

Management of Adult Patients with Diabetes undergoing Surgery - Full Clinical Guideline

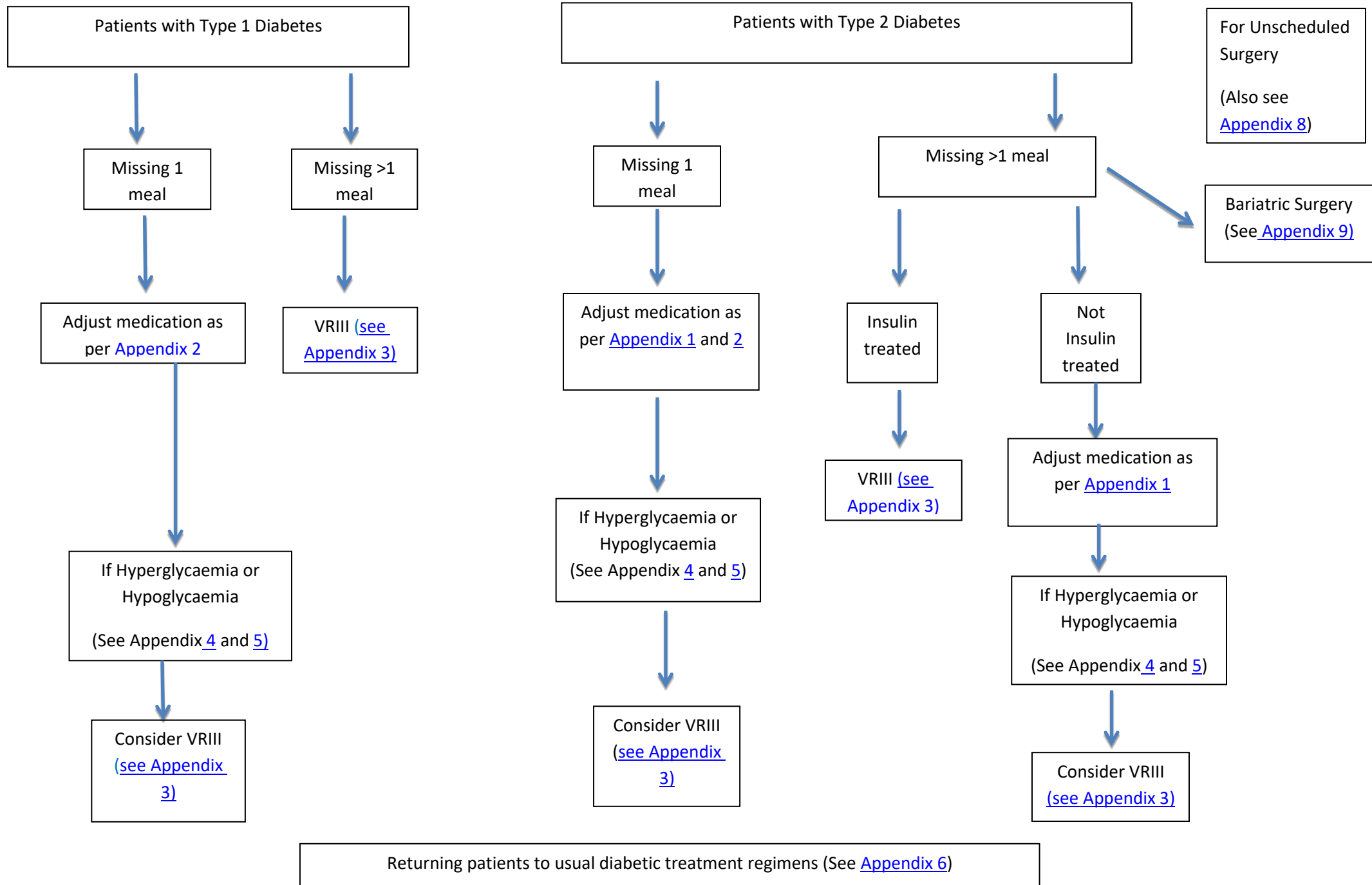
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CONTENTS

Section Number	Subject	Page Number
1	Introduction	2
2	Scope	2
3	General principles	3
4	Primary care referral	4
5	Surgical clinic and scheduling for surgery	5
6	Preoperative assessment Clinic	6
7	Hospital admission	8
8	Perioperative diet and diabetes medication	9
9	Management in theatre and recovery	9
10	Postoperative management	10
11	Discharge	10
12	References	11
13	Documentation Controls	12
Appendix 1	Perioperative diet and diabetes medications	13
Appendix 2	Perioperative adjustment of insulin	14
Appendix 3	Variable rate intravenous insulin infusion (VRIII)	17
Appendix 4	Perioperative management of hyperglycaemia	19
Appendix 5	Perioperative management of hypoglycaemia	22
Appendix 6	Returning to usual diabetes treatment regimen	23
Appendix 7	Discharge advice for patients with diabetes discharged after a surgical procedure.	25

Appendix 8	Bariatric surgery perioperative guidelines	29
Appendix 9	Burton site preoperative questionnaire	32
Appendix 10	Audit standards	35
Appendix 11	Urgent and emergency surgery	37

SUMMARY GUIDELINE FOR THE MANAGEMENT OF ADULTS WITH DIABETES UNDERGOING SURGERY



1. INTRODUCTION

The prevalence of diabetes in the UK is at least 6% and is expected to rise by 50% over the next decade as obesity increases. This and the increased likelihood of patients requiring surgery associated with co morbidities and complications means that 15% of the surgical population suffers with diabetes¹

Diabetes is a major predictor of perioperative mortality (50% greater than the general population) and is associated with increased morbidity. Length of hospital stay is increased by an average of 3 days.

The incidence of cardiovascular disease is increased 2-4-fold – the majority of patients with diabetes presenting for surgery will suffer from hypertension, ischaemic heart disease, stroke, or a combination of these.

Nationally, perioperative management of diabetes has been shown to be poor². Unnecessary overnight admission is common, as is excessive starvation time, unnecessary use of insulin infusion, poor management of insulin infusion and of conversion to usual medications. Problems arise from a failure to recognised increased risk, the lack of a management plan and failure to involve the diabetes team.

The 2018 NCEPOD review 'Highs and lows'² showed 60% of patients to have had no clear plan for the management of their diabetes. 47% of patients did not have their blood glucose recorded in theatre, and in 21% diabetes was not managed appropriately post-operatively.

Suboptimal preoperative glycaemic management is associated with perioperative hyperglycaemia and hypoglycaemia and is a risk factor for poor outcome.

2. SCOPE

These guidelines apply to all adult insulin, GLP-1 or oral hypoglycaemic treated patients with diabetes undergoing surgery under general or regional anaesthesia.

The guideline does not apply to:

- Patients with diet-controlled diabetes
- Patients undergoing surgery under local anaesthesia who do not require starvation.
- Obstetric patients (see separate [guideline](#))
- Patients below the age of 18 - see separate [guideline](#).
- Patients undergoing endoscopic procedures (see separate [guideline](#))

The guideline is organised according to the scheduled surgical pathway. The principles of the management of patients with diabetes undergoing unplanned surgery are the same and are summarised in [appendix 8 \(Urgent and Emergency Surgery.\)](#)

3. GENERAL PRINCIPLES

The presence of diabetes should be identified and highlighted to all relevant staff at each stage of the surgical pathway.

An assessment of glycaemic control, and of the presence and severity of diabetes complications, should be made at an early stage in the surgical pathway. Consideration should be given to optimisation of these prior to referral from primary care or prior to scheduling for surgery.

Every stage of the perioperative pathway, from primary care referral to discharge, should be considered an opportunity to address lifestyle factors known to benefit both perioperative and long-term outcomes. These include exercise, weight management, smoking cessation and alcohol reduction.

Recognition of increased perioperative risk associated with diabetes should be reflected in appropriate seniority of surgical and anaesthetic involvement, and in appropriate levels of postoperative care.

Each patient with diabetes will have an individualised plan for perioperative glycaemic management and other aspects of care relating to diabetes, such as the avoidance of hospital acquired foot pathology. At the Burton site, this will be documented within the Perioperative diabetes document within the electronic patient record.

Self-management of diabetes should be encouraged and facilitated when appropriate.

Routine overnight admission because a patient suffers with diabetes is not necessary. Starvation time should be minimised by:

- Placing patients early on operative lists.
- Attention to analgesia and anti-emesis.
- Encouraging an early return to diet and self-management of usual diabetes medication.

Variable rate insulin infusion (VRIII) can generally be avoided in patients missing only one meal. If instituted, it should be discontinued as soon as this is feasible and safe.

Capillary blood glucose (CBG) should be measured on admission and:

- Hourly thereafter for patients receiving treatment liable to cause hypoglycaemia (i.e. insulin or sulphonylureas).
- 2 hourly thereafter for other patients.
- Immediately prior to starting of anaesthesia and before discharge from theatre recovery.

Patient's own continuous glucose monitoring/ 'Flash' devices may provide useful supplementary information in patients who are well and stable, however they measure interstitial fluid glucose concentration which lags behind CBG by approximately 15 minutes. These readings should therefore be supplemented with CBG measurements and not relied upon, particularly in the anaesthetised or sedated patient.

The target perioperative capillary blood glucose range is 6-10 mmol/l.

- An upper limit of <12 mmol/l is acceptable.

- A lower limit of >4 mmol/l is acceptable **except** when a patient,
 - Is unwell.
 - Or has symptoms of hypoglycaemia.
 - Or is anaesthetised or sedated and treated with insulin or a sulphonylurea (Risk of undetected hypoglycaemia).

In addition, **measure capillary blood ketones daily if the person with diabetes is normally on SGLT2 inhibitors (gliflozins)** even if glucose concentrations are normal (as these medications can be associated with euglycaemic ketosis). It is important to withhold these drugs until the patient is fit for discharge.

Insulin should never be stopped in patients with Type 1 Diabetes as this may lead to ketoacidosis.

Burton site only

Completion of the relevant sections of the Perioperative diabetes document within the electronic patient record will ensure the gathering of relevant diabetes related information, and the planning of perioperative management

4. PRIMARY CARE REFERRAL

The following will be communicated to local General Practitioners.

