



CLINICAL GUIDELINE

Diabetes, Perioperative guideline for the management of Diabetes

A guideline is intended to assist healthcare professionals in the choice of disease-specific treatments.

Clinical judgement should be exercised on the applicability of any guideline, influenced by individual patient characteristics. Clinicians should be mindful of the potential for harmful polypharmacy and increased susceptibility to adverse drug reactions in patients with multiple morbidities or frailty.

If, after discussion with the patient or carer, there are good reasons for not following a guideline, it is good practice to record these and communicate them to others involved in the care of the patient.

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Important Note:

The Intranet version of this document is the only version that is maintained. Any printed copies should therefore be viewed as 'Uncontrolled' and as such, may not necessarily contain the latest updates and amendments.

Perioperative Guidelines for the Management of Diabetes

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Perioperative Guidelines for the Management of Diabetes 2024

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1. Introduction

This guideline aims to provide guidance to healthcare staff involved in the care of adult patients with diabetes undergoing elective and emergency surgery in the perioperative period. For the purposes of this document, the perioperative period is defined as when patients come into hospital for surgery or begin fasting (either on the day of surgery or the night before) until they are discharged from surgical care. However, as the patient moves beyond the immediate post-operative period (e.g. 24-48 hours) general in-patient pathways may be more appropriate. Clinical judgement should be used in these situations.

This guideline does **not** cover obstetric patients.

Patients with diabetes require additional considerations when preparing for surgical interventions as a consequence of fasting, as well as the risk of metabolic decompensation with increased physiological stress. Preoperative planning with clear and well communicated plans for the perioperative period are essential for safe management.

Additional care should be taken for patients with diabetes who are at higher risk. These include but are not limited to patients who are insulin deficient (Type 1 or Pancreatic diabetes), patients with impaired hypoglycaemia awareness, patients who are fed via NG/ NJ or TPN, elderly patients and patients with multi-morbidity.

2. Pre-operative assessment

In elective cases, all efforts should be made to optimise glycaemic control prior to surgery as this is linked to improved outcomes. Patients with HbA_{1c} > 69mmol/mol (checked within 3 months of date of surgery) should be highlighted to the team responsible for managing their diabetes via a Trak care referral and advice sought about any strategies for improvement.

In some circumstances, an HbA_{1c} < 69mmol/mol is not necessary or desirable and individual decisions will be made based on an assessment of risk versus benefit by the surgical and anaesthetic team, with input from the diabetes team if required.

In more emergent cases, a risk assessment must be made regarding the benefits of delay to optimise diabetes management versus the need for surgical intervention.

Please ensure the surgical and anaesthetic team are informed of any concerns regarding diabetes management or control.

In all cases, clear plans for withholding oral medication, reduction or withholding insulin and need for additional management strategies e.g. VR111, as well as restarting usual medications post operatively must be clearly documented and visible for all staff involved in the patients care (see Section 4 for further guidance). SCI-Diabetes pre-

operative assessment form should be used to document this in the case of elective surgery and this **must** be reviewed by medical and nursing staff pre and post operatively. In unplanned/ emergency surgery, this is the responsibility of the admitting surgical team with input from the anaesthetist if required and **must** be clearly communicated to nursing staff.

3. Perioperative monitoring requirements, CBG targets and ketone measurements

Capillary Blood Glucose (CBG) targets are 6-10 mmol/l in the perioperative period (4-14 mmol/mol may be acceptable but clinical judgment should be used as to the appropriate target and this should be clearly documented).

Patients on a VRIII require hourly CBG monitoring initially although this can be reduced if CBGs have been stable for the required length of time (Appendix 2). People with diabetes should have **CBG checked at least four times daily** in the perioperative period and more frequently if unstable or out with optimal range. In addition, CBG checks should be undertaken:

- At start and end of procedure
- In recovery
- On arrival back to ward area

GGC Clinical Guidelines are available for the management of hypo (Appendix 3) and hyperglycaemia (Appendix 4). CBGs between 4-6 mmol/l can be considered “looming hypoglycaemia”. It may be appropriate to adjust insulin, treat with oral carbohydrate or parenteral glucose in these situations depending on the clinical context.

