Management of Type 1 Diabetes

Definition: Type 1 diabetes mellitus (T1DM), one of the most common chronic diseases in childhood, is caused by insulin deficiency due to destruction of insulin-producing beta-cells. Most cases present in childhood, but one-fourth of cases are diagnosed in adults.

General management: Requires insulin given in one of the following ways:

1. Basal/Bolus insulin therapy: long-acting insulin is given for basal coverage and rapid-acting insulin is given as bolus doses prior to food intake
2. Insulin pump therapy: continuous infusion of rapid acting insulin (Humalog, NovoLog, apidra, fiasp, lyumjev) for basal control with the ability to give larger doses as directed by the user prior to eating.

Inpatient management of patients with Type 1 Diabetes on basal/bolus therapy:

1. All patients should receive basal insulin via continuous insulin infusion or long-acting insulin injections. Holding basal insulin in patients with T1DM will cause diabetic keto acidosis. **Basal insulin should not be held for any reason.** Give dextrose containing fluids if needed to avoid hypoglycemia.
2. Bolus (mealtime) insulin should be given prior to all meals and snacks unless treatment is needed for hypoglycemia. Missing bolus insulin with a snack or meal is a major cause of hyperglycemia.
3. **Typical insulin doses**
    a. Total daily dosing is usually 0.4-0.6 units/kg (start at 0.5 units/kg if home dose unknown)
    b. Provide 50% of the total daily dose as long-acting/basal & the other 50% as mealtime doses
    c. Example: 100kg patient needs a total of 50 units of insulin per day split between long-acting (25 units) and short-acting (25 units)
4. Insulin drips
    a. Indicated for patients who are severely hyperglycemic or need precise glucose management based on their clinical condition
    b. Most patients can be managed using the ICU glycemic control insulin drip titration protocol (exception is DKA)
    c. Use the DKA PowerPlan for patients in DKA
    d. Add long-acting insulin prior to discontinuing the insulin drip overlapping by at least 2 hours. Do not hold the drip for hypoglycemia, rather administer dextrose containing fluids with the drip at a low rate)
5. Current basal insulin formulations on the market include the following and usually have a 1:1 conversion with Lantus
    a. 2nd gen basal
        i. Tresiba (degludec) > 40 hr action profile
        ii. Toujeo (u-300 glargine) 30 hr action profile
    b. 1st Gen basal
        i. Lantus (glargine)
        ii. Basoglar (glargine)
        iii. Semglee (glargine)
        iv. Glargine
    c. NPH dosed BID is the oldest basal insulin

6. Rapid acting insulin formulations
    a. 2nd Gen
        i. Lyumjev (rapid humalog)
        ii. Fiasp (rapid novolog)
    b. 1st Gen
        i. Aspart (Novolog)
        ii. Lispro (humalog)
    c. Oldest version would be humulin R

<u>Inpatient management of patients with Type 1 diabetes on an insulin pump</u>

An insulin pump is a medical device filled with rapid acting insulin that infuses insulin through a sub q canula into the sub q tissue. The insulin dose is delivered every 3-6 minutes. For example, if the patient needs 1 unit/h, he will receive 0.1 unit every 6 minutes.

1. In addition to the basal doses, the user can administer larger bolus doses with mealtimes
2. Newer pumps may have automated insulin delivery with continuous glucose monitoring in which the pump adjusts the insulin dosing based on glucose levels
3. Types of insulin pumps:
    a. Tandem (tubed pump. Insulin runs through a tube that connects the pump to the infusion site)
    b. Medtronic (also tubed pump)
    c. Omnipod (tubeless system that sits on the skin, remove if not in use
4. Insulin pumps in the hospital
    a. Patients may continue to use their insulin pump, see hospital policy
    b. If the patient can't use the pump or it isn't working, they can
        i. Be placed on an insulin drip as above OR
        ii. Start basal/bolus therapy as above