Appropriate attempts should be made to optimise the condition of patients with diabetes prior to referral for surgical opinion. Consideration should be given to the adequacy of glycaemic control, and the management of complications and co morbidity.

National guidelines suggest a preoperative target HbA1c of 69 mmols/mol (8.5%). It is accepted that in a small number of patients this may be unrealistic.¹

Involvement of the specialist diabetes team or other secondary care involvement prior to referral may therefore be appropriate.

The general practitioner should provide the following information at the time of referral,

- Diabetes:
 - Type
 - Duration
 - Medications (dose, route)
 - Medical devices used (e.g. CGM/ Flash monitors, pumps)
 - Complications (including cardiac, renal, foot)
 - Main diabetes care provider (primary or secondary)
 - Date of last diabetes review
- Comorbidities and their treatment
- Recent BMI, BP, eGFR and HbA1c (within 3 months of referral).

There is the opportunity at the time of referral to offer advice regarding the benefits, in terms perioperative risk and long-term health, of lifestyle changes, including exercise, weight loss, nutrition, smoking cessation and alcohol reduction.

5. SURGICAL CLINIC AND SCHEDULING FOR SURGERY

Consideration should be given to the increased risk of perioperative morbidity and mortality associated with diabetes.

Poor control (as judged by an HbA1c >69 mmols/mol or 8.5%) is associated with increased perioperative morbidity and mortality. ¹

Consideration should be given to delaying non urgent surgery to improve diabetes control, however it is recognised that for some patients this level of control is unrealistic (a decision which should be made by a specialist diabetes team). The magnitude of the planned surgery, and hence the underlying associated risk should also be taken into consideration.

If a decision is made to delay surgery, a request should be made to the patient's general practitioner that a referral is made (by usual referral pathways) for specialist diabetes advice. For time critical surgery, discuss with diabetes specialist nurse.

If proceeding to schedule for surgery, the following should prompt discussion with the diabetes specialist nurse:

- HbA1c greater than 69 mmols/mol (8.5%), unless the patient is under the care of the diabetes team and a higher target has been deemed appropriate such as elderly patients at risk of hypoglycaemia.
- HbA1c less than 48mmols/mol (6.5%)
- History of hypoglycaemic unawareness
- Poor compliance with diabetes medications
- Previous admissions with diabetic ketoacidosis or hypoglycaemia
- Any dietary issues e.g. gastroparesis or coeliac disease
- Insulin Pump Therapy
- Unusual insulin regimes not covered by this guideline
- Any anticipated postoperative complications e.g. hand or arm surgery to the patient's dominant arm resulting in difficulty in giving injections or longer term changes to diet.
- Any preoperative changes not covered by this guidance

The presence of poor control, complications or co morbidities will also influence:

- The consent process.
- The need for preoperative anaesthetic referral.
- The need for postoperative critical care.

All people with diabetes should have an HbA1c, electrolytes/eGFR and random blood glucose arranged at the point of listing for surgery so that recent results are available at the time of preoperative assessment.

Diabetes alone is not an indication for overnight admission provided starvation time is not expected to be greater than one missed meal. Poor diabetes control (as judged by an HbA1c >8.5%) will increase the likelihood of overnight admission being necessary. Social circumstances, along with patient understanding and compliance with treatment, should also be taken into consideration.

Diabetes does not preclude entry into enhanced recovery programs, however carbohydrate drinks (e.g. 'Preload') should be omitted as they may raise blood glucose concentrations.

The diabetes section of the Preoperative questionnaire (Burton site only – see [Appendix 10](#)) which accompanies the patient to the preoperative assessment clinic should be completed by the surgeon. An early preoperative assessment clinic appointment increases the time available for preoperative optimisation.

There should be a note on the operation list alerting the perioperative team to the presence of diabetes.

In order to minimise starvation time, the patient should be prioritised first on the planned list. Morning lists are preferred to afternoon lists, but this is not always possible. ***Surgeons should therefore communicate the presence of diabetes to their secretaries when dictating clinic letters, so that this information can be included on the electronic scheduling form.***

Variable rate insulin infusion (VRIII) can generally be avoided in patients missing only one meal. ***At the Burton site, patients expected to require a VRIII should be admitted directly to the ward rather than the Elective Admissions Lounge.***

6. PREOPERATIVE ASSESSMENT CLINIC

An early preoperative assessment clinic appointment increases the time available for preoperative optimisation (see section 5.0). A recent glycosylated haemoglobin and eGFR should be available at the time of this appointment having been arranged in the surgical clinic (see section 5.0)

On the Burton site, the relevant section of the perioperative diabetes document should be completed within the electronic record.

The presence and type of diabetes should be identified preoperatively and an assessment should be made of,

- Glycaemic control (HbA1c)
- Duration of diabetes
- Diabetes medications and compliance

An assessment should be made of the presence of diabetes complications. Of particular importance are,

- Ischaemic heart disease (and complications thereof, including congestive heart failure)
- Peripheral vascular disease
- Cerebrovascular disease
- Renal insufficiency
- Neuropathy (peripheral or autonomic). Patients with autonomic neuropathy associated with postural hypotension should be discussed with the anaesthetist.
- Diabetic foot pathology

Recent (within 3 months) results of the following investigations should subsequently be

available at the time of admission for surgery:

- Full blood count.
- Urea & Electrolytes/ eGFR
- BMI
- Random blood glucose
- Glycosylated Haemoglobin
- 12 lead ECG.

An assessment should be made of the adequacy of glycaemic control, taking into consideration the following:

- Glycosylated Haemoglobin (HbA1c)
- Random blood glucose
- Patient's own record of capillary blood glucose measurements
- A history of diabetes related hospital admissions

Poor control (as judged by an HbA1c >69 mmols/mol or 8.5%) is associated with increased perioperative morbidity and mortality. Consideration should be given to delaying non urgent surgery to improve diabetes control, however It is recognised that for some patients this level of control is unrealistic (a decision which should be made by a specialist diabetes team). The magnitude of the planned surgery, and hence the underlying associated risk should also be taken into consideration. Decisions regarding cancellation should be made by the anaesthetic and/or surgical team.

If a decision is made to delay surgery, a request should be made to the patient's general practitioner that a referral is made (by usual referral pathways) for specialist diabetes advice. For time critical surgery, discuss with diabetes specialist nurse.

If proceeding to surgery, the following should prompt discussion with the diabetes nurse specialist:

- HbA1c greater than 69 mmols/mol (8.5%), unless the patient is under the care of the diabetes team and a higher target has been deemed appropriate such as elderly patients at risk of hypoglycaemia.
- HbA1c less than 48mmols/mol (6.5%)
- A history of hypoglycaemic unawareness
- Poor compliance with diabetes medications
- Previous admissions with diabetic ketoacidosis or hypoglycaemia
- Any dietary issues e.g. gastroparesis or coeliac disease
- Insulin Pump Therapy
- Unusual insulin regimes not covered by this guideline
- Any anticipated postoperative complications e.g., hand or arm surgery to the patient's dominant arm resulting in difficulty in giving injections or longer term changes to diet.
- Any preoperative changes not covered by this guidance

Burton site specific guidance

A provisional plan for the perioperative management of diabetes should be established in the preoperative assessment clinic and documented in the Perioperative diabetes document within the electronic patient record. This will generally be completed by the preoperative assessment nurse on the basis of this policy but may require discussion

with the Diabetes nurse specialist and/or anaesthetist. The patient should be provided with a copy of this plan. ***This is a provisional plan to enable discussion with the patient. Responsibility for the management of diabetes from the time of admission lies with the relevant anaesthetic and surgical teams, with or without input from the diabetes team.***

This should be discussed and agreed with the patient and should include the following:-

- Plans for starvation and preoperative diabetes medications, including the importance of eating breakfast when undergoing afternoon surgery.
- Target perioperative CBG range.
- An assessment of the likelihood of requirement for Variable Rate Intravenous Insulin infusion (VRIII).
- An assessment of the likelihood of requirement for diabetes nurse specialist involvement during admission.
- Highlight the need for special precautions for patients with hypoglycaemic unawareness or diabetic skin changes or ulceration.

The patient should be provided with a copy of the relevant section of the perioperative diabetes document.

7. HOSPITAL ADMISSION

The anaesthetic team, surgical team, ward nursing staff and the patient should be aware of the patient's diabetes management plan.

The capillary blood glucose should be measured on arrival and hourly (patients who have received insulin or sulphonylureas) or 2 hourly (other patients) thereafter.

The target perioperative capillary blood glucose range is 6-10 mmol/l.

- An upper limit of <12 mmol/l is acceptable.
- A lower limit of >4 mmol/l is acceptable **except** when a patient,
 - Is unwell
 - Or has symptoms of hypoglycaemia.
 - Or is treated with insulin or a sulphonylurea and anaesthesia or sedation is planned (risk of undetected hypoglycaemia)

If the CBG falls outside of this range refer to [appendix 4](#) (Hyperglycaemia) or [5](#) (Hypoglycaemia).

In addition, measure capillary blood ketones (and daily thereafter) if the person with diabetes is normally taking SGLT2 inhibitors (gliflozins) even if CBG is normal (as these medications can be associated with euglycaemic ketosis)

The time of the patient's last meal should be noted to help identify those at risk of prolonged starvation. Prolonged starvation (>1 missed meal) should be escalated to the surgical or anaesthetic team.

If VRIII is indicated this should commence a before 08:15 for morning surgery and 12:00 for afternoon surgery - see indications and instructions for use in [Appendix 3](#). Prescription of VRIII is the responsibility of the surgical team. **Long acting/basal insulin should be continued whilst VRIII is in use** (see [Appendix 2](#)).

Patients should have measures taken to protect feet and other high risk pressure areas prior to surgery.

8. PERIOPERATIVE DIET AND DIABETES MEDICATION

8.1 Diet

Starvation should be in accordance with Trust policy for all patients undergoing surgery. It is important that patients undergoing afternoon surgery eat breakfast. Carbohydrate drinks (e.g. 'Preload') should be omitted from enhanced recovery programs.

