Local Guideline

Health
Hunter New England
Local Health District

Document Number: JHH_BH_0047

Glycaemic management in patients awaiting elective surgery

Sites where guideline applies:	John Hunter Hospital and Belmont Hospital Perioperative Anaesthetic Clinics
Target audience:	Perioperative Anaesthetic clinic, Same Day/Day of Surgery units
Description:	Perioperative management of patients with diabetes mellitus who present for elective surgery. This includes assessment of diabetes control, perioperative management of medications and pathways for managing suboptimal control.
This local guideline applies to:	Excludes maternity patients. Please refer to Maternity – Diabetes in Pregnancy, Labour, Birth and the Postnatal Period
1. Adults	Yes
2. Children up to 16 years	No
3. Neonates – less than 29 days	No
Keywords:	JHH, Belmont, diabetes, perioperative anaesthetic service, hyperglycaemia,

Hyperlink to Guideline

Replaces Existing Guideline / Procedure:	No
Registration Number(s) and/or name and of Superseded Documents:	

Relevant or related Documents, Australian Standards, Guidelines etc:

- NSW Health Policy Directive PD2012_069 Health Care Records - Documentation and Management
- NSW Health Policy Directive PD2022_032 Medication Handling
- NSW Health Policy Directive PD2012_069 Health Care Records - Documentation and Management
- NSW Health Policy Directive PD2011_015 Care Coordination: Planning from Admission to Transfer of Care in NSW Public Hospitals
- HNELHD Policy Pol 15_06 Patient Identification
- HNELHD Clinical Guideline CG 19_25 Management of Hypoglycaemia
- HNELHD Clinical Procedure CP 16_13 Blood Glucose and Blood Ketone Monitoring with the Abbott Freestyle Optium H Device

Note: Over time some links in this document may cease working. Where this occurs please source the document in the PPG Directory at: http://ppg.hne.health.nsw.gov.au/

Prerequisites:	Nil
Local guideline note :	This document reflects what is currently regarded as safe and appropriate practice. However in any clinical situation there may be many factors that cannot be covered by a single document and therefore does not replace the need for the application of clinical judgment in respect to each individual patient. If this document needs to be utilised outside JHH/ Belmont perioperative areas contact the patient's medical officer ensure the

	appropriateness of the information contained within the guideline.
Date initial authorisation:	June 2016
Authorised by:	JHH Clinical Quality and Patient Care committee
This local guideline contains advice on therapeutics	Yes Approval gained from JHH Quality Use of Medicines Committee on 14/2/19
Contact Person:	Director of Perioperative Services
Contact Details:	Paul M Healey
Date Reviewed:	February 2019, February 2021, October 2022
Review due date:	October 2024
Responsible for review:	Director of Perioperative Services
Version:	4.0 18th of October 2022

RISK STATEMENT

Patients with diabetes that have below-target glycaemic control are at increased risk of morbidity and mortality in the perioperative period. This includes, but is not limited to, post-operative wound and joint infections, myocardial infarction, and acute kidney injury.

Any unplanned event resulting in, or with the potential for, injury, damage or other loss to patients/staff/visitors as a result of this procedure must be reported through the Incident Information Management System and managed in accordance with the Ministry of Health Policy.

OUTCOMES

1	Best practice management of patients with diabetes during the perioperative phase.
2	Risk of complications minimised.

ABBREVIATIONS & GLOSSARY

Abbreviation/Word	Definition
Perioperative Clinic	Multi-disciplinary service including nursing and anaesthetic medical staff. Purpose of optimising patient's health for elective surgical procedures.
JHH	John Hunter Hospital
BDH	Belmont District Hospital
Blood Glucose Level (BGL)	The blood glucose concentration or blood glucose level is the amount of glucose present in the blood.
HbA1c	The haemoglobin A1c (HbA1c), glycated haemoglobin, is primarily used as a tool to determine how well diabetes is being controlled. Identifies the average plasma glucose concentration over 90 days/3 months.
Type 1 Diabetes	Type 1 diabetes mellitus occurs when the pancreas stops producing insulin. This occurs due to the immune system destruction of the insulin making beta cells of the pancreas. Onset is usually in people under 30 but can happen at any age. About 15% of all cases of diabetes are type 1.
Type 2 Diabetes	Type 2 diabetes mellitus is a metabolic disease in which a person has high blood glucose concentrations. It is the most common type of diabetes and occurs when the pancreas is not producing enough insulin and the insulin that is produced is not working effectively.
Major surgery	Surgical procedures where there is expected to be a significant physiological stress on the patient. Is usually associated with more than overnight admission to hospital.
Minor surgery	Surgical procedures with minimal physiological stress on the patient. Is usually associated with day-only procedures.

