

Type 1 Diabetes Mellitus

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Learning Objectives

- Review the background, prevalence, and pathophysiology of Type 1 Diabetes
- Assess key differences between Type 1 and Type 2 Diabetes
- Evaluate treatment options per the 2024 ADA Diabetes Standards of Care
- Present caveats related to insulin injection treatment
- Discuss the management of Diabetic Ketoacidosis (DKA)

What is Type 1 Diabetes Mellitus?

- Type 1 diabetes is chronic condition in which the pancreas produces very little or no insulin
- Insulin is a hormone that is produced by the body that moves sugar from the bloodstream into the cells to be utilized as energy
- People with type 1 diabetes **require** insulin administration to control blood sugar

Prevalence



Type 1 Diabetes Mellitus

Risk Factors

- Family history
- Genetics

Signs and Symptoms

- Increased thirst, hunger, and urination
- Fatigue
- Blurred vision
- Delayed wound healing
- Weight loss

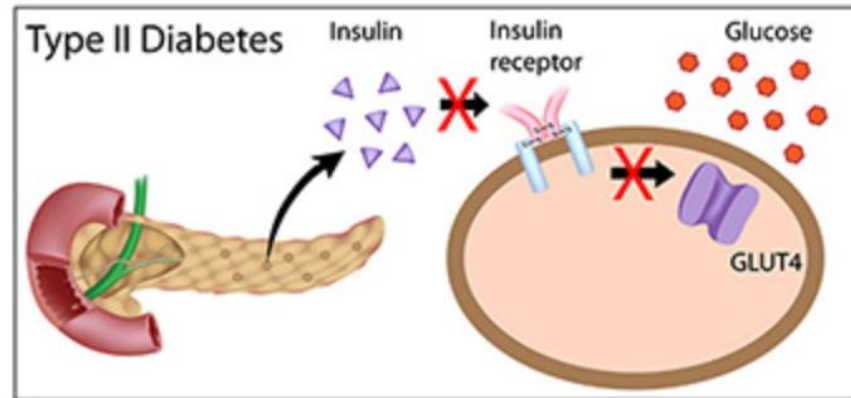
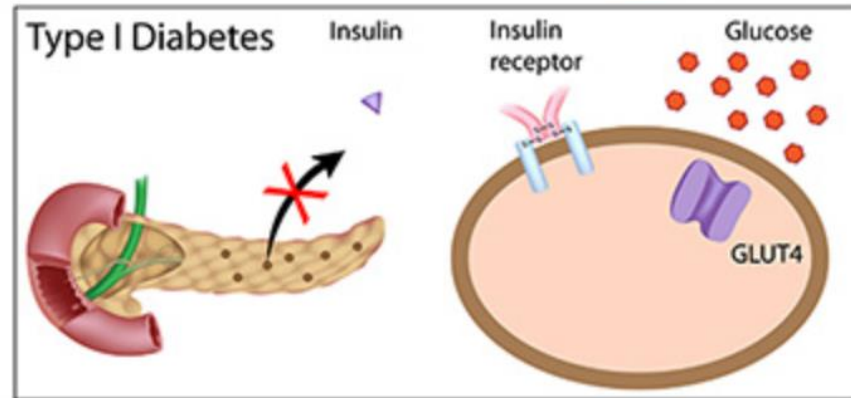
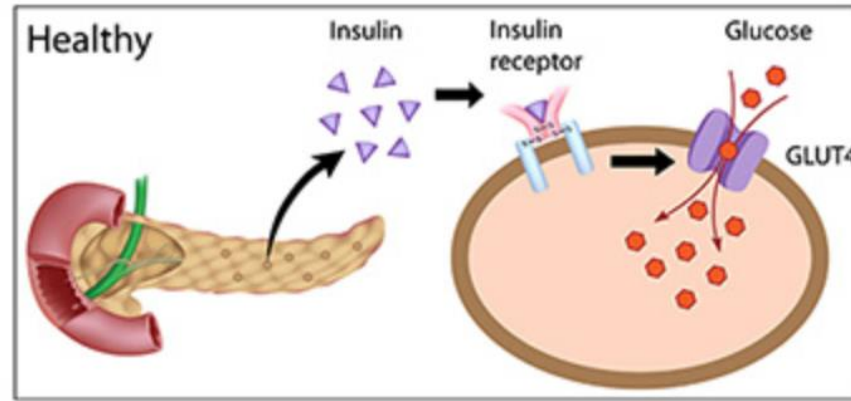
Diabetes Mellitus: Type 1 vs. Type 2