8.2 Diabetes Medications

Insulin and /or oral hypoglycaemic agent administration prior to surgery and on the day of surgery will depend on timing of surgery and anticipated starvation time, See: Appendix 1, [Perioperative Management of Diabetes Medications](#) and Appendix 2, [Perioperative Adjustment of Insulin](#)

People living with diabetes, both Type 1 and Type 2, treated with insulin will require a variable rate insulin infusion (VRIII) if their perioperative starvation time is anticipated to be greater than 1 meal.

9. MANAGEMENT IN THEATRE AND RECOVERY

Diabetes and the plan for its perioperative management should be highlighted at the preoperative team brief. This should include discussion of plans for avoidance of hospital acquired pressure area injury and mechanical thromboprophylaxis.

A CBG should be performed immediately prior to commencement of anaesthesia and hourly thereafter. A recent CBG should be included the 'sign out' from theatre. The target range is 6-10mmol/l. An upper limit of <12 mmol/l is acceptable). A pre or intraoperative CBG >4mmol/l is acceptable provided the patient is well and has not treated with insulin or a sulphonylurea. **A CBG < 6mmol/l in any preoperative, anaesthetised or sedated patient who has received or is receiving insulin or a sulphonylurea must be treated as hypoglycaemia as there is a risk of undetected hypoglycaemia.**

The risk of hypoglycaemia masked by sedation or general anaesthesia should be considered at all times.

VRIII commenced preoperatively (insulin and glucose substrate) should be continued.

Patient positioning and application of mechanical thromboprophylaxis should take into consideration the risk of injury to lower limbs affected by diabetes complications. Skin changes, ulceration or significant peripheral vascular disease in general preclude the application of mechanical prophylaxis. Patients who are at high risk of developing foot ulcers should have measures taken to protect their feet and other high risk areas during surgery. High risk patients include those with a history of previous ulceration and/or amputation, those with current ulceration, and those receiving dialysis as well as patients with peripheral vascular disease or neuropathy. Pressure areas should be inspected at admission / prior to induction of anaesthesia and high-risk areas should be identified

and protected using suitable equipment such as foam pressure relieving equipment, silicon and gel pads.

The presence of diabetes and plans for ongoing management should be discussed at the time of handover between theatre recovery and ward staff

This should include the following:

- Recent blood glucose and requirements for continuing blood glucose monitoring.
- Blood glucose in theatre and recovery
- Blood glucose level should be checked on arrival to the ward
- Ongoing management of diabetes, especially VRIII
- Criteria for contacting diabetes team (if appropriate)

10. POSTOPERATIVE MANAGEMENT

It is good practice for anaesthetists to review patients with diabetes on the ward after surgery.

Early eating, drinking and mobilisation should be encouraged and facilitated in all patients when feasible.

Optimal analgesia and prevention of postoperative nausea and vomiting (PONV) contribute to an early return to normal dietary intake and normal treatment regime. Difficulties with control of pain or PONV should prompt discussion with the acute pain or anaesthetic team. If starvation is longer than anticipated, the surgical team should be notified.

CBG should initially be monitored hourly. Once stable measurements can be reduced to four times per day for patients not treated with a VRIII. CBG frequency can be reduced in patients treated with VRIII according to the Trust VRIII/ 'Sliding Scale' guideline. The neuroendocrine response to surgical stress and reduced dietary intake may move the CBG outside the target range of 6-10 mmol/l (acceptable range 4-12 mmol/l). Advice regarding management of hyperglycaemia and hypoglycaemia are found in [appendix 4](#) and [5](#) (and the linked Trust policy for hypoglycaemia). ***Failure to achieve the target range CBG should prompt early referral to the diabetes team.***

Patients treated with VRIII require daily plasma electrolyte measurement.

For guidance on resumption of usual diabetes treatment see [appendix 6](#).

Meticulous infection control and appropriate measures to minimise the risk of pressure injury are vital as hospital acquired pressure ulcers are a cause of significant morbidity.

Patients who are at high risk of developing foot ulcers should have measures in place for foot protection after surgery. Pressure areas should be inspected immediately postoperatively and at regular intervals during the postoperative period to ensure they are not becoming discoloured and remain intact.

11. DISCHARGE

The following criteria should be fulfilled prior to discharge:

- Blood glucose should be stable within the target range.
- The plan for ongoing management of diabetes should be clear to patients and/or carers, including the restarting SGLT2 inhibitors if applicable.

It should be ensured that patients and/or carers understand, and are provided with:

- The written patient advice in [appendix 7](#) ('Sick day rules' in the event of subsequent illness or reduced dietary intake, and actions in the event of development of ketosis in insulin treated patients).
- Plans, if appropriate, for the frequency of patient CBG measurement, target CBG and associated dose alteration.
- Information regarding changes to diabetes treatment instituted during admission, including education relating to newly started insulin.

The following should be available to patient carers,

- Appropriate community support for ongoing diabetes management
- Access to equipment required for ongoing management of diabetes

The diabetes team should be involved in the following circumstances,

- Blood glucose remains uncontrolled.
- Long term dietary changes are anticipated.
- The patient is no longer able to manage their diabetes themselves.
- Medication has changed during their inpatient stay.

12. REFERENCES

1. Centre for Perioperative Care, Guideline for Perioperative Care for People with Diabetes Mellitus Undergoing Elective and Emergency Surgery, March 2021.
2. NCEPOD, Perioperative Diabetes: High and Lows, December 2018.

13. DOCUMENTATION CONTROLS

Reference Number CG-T/2014/002	Version: 5		Status Final	Author Dr Holbrook
Version / Amendment History	Version	Date	Author	Reason
	2	2015		Removal of letter to local GPs
	3	2019		Adopted latest JBDS Guidelines
	4	2020		Burton and RDH guidelines merged to form Trustwide guideline
	5	2022		Updated to incorporate 2020 AoMRC CPOC Guidelines
Intended Recipients: Preoperative assessment nurses. Anaesthetists. Surgeons and surgical teams. Elective Admissions lounge, Treatment Centre and Surgical ward nurses. Diabetes consultants. Diabetes specialist nurses.				
Training and Dissemination: Training sessions delivered to individual teams. Email.				
Development of Guideline: Dr Holbrook Job Title: Consultant Anaesthetist				
Consultation with: Anesthetists; Surgeons; Perioperative nurses; Consultant diabetes physicians; Diabetes nurse specialists; Surgical ward managers; Clinical theatre staff; Pharmacists				
Linked Documents: Diabetes in Pregnancy – Clinical Guideline, Diabetes – Management in Surgery – Paediatric – Clinical Guidelines, Diabetes – Endoscopy – Clinical Guideline, Fasting prior to general regional anaesthesia and sedation – clinical guideline.				
Keywords: Diabetes, Surgery, Perioperative				
Business Unit Sign Off			Group: Safe Surgery Group Date: August 2022	
Divisional Sign Off			Group: ACD Group, Anaesthesia Date: September 2022	
Date of Upload			Oct 2022	
Review Date			October 2023	
Contact for Review			Dr Holbrook	

Appendix 1: Perioperative diet and diabetes medications

Diet

Starvation should be according to the trust policy for patients undergoing surgery. **Patients undergoing afternoon surgery must eat breakfast.** Carbohydrate drinks (e.g. 'Preload') should be omitted from enhanced recovery programs.

Diabetes medications

Medication	Day prior to admission	Day of Surgery		
		AM Surgery	PM surgery	On VRlll
Metformin If eGFR >60 ml/min/1.73m ² OR procedure not requiring use of IV contrast media). If eGFR<60 AND procedure requiring IV contrast media.	Take as usual Omit for 48 hours prior to surgery	Omit morning dose. Resume when eating and drinking. Omit	Take morning dose with breakfast, omit lunchtime dose. Resume when eating and drinking. Omit	Omit Omit
Sulphonylurea Gliclazide, Glibenclamide, Glimepiride	Omit evening dose of Gliclazide MR, otherwise take as usual	Omit morning dose, Resume only when eating and drinking normal quantities.	Omit all doses Resume only when eating and drinking normally	Omit
DPP IV Inhibitors Alogliptin, Linagliptin, Sitagliptin, Saxagliptin, Vildagliptin	Take as usual	Take as usual	Take as usual	Omit
Thiazolidinedione Pioglitazone	Take as usual	Take as usual	Take as usual	Omit
SGLT2 Inhibitors Empagliflozin, Cangliflozin, Dapagliflozin	Omit until clinically well and only resume when fit for discharge. Check blood ketones daily and be aware of the risk of euglycaemic ketosis.			Omit
GLP-1 Agonists Lixisenatide, Liraglutide, Exenatide, Semaglutide Weekly - Exenatide MR, Dulaglutide, Semaglutide, Albiglutide,	Take as usual	Omit morning dose. Resume when eating and drinking	Take morning dose with breakfast. Resume when eating and drinking	Omit
	Take as normal but adjust timing if dose falls within 48 hours of surgery. (eg. Take an earlier dose 48 hours before or delay until 48 hours after surgery).			
Metglitinides Repaglinide, Nateglinide	Take as usual	Omit morning dose. Resume when eating and drinking.	Usual morning dose with breakfast. Omit lunchtime dose. Resume when eating and drinking.	Omit
Acarbose	Take as usual	Omit morning dose. Resume when eating and drinking.	Usual morning dose with breakfast. Omit lunchtime dose. Resume when eating	Omit

For patients undergoing bariatric surgery please refer to [appendix 9](#).

Appendix 2: Perioperative adjustment of insulin

Diet

Starvation should be according to trust policy for patients undergoing surgery. **Patients undergoing afternoon surgery must eat breakfast.** Carbohydrate drinks (e.g. 'Preload') should be omitted from enhanced recovery programs.

Insulins

The following is a guide. If in any doubt discuss with the specialist diabetes nurse.