Capillary blood ketone (CBK) measurements are currently available in some but not all clinical areas in GGC. Urinary ketones are an appropriate substitute. Values for both are given in this guidelines. Urinary or capillary ketones should be checked if CBG > 14mmol/l in patients with Type 1 or pancreatic diabetes. In addition, consider checking CBK in patients who have been taking SGLT2 inhibitors and are unwell (particularly if this has not been withheld in the perioperative period). Further information on further action if ketones are elevated can be found in the “Diabetes, Inpatient prescribing FAQs” document on the GGC clinical guidelines platform:

[Diabetes, Inpatient Prescribing FAQs for Junior Doctors \(897\) | Right Decisions \(scot.nhs.uk\)](https://www.scot.nhs.uk/ggc/clinical-guidelines/platform/897)

4. Perioperative management of oral/ non-insulin sub cutaneous medications in fasting period

Tablets	Day before admission	Day of surgery	
		Surgery in morning	Surgery in afternoon
*SGLT-2 inhibitor (dapagliflozin, Canagliflozin, empagliflozin)	Omit dose	Omit dose	Omit dose
<p><i>* SGLT2 inhibitors should be withheld for 24hs post op and only restarted when patient is stable, well and eating and drinking normally.</i></p> <p><i>SGLT-2 inhibitors are also used for management of heart failure and renal impairment. The guidance re withholding SGLT-2 inhibitors should be followed, regardless of the indication for prescribing.</i></p>			
Metformin / Glucophage MR (procedure not requiring contrast media)	Take as normal	Omit morning dose	Omit all doses
Sulphonylurea (glibenclamide, gliclazide / gliclazide MR, glipizide, glimepiride)	Take as normal	Omit morning dose	Omit all doses
Thiazolidinedione (pioglitazone)	Take as normal	Take as normal	Take as normal
DPP-IV inhibitor (sitagliptin, vildagliptin, saxagliptin, alogliptin, linagliptin)	Take as normal	Take as normal	Take as normal
Acarbose	Take as normal	Omit morning dose	Take morning dose if eating breakfast. Omit lunchtime dose
Meglitinides (repaglinide, nateglinide)	Take as normal	Omit morning dose	Take morning dose if eating breakfast. Omit lunchtime dose
*GLP-1 analogue (e.g. exenatide, liraglutide, semaglutide, dulaglutide)	Take as normal	Take as normal	Take as normal
<p><i>*GLP-1 analogues can affect intestinal motility. In patients undergoing bowel surgery, consider withholding until E&D well.</i></p>			

5. Perioperative management of subcutaneous insulin in patients Expected to miss **no more than one meal**.

Insulin	Day before admission	Day of surgery	
		Surgery in morning	Surgery in afternoon
Long acting insulin (evening) (e.g. Lantus, Levemir, Tresiba, Humulin I, Xultophy)	Reduce dose by 20%	No dose adjustment necessary. Check blood sugar on admission	No dose adjustment necessary. Check blood sugar on admission
Long acting insulin (morning) (e.g. Lantus, Levemir, Tresiba, Humulin I, Xultophy)	No dose change	Reduce dose by 20% and check blood sugar on admission	Reduce dose by 20% and check blood sugar on admission
Twice daily (mixed/ biphasic) insulin (e.g. Novomix 30, Humulin M3 Humalog Mix 25, Humalog Mix 50)	No dose change	Reduce morning dose by 50% Check blood sugar on admission Leave the evening meal dose unchanged	Reduce morning dose by 50% Check blood sugar on admission Leave the evening meal dose unchanged
Basal Bolus regime with long acting insulin at night (e.g. once daily long acting insulin and short/ rapid acting insulin with meals)	Reduce night time dose of basal/ long acting insulin by 20%. Continue short/ rapid acting insulin as normal	Omit the morning dose of short/ rapid acting insulins, this will be restarted when eating and drinking.	Take usual morning insulin dose if eating breakfast. Omit lunchtime dose of short/ rapid acting insulin, this will be restarted when eating and drinking.
Basal Bolus regime with long acting insulin in morning (e.g. once or twice daily long acting insulin and short/ rapid acting insulin with meals)	No Change	Reduce morning dose of basal/ long acting insulin by 20% Omit morning dose of short/ rapid acting insulin, this will be restarted when eating and drinking.	Reduce morning dose of basal/ long acting insulin by 20% Take usual morning insulin dose if eating breakfast. Omit lunchtime dose of short/ rapid acting insulin, this will be restarted when eating and drinking.
<p>Additional points:</p> <ul style="list-style-type: none"> • Some patients will be on other insulin regimes but these are less common. Contact the diabetes team for advice in these circumstances. • Patients who are on enteral/ parenteral feeding should be discussed with the diabetes team to confirm a management plan. • Patients with HbA1C out with the range of 53-69mmol/l may be at risk of hypo or hyperglycaemia during the perioperative period. Consideration should be given to amending 			