Type 1

- Often diagnosed in childhood & adolescence
- Insulin dependent
- Risk factors: genetics
- Managed with insulin

Type 2

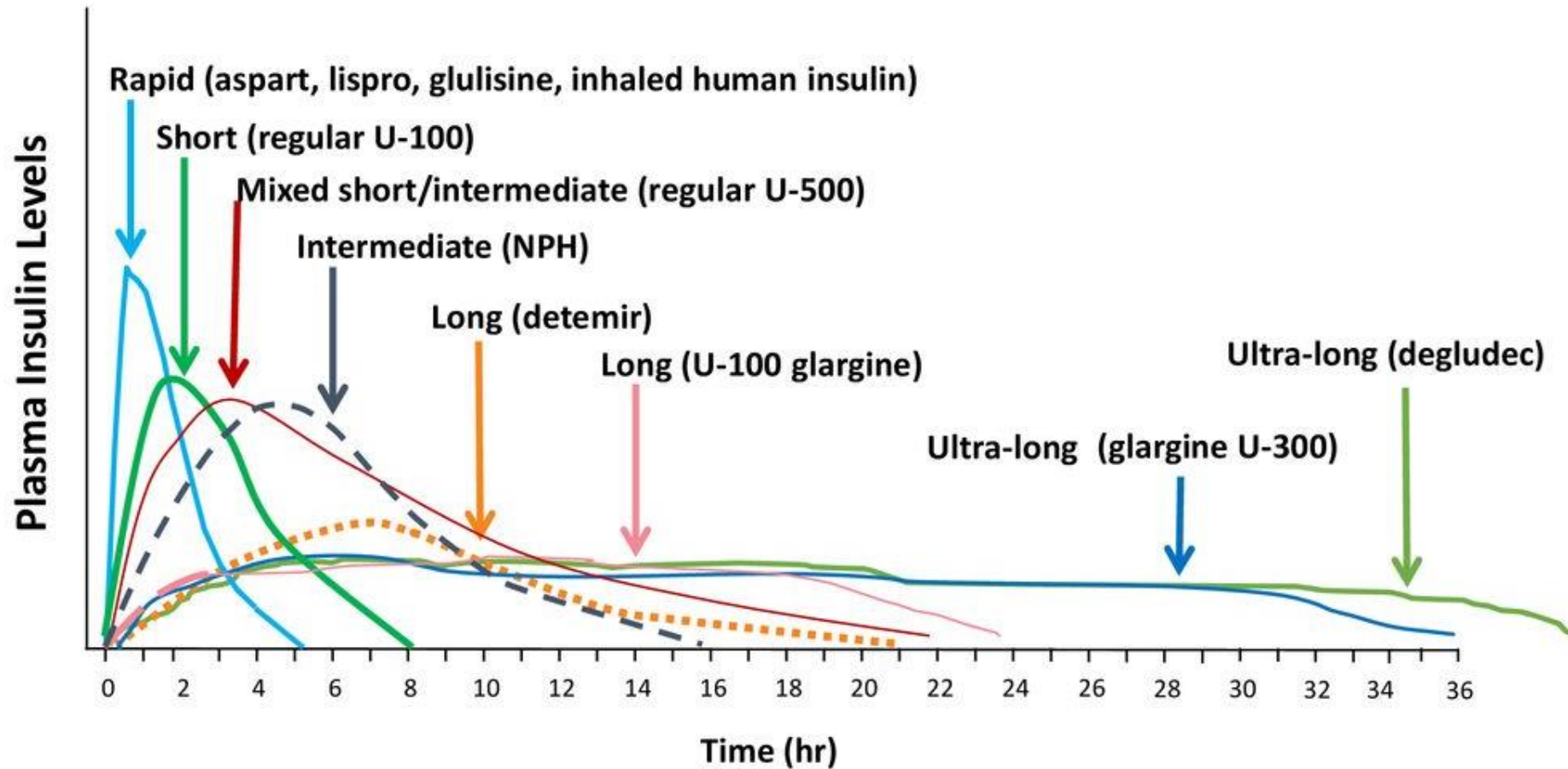
- Often diagnosed in adulthood
- Insulin resistant
- Risk factors: family history, diet, weight, lifestyle choices
- Managed with diet, exercise, oral medication, and insulin



Insulin Treatment

- Monitor blood glucose often (prevent episodes of hypoglycemia **and** hyperglycemia)
 - Often 6 – 10 times a day (or by CGM)
- Multiple Daily Injections (MDI) or Pump Therapy
- Types of Insulin
 - Rapid acting (including inhaled)
 - Short acting
 - Intermediate acting
 - Concentrated human regular insulin
 - Long acting
 - Premixed insulin

Insulin Treatment



Hirsch IB. *N Engl J Med.* 2005; 352:174-83.
Flood TM. *J Fam Pract.* 2007; 56(suppl 1):S1-S12.
Becker RH et al. *Diabetes Care.* 2015; 38:637-43.