OHA	Oral hypoglycaemic agent. Medications used to lower blood glucose levels in the blood, predominantly for the treatment of type 2 diabetes.
Non-insulin injectable agents	Medications used to lower blood glucose levels in the blood, that are injected by the patient, but do not act via insulin receptors. They are used in the treatment of type 2 diabetes.
Contrast agents	Intravenous agents used for advanced imaging procedures in x-ray, CT and MRI. This is predominantly interventional vascular and neurology procedures, as well as some urological and general surgical procedures.
BGL Target Range	The optimum level of blood glucose concentration that will minimise the risk of post-operative diabetes-related complications. For patients awaiting surgery, blood glucose concentrations should be maintained within a target range of 5–10 mmol/L.
SGLT2 inhibitors	Sodium-glucose co-transporter 2 inhibitors are oral medications that promote sodium and glucose excretion in the urine for the treatment of Type 2 diabetes

Hospital / Service Manager Responsibility

- Ensure that the principles and requirements of this guideline are applied, achieved and sustained

Line management responsibility

- Regularly review safety and quality performance data related to perioperative management and outcomes of patients with diabetes and take action to improve the safety and quality of patient care as considered necessary.
- Ensure that all staff are made aware of their obligations regarding this guideline through staff education
- Ensure that all staff read and understand this document

Employee responsibility

Clinical staff must:

- Read, understand and comply with the requirements of this guideline

GUIDELINE

This guideline aims to standardise care for patients with diabetes who are presenting for surgical procedures, it does not replace the need for the application of clinical judgement in respect to each individual patient.

Background

Diabetes is estimated to affect 5% of the general population.[1] However, it is thought that up to half of all cases are undiagnosed. The incidence of diabetes in the surgical population is as high as 20%.[2,3]

In Australia during 2017-18, 1.2 million hospitalisations were associated with diabetes.[1] Patients with diabetes present more frequently for surgical procedures and have longer hospital stays than patients without diabetes. The presence of above-target glycaemic control in the perioperative period has been associated with up to a 50% higher rate of morbidity and mortality. This includes increased incidence of post-operative respiratory and urinary tract infections, wound and prosthetic joint infections, myocardial infarction, and acute kidney injury.

There are many challenges in perioperative management of glycaemic control, including.

- Fasting
- Interruptions to usual diabetes medication
- Bowel preparation
- Metabolic sequelae of stress and surgery

The targets of optimal glycaemic control are usually individualized, but in general:

- **BGL range 5-10mmol/L[2]**
- **HbA1c < 7.5% [2,4]**

These targets are meant to serve as a guide in the assessment and management of diabetes. No single target will be suitable for all individual patients. In the perioperative period, the above challenges and the urgency of the surgery and resulting time constraints also need to be considered.