Insulin	Day prior to admission	Day of Surgery		
		AM Surgery	PM surgery	On VRIII
Basal Insulin (once daily, morning or evening, sometimes given twice daily) Lantus, Levemir, Abasaglar, Tresiba, Toujeo, Insulatard, Xultophy, Humulin I, Insuman basal, Semglee	Take 80% of usual evening dose if undergoing morning surgery. Otherwise take as usual.	Take 80% of usual morning dose Give usual evening dose Never omit basal insulin in people with Type 1 diabetes	Take 80% of usual morning dose with breakfast Take usual evening dose Never omit basal insulin in people with Type 1 diabetes	Continue usual dose
Twice Daily Mixed Insulin Novomix 30, Humulin M3, Humalog Mix 25, Humalog Mix 50, Insuman Comb 15, Insuman Comb 25, Insuman Comb 50.	Take as usual	Half morning dose Usual evening dose if eating and drinking normally. Consider a reduced dose (e.g. 50%) if eating less than usual – discuss with patient (or diabetes team if in doubt)	Half morning dose with breakfast. Usual evening dose if eating and drinking normally. Consider a reduced dose (e.g. 50%) if eating less than usual – discuss with patient (or diabetes team if in doubt)	Omit (Ensure overlap with VRIII when it is stopped)
Twice Daily separate injections short acting and intermediate acting Novorapid, Humulin S, Humalog, Fiasp, Insuman rapid, Apidra, Trurapi, Lyumjev Animal isophane, Insulatard, Humulin I, Insuman Basal	Take as usual	Calculate total dose of both insulins. Give half of this total dose as intermediate acting in morning. If dose >50units discuss with diabetes team. Usual evening doses if eating and drinking normally. Consider a reduced dose (e.g. 50%) if eating less than usual – discuss with patient (or diabetes team if in doubt)	Calculate total dose of both insulins. Give half of this total dose as intermediate acting in morning with breakfast. If dose >50units discuss with diabetes team. Usual evening doses if eating and drinking normally. Consider a reduced dose (e.g. 50%) if eating less than usual – discuss with patient (or diabetes team if in doubt)	Omit (Ensure overlap with VRIII when it is stopped)
3, 4 or 5 injections daily. Maybe mealtime short acting (SA) with once or twice daily basal (basal bolus) or three injections mixed insulin daily.	Take as usual	Basal insulin - Continue usual dose. Short acting insulin – Omit morning and lunchtime doses Usual evening dose if eating normally, Reduce dose (e.g. 50%) if eating less than usual* Premixed insulin – Take half morning dose, omit lunchtime dose, usual evening dose if eating and drinking normally. Consider a reduced dose (e.g. 50%) if eating less than usual* *Discuss with patient (or diabetes team if in doubt)	Basal insulin – Continue usual dose Short acting insulin - Usual morning dose with breakfast, omit lunchtime dose. Usual evening dose if eating and drinking normally. Consider a reduced dose (e.g.50%) if eating less* Premixed insulin – Take half morning dose, omit lunchtime dose, usual evening dose if eating and drinking less than usual *Discuss with patient (or diabetes team if in doubt)	Basal insulin should be continued. Otherwise omit (Ensure overlap with VRIII when it is stopped)

Insulin	Day prior to admission	Day of Surgery		
		AM Surgery	PM surgery	On VRIII
			drinking normally. Consider a reduced dose (e.g. 50%) if eating less than usual – discuss with patient.	
Insulin pump therapy (Continuous Subcutaneous Insulin Infusions – CSII)	See below			

Insulin Pump Therapy (Continuous Subcutaneous Insulin Infusions – CSII)

- This is a complex patient group and ALL patients should be referred to the diabetes team at pre-op assessment
- Insulin pumps deliver short acting insulin only and should not be discontinued without alternative insulin therapy in place.
- CSII pump manufacturers state that pumps may malfunction when exposed to diathermy or X-ray, and that patients should therefore be converted to either multiple daily injections (MDI) of insulin or VRIII in the immediate perioperative period.
- There are however genuine risks associated with conversion to MDI (e.g. glycaemic instability in the context of unfamiliar treatment and starvation, drug error) or VRIII (e.g. fluid and electrolyte disturbance, hypo/ hyperglycaemia, drug error). The risk of pump damage or malfunction is generally considered to be low. Continuity of usual treatment is particularly useful, especially in day surgery.
- National guidance is that continuation of CSII is appropriate in patients with well controlled diabetes missing one meal. However a risk/ benefit discussion should occur between the diabetes team and the patient in advance of surgery.
- Conversion to MDI or VRIII should be considered in patients with poor control.
- For many optimally managed people with diabetes using pumps and/or wearable glucose sensors, a range of 4–6mmol/l may be their normal when they are not eating. In these cases it is important to have a discussion with the patient about the need to avoid severe hypoglycaemia and therefore the need to aim for higher levels than they are used to.
- **Guidance is as follows for Patients with diabetes well controlled by CSII:**

Day prior to admission	Day of surgery		On VRIII
	AM Surgery	PM Surgery	
If morning CBG is usually less than 6mmol/l reduce overnight basal infusion to 80% of usual. Otherwise continue as usual.	<p>Minor surgery – If morning CBG is usually less than 6mmol/l reduce basal infusion to 80% of usual. Otherwise continue as usual.</p> <p>Major surgery – Pump therapy should be stopped only after the patient has been switched to VRIII</p>		Omit

- **If continuing CSII the following apply:**
- The anaesthetist should establish with the patient how ongoing normal functioning of their pump is confirmed.
- During surgery the pump should be placed at a site as distant as is feasible from the surgical site and from X-rays.
- A Teflon cannula should be in use intraoperatively, and patients advised to bring a supply of these to hospital.
- The cannula site should be visible throughout surgery.

Appendix 3: Variable Rate Insulin Infusions

Indications

A variable rate intravenous insulin infusion (VRIII) will be required for:

- Patients normally treated with insulin (type 1 or type 2 diabetes) undergoing surgery with a starvation period of greater than one meal.
- Other patients with diabetes in whom blood glucose exceeds the acceptable range, despite undertaking measures described in [appendix 4](#) and [5](#) to optimise it.
- VRIII is more likely to be required in patients in whom preoperative control is poor.

General principles

A variable rate intravenous insulin infusion (VRIII) refers to the simultaneous infusion of short acting/ soluble insulin, glucose substrate and potassium titrated against capillary blood glucose (CBG) and serum potassium concentrations. The aim of the IV insulin infusion is to achieve and maintain normoglycaemia (ideally, blood glucose levels between 6-10 mmol/l).

Substrate/ Fluid/Potassium

- Provision of sufficient substrate to prevent the gluconeogenesis, lipolysis and ketogenesis is important in the surgical patient with diabetes. Insulin should not be administered without substrate except rarely on senior advice in the critical care setting.
- **An initial infusion of 0.18% normal saline (NaCl) with 4% Glucose and 0.15% (20 mmol/litre) potassium Chloride should be infused via a volumetric infusion pump at a rate equivalent to the patient's baseline hourly fluid requirement.** The rate must not be altered thereafter without senior advice. Avoid gravity fed infusion as the rate is not reliable and may become obstructed, risking hypoglycaemia.
- On the basis of daily electrolyte measurement potassium concentration may be increased or decreased

If K+ <3.5 Consider saline 0.18%, glucose 4% + 40mmol KCL 1000ml
If K+ > 5.3 Consider saline 0.18%, glucose 4% (without KCL)

Additional fluid requirements may be provided by a separate infusion, according to the specific needs of the patient, e.g. as Hartmann's solution. Large volumes of 0.18% saline risk hyponatraemia.

Administration of insulin

- **Short acting insulin is prepared at a concentration of one unit of insulin per ml. On the Derby site this is a prefilled syringe supplied by pharmacy. On the Burton site this is 50 units in 49.5ml of saline (total volume 50ml) prepared by nursing or medical staff.**
- Insulin and substrate must be infused simultaneously via the same intravenous line with appropriate one way and anti-siphon valves. Separate IV access is required for other anesthetic drugs/medications.
- **The insulin infusion rate;**
 - is based on the bedside capillary blood glucose which is taken immediately before starting the VRIII, hourly thereafter, and documented on the VRIII chart
 - Is according to the scales found in the Trust Variable rate insulin infusion guideline
 - Note that patients with high preoperative daily insulin requirements require higher starting infusion rates.
- **Persistent hyperglycaemia**
 - If blood glucose remains above the target range, and is not falling by 3mmol/l or more

on 3 consecutive readings, despite increasing the infusion rate, check the infusion delivery and site, check capillary ketones, and consider an alternate scale - consider discussion with the Specialist Diabetes Nurse or medical registrar (out of hours)