Differences Related to Insulin Delivery Approaches - *MDI*

Injected insulin regimens	Flexibility	Lower risk of hypoglycemia	Higher costs
MDI with LAA + RAA or URAA	+++	+++	+++

Less-preferred, alternative injected insulin regimens

MDI with NPH + RAA or URAA	++	++	++
MDI with NPH + short-acting (regular) insulin	++	+	+
Two daily injections with NPH + short-acting (regular) insulin or premixed	+	+	+

Insulin Delivery Approaches, *Change of Language*

2023

Continuous insulin infusion regimens	Flexibility	Lower risk of hypoglycemia	Higher costs
Hybrid closed-loop technology	+++++	+++++	+++++
Insulin pump with threshold/ predictive low-glucose suspend	++++	++++	+++++
Insulin pump therapy without automation	+++	+++	++++

2024

Continuous insulin infusion plans	Greater flexibility	Lower risk of hypoglycemia	Higher costs
Automated Insulin delivery systems	+++++	+++++	+++++
Insulin pump with threshold/ predictive low-glucose suspend	++++	++++	+++++
Insulin pump therapy without automation	+++	+++	++++



Standards of Care – *Recommendations for Adults with Type 1 DM*

2023

Recommendations

- 9.1 Most individuals with type 1 diabetes should be treated with multiple daily injections of prandial and basal insulin, or continuous subcutaneous insulin infusion. **A**
- 9.2 Most individuals with type 1 diabetes should use rapid-acting insulin analogs to reduce hypoglycemia risk. **A**
- 9.3 Individuals with type 1 diabetes should receive education on how to match mealtime insulin doses to carbohydrate intake, fat and protein content, and anticipated physical activity. **B**

