

## Considerations for PO to IV Dose Conversions

There are times when a patient can't take oral medications, and administration via the parenteral route is the only option. Some examples may include the perioperative period and when there's uncertainty about GI absorption. Drugs with good bioavailability, such as most antimicrobials (e.g., fluconazole [Diflucan], levofloxacin [Levaquin], linezolid [Zyvox-U.S., Zyvoxam-Canada], etc), corticosteroids (e.g., dexamethasone, hydrocortisone, etc), and diuretics (e.g., bumetanide [Bumex-U.S., Burinex-Canada], furosemide [Lasix], etc) are dosed similarly, whether given orally (PO) or intravenously (IV). However, the IV dose of a drug with poor oral bioavailability can be just a fraction of the PO dose. The decision to switch a PO med to the IV form should be made on a per patient basis, taking into consideration the length of time the patient will be NPO, monitoring requirements for the IV med, the patient's clinical picture, indication for the med, etc. The following table has information on dose conversions for some commonly used chronic meds that come in both oral and injectable formulations.

**Abbreviations:** EE=erosive esophagitis; GERD=gastroesophageal reflux; HTN= hypertension; NPO=nothing by mouth.

*\*Doses in this chart do not take into consideration adjustments for renal or liver dysfunction. Information is from the most current product information (U.S.) or product monograph (Canada) unless otherwise indicated.*

**\*\*Some of the dose conversions below are approximations. When appropriate, monitor and adjust IV dose as necessary.**

Drug <sup>a</sup>	PO to IV Considerations	Comments
Amiodarone (Cordarone)	•Use an IV dose that's 50% of the PO maintenance dose. <sup>1</sup>	<ul style="list-style-type: none"> <li>•Amiodarone has a long half-life and extensive tissue storage.</li> <li>•Effects may last for days or months after stopping, but the time of arrhythmia recurrence is variable/unpredictable.</li> </ul>
Clonidine (Catapres)	•Injectable (U.S. only) is indicated for treatment of pain, via <u>epidural</u> infusion.	<ul style="list-style-type: none"> <li>•Clonidine patch may be an option for those who are NPO.</li> <li>•Patch takes two to three days for full effect.</li> <li>•Clonidine tabs have been used sublingually, off-label, as a substitute for PO, at the same dose.<sup>2</sup></li> </ul>
Digoxin	•Tablets and liquid are ~80% bioavailable.	•None
Diltiazem (Cardizem, etc)	•IV is indicated for acute treatment of serious arrhythmias.	•IV use not appropriate as a routine substitution for PO formulation.
Enalapril (Vasotec)	<ul style="list-style-type: none"> <li>•For HTN, start with enalaprilat 1.25 mg IV Q6H for patients who were on PO enalapril.</li> <li>•Start with enalaprilat 0.625 mg IV Q6H for patients taking a diuretic.</li> </ul>	•Patients taking a diuretic are at increased risk for hypotension with enalapril.

More . . .