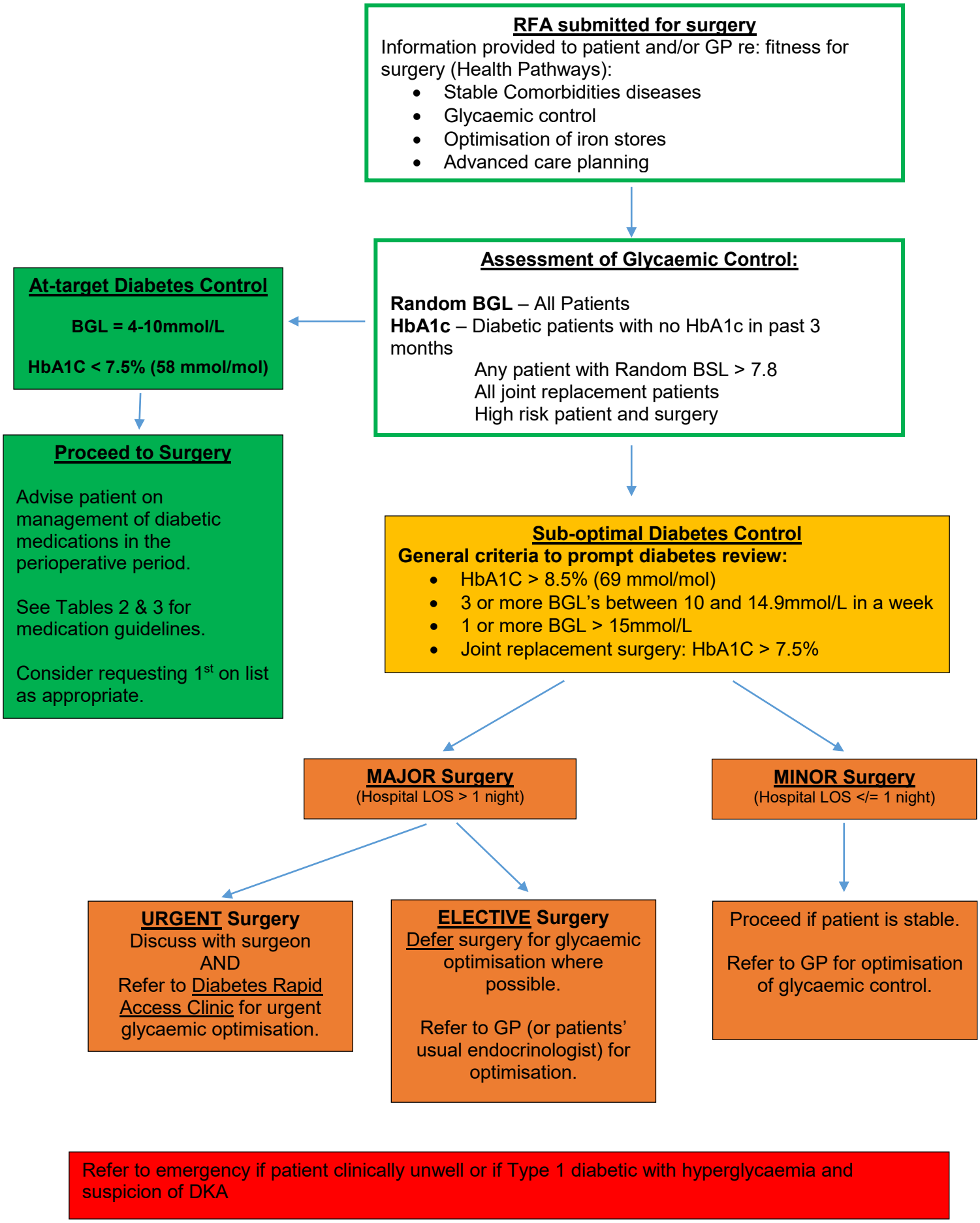
This guideline consists of 4 sections:

1. Flowchart for glycaemic management of surgical patients with diabetes seen in the Perioperative Clinic
2. Perioperative management of insulin therapy
3. Perioperative management of oral hypoglycaemic agents and non-insulin injectables
4. Flowchart for management of patients who have NOT ceased SGLT-2 inhibitors preoperatively
5. Patient management on day of surgery

Plus Frequently Asked Questions (Appendix 1)

All care, tests, treatment and outcomes are to be documented in the patient's healthcare record and made available for the patient's admission. Clinical handover must be provided to day of surgery unit/procedural anaesthetist for high risk/poorly controlled patients.

