Management of the Perioperative Adult Diabetic Patient

TARGET AUDIENCE	Secondary care including Preassessment clinics, Day Surgery, Theatres and Wards
PATIENT GROUP	Adult diabetic patients undergoing surgery; patients taking GLP-1 analogues for weight loss

Clinical Guidelines Summary

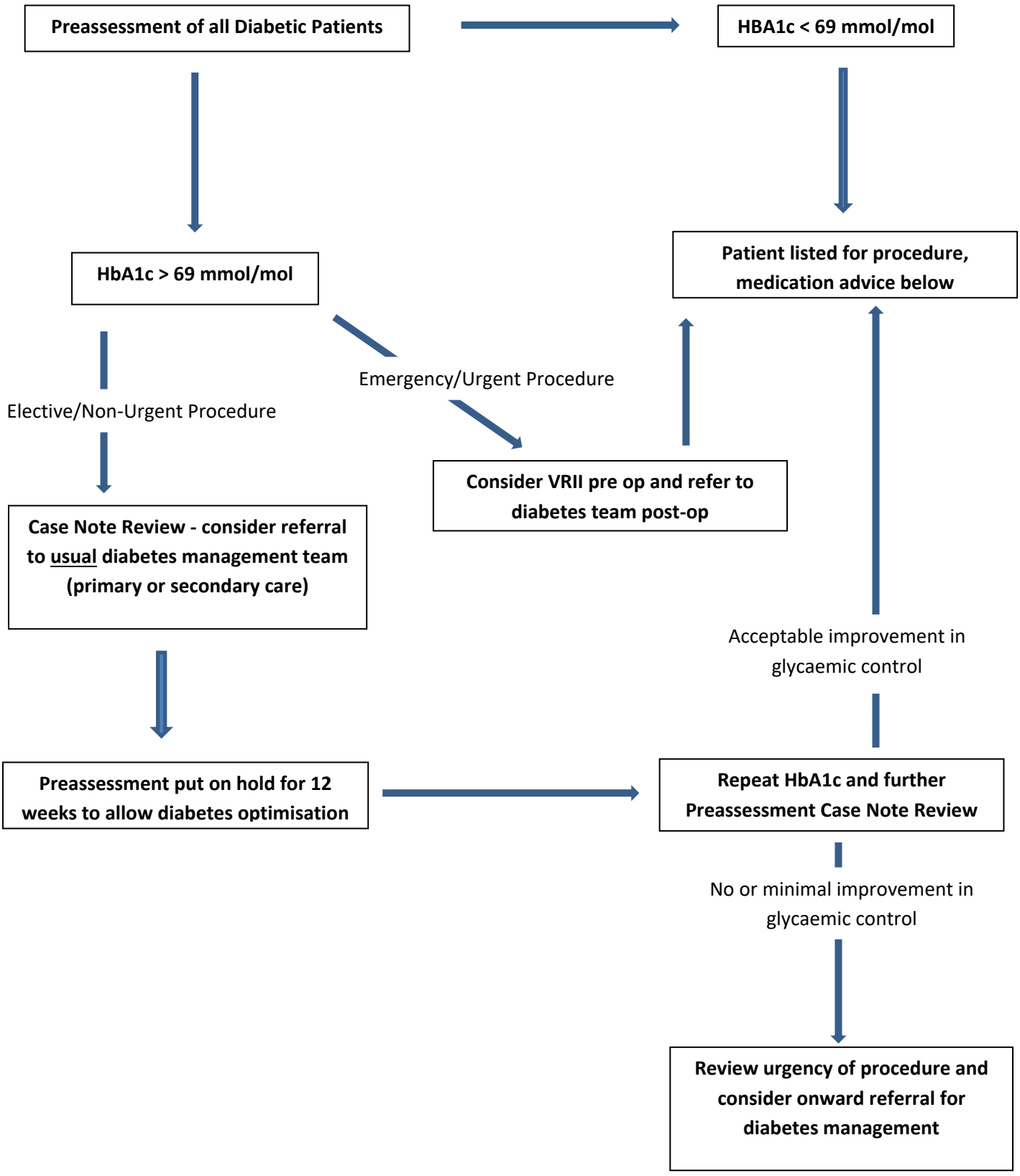
- **<u>This guideline is not for use in obstetrics, ICU or patients on continuous insulin pumps</u>**
- Target Blood Glucose 6 – 10 mmol/L
- Acceptable Blood Glucose 4 – 12 mmol/L
- Preoperative and postoperative insulin and non insulin medication advice should be followed as per this guideline
- In diabetic patients HbA1c should be <69 mmol/mol prior to elective surgery. There is recognition that this is not achievable for all patients and in procedures which are time-sensitive this may not be possible.

