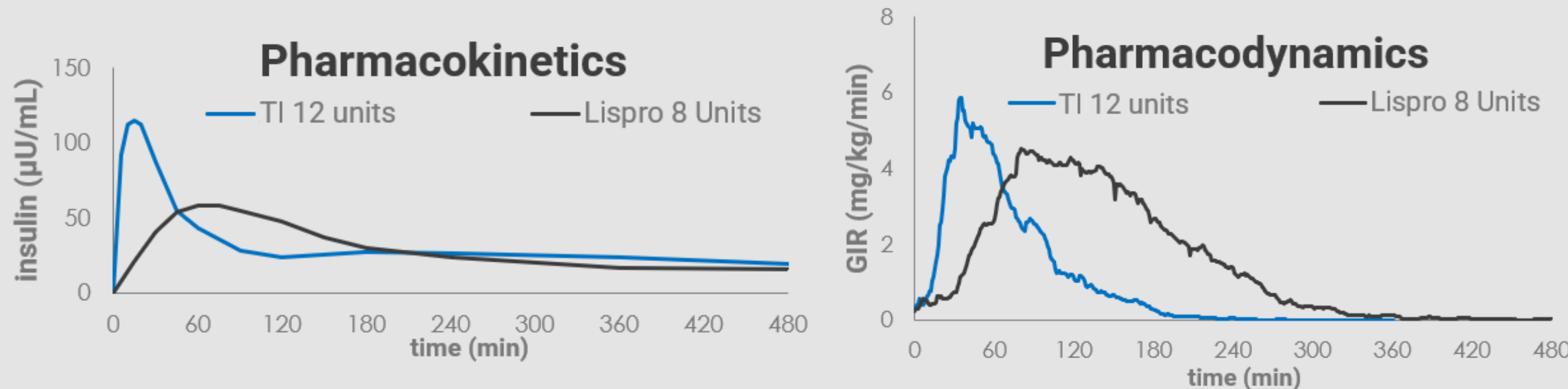


Inhaled Insulin Dosing in Schools, Considerations for Students with Diabetes

Insulin Overview

- Inhaled Technosphere® Insulin (TI) is a dry powder form of regular human insulin that is inhaled through the lungs, indicated to improve glycemic management in adult and pediatric patients 6 years of age and older with diabetes mellitus.¹
- TI has an ultra-rapid acting profile, due to its unique pharmacokinetic and pharmacodynamic properties, resulting in a much faster time-to-peak effect and clearance compared to subcutaneously administered rapid-acting insulin analogs (RAA).^{2,3}



Discussion

- Integrating inhaled insulin into daily school routines:** Nurses, families, and healthcare providers aligned on inhaled insulin units, delivery system, and rapid action. Shared resources, training, and clear science-based guidance supported individualized dosing plans and safe use within the school setting.
- Social drivers of health:** Strong provider-nurse-family relationships were critical for successful use of inhaled insulin, particularly in schools with limited health staffing. Clear communication helped set expectations for timing, supervision, and student independence during the school day.
- Challenges and practical solutions in schools:** When in-office pre-meal dosing was required, care structures were adapted to allow post-meal dosing or supervised self-administration, reflecting the rapid action of inhaled insulin and helping reduce hypoglycemia risk when meals were delayed.
- Patient-centered benefits and psychosocial considerations:** Increased satisfaction with inhaled insulin and less weight gain are important to highlight, especially for adolescents. Managing type 1 diabetes (T1D) is challenging at any age, and there is growing focus on the mental health burden associated with chronic disease management in pediatric populations.

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Real-World Case Examples

Case #1: Exercise



HISTORY OF PRESENT ILLNESS (HPI)

14 y/o boy, competitive basketball player with T1D (diagnosed 5 years ago), and current hemoglobin A1C [HbA1c] of 7.2%. He uses long-acting insulin (glargine 20 units once a day at night) and RAA.

SITUATION

He goes to his school nurse's office before lunch at 11:30am for his lunch RAA injection, where he counts his lunch carbohydrates, calculates the RAA dose with his school nurse, and receives the insulin.