1. **FLOWCHART FOR GLYCAEMIC MANAGEMENT OF SURGICAL PATIENTS WITH DIABETES SEEN IN PERIOPERATIVE CLINIC**



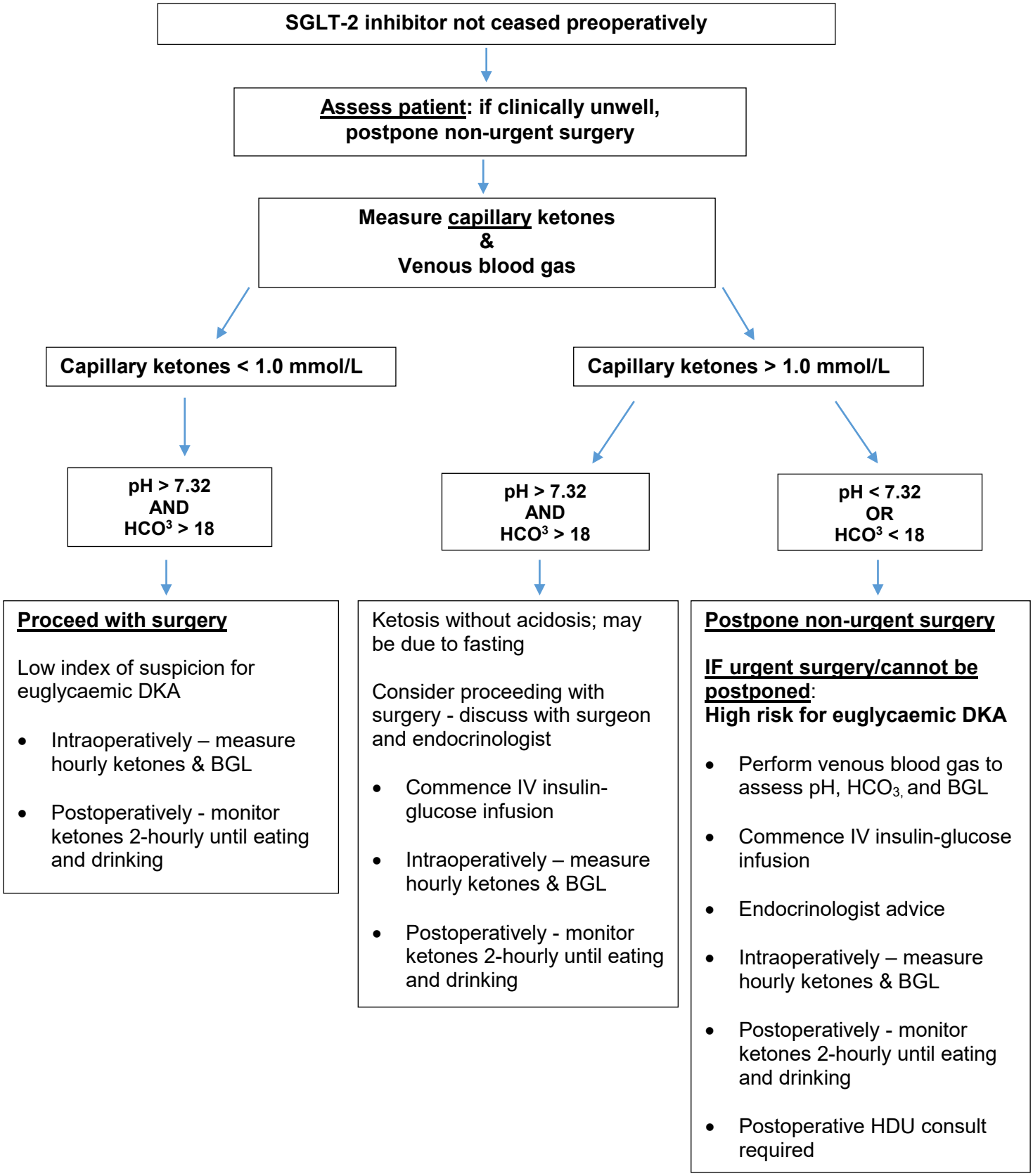
2. Perioperative management of insulin therapy