- **<u>Preoperatively</u>:**
  Blood glucose >12 should be discussed with anaesthetist who may consider Variable Rate Insulin Infusion (VRII)
  Blood glucose >12 in patient on insulin should have ketones checked and anaesthetist informed if these are >1.5. If level >3 this should be treated
  Blood glucose 3.1 – 3.9 should be discussed with anaesthetist/medical staff who may consider starting VRII
  Blood glucose <3.0 should be managed according to the Hypobox Protocol (Appendix 1)

- **<u>Postoperatively:</u>**
  Blood glucose 3.1 – 3.9 mmol/L follow Hypobox management protocol, ensure patient is alert and able to resume usual oral intake. Once blood glucose >4.0 mmol/L discuss with Anaesthetic/Medical staff prior to discharge
  If blood glucose < 3.0 mmol/L follow Hypobox management protocol. Arrange review by Anaesthetic/Medical Staff
- Minimum blood glucose monitoring should be hourly during procedure and two hourly afterwards, some patients will require more blood glucose checks

Guideline Body

Preoperative Management



Hypoglycaemia Management in the Perioperative Period

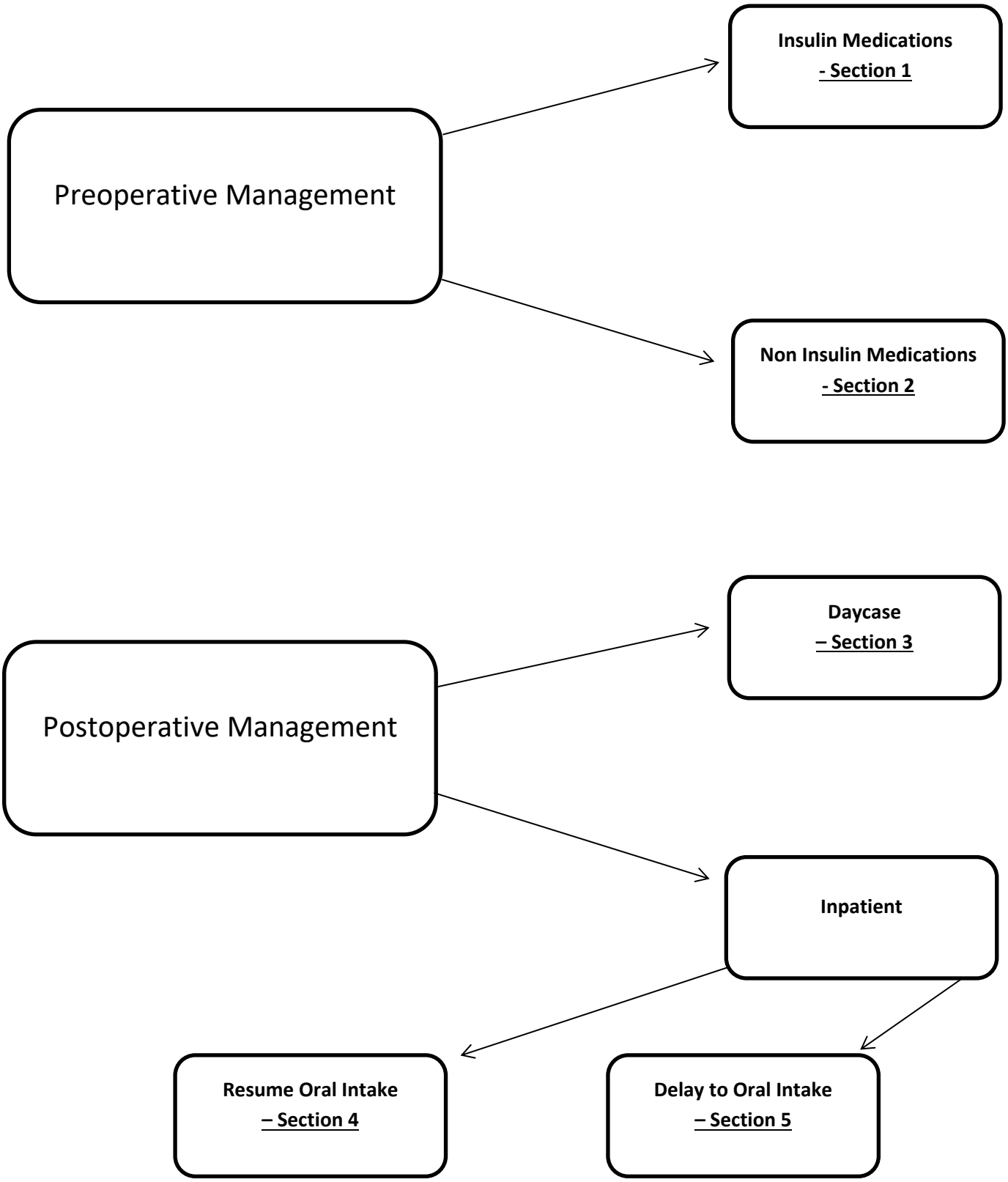
Pre-Procedure Hypoglycaemia:

