AS YOU ENTER your patient’s room, ready to administer his insulin, the unit secretary informs you that your patient has just been made N.P.O. Do you give the insulin? Hold it? Give a reduced dose? Ask three nurses, experienced or novice, and you’ll probably get three different answers.

In this article, I’ll help you make the right decision by reviewing insulin categories and discussing how to sort out the information to provide the best patient care based on the evidence. But first, consider these eye-opening facts about diabetes.

**Diabetes on the rise**

More than 23 million Americans have been diagnosed with type 1 or type 2 diabetes, and another 6 million have this complex disease but are undiagnosed. Even if a patient is hospitalized for another condition, his diabetes will affect his outcome while in your care.\(^1\) For a refresher on the role of insulin, see *The glucose and insulin dance.*

**Diabetes types**

The types of diabetes are defined by what’s happening at the cellular level:

- **Type 1 diabetes** is caused by pancreatic beta cell destruction and an absolute deficiency of insulin. Lacking endogenous insulin, a patient with type 1 diabetes needs exogenous insulin to survive. Without it, he has no “keys” for moving the glucose in his bloodstream into his cells.
- **Type 2 diabetes** results from the impaired ability of cells to use insulin, accompanied by a relative lack of insulin or impaired insulin release in relation to blood glucose levels. The patient has some “keys,” but many of them are rusty and can’t open the door. Type 2 diabetes is a much more complex disease than type 1 and can be even more challenging to understand and manage. Even if a patient with type 2 diabetes doesn’t normally rely on insulin, he may need it while hospitalized.

**Sorting out insulin products**

With dozens of insulin products on the market and more on the way, administering insulin can be challenging, with a high risk of mix-ups and other errors. In fact, insulin is on the Institute for Safe Medication Practices’ list of high-alert medications; this list is endorsed by the Institute for Healthcare Improvement as part of its 5 Million Lives
Campaign. Understanding the categories of insulin and how they work in the body is the first step to preventing errors and administering safe and effective therapy.

- **Basal insulin** is given to cover the body’s basal metabolic needs in the absence of food. The basal insulins used most often in the hospital setting are NPH, Lantus (insulin glargine), and Levemir (insulin detemir).

  NPH, the oldest formulation, is given twice a day, once in the morning and once in the evening. Lantus and Levemir, the newest generation of basal insulins, start to work within 30 minutes and maintain a consistent supply of insulin for 20 to 24 hours. Because of this “peaklessness,” they’re given once a day. They can’t be mixed with other insulins, so the safest time of day to administer
Lantus and Levemir is before bedtime.

No matter what type of basal insulin your patient is using, find out what schedule he uses at home and make all attempts to mimic that while he’s hospitalized. In general, hospitalized patients who are N.P.O. and on basal insulin need half of their usual dose.²

- **Prandial and preprandial insulin** is given to prevent postprandial hyperglycemia. Because rapid-acting prandial or bolus insulin mimics the normal pancreatic response to eating, it’s given with each meal. Regular insulin is considered a preprandial insulin because it takes about 30 minutes to start working. Prandial insulins such as Humalog (insulin lispro), NovoLog (insulin aspart), and Apidra (insulin glulisine) start working in 5 to 10 minutes. Administering these insulins at the right time is critical to minimize the patient’s risk of hypoglycemia.

For example, a patient might take 5 units of NovoLog with breakfast, 8 units with lunch, and 10 units with dinner. If the breakfast dose is scheduled for and administered at 0800 but breakfast doesn’t arrive until 0900, the patient is at risk for hypoglycemia.

To prevent this complication, ask your patient to inform you or the nursing assistant when he receives his meal and tell him not to start eating until you’ve administered his rapid-acting prandial insulin. If he needs assistance to eat, ask the nursing assistant to let you know when she’ll be available to help him so you can give the insulin at the appropriate time.

- **Correction insulin**, also called sliding scale insulin, is given to reduce an elevated blood glucose level to a normal range. Giving correction insulin is the worst way to manage dia-

betes. Rather than maintaining normal blood glucose levels, we’re actually waiting until hyperglycemia occurs, then trying to bring it down to normal.

What makes matters worse is that many of us don’t administer this type of insulin correctly. In my experience, holding correction insulin for a patient who’s N.P.O. is the most common mistake that healthcare providers make in relation to insulin management.

