

Improving Outcomes for People with Type 1 Diabetes and CKD or Heart Failure with SGLT2i

People with type 1 diabetes (T1D) have markedly elevated risks of chronic kidney disease (CKD), heart failure (HF), and cardiovascular death which collectively contribute to reduced life expectancy. SGLT2 inhibitors (SGLT2i) have demonstrated robust renal and cardiovascular protection in individuals with and without type 2 diabetes (T2D).

Although large outcomes trials in T1D are lacking, surrogate and mechanistic data support benefits to SGLT2i use, including reductions in albuminuria, improvements in renal hemodynamics, and changes in cardiorenal biomarkers.

Although no SGLT2i are FDA approved for glucose regulation in T1D, some SGLT2i are now approved for use in people with T1D for treatment of CKD or HF. This handout provides a summary of the benefits of SGLT2i use in individuals with T1D and CKD or HF along with strategies to mitigate the risk for diabetic ketoacidosis (DKA).

Clinical Benefits

Although studies of SGLT2i in people with T1D are limited, there is strong evidence to support their use in people with T2D and in those without diabetes. There is no reason to believe that the benefits seen in these populations would not extend to people with T1D.

RENAL OUTCOMES



Large CKD trials (CREDENCE¹, DAPA-CKD², EMPA-KIDNEY³) show a 30–40% reduction renal failure, with similar benefit in those with and without T2D

Studies of SGLT2i in T1D (EASE⁴, DEPICT^{5,6}, inTandem⁷ demonstrated:

- 20–50% reductions in UACR (placebo adjusted)
- Stabilization of eGFR after an initial decrease of 3–6 mL min/1.73 m²

Predictive modeling shows 5-15% reduction in 5-year renal failure risk in people with T1D⁸

CARDIOVASCULAR OUTCOMES



Meta-analyses of >90,000 people with T2D show⁹:

- 25-35% reduction in HF hospitalization
- 10-15% reduction in major atherosclerotic cardiovascular disease

The effects demonstrated in this trial were similar regardless of T2D status

Insulin Dose Adjustment Guidance

Studies of SGLT2i use in people with T1D have shown HbA1c improves by -0.3 to -0.5%.⁴⁻⁷

There is no standardized protocol to inform insulin dose adjustments when initiating SGLT2i. Clinical practice should align with findings from clinical trials of SGLT2i use in people with T1D and expert consensus.

SGLT2 initiation should not prompt clinicians to significantly reduce insulin doses. Excessive reduction in insulin doses is a significant risk factor for DKA

Continuous glucose monitoring (CGM) data should be monitored closely to allow for insulin dose adjustments based on glycemic trends

Basal insulin: For patients with an HbA1c <8% reduce basal insulin by no more than 10-20%. Those with HbA1c ≥8% typically require only minimal adjustments to their basal insulin dose

Bolus insulin: Consider slight reduction (5–10%) in situations with predictable post-meal drops for those with HbA1c <8%. Glucose trends should be closely monitored to guide further adjustments

1. Perkovic V, et al. N Engl J Med. 2019. PMID: 30990260. 2. Heerspink, et al. N Engl J Med. 2020. PMID: 32970396. 3. EMPA-KIDNEY Group. N Engl J Med. 2022. PMID 36331190. 4. Rosenstock et al. Diabetes Care. 2018. PMID: 30287422. 5. Dandona et al, Diabetes Care, 2018. PMID: 30352894. 6. Mathieu et al, Diabetes Care, 2018. PMID: 30026335. 7. Garg et al, N Engl J Med, 2017. PMID: 28899222. 8. Nardone et al, Clin J AM Soc Nephrol, 2025. PMID: 39918875. 9. McGuire et al, JAMA Cardiol, 2021. PMID: 33031522. 10. Li et al, J Diabetes Complications, 2024. PMID: 37907042. 11. Ehrmann et al, Lancet Diabetes Endocrinol, 2020. PMID: 32333879. 12. Danne et al, Diabetes Care, 2019. PMID: 30728224. 13. Garg et al, Diabetes Technol Ther, 2018. PMID: 30129772. 14. Goldenberg et al, Diabetes Obes Metab, 2019. PMID: 30129772

Diabetic Ketoacidosis Risk

SGLT2i use increases renal glucose excretion, leading to decreases in insulin requirement which can trigger ketogenesis. Meta-analyses have shown a ~4-fold risk for DKA in people with T1D using SGLT2i.¹⁰ While DKA classically presents with hyperglycemia (≥ 200 mg/dL), up to one third of people using SGLT2i who develop DKA experience euglycemic DKA, in which ketosis and acidosis occur with normal glucose levels.¹¹

Risk factors for DKA include:



Illness and dehydration



Low carbohydrate diets



Missed insulin doses, pump failures



History of recurrent DKA



Excess alcohol intake



Prolonged fasting



Excessive reduction in insulin doses



Limited engagement with T1D care

DKA Risk Mitigation Strategies

PATIENT SELECTION

SGLT2i use should be considered for patients with T1D and CKD or HF who are engaged with T1D management, use a CGM, have access to ketone monitoring and agree to monitor as recommended, and have not recently experienced DKA.

PATIENT EDUCATION

Thorough patient education is essential to support people in safely using these medications.

Key Educational Points Include:



The importance of monitoring ketones when indicated



Recognizing that normal glucose levels do not rule out DKA



SGLT2i-induced polyuria may be mistaken for symptoms of hyperglycemia

Temporarily hold SGLT2i during illness including those with nausea and vomiting, in case of dehydration or decreased oral intake, and 3 days before medical procedures.

Ensure patients have access to blood ketone monitoring before prescribing an SGLT2i. Ketones should be monitored in case of:

- Periods of illness, fasting, nausea, or vomiting
- Persistent glucose levels >250 mg/dL
- Sudden reductions in insulin needs

Ketone thresholds necessitating action¹²

- BOHB ≥ 0.6 mmol/L: Initiate the plan for elevated ketones detailed below
- BOHB ≥ 1.5 mmol/L: Continue ketone plan, consider seeking medical attention
- BOHB ≥ 3.0 mmol/L: Seek immediate medical attention

Action Plan for Elevated Ketones (STICH¹³/STOP-DKA Frameworks¹⁴)

- **S**Top SGLT2i
- **I**nject rapid-acting bolus insulin
- **C**onsume 30 grams of carbohydrates
- **H**ydrate aggressively

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