Understanding Insulin on Board (IOB) and Reverse Corrections – For Educators

There are four factors that insulin pumps consider when calculating a suggested bolus dose. Insulin to carbohydrate ratio (ICR), insulin sensitivity factor (ISF), insulin on board (IOB), and if reverse correction is enabled. While the pumps are similar in how they use ICR and ISF for dose calculations, each pump can differ in how they apply the IOB and reverse correction to the calculation. This handout is designed for diabetes educators to build understanding of how these features are used in the different pumps currently available in Canada.

What is Insulin on Board?

Insulin on board (IOB) refers to insulin that is still active in the body from previous bolus doses. All insulin pumps have an IOB feature that allows the pump to calculate this active insulin based on the insulin action time programmed in the pump. The pump will display IOB as a total of all insulin from recent boluses (both food & correction).

How Does Insulin on Board Work?

When using the bolus calculator for food and/or correction doses, the pump will adjust for IOB in the suggested dose calculation. This helps to prevent insulin stacking, which can lead to hypoglycemia. This feature therefore allows greater flexibility to give multiple boluses for frequent snacking or corrections while reducing the risk of hypoglycemia. IOB is used in different ways when calculating a bolus dose depending on which pump the patient uses.

What is Reverse Correction?

Reverse correction refers to an adjustment a pump will make to a suggested bolus dose to account for a blood sugar that is below the target range set in the pump.

How Does the Reverse Correction Work?

If the blood sugar is below the target range, the pump will use the insulin sensitivity factor to determine how much insulin needs to be subtracted from the current suggested dose to bring the blood sugar levels back into target range.

How Does Each Pump Apply These Factors?

Medtronic MiniMed Veo/630G

- Considers both meal and correction insulin **together** when adjusting for IOB.
- When the blood sugars before a meal are **above target** and there is IOB present, the IOB is subtracted only from the new correction dose. **No insulin will be subtracted from the food bolus**.
- When the blood sugars before a meal are **below target**, IOB does not affect the Bolus Wizard calculations. In this situation, the **Reverse Correction** will use the ISF to calculate **a dose reduction to correct the blood sugar up into target range.**

Animas Ping/Vibe

- Considers both meal and correction insulin **together** when adjusting for IOB.
- When the blood sugars before a meal are **above target** and there is IOB present, the IOB is subtracted only from the new correction dose. **No insulin will be subtracted from the food bolus**.
- When the blood sugars before a meal are **below target**, the IOB is deducted from the total bolus (food and correction). In addition to the IOB subtraction, a **Reverse Correction** using the ISF will calculate a **further** dose reduction to correct the blood sugar up into target range.

OmniPod

- Considers meal insulin and correction insulin **separately** when adjusting for IOB.
- When the blood sugars before a new meal are **above target**, the meal IOB is subtracted from the current correction bolus first, then correction IOB will be subtracted from the correction bolus until the amount is zero. **No insulin will be subtracted from the food bolus.**
- When the blood sugars before a meal are **below target**, IOB does not affect bolus calculations.
- **Reverse Correction:**
  - When the blood sugar is **below target** AND the Reverse Correction feature is turned **OFF**, **no insulin will be deducted from the new meal bolus**.
  - When the blood sugar is **below target** AND the Reverse Correction feature is turned **ON**, ISF is used to calculate a dose reduction to bring the blood sugar back up into the target range.

Perspective:

The method used by Medtronic and Omnipod pumps for bolus calculations could be considered more aggressive since the pump does not consider IOB when the blood sugars are below target before a meal. This will result in less insulin deducted from the bolus. In contrast, the Animas pumps may be considered less aggressive as it does deduct insulin for IOB if the pre-meal blood sugar is below target resulting in less insulin given for the new bolus.

OmniPod offers some flexibility in how aggressive a person wants to be with their bolus by way of the ability to turn reverse correction on or off, however, if the reverse correction is turned off, this would be the most aggressive form of bolus.

**Note: Animas insulin pumps are no longer available to be purchased in Canada, however, some patients may still be using these pumps until their warranty is expired.*