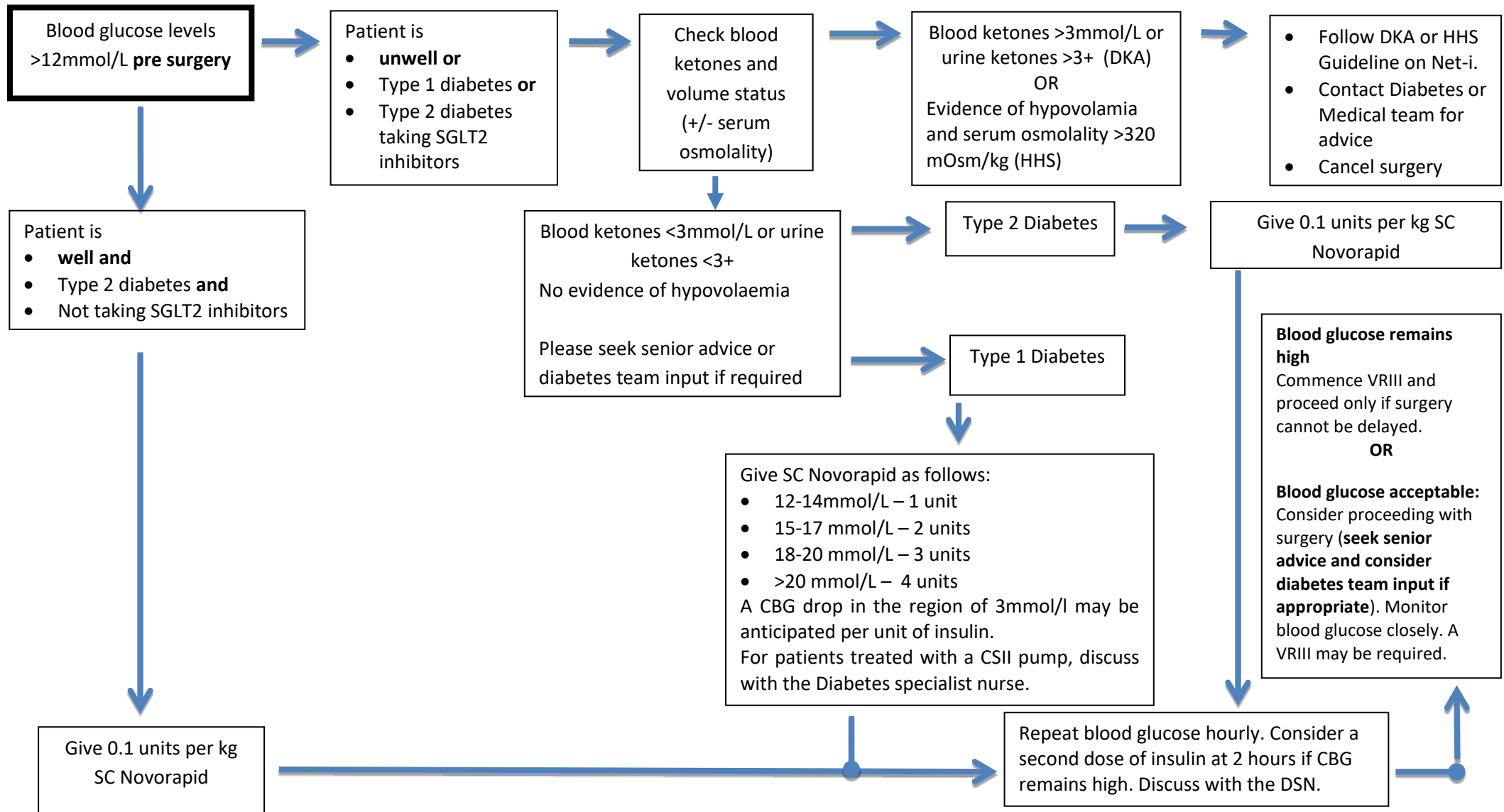
- It should be noted that larger patients are more likely to require higher infusion rates.
- **Variable rate scales** – Please refer to the Trust Variable rate insulin infusion guideline.

Treatment of hypoglycaemia whilst on VRIII

- Reduce the insulin infusion rate to 0.5 units per hour, or 0.25 units per hour for patients receiving background insulin.
- Try to avoid stopping the insulin infusion in patients with type 1 diabetes as this risks ketosis.
- **Treat according to [Appendix 5](#) – Perioperative Management of Hypoglycaemia**

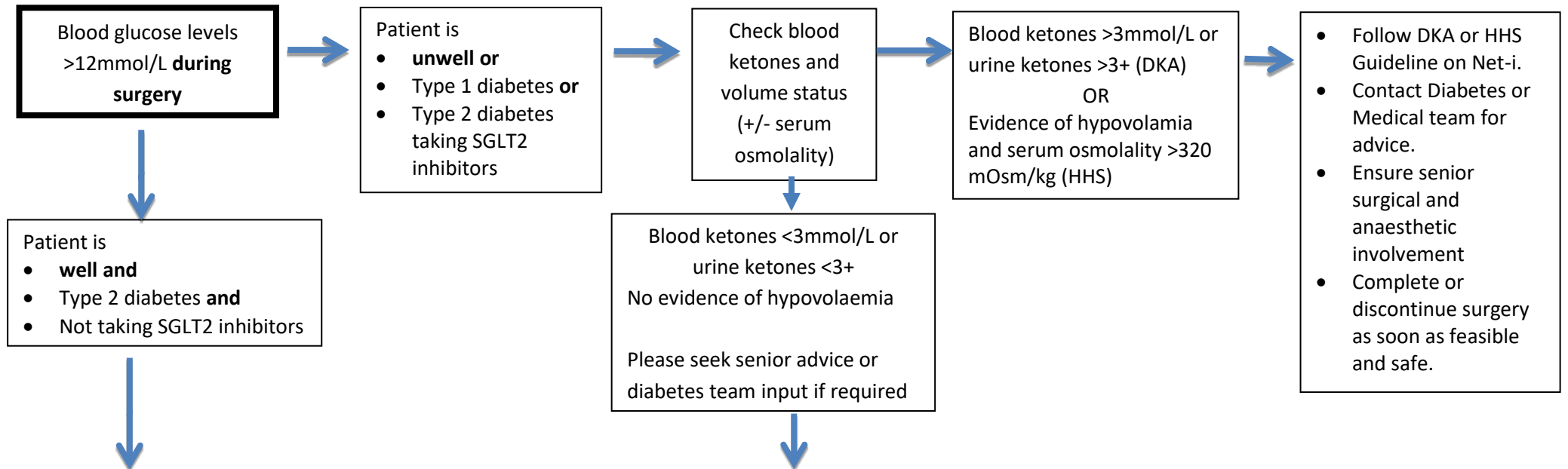
Appendix 4: Perioperative management of Hyperglycaemia – 1. Preoperative

For patients treated with insulin, missing more than one meal, who are well, without raised ketones, commence VRIII as planned ([see appendix 3](#)) and proceed with surgery when blood glucose is acceptable (seek senior advice and consider diabetes team input). For other patients, see the following:



Appendix 4: Perioperative management of Hyperglycaemia - 2. Intraoperative

For patients treated with VRIII who are well, without raised ketones, make an appropriate adjustment to the insulin infusion rate ([see appendix 3](#)). For other patients, see the following;



If hyperglycaemia occurs towards the conclusion of surgery, Avoidance of VRIII may be possible through early postoperative recommencement of diet and usual medicines/ insulin +/- an additional SC Novorapid bolus as per the Following section (Postoperative Hyperglycaemia). **Do not administer insulin boluses in anaesthetised patients.**

However a VRIII should be commenced if:

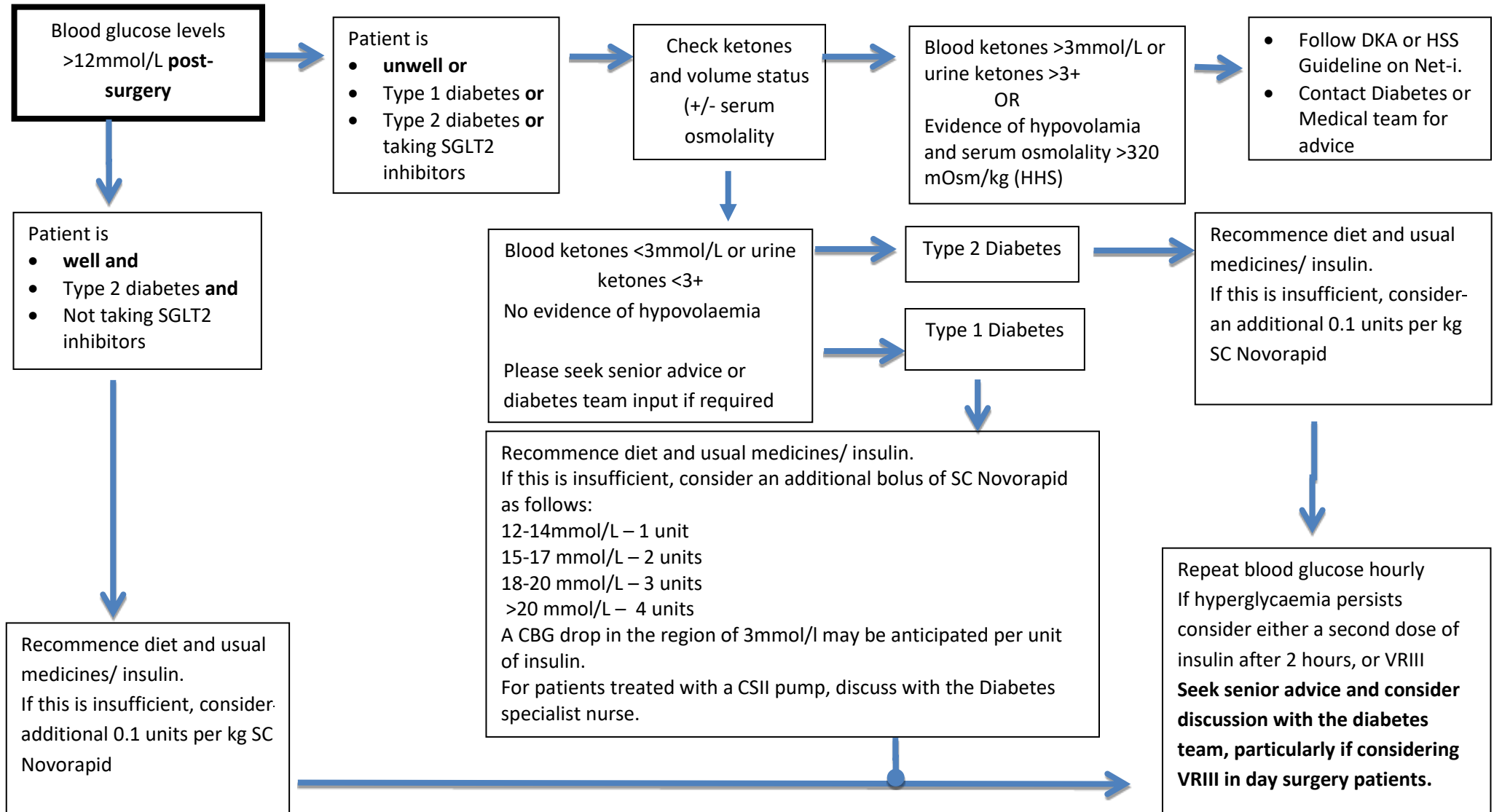
- Completion of surgery is not imminent
- CBG is very high (≥ 14 mmol/l) or rising rapidly
- There is ketosis or polyuria.

Have a low threshold for discussion with the Diabetes Specialist Nurse, particularly if considering a VRIII in patients scheduled for day surgery.