the above regime in these circumstances and early referral to parent diabetes team should be considered (see appendix 5 for contact details of the relevant diabetes centres).

6. Use of variable rate intravenous insulin infusion (VRIII)

VRIII should be considered in the following circumstances:

- Elective surgery in patients treated with insulin who are anticipated to have a prolonged starvation period (i.e more than one missed meal)
- Persistent hyperglycaemia following failed subcutaneous protocol (see hyperglycaemia protocol)
- Emergency surgical procedure or admission in patients treated with insulin, likely to be associated with more than one missed meal

In patients with poor glycaemic control (HbA1C > 69mmol/mol), the benefits of a VRIII should be balanced against the risks. In many circumstances where the surgical intervention is short and recovery is likely to be rapid, short term correction of hyperglycaemia/ accepting suboptimal control may be a pragmatic solution.

The GGC VRIII guidelines can be found on the clinical guidelines platform:

[Diabetes, Variable Rate Intravenous Insulin Infusion \(671\) | Right Decisions \(scot.nhs.uk\)](https://www.scot.nhs.uk/clinical-guidelines/ggc/671/)

Frequently asked questions are another useful resource and can also be found on the clinical guidelines platform:

[Diabetes, Variable Rate Intravenous Insulin Infusion \(VRIII\) Frequently Asked Questions \(923\) | Right Decisions \(scot.nhs.uk\)](https://www.scot.nhs.uk/clinical-guidelines/ggc/923/)

Some key points regarding VRIII

- IV insulin should **always** be administered alongside dextrose containing fluid as substrate (e.g 0.18% NaCl 4% glucose 0.15% KCl or 0.45% sodium chloride + 5% glucose + 0.15% potassium chloride)
- Basal/ long acting insulin (Tresiba, Levemir, Lantus, Humulin I etc.) should **continue** while a VRIII is running. Mixed/ biphasic insulin, combination of insulin and GLP-1 analogues (xultophy) and bolus/ short acting insulin should be **withheld** while a VRIII is running.
- The rate of IV insulin should be adjusted to maintain patients within target CBG range if the standard rate does not achieve this. This should be prescribed and documented on the front of the VRIII document.

7. Use of continuous glucose monitors in the perioperative period

Continuous glucose monitors (e.g. Freestyle Libre/ Dexcom) are worn for 10-14 days. These can remain in situ during surgical procedures if no contraindications eg

location in surgical field. While some aspects of their functions may be useful (e.g. low glucose alarm) they should not be used for routine glucose monitoring during this period. They measure interstitial glucose thus have a “physiological time lag” of 10-15mins behind capillary glucose measurements and their accuracy is reduced at extremes of glycaemia. Therefore capillary glucose measurements on a calibrated instrument are required.

8. Use of continuous subcutaneous insulin infusion(CSII) pump in the perioperative period

Subcutaneous pumps and continuous glucose monitoring systems used separately or as part of a hybrid closed loop system are not recommended for use during surgical procedures by the manufactures of the devices, based on the perceived risk of damage to them by diathermy or imaging equipment. However, little/ no evidence exists currently to support this concern and there may be situations where use of continuous subcutaneous insulin pump would lead to better management of diabetes in the perioperative period. Use of CSII presents a number of other potential hazards however and should only be undertaken by experienced staff in carefully selected patients according to approved local guidelines, pending GGC wide guidelines. Patients who use CSII should be discussed with their diabetes team in the preoperative period to plan their diabetes management.

9. Post-operative care

The perioperative care plan (documented on SCI diabetes and anaesthetic chart) must be checked and followed on return to a ward area.