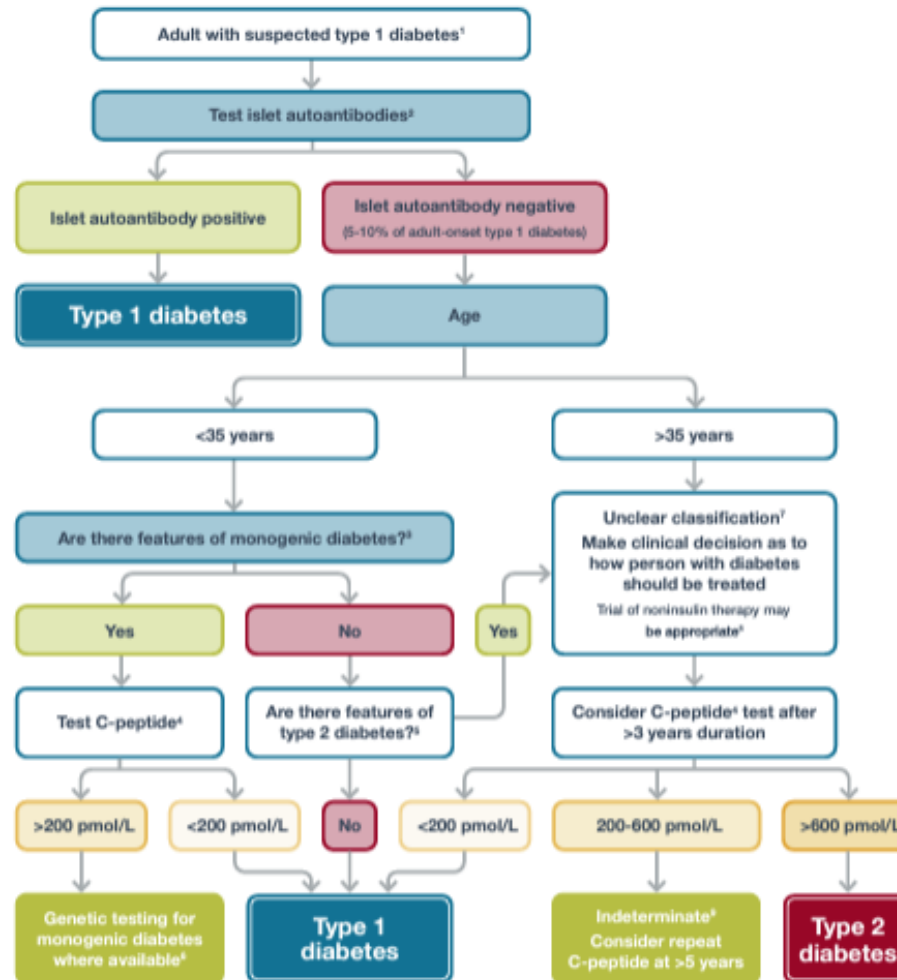
2024

Recommendations

- 9.1 Treat most adults with type 1 diabetes with continuous subcutaneous insulin infusion or multiple daily doses of prandial (injected or inhaled) and basal insulin. **A**
- 9.2 For most adults with type 1 diabetes, insulin analogs (or inhaled insulin) are preferred over injectable human insulins to minimize hypoglycemia risk. **A**
- 9.3 Early use of continuous glucose monitoring is recommended for adults with type 1 diabetes to improve glycemic outcomes and quality of life and minimize hypoglycemia. **B**
- 9.4 Automated insulin delivery systems should be considered for all adults with type 1 diabetes. **A**
- 9.5 To improve glycemic outcomes and quality of life and minimize hypoglycemia risk, most adults with type 1 diabetes should receive education on how to match mealtime insulin doses to carbohydrate intake and, additionally, to fat and protein intake. They should also be taught how to modify the insulin dose (correction dose) based on concurrent glycemia, glycemic trends (if available), sick-day management, and anticipated physical activity. **B**
- 9.6 Glucagon should be prescribed for all individuals taking insulin or at high risk for hypoglycemia. Family, caregivers, school personnel, and others providing support to these individuals should know its location and be educated on how to administer it. Glucagon preparations that do not require reconstitution are preferred. **E**
- 9.7 Insulin treatment plan and insulin-taking behavior should be reevaluated at regular intervals (e.g., every 3–6 months) and adjusted to incorporate specific

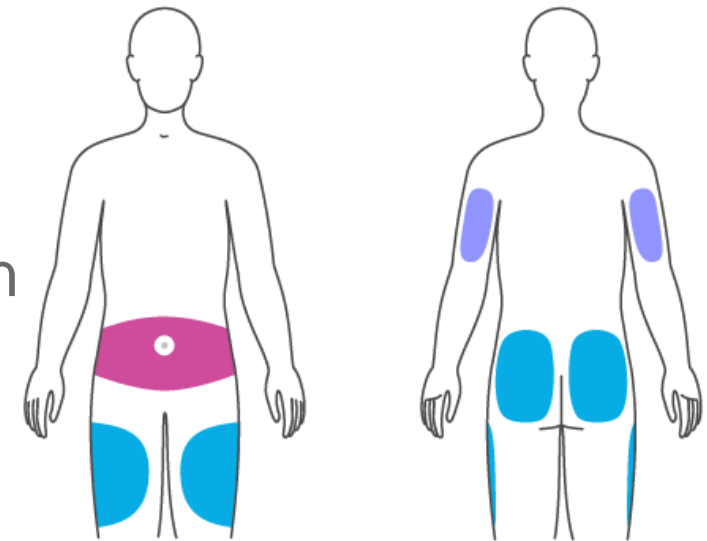
Type 1 DM in Adults, *New Chart*

Flow chart for investigation of suspected type 1 diabetes in newly diagnosed adults, based on data from White European populations



Caveats of Insulin Therapy

- **Split dosing of Insulin Glargine**
 - Consider when patients are receiving high doses of insulin
 - Helps to improve insulin absorption
 - Consideration for concentrated insulins
- **Administration Sites**
 - Reminding patients to rotate sites
 - Appropriate needle length to avoid IM injection
 - Helps to improve insulin absorption
- **Availability of Insulin Therapies**
 - Cost considerations
 - R and N (separate as well as combo) available OTC



Diabetic Ketoacidosis (DKA)

- Serious complication, life–threatening complication of diabetes
 - Most common in type 1 diabetes
- DKA occurs when your body doesn't have enough insulin to allow blood sugar into your cells to be used for energy
- Early Signs and symptoms
 - High blood sugar (over 250)
 - Thirst, urination
- More Severe Symptoms
 - Fast, deep breathing
 - Headache
 - Fruity smelling breath
 - Muscle stiffness or aches
 - Nausea and vomiting
 - Stomach pain

Managing High Blood Sugars

- Test for Ketones if BG >240
 - Can test at home, strips OTC
 - Check every 4 – 6 hours
 - Test even if you don't have symptoms
 - Contact provider or seek care if ketones are Moderate or greater
- Treatment
 - Hydration
 - Insulin (per prescriber orders)
 - Management of symptoms

