: 75 mcg once daily or q 12 h (<30 mg/day oral morphine equivalent), 150 mcg q 12 h (30 to 89 mg/day oral morphine equivalent), or 300 mcg q 12 h (90 to 160 mg/day oral morphine equivalent).^{67,68} Consider an alternative agent for patients taking higher opioid doses.^{67,68}</p>
Tapentadol (<i>Nucynta</i> , <i>Nucynta ER</i>): mu receptor agonist/norepinephrine reuptake inhibitor ³¹	Consider a conversion of 100 mg tapentadol for 30 mg morphine. ^{4,31} For opioid-naive patients, the starting dose of tapentadol extended-release is 50 mg twice daily. ^{31,32} The maximum dose of tapentadol extended-release is 250 mg twice daily. ^{31,32} The starting dose of immediate-release tapentadol is 50 to 100 mg q 4 to 6 h. ^{33,38} The maximum total daily dose of immediate-release tapentadol is 600 mg (700 mg on day 1). ^{33,38} Not for use in severe renal or hepatic dysfunction. ^{31-33,38}
Tramadol (e.g., <i>Ultram</i> , <i>Ralivia</i> [Canada], combination products with acetaminophen): partial mu receptor agonist/ weak serotonin and norepinephrine reuptake inhibitor ²²	Consider a conversion of 120 to 150 mg tramadol for 30 mg morphine. ^{1,4} The maximum daily dose of tramadol is 300 mg to 400 mg, depending on the product. ^{22,23,25-28,36,37,61} Also see product labeling for dosing in elderly, or in renal or hepatic dysfunction. May cause withdrawal in opioid-tolerant patients. ⁵⁰
Mixed Agonist/Antagonists: kappa receptor agonist or partial agonist/high affinity but poor (partial or no) efficacy at mu receptor ^{40,69}	Parenteral morphine 10 mg is approximately equal to parenteral pentazocine 60 mg, oral pentazocine 180 mg, parenteral butorphanol 2 mg, and parenteral nalbuphine 10 mg. ⁴⁹ The analgesic efficacy of these drugs is limited by a dose ceiling. ⁴⁰ Also, kappa agonist effects can include dysphoria, psychotomimetic effects, and feedback inhibition of the endorphin system, leading to dysesthesia. ^{24,40} May cause withdrawal in opioid-tolerant patients. ⁵⁰

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- a. Product labeling for **hydromorphone** recommends a starting dose of 0.2 mg to 1 mg IV every two to three hours (Canadian monograph: 2 mg IV every four to six hours), or 2 mg to 4 mg orally (tablets) every four to six hours.^{8,15,20} An even lower oral starting dose (2 mg two or three times daily) has been recommended for chronic pain in opioid-naive patients.¹⁴ Some institutions use even lower doses of parenteral hydromorphone (e.g., 0.2 mg to 0.5 mg every two hours as needed). One regimen starts opioid-naive patients at 0.2 mg IV every two hours as needed for mild or moderate pain, with the option in moderate pain to give an extra 0.2 mg after 15 minutes if relief is inadequate after the first 0.2 mg dose. For severe pain, 0.5 mg IV every two hours as needed is used initially. In adults <65 years of age, the 0.5 mg dose can be repeated in 15 minutes if relief is inadequate, for a maximum of 1 mg in two hours.
- b. Per the product labeling, convert **to Exalgo** 12 mg *from* oral codeine 200 mg, hydrocodone 30 mg, morphine 60 mg, oxycodone 30 mg, oxymorphone 20 mg, or transdermal fentanyl 25 mcg/hr. (These conversion doses should NOT be used when switching from *Exalgo* to another opioid.) After 50% dose reduction for incomplete cross-tolerance, reduce dose again by 50% for moderate renal impairment, and by 75% for severe renal or moderate hepatic impairment. Not for use in severe hepatic impairment.¹³ The **Jurnista** product monograph recommends a 5:1 oral morphine:oral hydromorphone conversion ratio.¹⁹ When converting from immediate-release hydromorphone, the *Jurnista* dose should be rounded down.¹⁹
- c. Some experts do not recommend long-acting products for chronic noncancer pain in opioid-naive patients.¹⁴
- d. Start with an oral **oxymorphone** dose of 5 mg q 4-6 h for opioid-naive elderly or opioid-naive patients renal or liver impairment.⁴⁴
- e. **Kadian** labeling: switch patients receiving any opioid other than morphine to 30 mg q 24 h to start.⁶ **Morphabond ER** labeling: switch patients receiving any opioid other than morphine to 15 mg q 12 h to start.⁵¹ **Arymo ER** labeling: switch patients receiving any opioid other than morphine to 15 mg q 8-12 h.⁵³
- f. **Zohydro ER**. Conversion factors for converting **to Zohydro ER** are 1 for hydrocodone, methadone, or oxycodone; 2 for oxymorphone; 2.67 for hydromorphone; 0.67 for morphine; and 0.1 for codeine. Sum the current total daily dose of opioid, then multiply by the conversion factor to get the total daily *Zohydro ER* dose. Round down. Divide q 12 h. Fentanyl 25 mcg/h patch = *Zohydro ER* 10 mg q 12 h. Start 18 h after removing patch. ⁵⁸ (Conversion factors should NOT be used to switch **from Zohydro ER** to another opioid.) **Hysingla ER**. Conversion factors for converting **to Hysingla ER** are 0.15 for codeine, 4 for hydromorphone, 1.5 for methadone, 0.5 for morphine, 1 for oxycodone, 2 for oxymorphone, and 0.1 for tramadol. Reduce the calculated dose by 25% and give once daily. Patients taking hydrocodone can switch to **Hysingla ER** at the same total daily dose taken once daily.⁶² **Apadaz** labeling recommends substituting *Apadaz* 6.12 mg for hydrocodone bitartrate 7.5 mg.⁷¹
- g. Examples of doses seen in clinical practice, taking into account available dosage strengths.
- h. **Xtampza ER** labeling: switch patients receiving any opioid other than oxycodone to 9 mg q 12 h.⁶⁶
- i. Per the product labeling, oral **oxymorphone** 10 mg ER is approximately equivalent to hydrocodone 20 mg or oxycodone 20 mg.⁷³

Users of this resource are cautioned to use their own professional judgment and consult any other necessary or appropriate sources prior to making clinical judgments based on the content of this document. Our editors have researched the information with input from experts, government agencies, and national organizations. Information and internet links in this article were current as of the date of publication.

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