- If pre-operative capillary blood glucose 3.1 – 3.9 mmol/L alert Anaesthetic/Medical Staff who may commence IV Dextrose +/- VRII
- If blood glucose 3.0 or less follow Hypobox management protocol (Appendix 1), alert Anaesthetic/Medical Staff

Post-Procedure Hypoglycaemia:

- If post procedure blood glucose 3.1 – 3.9 mmol/L follow Hypobox management protocol (Appendix 1), ensure patient is alert and able to resume usual oral intake. Once blood glucose >4.0 mmol/L discuss with Anaesthetic/Medical staff prior to discharge
- If blood glucose < 3.0 mmol/L follow Hypobox management protocol. Arrange review by Anaesthetic/Medical Staff

Continuous glucose monitors: Shouldn't be used to measure blood glucose in hospital. Can be kept in place for shorter procedures but may need removed for longer procedures/ planned use of diathermy intra-operatively.


Preoperative Management
Insulin Medications
- Section 1
Non Insulin Medications
- Section 2
Postoperative Management
Daycase
– Section 3
Inpatient
Resume Oral Intake
– Section 4
Delay to Oral Intake
– Section 5

Section 1: Insulin Medications

General Advice:

- Usual insulin day before including long acting (basal) insulin
- Advice as per non insulin medications section (if taking any)
- Check blood glucose on admission and 1-2 hourly
- Target blood glucose 6 – 12mmol/L
- If blood glucose >12 mmol/L:
  - Inform anaesthetist who may consider VRII
  - Check blood ketones – Alert anaesthetist if > 1.5. Treatment should be instigated if >3.
- Foot care must be optimised for patients immobile beyond 12 hours; assess foot risk and consider heel protection. (Contact Diabetes Podiatry for advice if needed)

Medication examples: (not an exhaustive list)

Long Acting Insulins	Abasaglar Humulin I Insulatard Insuman Basal Lantus	Levemir Semglee Tresiba Tuojeo Xultophy
Premixed Insulins (Intermediate Acting)	Humulin M3 Humalog Mix 25 Humalog Mix 50 Hypurin Porcine 30/70 Mix	Insuman Comb 15 Insuman Comb 25 Insuman Comb 50 NovoMix 30
Short Acting Insulins	Actrapid Apidra Fiasp Humalog Humulin S	Hypurin Porcine Neutral Insuman Rapid Lyumjev NovoRapid

Listed for morning procedure

Long Acting Insulin	Takes at night: Usual dose Takes in morning: 50% usual dose
Premixed Insulin (intermediate acting)	Withhold
Short Acting Insulin	Withhold

Listed for afternoon procedure

Encourage to have light breakfast on morning of surgery

Long Acting Insulin	Takes at night: Usual dose
	Takes in morning: Usual dose
Premixed Insulin (intermediate acting)	50% dose with light breakfast
Short Acting Insulin	50% dose with light breakfast

Section 2: Non Insulin Medications and Diet Controlled Diabetes

- General Advice:
  - ❖ Usual medications day before surgery *except SGLT2 Inhibitors and GLP-1s (see below)*
  - ❖ Check blood glucose on admission and 4 hourly
  - ❖ Target glucose between 6 – 12 mmol/L
  - ❖ If glucose >12mmol/L advise anaesthetist who may consider VRII
  - ❖ Check blood glucose hourly during procedure

