Disclaimer:
Our recommendations are based on current national guidelines and relevant evidence-base. This guideline helps inform clinicians clinical judgement. However, clinicians will consider the trade-off between the benefits and harms of an intervention before making a clinical decision.

GDL09

Guidelines for Peri-Operative Management of Adult Patients with Diabetes Undergoing Surgery

1.0 Procedure Statement (Purpose / Objectives of the Procedure)

This clinical guideline has been developed in response to the NCEPOD report in relation to Diabetes Management prior to elective surgical procedures and provides a clear guidance for all health professionals regarding the referral of patients with poorly controlled Diabetes requiring surgery to the Diabetes pre-operative clinic.

Specific aims are:

- To ensure quick and appropriate referrals to the Diabetes team for patients waiting for surgery and reduce the risk of late cancellations of surgical procedures due to poorly controlled Diabetes.
- To support pre-operative assessment with managing Diabetes medications whilst patients are fasting.
- To support inpatient areas with managing hypo and hyperglycemia prior to and after surgery.

2.0 Accountabilities

The Diabetes Team are accountable for the initial ratification of this guideline. They are responsible for the ongoing monitoring and development of practice in Management of Diabetes in a Pre-Operative setting.

Anaesthesia Team are accountable for distributing the guideline to all staff within their specialty and will be actively involved in consultation processes for updates to this guideline.

Healthcare Professions leaders and managers (medical, nursing, midwives and other allied healthcare professionals) are accountable for distributing this guideline to all relevant staff within their spheres of responsibility.

All relevant healthcare staff are accountable for following this guideline and for reporting any incidents of non-compliance (whether this has had an adverse effect or not).

Ward Teams: the ward team (which may comprise medical staff, physicians associates, registered midwives, advanced nurse practitioners and nonmedical prescribers) must ensure that the management of diabetes in a pre-operative situation is adhered to.

3.0 Procedure/Guidelines Detail / Actions

See guideline body – appendix 1.

4.0 Equipment Required

None

5.0 Training

This guideline will be available on the trust intranet under Diabetes, Anaesthesia and Surgical specialties.

Training will be offered to the Pre-Operative teams across RWHT on guideline launch. No additional training is required for medical staff who are accessing this document.

6.0 Financial Risk Assessment

1	Does the implementation of this document require any additional Capital resources	No
2	Does the implementation of this document require additional revenue resources	No
3	Does the implementation of this document require additional manpower	No
4	Does the implementation of this document release any manpower costs through a change in practice	No
5	Are there additional staff training costs associated with implementing this document which cannot be delivered through current training programs or allocated training times for staff.	No
	Other comments	

7.0 Equality Impact Assessment

An equality analysis has been carried out and it indicates that:

Tick	Options
X	A. There is no impact in relation to Personal Protected Characteristics as defined by the Equality Act 2010.
	B. There is some likely impact as identified in the equality analysis. Examples of issues identified, and the proposed actions include:

8.0 Maintenance

The guideline will be reviewed once a year or sooner if dictated by changes in national guidance. The Diabetes Team will be responsible for coordinating the review and ratifying any amendments prior to final approval by the Trust Management Team.

9.0 Communication and Training

Initial face to face training will be offered to all pre-operative teams across RWHT as

well as virtual training if required. This training will cover the background behind the guideline production as well as it's implementation in general practice.

10.0 Audit Process

Criterion	Lead	Monitoring method	Frequency	Evaluation
Cancelled surgery/position on waiting list/Datix	Dr D. Meessala	Clinic audit	Annually	Departmental governance meetings.

11.0 References - Legal, professional or national guidelines

This guideline has been developed in response to the following documents:

- NICE Guideline NG180: Perioperative Care in Adults (2020).
  NICE Guideline Template
- National Confidential Enquiry into Patient Outcome and Death (NCEPOD).
  Perioperative Diabetes: Highs and Lows (2018)
  NCEPOD - Perioperative Diabetes: High and Lows(2018)
- Guideline for Perioperative Care for people with Diabetes Mellitus undergoing elective and emergency surgery (Updated December 2022).
  JBDS_03_CPOC_Diabetes_Surgery_Guideline_Updated_2022.pdf (abcd.care)
- The hospital management of Hypoglycaemia in adults with Diabetes Mellitus (Revised January 2023).
  JBDS 01 Hypo Guideline with qr code.pdf (amazonaws.com)
- Diabetes GIRFT Programme National Specialty Report (2020).
  Layout 1 (gettingitrightfirsttime.co.uk)
- Royal Wolverhampton NHS Trust: Algorithm for treatment of Hypoglycaemia
  Algorithm_treatment_Hypoglycaemia_adults_diabetes_hospital (10).pdf
- Royal Wolverhampton NHS Trust: Inpatient management of Hyperglycaemia and Hyperglycaemia emergencies.
  inpatient_management_hyperglycaemia_and_hyperglycaemic_emergencies-2022-V5.pdf

