

# Levothyroxine IV

Synthroid (levothyroxine) is a synthetic form of thyroxine (T<sub>4</sub>), an endogenous hormone secreted by the thyroid gland. The pharmacokinetics of levothyroxine are outlined below.

Pharmacokinetics	PO	IV
Onset	3-5 days	6-8 hours
Bioavailability	~64% nonfasting 79-81% fasting	100%
Half-life	Euthyroid 6-8 days Hypothyroid 9-10 days Hyperthyroid 3-4 days	

Levothyroxine has a long half-life as noted above, if a few doses are skipped the body is able to maintain adequate levels of thyroid hormones without additional supplementation. Additionally, the price for a vial of levothyroxine is high. Due to the long half-life and high price tag, there are only few instances when IV therapy is deemed appropriate: **myxedema coma patients or LOPA patients**.

Evaluation of our current use of the IV product was performed from April and May with the following findings:

- 26 patients included
- 19 (73%) could have converted to PO at some point during therapy
- 8 patients did not receive equivalent doses when converted from PO to IV

## **How can we eliminate inappropriate use?**

1. **Restriction.** We are placing a *soft restriction* on IV levothyroxine. We are asking the pharmacists verifying orders for levothyroxine IV to determine whether this formulation is appropriate for the patient. If the patient is suffering from myxedema coma or is a LOPA patient they are able to receive the IV formulation. If the patient is NPO for surgery or other procedure, a conversation with the physician should be had. Due to the long half-life, the patient can miss a day or two of therapy without adverse effects and resume their home medication when they can tolerate PO again.
2. **Dose conversion.** Should IV be required, ensure proper conversion between the two dosage forms. The conversion for levothyroxine IV to PO is 1:2. To ensure the patient receives the proper dose always review their home medication list and ensure proper conversion of PO to IV doses when a new order comes across. *If the dose is incorrectly input, call the physician to recommend the proper conversion.* \*\*\*Patients with myxedema coma and LOPA patients are excluded from this dose conversion\*\*\*
3. **IV to PO.** Levothyroxine is now on the pharmacy automatic IV to PO interchange protocol. If the patient is tolerating other oral medications (look at the MAR) please convert any IV orders to their corresponding PO dose. Again, exceptions to this conversion are patients with myxedema coma

and those with the LOPA Catastrophic Brain Injury power plan. Pay special attention to this drug when doing your daily IV to PO duties for your assigned units.

**Situation 1:**

A patient is admitted with plans for surgery in the next 24 hours and is currently NPO. The physician wishes to restart their home dose of levothyroxine IV until they are able to take PO medications again. You check the admission medication reconciliation and find that the patient is taking levothyroxine 50mcg PO QAM at home. The physician puts in an order for levothyroxine 50mcg IV QAM. What should you, the pharmacist verifying the order, do?

**Step 1:** First, if the patient is expected to be able to tolerate PO within 48-72 hours a call to the physician should be made. The pharmacist should recommend holding levothyroxine until PO can be initiated as the long half-life of the drug will cover the patient during their time without the medication.

**Step 2:** If it is decided that holding the levothyroxine is not an option (maybe they are having abdominal surgery and will be NPO for at least a week) then they may still receive the IV formulation, but the PO to IV conversion must be appropriate. As it is now, the incorrect conversion was utilized and the pharmacist verifying the order must contact the physician and recommend the proper dosing. In this case the PO dose was 50mcg corresponding to a 25mcg IV dose. The pharmacist should recommend changing the IV dose from 50mcg to 25mcg daily.

**Situation 2:**

While doing your daily IV to PO duties for your units, you come across an order for levothyroxine 100mcg IV daily. You view the patients chart to find that they were NPO a few days ago but are now tolerating a full liquid diet and receiving their blood pressure and diabetes medications orally. What should you do?

This patient no longer requires IV levothyroxine. With our IV to PO protocol, you are able to automatically convert the patient from the 100mcg IV dose to 200mcg PO daily. Don't forget to put 'Automatic IV to PO conversion per P&T approved protocol' in the order comments.