For example, using correction insulin, if your patient’s blood glucose is 200 mg/dL you’d generally administer 4 units of regular insulin. But suppose the unit secretary informs you that the healthcare provider just made your patient N.P.O. Do you administer the insulin as ordered, or should you hold it because the patient is N.P.O.?

The correct answer is to administer the insulin as ordered. Correction insulin is designed to be given independent of nutritional intake. You may hesitate to give insulin to a patient who’s not eating for fear of causing hypoglycemia. But more patients die of hyperglycemia (because of its negative effects on the healing process) than hypoglycemia. The challenge is to be vigilant for signs of hyperglycemia while also keeping the patient’s blood glucose within the target range.

### Getting tight with glycemic control

Hyperglycemia in hospitalized patients is predictive of poor outcomes. Other evidence indicates that ICU patients with blood glucose levels above 130 mg/dL are more likely to die.³ Research supports a target blood glucose under 110 mg/dL in a CCU; in a medical-surgical unit, research supports a fasting blood glucose level of
126 mg/dL or less and a nonfasting level of 130 to 180 mg/dL. However, fearing hypoglycemia, many nurses are still most comfortable when a patient's blood glucose level is just under 200 mg/dL and don’t aggressively treat hyperglycemia. In the past, standard treatment for a patient with hypoglycemia was a big glass of orange juice with three packets of sugar, for a carbohydrate load of 45 grams. The nurse would encourage him to drink it rapidly and keep checking his blood glucose until it reached 200 mg/dL or more. Not understanding the importance of tight glycemic control, she overtreated the hypoglycemia and put the patient at risk for more serious complications.

The current recommendation for treating hypoglycemia in a conscious patient is to provide 15 to 20 grams of glucose. Follow your facility's hypoglycemia protocol and encourage team members to follow this method for managing a patient's low blood glucose level.

**Spotlight on common errors**

Now let’s look at a few common scenarios in which insulin may be incorrectly administered.

- *Where’s the starting point?* You might think that because a patient’s blood glucose is elevated before a morning dose of NPH, you don’t need to administer correction insulin along with scheduled doses of insulin. In reality, the scheduled doses of insulin, whether basal or prandial, are based on starting out at a normal blood glucose level. For example, if your patient's blood glucose is 200 mg/dL before he receives his basal insulin (40 units of NPH), you should give 4 units of correction insulin as ordered in addition to the basal insulin. The correction insulin reverses the current hyperglycemia, and the basal insulin can then keep the patient's glucose levels normal.

- *When not to mix it up.* A common prescribing mistake is to order a short-acting formulation (such as regular insulin) as correction insulin for a patient whose prandial insulin is a rapid-acting formulation such as NovoLog. A patient who takes a rapid-acting insulin should use the same insulin as his correction insulin. If necessary, contact the prescriber to change the order so that the patient receives the same rapid-acting insulin for his prandial and correction doses.

You can safely mix the two doses of rapid-acting insulin together in one syringe (for example, the prandial and the correction dose of NovoLog). Here’s an example: Your patient is scheduled for NovoLog, 5 units with breakfast. His morning blood glucose is 200 mg/dL. The correction dose is 4 units of NovoLog, which you add to the 5 units already ordered. By giving one injection of 9 units, you’ve taken care of hyperglycemia before and after the meal.

**Putting it all together**

Diabetes management is all about timing—the one thing that isn’t always in your control. Use a team approach to keep your patient safe from complications.

In most hospitals, a patient’s capillary blood glucose level is tested before each meal and at bedtime. Many hospitals still follow the classic 0700, 1100, 1600, and 2100 schedule. This is appropriate if meals arrive at 0730, 1130, and 1630, with a bedtime snack at 2130. Because the ideal time to check a capillary blood glucose level is 30 minutes before a meal, find out when meals are delivered in your unit. You’ll need to know when a patient’s capillary blood glucose level is tested because you have only 1 hour to give correction insulin based on that test result. If your facility uses electronic medical records, you should be able to get the precise time of the last blood glucose test. If you can’t administer your patient’s correction insulin dose on time, check his blood glucose level again to ensure that you’re administering the appropriate dose.

By understanding the basics of diabetes and the types of insulin, and having the commitment to pull it all together, you can help ensure the best outcome for a hospitalized patient with diabetes.

**REFERENCES**


**RESOURCES**


Renee Thompson is director of academic service partnerships at the University of Pittsburgh (Pa.) Medical Center’s Center for Nursing Excellence.