Insulin	Day before Procedure	Day of Surgery
Long-Acting: Glargine - Lantus, Toujeo, Optisulin Determir - Levemir	Normal dose	• Normal dose • Reduce to 80% of normal dose if concern regarding hypoglyaemia
Premixed long-acting Insulin Ryzodeg 70/30	Normal dose	• Half normal dose • Give 200 mL of clear apple juice at time of insulin injection and/or if BGL <6mmol/L • Patient must be able to monitor BGL • Check BGL on waking and 2-hourly • If prolonged fasting, consider switching to Optisulin at 70% of the total Ryzodeg dose
Pre-mixed Humalog Mix25 Humalog Mix50 NovoMix 30 Mixtard 30/70 Mixtard 50/50 Humulin 30/70	Normal dose	• Half normal dose • Patient must be able to monitor BGL • Check BGL on waking and 2-hourly • Give 200 mL of clear apple juice at time of insulin injection and/or if BGL <6mmol/L
Intermediate-acting Insulin Isophane - Protophane, Humulin NPH	Normal dose	• Half normal dose • Give 200 mL of clear apple juice at time of insulin injection and/or if BGL <6mmol/L Patient must be able to monitor BGL • Check BGL on waking and 2-hourly
Short-Acting and Ultra-short Acting Insulin Aspart – NovoRapid, Fiasp Lispro – Humalog Glulisine – Apidra Neutral – Actrapid, Humulin R	Normal dose	• **OMIT** • Do not give any rapid-acting insulin on day of surgery
Insulin Pump		
Insulin pump – delivers basal insulin and a bolus depending on meals and activity. Often contains highly concentrated insulin.		All insulin pumps should be discussed with treating endocrinologist or referred to the diabetes team.

3. Perioperative management of oral hypoglycaemic agents and non-insulin injectables

ORAL HYPOGLYCAEMIC AGENTS	PERIOPERATIVE INSTRUCTIONS
Biguanides: metformin **Sulphonylureas:** glibenclamide, gliclazide, glimepiride, glipizide **DPP-IV inhibitors**: alogliptin, linagliptin, sitagliptin, saxagliptin, vidagliptin **Thiazolidinediones:** pioglitazone **Alpha-glucosidease inhibitors:** acarabose	**Withhold on day of surgery** **Recommence when eating and drinking as normal** *Consider ceasing for a further 48 hours postoperatively if: • Contrast media has been used • eGFR < 60ml/min/1.73m^2
SGLT-2 inhibitors (aka "-flozins") dapagliflozin, empagliflozin, ertugliflozin	**Cease 3 days preoperatively** **Recommence when:** • **Fully recovered from surgery** • **Eating and drinking normally** • **eGFR > 45ml/min/1.73m^2** *See flowchart for management of patients who have not ceased SGLT-2 inhibitor preoperatively
Combination Medications	Manage as per individual agents i.e. If contains SGLT2 inhibitor, then cease 3 days preoperatively
NON-INSULIN INJECTABLE AGENTS	**PERIOPERATIVE INSTRUCTIONS**
GLP-1 ANALOGUES: • **exenatide** (Byetta) • **liraglutide** (Victoza, Saxenda)	**Withhold on day of surgery** **Recommence when eating and drinking as normal**
GLP-1 ANALOGUES, weekly dosing: • **dulaglutide** (Trulicity) • **semaglutide** (Ozempic)	**Continue as normal** **Consider withholding week of surgery if increased risk of post-operative nausea and vomiting**

4. Flowchart for the management of patients who have NOT ceased SGLT-2 inhibitor preoperatively



5. Patient management on day of surgery

PRE-OPERATIVE

- Review fasting status
- Check perioperative management of oral hypoglycaemic agents and insulin
- Measure and record BGL 2-hourly

BGL 5-10 mmol/L →

- Proceed to OT
- Continue to measure BGL 2-hourly

BGL < 5 mmol/L →

- Discuss with procedural anaesthetist
- Asymptomatic
  - 200 mL of clear juice can be given up to 2-hours preoperatively, OR
  - 5% dextrose, 300mL bolus then 100mL/hr
- Symptomatic
  - **Call Rapid Response Team if patient unstable**
  - Treat as for asymptomatic
  - Consider bolus of IV 50% glucose, 25-50 mL over 1-3 mins if neuroglycopenic symptoms.
- Monitor BGL hourly

BGL > 10 mmol/L →

- Discuss with procedural anaesthetist
- Consider IV insulin-glucose infusion (use standard Adult Intravenous Insulin Infusion Guideline).
- Consider checking ketones, especially if T1DM, pregnancy, of SGLT2 inhibitor
- Monitor BGL hourly