Appendix 4: Perioperative management of Hyperglycaemia – 3. Postoperative

For patients missing only ONE meal who are well, without raised ketones, restart usual medication and diet. Additional insulin boluses can be considered in accordance with the patient's glucose and usual therapy regimen (see below) – **seek advice from the diabetes team if in any doubt.**

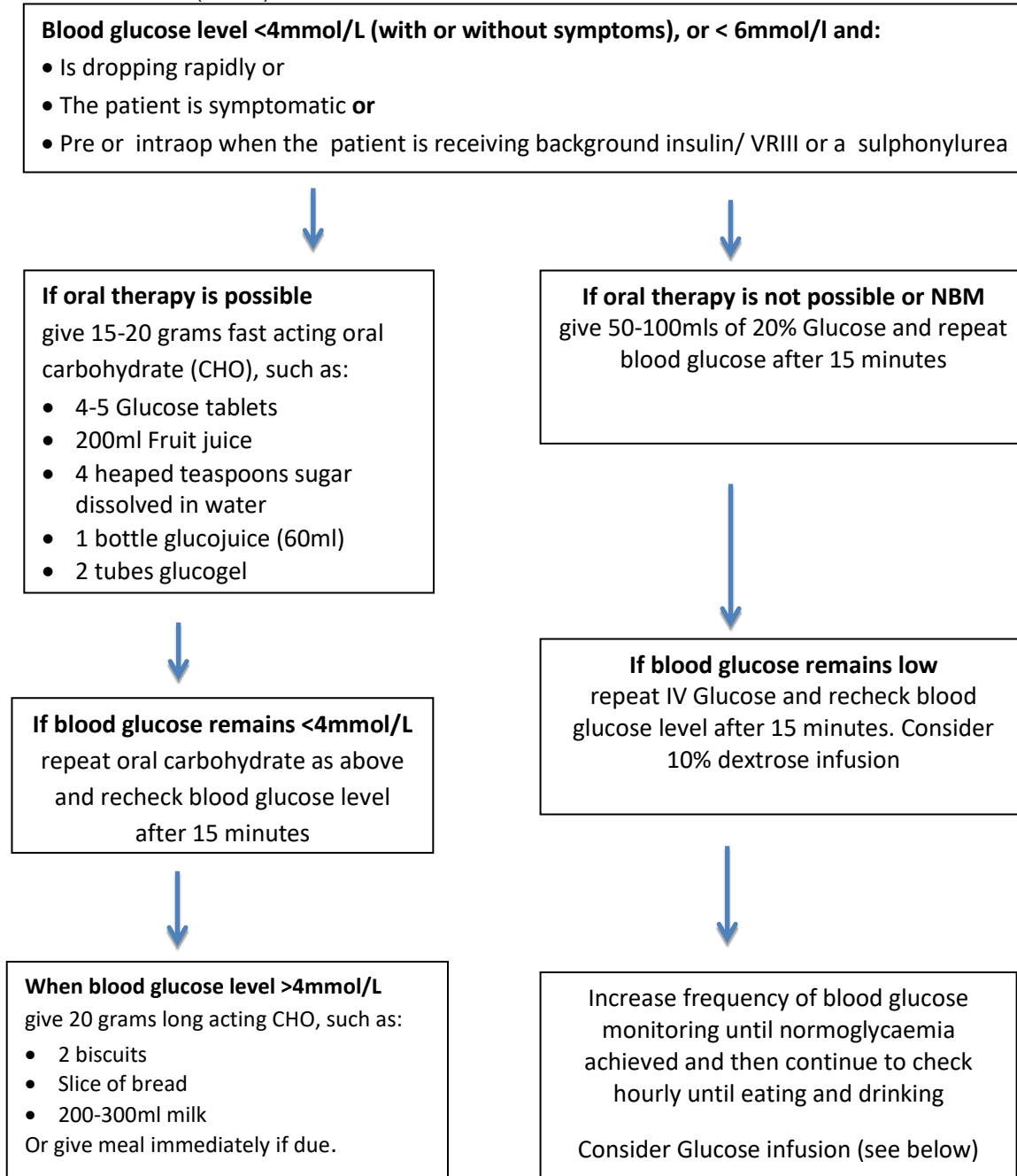
For patients treated with a VRIII who are well, without raised ketones, adjust the infusion rate to achieve the target blood glucose (see [appendix 3](#))



Appendix 5: Perioperative management of hypoglycaemia

Admission or pre-operative hypoglycaemia is defined as a fingerprick blood glucose less than 4 mmol/l with the **exception** being patients who have received or receiving insulin or sulphonyureas, in whom a blood glucose less than 6mmol/l should be treated as hypoglycaemia in the pre and intraoperative period.

Please note: patients on diet alone are not at risk of hypoglycaemia and are excluded from the guideline below. If hypoglycaemia is not occurring peri-operatively please follow the Trust hypoglycaemia guideline, available via the intranet (Koha).



- If hypoglycaemia occurs preoperatively; consider delaying or postponing surgery- discuss with surgeon and anaesthetist.
- **If proceeding with surgery, there is a risk of further hypoglycaemia which may be masked by anaesthesia or sedation.** Monitor the CBG closely (initially every 15 minutes) and have a low threshold for commencing a 10% Dextrose infusion.
- If a patient is hypoglycaemic, treat as above, and then give insulin at the usual time. If not able to eat or drink use VRIII ([Appendix 3](#)).
- **Persistent hypoglycaemia should be referred urgently to the diabetes specialist team.**

Appendix 6: RETURNING TO USUAL DIABETES TREATMENT REGIMEN

IN PATIENTS NOT TREATED WITH A VRIII.

6.1 Patients not treated with a VRIII whose normal regime includes subcutaneous insulin

The goal for these patients is the resumption of normal diet and normal subcutaneous insulin at the mealtime immediately following return from theatre.

Attention to analgesia and antiemetics, patient understanding, and appropriate attention from ward staff will increase the chances of this being achieved.

Although patients may eat successfully, calorific intake may be less than usual and may necessitate a reduction in insulin dose. The patient (or their carer) is often well placed to guide such adjustments. ***If in any doubt advice should be sought from the diabetes team.***

Patients who manage insufficient dietary intake to allow subcutaneous insulin administration require a VRIII.

6.2 Patients not treated with VRIII whose normal regime does not include subcutaneous insulin

The patient's usual diabetes medications should be recommenced when they are able to eat and drink. SGLT2 inhibitors are the exception (risk of euglycaemic ketosis) and should not be recommenced until the patient is fit for discharge.

In addition, It is important that patients are well and eating and drinking normally before resuming sulphonylureas (risk of hypoglycaemia).

IN PATIENTS TREATED WITH A VRIII.

The patient's usual diabetes medications should be recommenced when they are able to eat and drink without nausea or vomiting. SGLT2 inhibitors are the exception (risk of euglycaemic ketosis) and should not be recommenced until the patient is fit for discharge.

It is important to be aware that the patient's usual requirements may be increased by factors such as surgical stress or infection or reduced by a reduction in dietary intake.

If such alterations are anticipated the diabetes team should be consulted.

Transition should take place at the next meal related dose of the patient's usual medication.

Hourly CBG measurement should continue for 4 hours, then 4 hourly until these are stable within the acceptable 4-12 mmol/l range. In addition, transition to subcutaneous insulin regimes should also be accompanied by measurement of capillary ketones until CBG measurements are stable. The capillary ketones should be checked if the CBG is 14mmols/l or over.

Contact the diabetes team if CBG measurements fail to remain within acceptable limits, or capillary ketones are high, 1.5mmol/l or greater.

Refer to Trust guidelines for longer term guidance on blood glucose testing.

6.3 Transition to oral hypoglycaemics medication from a VRIII

Metformin should not be recommenced if the estimated GFR is $< 45\text{ml/min/1.73m}^2$. It is important that patients are well and eating and drinking normally before resuming sulphonylureas (risk of hypoglycaemia). Sulphonylurea doses may need to be reduced if a sustained reduction in oral intake below preoperative levels is anticipated, or the patient has acute kidney injury. ***The diabetes team should be consulted.***

SGLT2 inhibitors should not be restarted until the patient is fit for discharge (risk of euglycaemic ketosis)

6.4 Transition to regular subcutaneous insulin from a VRIII

6.4.1 Basal Bolus insulin regimens (separate long acting and short acting preparations)

Long acting insulins will usually have been continued throughout the perioperative period.

Should these have been omitted, some form of background insulin, followed by a mealtime short acting insulin should be instituted before discontinuing the VRII.

The short acting subcutaneous insulin should be administered with the meal, and the VRII and fluid substrate continued for a further 60 minutes

6.4.2 Twice daily fixed-mix insulin regimens

The regular insulin should be reintroduced before breakfast or the evening meal.

The VRIII and fluids should be continued for a further 60 minutes after administration of the insulin.

6.4.3 Separate intermediate and short acting regimens

The intermediate insulin should be reintroduced before breakfast or the evening meal.

The VRIII and fluids should be continued for a further 60 minutes.

6.4.4 Continuous subcutaneous insulin infusions (CSII pump)

Patient must be well enough to manage their pump therapy.

Commence the subcutaneous insulin infusion at the patient's normal basal rate. The VRII should be continued until the next meal bolus has been given and thereafter, continued for a further 60 minutes.

Do not recommence the CSII in the evening

The diabetes team should be consulted

Appendix 7: Advice for patients with diabetes who are discharged following a surgical procedure.

See patient information leaflets on the next pages

- First leaflet for all patients with diabetes
- Second leaflet for all patient with Type 1 diabetes/need for ketone testing

Patient Information

www.uhdb.nhs.uk

Instructions for all patients with diabetes following surgery

- Unless you have been advised otherwise you should continue with your usual insulin and /or other diabetes medication.
- Monitor your blood glucose if you have the equipment to do so – 4 times per day if possible. You should test more frequently if you are unwell, feeling or being sick.
- Your blood glucose may be a little higher than usual. This is not a concern if you are feeling well.

