Management of Peri-operative Euglycaemic Diabetic Ketoacidosis (EDKA) secondary to SGLT2i on the Cardiac Intensive Care Unit:

Introduction:

Sodium-glucose co-transporter-2 inhibitors (SGLT2i) are licensed as a second line oral therapy for those with type 2 diabetes mellitus. It is also licensed in non-diabetics for heart failure and chronic kidney disease. Currently licensed SGLT2i include **Canagliflozin, Dapagliflozin, Empagliflozin and Ertuglifozin.**

An atypical presentation of diabetic ketoacidosis (DKA) with near normal blood glucose concentrations is known as Euglycaemic Diabetic Ketoacidosis (EDKA). This is an adverse side effect associated with the use of SGLT2i.

Risk factors for EDKA include prolonged fasting, surgical stress, carbohydrate depletion, volume depletion, intercurrent illness (including acute coronary syndromes) and insulin therapy (especially if held or doses reduced.)

As such patients on the CICU are at ***high risk for developing EDKA.***

Prevention and detection of EDKA:

Preop:

- Early identification of those on SGLT2i, especially emergency transfers from other trusts.
- Cessation of SGLT2i for at least 48 hours prior to surgery [1]
- Ensure long acting insulins continued at 80% of usual dose (Levemir, Lantus (Glargine), Tresiba, Insulatard, Humulin I, Toujeo, Abasaglar, Insuman Basal)

Intra-op:

- Avoidance of dexamethasone.
- 4 hourly monitoring of capillary ketones.

Post-op:

- Hand over to CICU staff regarding SGLT2i status.
- 4 hourly monitoring of capillary ketones.
- Restart SGLT2i once **full** feeding re-established and eGFR >45.
- Caution with loop diuretics (Furosemide/Bumetanide)
- Symptoms suggestive of EDKA include abdominal pain, nausea, vomiting, fatigue and dyspnoea.

[1] As per Guidance on perioperative management of ardiothoracic patients admitted on medication containing SGLT2i written 15/08/22

Management of EDKA:

Diagnosis of EDKA

On SGLT2i and:

- pH <7.3 (or HCO3 <15mmol/L)
- Capillary Ketones > 3mmol/L (Must be capillary ketones that are checked)
- Blood glucose can be normal (6-10mmols/L)

Treatment:

- Stop SGLT2i
- Early involvement of inpatient diabetic team (ext. 30170)
- Fixed rate insulin infusion at 0.1units/kg/hr until resolution of EDKA (Ketones <0.6mmol/L AND HCO_3 >15mmol/L AND pH >7.3).
- If blood glucose <8mmol/L during fixed rate insulin give 20% dextrose at 30mls/hr (via CVC) and aim for glucose 6-10 mmols/L
- Monitor K+ and replace as per usual CICU guidance and aim 3.5-5.5mmol/L.
- Fluid balance. Post surgical CICU patients are at high risk of cardiac decompensation with excessive fluid resuscitation. As such, fluid resuscitation in EDKA on CICU should be carefully considered with regular clinical assessment following boluses of 250mls of Hartmans, while keeping in mind the **CICU Fluid Management protocol,** especially for those with poor LV function. Fixed volume resuscitation, as in the standard trust DKA management protocol, should be avoided.

Resolution:

- Declare resolution when Ketones <0.6mmol/L AND HCO_3 >15mmol/L AND pH >7.3.
- If normal oral intake is not resumed at this point, switch to the variable rate insulin protocol.
- Only restart SGLT2i once **full** feeding re-established and eGFR >45.
- Caution with restarting SGLT2i if also on loop diuretics (Furosemide/ Bumetanide)

References:

1. Thiruvenkatarajan V, Meyer EJ, Nanjappa N, Van Wijk RM, Jesudason D. Perioperative diabetic ketoacidosis associated with sodium-glucose co-transporter-2 inhibitors: a systematic review. Br J Anaesth. 2019 Jul;123(1):27-36. doi: 10.1016/j.bja.2019.03.028. Epub 2019 May 3.
2. NICE Clinical Knowledge Summaries – SGLT-2 inhibitors. https://cks.nice.org.uk/topics/diabetes-type-2/prescribing-information/sglt-2-inhibitors/ Accessed 5/2/22
3. Legate P and Poole RB. “Double trouble: managing diabetic emergencies in patients with heart failure.” Practical Diabetes 35 (2018): n. pag.