BGL > 15 mmol/L →

- Discuss with procedural anaesthetist
- Measure blood ketones; if > 1.0mmol/L perform VBG to assess for acidosis. Consult Endocrinology if pH <7.32 or HCO3 <18mmol/L.
- Commence insulin-glucose infusion (use standard Adult Intravenous Insulin Infusion Guideline) and monitor response of glucose, ketones and acid-base status
- If ketones > 1.0mmol/L and on SGLT-2 inhibitor follow advice provided on flowchart on page 7
- Monitor BGL hourly

APPENDICES

Appendix A: Frequently asked questions

Appendix B: Referral form to GNS Diabetes Services for pre-operative stabilisation

REFERENCES

1. Australian Government. Australian Institute of Health and Welfare. https://www.aihw.gov.au/reports/diabetes/diabetes/contents/what-is-diabetes
2. Valentine NA et al. detecting Diabetes using glycated haemoglobin: an automated screening test in hospitalised patients. MED J Aust. 2011; 194(4): 160-4
3. Story, D.A et al. Complications and mortality in older surgical patients in Australia and New Zealand: (the REASON Study). A multi-centre, prospective observational study. Anaesthesia 2010; 65: 1022-1030.
4. Hospital Health Pathways Hunter New England. Periprocedural Management of Glycaemia. October 2019. https://hne.hospitalhealthpathways.org/57151.htm
5. Australian Diabetes society. Guidelines for routine glucose control in hospital. 2012. https://diabetessociety.com.au/documents/ADSGuidelinesforRoutineGlucoseControlinHospitalFinal2012_000.pdf
6. Joint ANZCA and ADS position statement on Periprocedural Diabetic Ketoacidosis (DKA) with SGLT2 Inhibitor Use: https://diabetessociety.com.au/downloads/20201015%20ADS_DKA_SGLT2i_Alert_update_Sept_2020.pdf
7. Association of Anaesthetists of Great Britain and Ireland (2015) Guideline: Perioperative Management of the surgical patient with Diabetes 2015: http://onlinelibrary.wiley.com/doi/10.1111/anae.13233/epdf
8. Zhang A. Perioperative glycaemic control in diabetic surgical patients – review. Australian Medical Students Journal. 2015 6(2): 19-23.
9. Frisch A, Chandra P, Smiley D, et al. Prevalence and clinical outcome of hyperglycaemia in the perioperative period in non-cardiac surgery. Diabetes Care 2010; 33: 1783–8.
10. New South Wales Agency for Clinical Innovation (2016). Perioperative Fasting in NSW Public Hospitals. http://www.aci.health.nsw.gov.au/__data/assets/pdf_file/0006/299301/ACI_Key_Principles_Preoperative_fasting_in_NSW_public_hospitals.pdf
11. HNELHD District QUM Medication Alert February 2018 - Severe Euglycaemic Ketoacidosis with SGLT2 Inhibitor Use in the Perioperative Period
12. Diabetes Australia guideline development consortium. National Evidence Based Guideline for Case Detection and Diagnosis of Type 2 Diabetes. www.diabetesaustralia.com.au
13. World Health Organisation. Classification of diabetes Mellitus. 2019. www.who.int

Useful Links

1. Australian Diabetes Society (2012) Perioperative Diabetes Management Guideline
2. Association of Anaesthetists of Great Britain and Ireland (2015) Guideline: Perioperative Management of the surgical patient with Diabetes 2015
3. Joint British Diabetes Societies for Inpatient Care (2015) Management of adults with diabetes undergoing surgery and elective procedures: Improving standards.

Appendix A: FREQUENTLY ASKED QUESTIONS

1. How is the diagnosis of diabetes made?

The criteria for the diagnosis of diabetes are:

- HbA1c ≥48 mmol/mol (6.5%) OR
- Fasting glucose ≥7 mmol/L OR
- Random glucose ≥11.1 mmol/L OR

Asymptomatic patients – test should be repeated to confirm diagnosis.
Equivocal random plasma glucose levels of 6.1 – 9.9mmol/L, refer to GP for Oral Glucose Tolerance Test (OGTT).