Morning or Afternoon list

Drug Group	Drug names	Day of Surgery Advice
Acarbose	Acarbose	Withhold
DPP4 Inhibitors	Sitagliptin, Vildagliptin, Saxagliptin, Alogliptin, Linagliptin	Continue
GLP-1 Analogues	Exenatide, Liraglutide, Lixisenatide, Dulaglutide, Semaglutide (oral and subcutaneous), Tirzepatide (Mounjaro)	Withhold one dose pre-op
Meglitinide	Repaglinide, Nateglinide	Withhold
Metformin	Metformin	Continue **
Sulphonylureas	Gliclazide, Glipizide, Glimiperide, Glibenclamide	Withhold
Pioglitazone	Pioglitazone	Continue
SGLT2 Inhibitors	Dapagliflozin, Canagliflozin, Empagliflozin, Ertugliflozin	Stop 72 hours preoperatively

** If procedure involves contrast, and patient has CKD (baseline eGFR less than 59 ml/min), Metformin should be withheld for 48 hours post procedure and U+E checked after 48 hours

- **SGLT2 Inhibitors**: Should be stopped 72 hours preoperatively for most surgery due to the risk of euglycaemic ketoacidosis.
  NB some patients e.g. liver shrinkage diet pre operatively will require this to be withheld for longer preoperatively, if in doubt this should be discussed with the

surgical/anaesthetic team. If presenting for emergency surgery ketones should be checked and treated appropriately.

- **GLP-1 Analogues:** Concerns have been raised that the delayed gastric emptying caused by these medications is linked with regurgitation and aspiration under anaesthesia despite adequate fasting times. There is a lot of uncertainty around this at present including whether it is linked to duration of therapy and how long the medication needs to be withheld to reverse this. Currently the advice for patients with diabetes and those taking it for weight loss is different. Various organisations have released recommendations to try and address this whilst further studies are undertaken so this will remain an evolving area.

  Diabetes:

  If the patient is on a weekly injection they should stop this one week pre-operatively. If they are on a daily injection/tablet this should be withheld on the day of surgery.

  Weight loss:

  Liraglutide (Saxenda) should be stopped 48 hours pre operatively

  Semaglutide (Wegovy) should be stopped 3 weeks pre operatively

Post Operative Management

Section 3: Daycase Patients

General Advice:

- Target blood glucose 6- 12mmol/L
- Check blood glucose hourly during procedure and 2 hourly post operatively
- If blood glucose persistently >12 inform anaesthetist who may consider VRII – See Perioperative VRII Guideline

Resuming medications:

Insulin Medications

Long Acting Insulin	Resume usual dose at usual time
Premixed insulin – twice daily regime	Give 50% usual morning dose with lunch post operatively
Premixed insulin – three times daily regime	Restart with next meal
Short acting insulin	Restart with next meal

Non Insulin Medications

Resume usual medications once eating and drinking

Metformin: If patient has received contrast during procedure need to omit this for 48 hours post operatively. Should get U+E checked after 48 hours.

Section 4: Inpatient Resume Oral Intake

General Advice:

- Target blood glucose 6- 12mmol/L
- Monitor blood glucose hourly during procedure
- If blood glucose persistently >12 consider VRII – See Perioperative VRII Guideline
- If unable to manage reasonable oral intake then consider converting to VRII

Insulin Medications

Long Acting Insulin	Resume usual dose at usual time
Premixed insulin – twice daily regime	Give 50% usual morning dose with lunch post operatively
Premixed insulin – three times daily regime	Restart with next meal
Short acting insulin	Restart with next meal

Non Insulin Medications

Resume usual medications once eating and drinking

Metformin: If patient has received contrast during procedure need to omit this for 48 hours post operatively. Should get U+E checked after 48 hours.