<b>Drug<sup>a</sup></b>	<b>PO to IV Considerations</b>	<b>Comments</b>
Esomeprazole ( <i>Nexium</i> )	<ul style="list-style-type: none"> <li>•Usual IV dose is 20 mg or 40 mg once daily, for GERD with EE.</li> <li>•Pharmacokinetics of same IV and PO doses are similar. Bioavailability of PO is ~90%.</li> </ul>	•Injectable esomeprazole is not available in Canada.
Famotidine ( <i>Pepcid</i> )	<ul style="list-style-type: none"> <li>•Use 20 mg IV Q12H. May need dose increase for hypersecretory conditions.</li> <li>•Bioavailability of PO is 40% to 45%.</li> </ul>	•PO doses vary by indication.
Hydromorphone ( <i>Dilaudid</i> , etc)	•1.5 to 2 mg of parenteral is equianalgesic to 7.5 to 8 mg of oral.	•Equianalgesic dose is approximate. Titrate to patient response.
Labetalol ( <i>Trandate</i> )	<ul style="list-style-type: none"> <li>•PO is 25% bioavailable.</li> <li>•Injectable is indicated for emergency treatment of severe hypertension.</li> </ul>	•None
Levetiracetam ( <i>Keppra</i> )	•IV levetiracetam given at same total daily dose/same interval as immediate-release PO formulation.	•Injectable levetiracetam is not available in Canada.
Levothyroxine ( <i>Synthroid</i> )	•Start with 50% of the established PO maintenance dose.	•Levothyroxine has a long half-life. IV therapy may only be necessary if a patient is NPO for a prolonged period of time.
Meperidine ( <i>Demerol</i> )	•75 mg of parenteral is equianalgesic to 300 mg of oral.	•Equianalgesic dose is approximate. Titrate to patient response.
Methadone	•Conversion is highly variable and dependant on many factors.	•See our document, <i>Opioid Dosing: Focus on Safety</i> .
Metoprolol ( <i>Lopressor</i> , etc)	<ul style="list-style-type: none"> <li>•Equivalent maximal beta-blocking effect is achieved with PO and IV doses in the ratio of 2.5:1.</li> <li>•IV duration of action is less than PO dosage forms. Monitor and adjust as needed.</li> </ul>	•None
Morphine	•10 mg of parenteral is equianalgesic to 30 mg of oral.	•Equianalgesic dose is approximate. Titrate to patient response.
Pantoprazole ( <i>Protonix</i> -U.S., <i>Pantoloc</i> -Canada)	<ul style="list-style-type: none"> <li>•40 mg IV once daily for GERD with EE. 80 mg IV Q12H for hypersecretion. Adjust dose if necessary.</li> <li>•Pharmacokinetics of same PO and IV doses are similar. Bioavailability of PO is ~80%.</li> </ul>	•Injectable pantoprazole is not available in Canada.
Phenytoin ( <i>Dilantin</i> )	<ul style="list-style-type: none"> <li>•IV phenytoin sodium given at the same total daily dose as PO phenytoin sodium.</li> <li>•IV doses given Q6H or Q8H, not once daily as with <i>Dilantin</i> capsules.</li> </ul>	•None
Prednisolone, prednisone	•Conversion of prednisolone or prednisone to methylprednisolone is 5 mg:4 mg.	•None

Drug <sup>a</sup>	PO to IV Considerations	Comments
Propranolol	•IV is only indicated for acute treatment of life-threatening arrhythmias.	•Injectable propranolol is not available in Canada. •IV use is not appropriate as a routine substitute for PO formulation.
Valproic acid ( <i>Depakene</i> , etc)  Divalproex sodium ( <i>Depakote</i> , <i>Depakote ER</i> ),	•IV valproate sodium ( <i>Depacon</i> ) given at same total daily dose/same frequency as oral valproic acid/divalproex products. However, <u>daily</u> doses >250 mg should be divided. •Extended-release tabs ( <i>Depakote ER</i> ) are about 8% to 20% less bioavailable than delayed-release tabs ( <i>Depakote</i> ).	•Injectable valproate sodium is not available in Canada.
Verapamil ( <i>Isoptin SR</i> , etc)	•IV is only indicated for acute treatment of serious arrhythmias.	•IV use is not appropriate as a routine substitute for PO formulation. •Injectable verapamil is not available in Canada.

**a. The following product labeling was used for the above chart:** Amiodarone (January 2006), Amiodarone Canada (May 2010), Clonidine (December 2009), *Lanoxin* (August 2009), Digoxin Canada (June 2006), Diltiazem (June 2006), Diltiazem Canada (December 2009), Enalaprilat (May 2010), *Vasotec* Canada (March 2008), *Nexium* (March 2010), *Pepcid* (October 2006), Famotidine Canada (May 2004), Labetalol (January 2006), Labetalol Canada (August 2005), *Keppra* (May 2008), Levothyroxine (January 2008), Levothyroxine Canada (May 2008), *Lopressor* (March 2009), *Betaloc* Canada (September 2009), *Protonix* (April 2007), Phenytoin (August 2007), Methylprednisolone (April 2009), Propranolol (January 2008), *Depacon* (October 2006), Verapamil (July 2006).

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2. Cunningham FE, Baughman VL, Peters J, Laurito CE. Comparative pharmacokinetics of oral versus sublingual clonidine. *J Clin Anesth.* 1994;6:430-3.

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