- 75 g oral glucose tolerance test: fasting glucose ≥7 mmol/L or 2 h glucose ≥11.1 mmol/L

2. Why do we stop all oral hypoglycaemic agents perioperatively?

Oral hypoglycaemic agents (OHA) and the non-insulin injectable agents act at a sub-cellular level and stopping these agents on the day of surgery does not reverse the cellular changes that allow the drug to have an effect. However, some agents do have potential adverse effects.

The Association of Anaesthetists of Great Britain and Ireland (AAGBI) guidelines for perioperative management of diabetes[7] suggested continuation of all OHA and non-insulin injectable agents on the day of surgery, except sulfonylureas and SGLT-2 inhibitors. These agents pose a risk of hypoglycaemia and ketoacidosis respectively. It also recommended the continuation of metformin except if the surgery involves the use of contrast or the patient's eGFR is <60mL/min/1.73m^2.

However, given the potential for confusion, a pragmatic approach is to withhold all OHA and non-insulin injectable medications on day of surgery (except SGLT-2 inhibitors which should be withheld for 3 days).

3. What is a light breakfast? What fluids are appropriate with insulin administration?

An example of a light breakfast includes toast and a clear fluid or breakfast cereal and milk. It excludes fried and fatty food, as these may prolong gastric emptying time.

The appropriate oral fluid to be administered with insulin includes carbohydrate to avoid hypoglycaemia. This includes apple juice, other pulp-free fruit juice, cordial, black tea and coffee WITH sugar. Other alternatives include commercial rehydration fluids (e.g. Gastrolyte/Hydralyte) and commercial fat-free, protein-free high-energy nutritional supplements.

4. When patients are prescribed an insulin infusion post-operatively, what should we do with their diabetes medication?

- <u>OHAs and non-insulin injectables</u> – should be discontinued until patients are eating and drinking.
- <u>Long-acting insulins, Levemir (insulin detemir) and Optisulin/Toujeo (insulin glargine),</u> should be continued while patients are on an insulin infusion. This provides basal insulin requirements and allows an easier transition to previous insulin regimen. It also protects against the development of diabetic ketoacidosis in patients with Type 1 diabetes.
- <u>Intermediate-acting insulin and short/rapid-acting insulin</u> (including mixed insulins) – should be discontinued until patient is eating and drinking. Generally, insulin infusions are ceased 2 hours after the recommencement of rapid/short-acting insulins and patients are eating and drinking normally.

Appendix B:

Health
Hunter New England
Local Health District

GNS DIABETES SERVICE
Referral for Pre-operative Patients undergoing urgent, major surgery with Diabetes, Requiring Intervention

Date of referral _____

MRN	
Name	
DOB	
Gender	
Address	
Telephone contact	

0407232639, to advise a referral is being made.
Fax referral to 49 223895 (RIMS).
Referral to Diabetes Nurse Educator (DNE)

Please tick the referring preoperative clinic
☐ John Hunter ☐ Belmont ☐ Maitland ☐ Cardiothoracic pre-operative patients

☐ Calvary Mater (JHH Wait List) ☐ Calvary Mater (Pre-op clinic)

An Endocrine consultant may be required once the patient has been assessed by the DNE
Referral to Diabetes Endocrinologist: Dr S.Acharya

Referral Criteria Pre-operative patients with **new or existing diabetes** with ALL of the following

- ❑ HbA1c > 8.5% within the preceding 3 months (>7.5% if undergoing joint replacement), AND
- ❑ Major surgery (e.g. abdominal, cardiac or joint surgery requiring >1 night LOS), AND
- ❑ >8 days and < 30 days until surgery (if < 8 days, there is insufficient time to arrange outpatient review, if > 30 days, patient should be referred to see GP in first instance)

Patient Details

☐ Type 1 Diabetes ☐ Type 2 Diabetes ☐ Other: please specify _____

☐ New diabetes diagnosis ☐ Existing diabetes

HbA1c result _____ Date of HbA1c test _____ Patient's Weight _____Kgs

Surgeon's Name _____ GP's name _____

Planned date of surgery_____ Type of surgery _____

Current diabetes medications including insulin (where applicable):

Name of Diabetes Medication:	Dose:	Route:

Referring clinician name: Perioperative Service **Dr Paul Healey**

Referring clinician Signature _____

Provider number - 2741992J
Phone: 4922 3018
(all fields are mandatory)