Perioperative Management of Diabetes

Contents

1. Overview

Purpose & Scope

This document was developed to guide glycaemic management in patients with diabetes undergoing surgery. The following protocols encompass management of both Type 1 and Type 2 diabetes undergoing either minor or major surgery. Protocols were devised to minimise fluctuations in plasma glucose levels preoperatively, aiming to maintain blood capillary glucose (BCG) in 5 – 11 mmol/L range.

1.1 Preoperative Diabetes Review, Scheduling, & Patient Instructions

Ideally elective surgery in those with poor glycaemic control (HbA1c >75 mmol/mol) should be postponed. They should be referred to the diabetes clinic for optimisation of glycaemic control before planning surgery. Perioperative diabetes management for all insulin pump users should be individually discussed with the diabetes team prior to surgery booking.

All type 1 diabetics and insulin dependent type 2 diabetics should ideally be scheduled for early AM list.

Perioperative management of diabetes is discussed in all preassessment clinics. After clinic review, a nurse will contact and re-discuss preoperative diabetes management a day prior to hospital admission. Wherever possible, the hospital pharmacist will carry out medication reconciliation (including diabetes treatment for the operation day) for all Type 1 patients and insulin using Type 2 diabetics prior to admission. All anti-diabetic medicines prefilled by the pharmacist should be reviewed and signed off by the anaesthetist.

The anaesthetist at preassessment clinic should document the preoperative diabetic management of their patient and **ensure accurate information is discussed with the patient**.

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1.2 In Hospital Management of Hyper/Hypoglycaemia

- If BCG rises above 15 mmol/L, a stat subcutaneous dose of a rapid acting insulin should be given (e.g. 3 - 6 units of NovoRapid or Humalog) at prescribing doctor's discretion. Patients with continuous subcutaneous insulin pumps and the capacity to operate them may be able to self-administer a measured bolus off their pump. Proper function of their pump should also be confirmed. Refer to the clinical support guideline "Correction of Hyperglycaemia" via CeDSS.
- If marked hyperglycaemia (BCG >18 mmol/L) in a Type 1 diabetic is noted, check for capillary blood ketones to ensure patient is not in DKA. If capillary blood ketones are greater than 3mmol/L, call for medical review for diabetic ketoacidosis.
- Refer to the clinical support guideline "Diabetic Ketoacidosis (DKA) Management – Adults" via the CeDSS portal.
- Regardless of types of diabetes or management regimens, patients with persistently elevated BCG may require transitioning to a GIK. Specialist anaesthetist or diabetic nurse specialist input should be sought at this point.
- Hypoglycaemia (BCG <4.0 mmol/L) should be treated promptly (refer to WDHB intranet document 'Diabetes – Hypoglycaemia')
    - **In short:** conscious patients should be treated with oral glucose (1-2 Hypofit satchet). For unconscious patients, a medical emergency alert (777) should be activated, stat iv dextrose (50 mL of 50%) be given if iv access available, otherwise give stat IM glucagon (1mg vial in resus trolley).

1.3 Who to Contact

Any uncertainties in diabetes management, whether or not covered by this document, should be discussed with the list anaesthetist and/or anaesthesia coordinator (ext. 43540) and/or the diabetes team.

Diabetes Services Contacts

(*Mon-Fri 8am-4pm*)
NSH Nurse cell phone: 021 815 463
Consultant cell phone: 021 242 8702

WTK Nurse cell phone: 021 813 629

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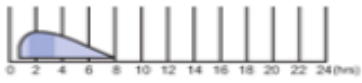
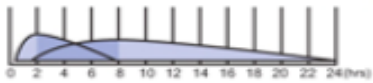
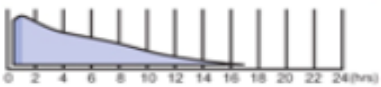
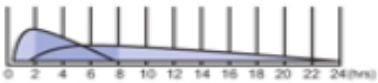
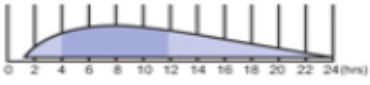
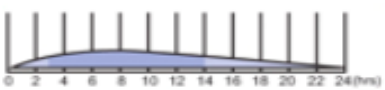
2. Glossary