IF YOU ARE UNWELL ('Sick day rules' for people with diabetes)

- **NEVER** stop taking your insulin or tablets – illness usually increases your body's need for insulin
- **TEST** your blood glucose every 2 hours, day and night.
- If you have Type 1 diabetes, check your blood ketones (or urine ketones) and follow sick day rules if elevated.
- **DRINK** at least 100mls water/sugar free fluid every hour – you must drink at least 2.5 litres per day during illness (approximately 5 pints)
- **REST** and avoid strenuous exercise as this may increase your blood glucose during illness
- **EAT** as normally as you can. If you cannot eat or if you have a smaller appetite than normal, replace solid food during illness with one of the following:-
 - 400 mls milk
 - 200 mls carton fruit juice
 - 150-200 mls non-diet fizzy drink
 - 1 scoop ice cream.

You should contact the Diabetes Nurse Specialist or your GP if you experience any of the following.

- Continued diarrhoea and/or vomiting.
- Unable to keep food down for more than 4 hours.
- High fever.
- High blood glucose with symptoms of illness (above 15 mmol/l – you may need more insulin).
- Ketones at ++2 or +++3 in your urine or 1.5 mmol/l blood ketones or more (you may need more insulin). In this case contact the person who normally looks after your diabetes immediately.

Outside of normal working hours consult the local out of hours service or go to Accident and Emergency.

Patient Information

www.uhdb.nhs.uk

Department of Diabetes
Medicine

Self-Management of Blood Ketones

In Patients with Type 1 Diabetes on multiple daily injections (background insulin with rapid acting insulin with food)

What are Ketones?

Ketones are the by-product of fat breakdown. Ketones can provide the body with energy if glucose is not available. Insulin is needed to transport glucose into the cells in order to give you energy. If there is insufficient insulin then the glucose will be unable to enter the cells and therefore glucose levels within the blood rise. The body then starts to break down fat to gain energy and this produces ketones. High blood glucose and high ketones can cause you to become unwell very quickly if not treated as you can become dehydrated and a buildup of dangerous acids form in the blood. This can cause Diabetic Ketoacidosis (DKA)

Why test blood rather than Urine?

Urine ketones reflect what has happened in the past rather than what is happening now. Blood ketones give us a better idea of what is happening now within the body. Blood ketones are not affected by fluid intake whereas urine ketones are. Blood ketone tests also test for the main ketone that causes DKA.

When to check for Ketones

Ketones should be checked if

- You are unwell
- If you are vomiting

You have had 2 consecutive unexplained high blood glucose readings. (Greater than 13.9 mmol/l)

Remember NEVER stop taking your background insulin

- *Your correction dose should already have been calculated by your health care professional*

If your Ketones are above 3mmol/l then go to A&E immediately. If you are pregnant and have Ketones above 0.6 and blood sugar above target phone diabetes centre or go to A&E

Type 1 diabetes – what to do when you are ill

The following link provides information for you to follow:

https://trend-uk.org/wp-content/uploads/2020/03/A5_T1Illness_TREND_FINAL.pdf

Please ask a member of staff to print you a copy of this information for your records if you do not have access to the internet or if you prefer a paper copy and don't have access to a printer.

Appendix 8: Initial Management of patients with diabetes admitted for urgent or emergency surgery

Principles

The principles for the management of patients with diabetes undergoing elective surgery can be applied to those admitted for urgent or emergency surgery. This includes the potential to avoid VRIII in patients who are expected to miss only one meal. There are however additional factors to consider in this group of patients which make the situation more complex. **If in any doubt, please discuss with the diabetes team.**

- Acute surgical pathology often has systemic effects. Increased circulating stress
- Nausea and vomiting cause dehydration and reduces calorific intake. Usual advice relating to preoperative adjustment of diabetes treatment will generally not have been followed, so there can be an increased risk of hypoglycaemia.
- The surgical course is often less predictable in terms of the timing and nature of surgery and postoperative return to diet.

Assessment

- When patients with diabetes are admitted as surgical emergencies, CBG should be measured on admission, and hourly (patients treated with insulin or at risk of hypoglycaemia – see below) or 2 hourly (patients not treated with insulin) thereafter. Frequency of monitoring may be reduced when stable, but should be performed immediately before anaesthesia and hourly whilst in theatre.
- In addition capillary ketones should be measured in patients who have type 1 diabetes or type 2 diabetes treated with an SGLT2 inhibitor, or who are unwell. Measure ketones at least daily thereafter.
- If capillary ketones are $>3.0\text{mmol/l}$ check venous pH and bicarbonate.
- If HHS is suspected measure serum osmolality

Management

Patients with evidence of a diabetic crisis	
Capillary Ketones > 3 mmol/l and venous pH < 7.3	Treat as DKA (see separate Trust guidance)
CBG > 30 mmol/l and venous pH >7.3 and serum osmolality > 320 mOsm/kg	Treat as HHS (see separate trust guidance)

Patients without evidence of DKA or HHS and CBG <12mmol/l	
Patients treated with insulin who are expected to miss > 1 meal	VRIII (see appendix 3)
Patients treated with insulin who are expected to miss only 1 meal	<p>If systemically well, follow guidance for adjustment insulin in appendix 2. Note that pre-admission doses of insulin may not have been reduced, which may increase the risk of hypoglycaemia. Increase the frequency of CBG monitoring accordingly.</p> <p>If there is any doubt or the patient is systemically unwell (especially if capillary ketones are >1.5 mmol/l), have a low threshold for commencing VRIII. Discussion with the diabetes team is strongly advised in this group of patients</p> <p>Always continue background insulin in patients with diabetes treated with insulin</p>
Patients with type 2 diabetes not treated with insulin	<p>Follow guidance for adjustment of diabetes medications in appendix 1 Note that preadmission doses of sulphonylureas may not have been stopped, which may increase the risk of hypoglycaemia.</p> <p>If the patient takes an SGLT2 inhibitor this should be stopped, and capillary ketones measured daily. Omit until clinically well and fit for discharge Stop Metformin if there is an acute kidney injury.</p>
Patients without evidence of DKA or HHS and CBG >12mmol/l	
Patients treated with insulin who are expected to miss > 1 meal	VRIII (appendix 3)
Patients treated with insulin who are expected to miss only 1 meal	<p>If systemically well manage according to appendix 4, Perioperative hyperglycaemia.</p> <p>If systemically unwell (especially if capillary ketones >1.5 mmol/l) commence VRIII</p>
Patients with type 2 diabetes not treated with insulin but expected to miss more than 1 meal.	VRIII

Patients with type 2 diabetes who are expected to miss only 1 meal	If systemically well manage according to appendix 4 , Perioperative hyperglycaemia If systemically unwell commence VRIII
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Appendix 9: Patients with diabetes undergoing elective bariatric surgery - Full Clinical Guideline

Introduction

This guidance provides information on the identification of diabetes type, along with a description of both pre and post operative treatment for patients with diabetes undergoing bariatric surgery. It does not discuss details of bariatric surgery or the treatment of non diabetes patients.

Aim and purpose of the guideline

To provide guidance on the pre and post operative treatment of diabetes patients undergoing bariatric surgery in order to reduce the risk of post-operative complications related to the patients diabetes.

Definition/abbreviations

GAD	Glutamic Acid Decarboxylase
GP	General Practitioner
VLCD	Very Low Calorie Diet

Main body of guideline

It is essential to determine what type of diabetes the patient has in order to determine the correct peri-operative treatment. The patient's treatment is determined by whether they have Type 1 or Type 2 diabetes. *If there is any concern about the type of diabetes, please discuss with the oncall diabetes team.*

Treat as Type 1 Diabetes	Treat as Type 2 Diabetes
<ul style="list-style-type: none"> ● Patient is known to have type 1 diabetes. ● Patient has had an episode of diabetes ketoacidosis ● Started on insulin with months of being diagnosed with diabetes ● Previous pancreatectomy or pancreatitis ● Positive GAD antibodies or low stimulated c-peptide levels. 	<ul style="list-style-type: none"> ● Everybody else

Type 1 diabetes

Patients will be entirely dependent on insulin and insulin should never be stopped.

1. NEVER STOP THE PATIENT'S INSULIN.
2. If possible prior to the date of surgery please refer to the Diabetes Specialist Nurses to informing them of:
 - a. The intended surgery and preferably date.
 - b. Patient's contact details
 - c. Current diabetes medication.

3. The patient should record their blood sugars 4 times per day (before every meal and before bed).
4. Advise the patient to contact their 'Diabetes Team' before starting the 'Very Low Calorie Diet' (VLCD).
 - a. For information on insulin management immediately pre op i.e. day before and day of surgery refer to the Trust's Guidelines under Diabetes.
5. All patients will need to be started on variable rate insulin infusions (sliding scale) prior to surgery. This may involve admitting the patient the night before surgery.
6. When patient is admitted to the ward then please send an electronic referral to the diabetes specialist nurse.

Type 2 Diabetes

Patients with Type 2 diabetes can be treated by various medications, that may require adjusting either pre and post operatively.

For information on insulin management immediately pre op i.e. day before and day of surgery refer to the Trust's Guidelines under Diabetes.

<u>Drug</u>	<u>Pre-operative (Very Low Calorie Diet)</u>	<u>Post-operative</u>
Insulin	<p>Refer the patient to the Diabetes Specialist Nurses</p> <ul style="list-style-type: none"> ● If on 4-5x/day insulin injections involving a long background and meal time insulin (basal bolus regime) then stop the meal time insulin and reduce background insulin by 50% of original dose. ● If on 2x/day insulin injections, then reduce both doses to 25% of original dose (ie 75% dose reduction). 	<p>ALL patient should monitor blood glucose before every meal and before bed.</p> <p>For gastric band:</p> <ul style="list-style-type: none"> ● If on 4-5x/day insulin injections, background and meal time insulin (basal bolus regime) then; stop meal time insulin & reduce background insulin to 25% of original dose (ie 75% dose reduction). ● If on 2x/day insulin injections then reduce both doses to 25% of original dose (ie 75% dose reduction). <p>For bypass/sleeve:</p> <ul style="list-style-type: none"> ● Stop all insulin injections. <p>If prior to discharge blood glucose levels are >15 then please contact Diabetes Specialist Nurse.</p>

		On discharge patients should continue to monitor blood glucose before every meal. They should contact their local GP practice or usual diabetes team, for ongoing advice, within first week after discharge.
Sulfonylureas (eg gliclazide or glipizide)	Stop medication	Stop medication
Metformin	Continue current dose	Restart 48hrs after surgery at a dose of 500mg once a day.
Glitazones (eg pioglitazone)	Continue current dose	Stop medication
Gliptins (eg Linagliptin, alogliptin, sitagliptin)	Continue current dose	Stop medication
SGLT2 Inhibitors (e.g dapagliflozin, canagliflozin & empagliflozin)	Stop Medication. Measure capillary ketones on admission and daily thereafter. (Risk of euglycaemic ketosis)	Stop medication. Measure capillary ketones on admission and daily thereafter. (Risk of euglycaemic ketosis)
GLP-1 agonist (eg Exenatide, Liraglutide, Lixisenatide)	Continue current dose	For gastric band: <ul style="list-style-type: none"> Continue current dose For bypass/sleeve: <ul style="list-style-type: none"> Stop medication

For ALL patients after Discharge:

- If the patient has a glucose monitor, tell patient to monitor blood sugars before meals and before bed.
- Ask the patient to contact their local GP practice or usual diabetes team, for ongoing advice, within first week after discharge and arrange a follow up appointment.
- In the case of a diabetic emergency tell patient to contact their usual diabetes team urgently or attend their local walk in centre or emergency department.