CBGs should be checked on arrival and frequently thereafter (the frequency will depend on a number of factors e.g. eating and drinking, on VRII etc.) but should be four times daily for most people with diabetes. If the required frequency is not clear, guidance should be sought from medical staff.

VRIII should never be stopped in a patient with diabetes treated with insulin or with a new diagnosis of T1/ pancreatic diabetes unless long acting/ basal insulin has been administered subcutaneously in the form of basal or mixed/ biphasic insulin.

Nausea and vomiting should be actively managed and normal eating and drinking should be promoted when it is safe to do so.

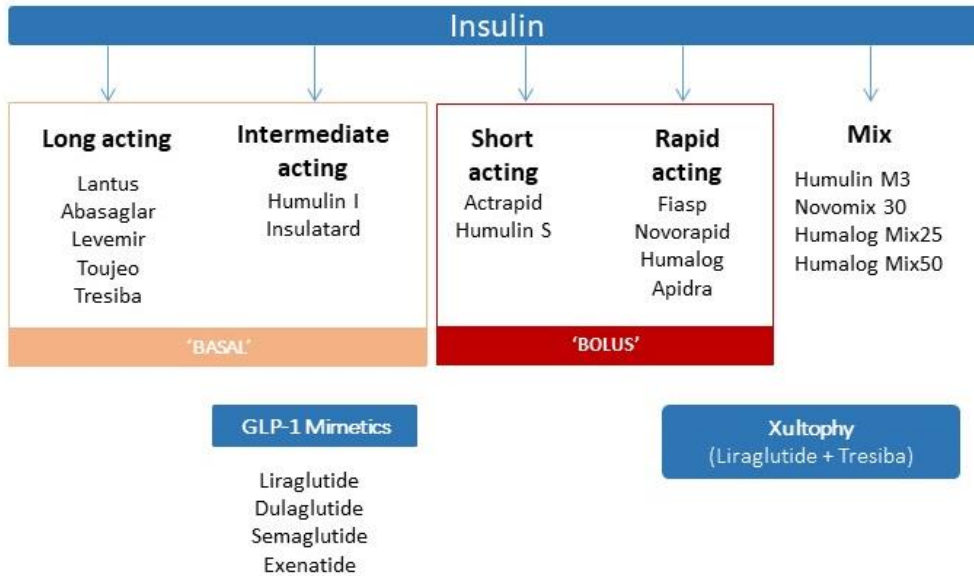
Oral medications and insulin should be restarted when patients are eating and drinking (with the exception of SGLT2 inhibitors- see section 4) however may require dose adjustment if oral intake is substantially different from normal.

The management of hyperglycaemia in the immediate post-operative period should be managed according to the guideline in this document. Thereafter, information in the “Diabetes, Inpatient Prescribing FAQs for Junior Doctors” document on the GGC Clinical Guidelines platform should be followed.

[Diabetes, Inpatient Prescribing FAQs for Junior Doctors \(897\) | Right Decisions
\(scot.nhs.uk\)](https://www.scot.nhs.uk)

Appendix 1 Drugs used in the management of people with diabetes

INJECTABLE THERAPIES



ORAL THERAPIES



Commonly used non-insulin medications and their brand names

Drug class	Brand name/Drug Name
Acarbose	Glucobay/acarbose
Meglitinide	Prandin/repaglinide Starlix/nateglinide
Metformin	Metformin/metformin Glucophage/metformin Glucophage SR/metformin prolonged release
Sulphonylurea	Gliclazide/gliclazide Diamicron/gliclazide Zicron/gliclazide Diamicron MR/gliclazide modified release Bilxona 30mg MR/gliclazide 30mg modified release Dacadis MR 30mg/gliclazide 30mg modified release Edicil MR 30mg/gliclazide 30mg modified release
DPP IV inhibitor	Januvia/sitagliptin Onglyza/saxagliptin Trajenta/linagliptin Galvus/vildagliptin Vipidia/alogliptin
GLP1 analogue	Byetta/exenatide Bydureon/exenatide (weekly) Ozempic/ Semaglutide (weekly) Trulucity/ Dulaglutide (weekly) Victoza/liraglutide Lyxumia/lixisenatide Xultophy (contains Victoza/ liraglutide and Tresiba/ <u>degludec insulin</u>)
SGLT2 inhibitor	Forxiga/dapagliflozin Invokana/canagliflozin Jardiance/empagliflozin