Term	Definition
Major surgery	Surgery requiring a starvation period greater than 1 missed meal
Minor surgery	Surgery requiring 1 missed meal only
Oral hypoglycaemic agents	Metformin, Glibenclamide, Gliclazide, Glipizide, Repaglinide, Nateglinide, Dapagliflozin, Canagliflozin, Acarbose, Pioglitazone, Sitagliptin, Vildagliptin, Saxagliptin, Exenatide
Rapid acting insulin	NovoRapid, Humalog, Apidra
Short acting insulin	Actrapid, Humulin R
Premixed insulin	NovoMix30, PenMix30, PenMix50, HumalogMix25, HumalogMix50, Humulin30/70
Intermediate acting insulin	Humulin NPH, Protaphane
Long acting / basal insulin	Glargine (Lantus), Detemir (Levemir)
Intermittent subcutaneous (SC) insulin	Insulin, in any combination of preparations, which is delivered intermittently by subcutaneous injections
Continuous subcutaneous insulin (CSI) pump	An mechanical device used in conjunction with a sub-cutaneous catheter to deliver insulin via a continuous basal rate and intermittent measured boluses as required and with meals

⚠ Items written in ***italics*** in the flowcharts refer to terms defined in the above glossary

2.1 Insulin Action Profiles

Types of Insulin Available	Brand Name	Activity (may vary between patients)	Profile
Rapid Acting	Humalog®* Apidra® Novorapid®	Onset: up to 20 minutes Peak: 1-2 hours Duration: 2-5 hours	
Short Acting	Humulin R® Actrapid®	Onset: 30 minutes Peak: 2-4 hours Duration: 6-8hours	
Premixed insulin	Humulin 30/70® Penmix 30® Mixtard 30® Penmix 50®	Onset: 30 minutes Peak: 2-8 hours Duration: Up to 24 hours	
	Humalog Mix 25® Novomix 30®	Onset:0-15 minutes Peak: 30-70 minutes Duration:16-18 hours	
	Humalog Mix 50®	Onset:0-15 minutes Peak: 30-70 minutes Duration:16-18 hours	
Intermediate Acting	Humulin NPH® Protaphane®	Onset:1-2 hours Peak: 4-12 hours Duration: Up to 24 hours	
Long Acting	Detemir (Levemir®) Glargine (Lantus®)	No pronounced peak Duration: Up to 24 hours	

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3. Perioperative Management Guidelines

3.1 Management Pathway for All patients with Diabetes

ELECTIVE SURGERY = Ideally early on AM list especially for major surgeries

	Perioperative Management		Once eating NORMALLY
Oral Hypoglycaemic Agents (OHA)	▪ See table 3.2 for full detail ▪ If using GIK stop OHA		Restart; except for metformin/SGLT2i
Metformin *omit 48hr preop if high risk surgery. See 3.2.*	Single missed meal: continue on day of surgery >1 missed meal and/or increased risk of lactic acidosis: withhold on day of surgery		If withheld, restart only with renal function at baseline
Sulphonylurea eg. Gliclazide/Glipizide	Withhold on day of surgery		Restart usual OHA
SGLT2 Inhibitors eg. Dapagliflozin/Canagliflozin	*omit 48hr preop. See table 3.2.*		Restart once eating normally AND close to discharge (eg. ≥3 days post-surgery for major surgery)
Insulin	**AM list**	**PM list**	
Bolus Insulin ie. Rapid/Short Acting Insulin	Withhold all bolus insulin when fasting	Light breakfast (0700 or before). Give half dose of all morning insulin eg. 10U Lantus + 4U Novorapid → 5U Lantus + 2U Novorapid	Normal dose (consider halving if reduced oral intake)
Basal Insulin ie. Intermediate/Premixed/ Long Acting Insulin	Give half of morning basal insulin as **Lantus** in PreOp bay eg. 10U Penmix30 → 5U Lantus		Normal dose
Continuous SC Insulin (CSI) Pump	In selected patients may be continued See guideline section 3.3		Restart normal pump setting
Major Surgery: starvation period > 1 missed meal	Contact List Anaesthetist to consider early GIK		If on insulin, give normal SC insulin prior to meals. Stop GIK 2 hours after SC insulin
MONITORING & MANAGEMENT OF UNSTABLE BLOOD CAPILLARY GLUCOSE (BCG)			
Monitoring 1-2hr BCG till stable post-op	Target: 5 – 11 mmol/L		
Hypoglycaemia BCG < 4	• Oral (Hypofit satchet) or IV glucose (Up to 50mL 50% dextrose) • If unconscious: Activate medical alert (777) • Consider Glucagon 1mg IM (if no IV line)		
Hyperglycaemia BCG >15	• 3-6U SC rapid acting insulin • Consider GIK if BCG >11 for >4hrs		

ACUTE SURGERY: Same principles, however more unpredictable fasting times mean should consider GIK early with type 1 DM or persistent hyperglycaemia

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3.2 Management of Oral Hypoglycaemic Agents

Perioperative Metformin Management requires more considerations than other OHAs:

1. Minor/moderate surgery with single missed meal only (eg. THJR/TKJR/day surgery)
   ⇒ Continue metformin
2. Major surgery with >1 missed meal (eg. bowel resections/major urology/bariatric surgery/significant fluid shifts)
   ⇒ Omit metformin on day of surgery
3. **ICU cases** (eg. hepatic resection surgery/Whipple's procedure/Ivor Lewis oesophagectomy)
   ⇒ Omit metformin from 48 hours before surgery

NB

Patient risk factors for lactic acidosis (eg. iodinated contrast media use, renal impairment eGFR <50ml/min, significant heart failure, severe liver disease, alcoholism, sepsis or severe diarrhoeal illness)
⇒ Omit metformin on day of surgery. If inpatient, stop metformin immediately

SGLT-2 inhibitors need to be stopped perioperatively due to risk of euglycaemic ketoacidosis

If your patient takes Dapagliflozin, Canagliflozin or Xigduo (= dapagliflozin + metformin)
⇒ Omit these agents from 48 hours before surgery
⇒ Check blood ketone levels every 8 hourly until the patient starts eating normally
⇒ If blood ketones are >3mmol/L, call for medical review for diabetic ketoacidosis

If these agents were not omitted for 48 hours preop, strongly consider postponing non-urgent surgery, especially if blood ketones are >0.6mmol/L or HbA1c is >75 mmol/mol

NB. SGLT-2 = sodium-glucose co-transporter-2

Agent	Adjustment on Day of Surgery	
	AM list	**PM list**
Drugs that require omission when fasting		
Sulphonylureas, eg. • Glibenclamide • Gliclazide • Glipizide	Withhold	Withhold
Meglitinides, eg. • Repaglinide • Nateglinide	Withhold	Give morning dose with breakfast
Acarbose	Withhold	Give morning dose with breakfast
Drugs that may be continued when fasting		
Pioglitazone	Take as normal	Take as normal
DPP-IV inhibitors, eg. • Sitagliptin • Vildagliptin • Saxagliptin	Take as normal	Take as normal
GLP-1 analogues, eg. • Exenatide (injectable)	Take as normal	Take as normal

NB. DPP-IV = dipeptidyl peptidase-IV; GLP-1 = glucagon-like peptide-1

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3.3 Management of Continuous Subcutaneous Insulin Pump

Checklist for perioperative continuation of CSI Pump

Eligibility –

- ☐ *Minor surgery (surgery requiring 1 missed meal only)*
- ☐ *No body X-ray screening (chest, neck, abdomen, torso)*
  - *For dental or limb X-rays, pump should be covered by lead apron*
- ☐ *Patients capable of self-managing their diabetes appropriately*

Preparation –

- ☐ *Re-siting of infusion set on the day before surgery*
- ☐ *Adequate supply of pump consumables over hospital stay*
- ☐ *Safe positioning of Infusion set – plastic catheter used, away from operative field/diathermy and is accessible to anaesthetist*
- ☐ *Clear patient understanding that pump must be set to 'sick day' or 'sleep' basal rates during fasting and only restart bolus regime when eating adequately ie.*
  - *AM list: continue the basal rate, do not give bolus insulin*
  - *PM list: With an early light breakfast (0700 or before), a measured bolus dose is given. From 0700 while fasting, set pump infusion to 'sick day' or 'sleep' basal rate*

NB

- **DO NOT** monitor BCG via patient's CSI Pumps nor patient's continuous glucose monitoring device (due to potential inaccuracy and lag of measurement using such devices)
- Care must be taken to avoid occlusion or cessation of pump therapy, which could render pump-user insulin deficient quickly if alternative insulin is not provided

⚠ Perioperative Continuous SC Insulin Pump is contraindicated in

- **Major surgery**, as significant stress from surgery, large fluid shift or perioperative hypotension may decrease skin perfusion leading to erratic SC insulin absorption
- **Procedures where screening radiology of the trunk** is required, as X-ray exposure to insulin pump must be avoided to prevent potential pump failure

⚠ Therefore, provide alternative insulin by one of the two techniques described below –

1. **Change to IV GIK protocol**
   - If possible, start IV GIK 30 min before removing the CSI pump
   - Confirm the 24 hr insulin dose from CSI Pump interrogation, select an GIK insulin scale
   - Titrate subsequent infusion rate to CBG

OR 2. **Replace CSI Pump basal insulin with SC Lantus insulin**

   - Confirm the 24 hr basal dose from CSI Pump interrogation
   - Give half of the equivalent dose as SC Lantus insulin 2 hr before pump disconnection eg. 12 units/24 hrs via CSI Pump → 6 units Lantus SC

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4. References

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