He has frequent hypoglycemia during recess and basketball practice in the afternoon despite eating lunch and eating a snack before exercise. He is frustrated that both activities are interrupted with hypoglycemic episodes. Because of these frequent episodes, he sometimes stays at the school nurse's office for observation and can't join his friends to play basketball.

ACTION

His diabetologist replaces his school lunch insulin with inhaled insulin. He uses inhaled insulin for his pre-lunch bolus at school, with doses ranging from 8-12 units (U) to cover 40-60 g of carbohydrates for lunch.

OUTCOME

- Significantly fewer exercise-induced hypoglycemia episodes at school. No episodes of severe hypoglycemia
- Reduced need for rescue carbohydrates
- Improved confidence in glucose management during exercise

TAKE HOME MESSAGE

Compared with RAA, inhaled insulin has a rapid onset and offset, completing glucose-lowering within 90 minutes without a prolonged tail effect, thereby reducing the risk of late postprandial hypoglycemia.

Case #2: Injection Aversion



HPI

16 y/o boy with T1D (diagnosed 11 years ago), and current HbA1c of 10.2%. He uses long-acting insulin (glargine 35 units once nightly) and RAA. He has a history of persistent hyperglycemia due to missed insulin injections. He tells his parents that he dislikes needles and does not want his friends to see him injecting insulin. He sometimes arrives at school with blood glucose levels in the 200 mg/dL range, which rise further during the school day due to snack consumption without RAA boluses.

SITUATION

He presents to the school nurse with nausea and a blood glucose of 380 mg/dL and reports missing his morning RAA dose for breakfast and a snack. He refuses insulin injections at school to correct the hyperglycemia. His diabetologists recommend urine ketone testing and an insulin correction dose to prevent diabetic ketoacidosis. Despite his school nurse's efforts, he refuses to receive any insulin injections.

ACTION

Inhaled insulin is available as a backup treatment at school. The nurse calculates the dose and then gives the patient 20 U of inhaled insulin (12 U and 8 U cartridge).

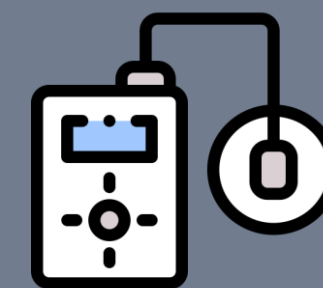
OUTCOME

- Blood glucose decreased to 184 mg/dL within one hour, with resolution of nausea and return to class
- Transitioned to inhaled insulin for meals, reducing school nurse visits
- Improved comfort using insulin around peers, HbA1c improved to 8% within three months, and overall diabetes burden and stress decreased

TAKE HOME MESSAGE

Inhaled insulin may improve treatment adherence and quality of life in individuals with needle aversion or injection fatigue.

Case #3: Automated Insulin Delivery (AID)



HPI

17 y/o girl with T1D (diagnosed 8 years ago), current HbA1c of 6.8%, and on AID treatment.

SITUATION

She presents to the school nurse with persistently "HIGH" sensor glucose despite meal bolus and multiple AID corrections. She suspects infusion-set failure but cannot change it because she forgot her pump supplies and is concerned about developing ketosis without prompt insulin.

ACTION

The school nurse contacted the diabetes call center for guidance. The diabetologist advised checking urine ketones and asked whether the parents could bring pump supplies and insulin. Because the parents were out of state and would not return for three hours, the patient used inhaled insulin she had with her. The nurse and diabetologist calculated a correction dose, and she immediately administered 16 units of inhaled insulin (12 U and 4 U cartridge).

OUTCOME

- Sensor glucose decreased to 320 mg/dL after 90 minutes and to 160 mg/dL after a second inhaled insulin dose another 90 minutes after. She had no ketosis, felt well, and a new infusion set was placed at home.

TAKE HOME MESSAGE

Inhaled insulin allows for rapid correction of postprandial hyperglycemia because of its faster onset and shorter duration than subcutaneous RAA, and early use may prevent hospital admission and progression to diabetic ketoacidosis.