Combination Products (If unsure of a brand name refer to current BNF to confirm component drugs)

Metformin + SGLT2inhibitors	Vokanamet (Metformin plus Canagliflozin)
	Xigduo (Metformin plus Dapagliflozin)
	Synjardy (Metformin plus Empagliflozin)
Meformin + DPP4 inhibitor	Vipdomet (Metformin plus Alogliptin)
	Jentadueto (Metformin plus linagliptin)
	Komboglyze (Metformin plus saxagliptin)
	Janumet (Metformin plus Sitagliptin)
	Eucreas (Metformin plus Vildagliptin)
Metformin and Thiazolidinedione	Competact (Metformin and Pioglitazone)
SGLT2 inhibibor + DPP4 inhibitor	Glyxambi (Empagliflozin plus Linagliptin)
	Qtern (Dapagliflozin plus Saxagliptin)

Appendix 2. GGC VRIII guidelines

[Diabetes, Variable Rate Intravenous Insulin Infusion \(671\) | Right Decisions \(scot.nhs.uk\)](#)

[Diabetes, Variable Rate Intravenous Insulin Infusion \(VRIII\) Frequently Asked Questions \(923\) | Right Decisions \(scot.nhs.uk\)](#)

Appendix 3. Management of hypoglycaemia

Management of Hypoglycaemia in the Peri-operative Period

Hypoglycaemia is defined as CBG <4mmol and should be managed as described here.

"Looming hypoglycaemia" is defined as a CGB of 4-6mmol in a person with diabetes on glucose lowering medication.

It is now recognised that aiming for tight glycaemic management (CBG 4-6mmol/l) in unwell people with diabetes, especially if the person is on medication that actively lowers blood glucose, may cause hypoglycaemia. Consideration should be given to actively managing a CBG less than 6mmol/l in a person with diabetes on glucose lowering medication to prevent hypoglycaemia..

Eating, Drinking or "Sip to Send" and Co-operative

- Give 15-20g of quick acting sugar such as
 - 60ml Glucojuice*
 - 5-7 Dextrosol® tablets or 4-5 Glucotabs*
 - 170ml Original Lucozade* (non-fizzy)
- Recheck CBG after 10-15 minutes: if less than 4 mmol/L repeat above **up to 3 times**.
- If remains < 4mmol/l despite above, consider 150-200ml 10% glucose IV over 15 mins or 1mg glucagon (once only) IM*
- When CBG > 4mmol/l, give 20g of long-acting carbohydrate (two biscuits/slice of bread/200-300ml milk) if able to eat and drink

Unable to take any oral treatment

- Stop IV Insulin if ongoing VR11 infusion
- Give IV Glucose over 15 mins
 - 75ml 20% glucose or
 - 150ml 10% glucose or
 - 30ml 50% glucose or
 - IM Glucagon 1mg* (once only)
- Recheck CBG after 10 minutes, if remains less than 4mmol/L repeat.
- Once CBG once glucose >4.0mmol/L restart VR111 and consider amending rate to avoid further hypoglycaemia.
- In patients not previously on VR111 consider commencing this until eating and drinking**