Section 5: Inpatient Delay to Oral Intake

Insulin Medications

- Target blood glucose 6 – 12 mmol/L in all patients
- Should be converted to VRII on admission to hospital. See Perioperative VRII Guideline
- Continue any usual subcutaneous long acting insulins in the background
- Monitor blood glucose hourly during procedure, follow monitoring guidance post operatively as per VRII guideline
- Serum Potassium must be monitored postoperatively at 12 hours and then every 12 to 24 hours as necessary for patients on VRII longer than 12 hours. Patients with normal renal function, satisfactory urine output and normal pre-op serum potassium will need 40 – 60 mmol potassium replacement every 24 hours. Adjustments would be necessary where pre-op serum potassium is outwith normal range or there is renal impairment or poor urine output – discuss with anaesthetist
- If blood glucose >20 persistently, lab glucose and ketones must be checked. If evidence of diabetic ketoacidosis please revert to DKA protocol. Hospital Diabetes team must be contacted in this scenario.
- Patients who need TPN or parenteral feeding post operatively will need to be prescribed a suitable subcutaneous insulin regime – contact Hospital Diabetes Team
- Once eating and drinking normally can be converted back to subcutaneous insulin, this should be initiated *before* stopping VRII. Usual basal insulin dose can be restarted at patient's usual dose; short acting insulin doses should be titrated depending on patient's oral intake. Non-insulin medications can be restarted when oral intake has resumed.

Non Insulin Medications

- Check blood glucose hourly during procedure and 2 hourly for first 24 hours post operatively (unless patient stable and blood glucose <10 when can be reduced to 4 hourly)
- Withhold all glucose lowering medications whilst not eating and drinking
- If blood glucose persistently >12 consider VRII – use perioperative VRII guideline
- Restart medications when able to take normal oral diet

Appendix 1:

Management of Hypoglycaemia using Orange "Hypobox"

Hypoglycaemia is a blood glucose < 4 mmol/L with symptoms, or a confirmed blood glucose < 4 mmol/L without symptoms. **NB** All such episodes must be documented on the insulin prescription sheet.

	Mild	Moderate	Severe
Assess	Conscious and able to swallow May be trembling, sweaty, anxious, but alert and cooperative	Conscious and able to swallow but needs assistance May be confused, weak, drowsy, slurred speech	Unconscious
Step 1 Step 2 Step 3	**1 Full bottle of Glucojuice 59mls** **OR** **1-2 Tubes Glucogel (Hypostop)** **OR** **3-5 Glucotabs**	If gag reflex present, give 1-2 tubes Glucogel Otherwise, give Glucagon 1mg IM	Place in recovery position Give 1mg Glucagon IM/IV Seek medical advice
	Stay with patient and recheck blood glucose after 5-10 minutes. Repeat above steps if blood glucose < 4 mmol/L and/or symptoms are not improving		When conscious give treatment as for "Mild" or "Moderate"
	When recovered, give patient a further starchy snack:- e.g. 1-2 slices bread/toast, bowl of cereal, 2 digestive biscuits, 1 large banana **Always recheck and record blood glucose level 15 minutes after an episode of hypoglycaemia.**		

All staff should know where box is stored in ward.

Hypobox and replacement stock are ordered from pharmacy.

Check hypobox contents daily.

References/Evidence

NHS Lanarkshire Guidelines for the Management of the Perioperative Adult Diabetic Patient, April 2020

Perioperative Care of People with Diabetes, Centre for Perioperative Care, Updated October 2023

Perioperative management of long-acting glucagon-like peptide-1 (GLP-1) receptor agonists: concerns for delayed gastric emptying and pulmonary aspiration. Zuylen et al; British Journal of Anaesthesia; 29th January 2024

Glucagon-like peptide-1 receptor agonists: a narrative review of clinical pharmacology and implications for peri-operative practice. Milder, Milder, Liang and Kam; Anaesthesia; 2nd April 2024

Appendices

1. **Governance information for Guidance document**

Lead Author(s):	Dr Claire Carson; Dr Babu Mukhopadhyay
Endorsing Body:	Preassessment Anaesthetic Governance Group
Version Number:	1.0
Approval date	22/05/2025
Review Date:	01/05/2028
Responsible Person (if different from lead author)	Dr Claire Carson

CONSULTATION AND DISTRIBUTION RECORD	
Contributing Author / Authors	Dr Claire Carson, Dr Babu Mukhopadhyay

Consultation Process / Stakeholders:	Approved by Preassessment Anaesthetic Governance Group, Reviewed and approved by Endocrinology Consultant Body
Distribution	NHS Lanarkshire Secondary Care

CHANGE RECORD

Date	Lead Author	Change	Version No.
		e.g. Review, revise and update of policy in line with contemporary professional structures and practice	1
			2
			3
		.	4
			5

2.You can include additional appendices with complimentary information that doesn't fit into the main text of your guideline, but is crucial and supports its understanding.

e.g. supporting documents for implementation of guideline, patient information, specific monitoring requirements for secondary and primary care clinicians, dosing regimen/considerations according to weight and/or creatinine clearance