References

https://www.diabetes.org.uk/resources-s3/2017-09/Surgical%20guidelines%202015%20-%20full%20FINAL%20amended%20Mar%202016_0.pdf

TREND UK - https://trend-uk.org/wp-content/uploads/2020/03/A5_T1Illness_TREND_FINAL.pdf

Appendix 10: Burton site perioperative questionnaire Pre-op Assessment Questionnaire



Pre-op reception is open 9-4 Monday-Friday

(*MANDATORY INFORMATION REQUIRED)

(Please note the patient will only be triaged, an appointment will be arranged for a pre-op in due course)

SCHEDULER	
PRE-OP DATE:	
W/L:	N.S:

*Consultant Name:		*Date seen in Clinic: / /	
*Patient details / Affix patient label		Operation	
Address checked with patient <input type="checkbox"/>		Please specify: Routine <input type="checkbox"/> Soon <input type="checkbox"/> <u>UCR</u> <input type="checkbox"/> OR DATE AGREED: / / ERAS <input type="checkbox"/>	
Surgeon instructions for pre-assessment team:			
SURGEON INSTRUCTION TO STOP ANTICOAGULANT MEDICATION PRIOR TO SURGERY			
WARFARIN	DAYS		
CONVERT TO ENOXAPARIN	DOSE		
ASPIRIN	DAYS		
CLOPIDOGREL	DAYS		
DIPYRIDAMOLE	DAYS		
RIVAROXABAN	DAYS		
APIXABAN	DAYS		
DABIGATRAN	DAYS		
DIABETES			
Does the patient have diabetes? Type 1 <input type="checkbox"/> Type 2 <input type="checkbox"/> Latest Hb1c result Date			
Other evidence of poor control?			
An HbA1c > 69mmol/ml (8.5%) is associated with increased perioperative morbidity and mortality. Consider delaying surgery and GP referral for specialist diabetes advice (by usual referral pathways. Patients already under the care of the QHB diabetes team can be discussed with the diabetes specialist nurse)			
If proceeding despite high HbA1c has a referral been made to the Diabetes specialist nurse? Yes <input type="checkbox"/> No <input type="checkbox"/>			
Lower limb complications (PVD, neuropathy, skin changes, ulceration)? Yes <input type="checkbox"/> No <input type="checkbox"/>			
Anticipated postoperative return to normal diet (number of missed meals)			
Please arrange HbA1c & U&E at the time of listing for surgery <input type="checkbox"/>			
Please highlight the presence of diabetes (and lower limb complications if present) to the surgical secretary - for inclusion on the scheduling form <input type="checkbox"/>			
FOR COMPLETION BY PRE-ASSESSMENT TRIAGE NURSE ONLY			
(TEAM ADDING TO WL) DENTAL <input type="checkbox"/> ENT <input type="checkbox"/> GYNAE <input type="checkbox"/> ORTHO <input type="checkbox"/> SURG <input type="checkbox"/> URO <input type="checkbox"/>			
APPT TYPE: 30 MIN <input type="checkbox"/> 45 MIN <input type="checkbox"/> ORTHO 60 MIN <input type="checkbox"/> BOWEL 60 MIN <input type="checkbox"/> ANAES <input type="checkbox"/>			



FOR COMPLETION BY PATIENT (all questions must be answered)DO YOU REQUIRE AN INTERPRETER? YES NO (If yes) LANGUAGE: _____**PLEASE PROVIDE BOTH CONTACT NUMBERS TO ENSURE WE ARE ABLE TO CONTACT YOU**

Landline: _____ Mobile: _____

Are you available at short notice for your surgery Yes No

Any unavailable dates/Booked Holidays? _____

ANY GENERAL ANAESTHETIC PROBLEMS/FAMILY HISTORY OF ANAESTHETIC PROBLEMS: Yes No
(If yes please give details)

Do you have any allergies if so please note here: _____

DO YOU HAVE/HAD ANY OF THE FOLLOWING CONDITIONS? (Please tick)

MI/HEART ATTACK	YES	NO
PALPITATIONS	YES	NO
ATRIAL FIBRILATION	YES	NO
PACEMAKER	YES	NO
IMPLANTED DEFIBRILLATOR	YES	NO
HIGH BLOOD PRESSURE	YES	NO
CHEST PAINS/ANGINA	YES	NO
ASTHMA	YES	NO
COPD	YES	NO
SLEEP APNOEA/CPAP	YES	NO
STROKE/CVA	YES	NO
TIA	YES	NO
EPILEPSY	YES	NO
BLACKOUTS	YES	NO
DIABETES	YES	*TYPE: NO
ANAEMIA	YES	NO
EXCESSIVE BLEEDING/HAEMOPHILIA	YES	NO
BLOOD CLOTS IN THE LEGS	YES	NO
BLOOD CLOT IN THE LUNG	YES	NO
THYROID DISEASE	YES	NO
JAUNDICE OR LIVER DISEASE	YES	NO
HIATUS HERNIA	YES	NO

Any other health problems or serious illness past/present please give details here:



Appendix 11: Audit Standards

Indicator	Standard
Access	
Percentage of staff involved in the care of people with diabetes undergoing surgery or procedures who have received training in blood glucose measurement	100%
Percentage of staff involved in the care of people with diabetes undergoing surgery or procedures receiving appropriate education from the Diabetes inpatient Specialist Team.	75%
Safety, quality and effectiveness during the patient journey	
Percentage of patients in whom control of diabetes is optimal at the time of referral for surgical opinion (HbA1c \leq 69 mmol/mol (8.5%) or higher level deemed acceptable by specialist diabetes team)	100%
Percentage of patients in whom control of comorbidities and complications of diabetes is optimal at the time of referral for surgical opinion	100%
Percentage of referrals for surgical opinion which include recent (within 3 months) HbA1c and eGFR.	100%
Percentage of patients in whom control of diabetes is optimal at the time of scheduling for surgery (HbA1c \leq 69 mmol/mol (8.5%) or higher level deemed acceptable by specialist diabetes team)	100%
Percentage of patients attending an early preoperative assessment (at least 4 weeks before surgery).	
Percentage of patients in whom recent (within 3 months) HbA1c and eGFR are available at the time of preoperative assessment clinic attendance.	100%
Percentage of patients for whom a clear plan for the perioperative management of diabetes is developed in the preoperative assessment clinic, and who receive written instructions in relation to this.	100%
Percentage of patients in whom preoperative diabetes medication and insulin administration is in keeping with this policy.	100%
Percentage of patients whose last meal time is recorded on admission.	100%
Percentage of patients in whom unanticipated prolonged fasting (greater than 1 meal) occurs without appropriate escalation and intervention.	0%
Percentage of patients admitted before the day of surgery because of their diabetes.	0%
Percentage of patients for whom surgery is cancelled on the day of surgery.	0%
Percentage of patients for whom surgery occurs early during theatre sessions.	100%
Percentage of patients for whom surgery occurs during evening theatre sessions.	0%
Percentage of patients for whom diabetes and plans for its management are highlighted at the preoperative team brief.	100%

Percentage of patients for whom diabetes is highlighted on the theatre list.	100%
Percentage of patients for whom blood sugar is included at the sign-in and sign-out stages of the perioperative checklist.	100%
Percentage of patients for whom there is evidence of appropriate handover from the anaesthetist to recovery staff, and recovery staff to ward staff, of blood sugar control and plans for ongoing monitoring and management.	100%
Percentage of patients for whom blood sugar is measured on admission and hourly thereafter, until resumption of diet and usual diabetes medications.	100%
Percentage of patients in whom blood sugar remains within the target range throughout the perioperative pathway.	100%
Percentage of patients developing ketoacidosis, hyperosmolar hyperglycaemic state or hypoglycaemia requiring 3 rd party intervention.	0%
Percentage of patients fulfilling requirements for VRII who receive this.	100%
Percentage of patients unnecessarily receiving VRII.	0%
Percentage of people in whom an IV insulin infusion is established with correct configuration of the one-way and antisiphon valves.	100%
Percentage of patients fulfilling requirements for specialist diabetes team involvement in whom this occurs.	100%
Percentage of patients in whom an assessment of lower limb skin integrity is recorded.	100%
Percentage of patients in whom lower limb skin changes or ulceration worsen during the perioperative period.	0%
Percentage of patients for whom discharge is delayed by diabetes related problems	0%
Institutional accountability and integrity:	
Percentage of patients with diabetes identified as such on hospital patient administration system	95%
Percentage of clinical coding that identifies people with diabetes correctly.	100%
Patient and staff satisfaction:	
Percentage of staff who feel that they have sufficient levels of appropriate and timely support from the Diabetes Inpatient Specialist Team	100%
Percentage of patients who express satisfaction with their patient journey using validated tools such as the Diabetes Treatment Satisfaction Questionnaire (DTSQ) and the Diabetes Treatment Satisfaction Questionnaire for Inpatients (DTSQ-IP)	80%