Persistent hypoglycaemia should be referred to the Diabetes team

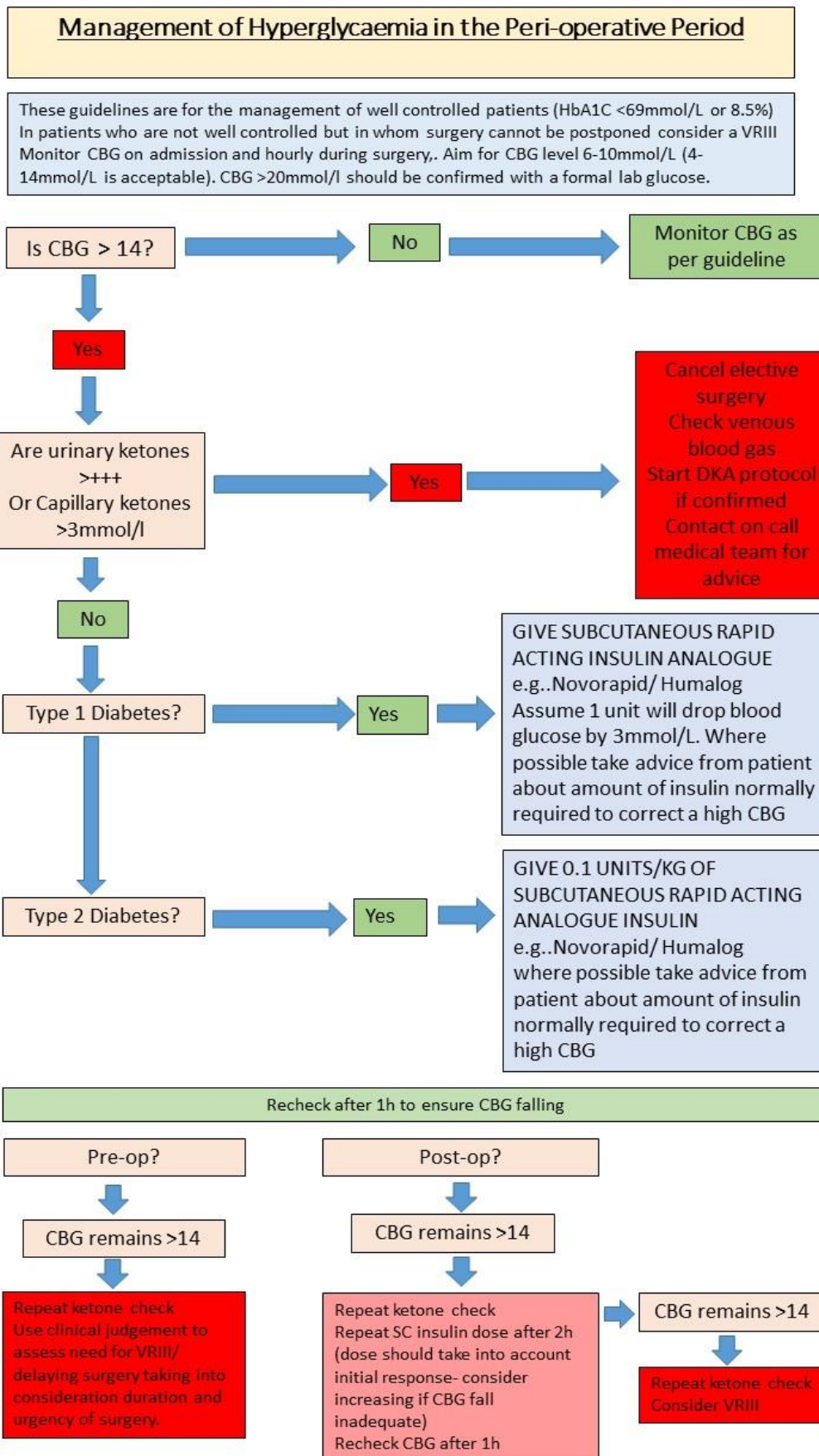
Increase frequency of CBG monitoring until BM>6mmol, revert to one hourly until patient is eating and drinking.

*GLUCAGON takes 15 minutes to work and may be ineffective if malnourished, liver disease or recurrent hypoglycaemia.

**In patients with renal/cardiac use IV fluids with caution

Adapted from Guideline for Perioperative Care for People with Diabetes Mellitus Undergoing Elective and Emergency Surgery and Management of adults with diabetes undergoing surgery 2011 and Elective Procedures: Improving standards 2015

Appendix 4. Management of hyperglycaemia in the perioperative period



Appendix 5

Please note referrals for optimisation of HbA1c pre-operatively should be made via TrakCare as OP follow up will depend on patient postcode and diabetes subtype

Gartnavel General Diabetes Centre

Phone no: 0141 211 3136

New Victoria/ South Hub Diabetes Centre

Phone no: 0141 3478279

Royal Alexandra/ Vale of Leven Diabetes Centre

Phone no: 0141 314 7009

Stobhill Diabetes Centre

Phone no: 0141 355 1076