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Part A - Document Control

Procedure/ Guidelines number and version Version 1.0 GDL09	**Title of Procedure/Guidelines** GDL09: Guidelines for Peri-Operative Management of Adult Patients with Diabetes undergoing surgery.	**Status:** Final		**Author:** J. Dudley Senior Diabetes Specialist Nurse **For Trust-wide Procedures and Guidelines Chief Officer Sponsor:** Dr B McKaig.
Version / Amendment History	Version	Date	Author	Reason
	1.0	Nov. 2023	Senior Diabetes Specialist Nurse	Implementation of guideline
Intended Recipients: All clinical staff caring for adult patients with Diabetes undergoing a surgical procedure.				
Consultation Group / Role Titles and Date: Dr R. Raghavan, CD Diabetes & Endocrinology Dr M Ahuja, CD Anaesthetics Dr D, Meesala, Consultant Anaesthetist				
Name and date of group where reviewed	Diabetes and Endocrinology Departmental Governance Meeting November 2022 Trust Policy Group – November			
Name and date of final approval committee (if trust-wide document)/ Directorate or other locally approved committee (if local document)	Trust Management Committee – November 2023			
Date of Procedure/Guidelines issue	December 2023			
Review Date and Frequency (standard review frequency is 3 yearly unless otherwise indicated – see section 3.8.1 of Attachment 1)	November 2024 - Annual Review			

Training and Dissemination: Shared via Surgical and Diabetes Governance meetings. Cascaded via Matron and Departmental Managers across Surgical directorate. Diabetes Outreach Team to share with wards and staff via local level training.	
To be read in conjunction with: N/A	
Initial Equality Impact Assessment: Completed No **Full Equality Impact assessment (as required): Completed NA** If you require this document in an alternative format e.g., larger print please contact Policy Management Officer 85887 for Trust- wide documents or your line manager or Divisional Management office for Local documents.	
Contact for Review	Jenny Dudley – Senior Diabetes Specialist Nurse Jenny.dudley@nhs.net
Monitoring arrangements	Datix, complaints
Document summary/key issues covered.	• This guideline has been drafted in response to a report generated nationally in relation to the management of patients with Diabetes undergoing surgical procedures. It has also been discussed within the Diabetes GIRFT visit. The national report can be found here: NCEPOD - Perioperative Diabetes: High and Lows(2018) • The care of patients with diabetes is complex and this is particularly true of those undergoing surgery. The care can cross numerous specialties which can compound the issue of diabetes not being managed consistently. • The recent National Diabetes Inpatient Audit (NaDIA) showed that 18% of inpatients have diabetes and previous work has shown that more than 15% of patients undergoing surgical procedures are known to have diabetes, therefore it is essential that all staff are familiar with diabetes management to ensure care of the patient's glycaemic control, along with the clinical reason for their admission and surgery is coordinated and appropriate. • The national report summarises a variety of recommendations, this guideline is produced in relation to several of these. The first discusses generating a standardised referral process for patients with Diabetes undergoing elective surgery, to ensure appropriate assessment and optimisation of diabetes. The second being the involvement of the Diabetes MDT where required to support patients through the perioperative process. The third being ensuring that patients with Diabetes attending a pre-operative assessment clinic have

	access to the Diabetes MDT and written instructions regarding their Diabetes management plan. • This guideline has also been discussed in relation to a serious incident investigation, where a patient suffered harm as a result of incorrect diabetes management prior to surgery.
Key words for intranet searching purposes	Diabetes. Surgery. NCPOD. Pre-Op care.

Pre-operative adjustment of insulin in adult patients with Diabetes

Insulin	Day before admission	Day of surgery	
		AM Surgery	**PM Surgery**
Once daily ONLY (no other insulin taken) (e.g. Lantus, Levemir, Tresiba, Toujeo, Abasaglar, Insulatard, Humulin I, Insuman Basal)	**Reduce** dose by **50%** ****DO NOT FOLLOW THIS GUIDANCE IF PATIENT ALSO TAKES RAPID ACTING INSULIN AS WELL****	Check blood glucose on admission	Check blood glucose on admission
Twice daily pre-mixed (e.g. Novomix 30, Humulin M3, Humalog Mix 25, Humalog Mix 50, Insuman Comb 25, Insuman, Comb 50, twice daily)	**No** dose change	**Reduce** the **morning** dose by **50% (half).** Check blood glucose on admission. Leave the **evening** meal dose **unchanged**.	**Reduce** the **morning** dose by **50% (half).** Check blood glucose on admission. Leave the **evening** meal dose **unchanged**.
Twice daily intermediate/long acting insulin (e.g. Lantus, Levemir, Abasaglar, Insulatard, Humulin I Insuman Basal)	**Reduce** the **PM** dose by 50%	**Reduce** the **AM** dose by **50% (half).** Check blood glucose on admission. Leave the **evening** meal dose **unchanged.**	**Reduce** the **AM** dose by **50% (half).** Check blood glucose on admission. Leave the **evening** meal dose **unchanged**.

For adult patients on insulin given once or twice a day only:

Pre-operative adjustment of insulin

For adult patients on insulin given 3 or more times a day:

Insulin	**Day before admission**	**Day of surgery**	
		AM Surgery	**PM Surgery**
Three injections of pre-mixed insulin (E.g. Humalog Mix 50, Novomix 30, Humalog Mix 25)	No dose changes	**Reduce** the **morning** dose by 50% and **omit lunchtime dose.** Check blood glucose on admission. Leave the **evening** dose **unchanged** as long as eating post-op	**Reduce** the **morning** dose by 50% and **omit lunchtime dose.** Check blood glucose on admission. Leave the **evening** dose **unchanged** as long as eating post-op
Multiple injections of 2 different insulins **Long acting:** (e.g. Lantus, Levemir, Tresiba , Toujeo, Abasaglar) **PLUS** **Short acting** (e.g. Novorapid, Fiasp, Humalog, Lyumjev)	No dose changes for any insulin	**Continue the long acting** (once daily) insulin dose as normal. **Omit** the **mealtime** (quick acting) insulin until eating and drinking. Check blood glucose on admission. **Restart mealtime** (quick acting) insulin **once eating and drinking** post-op.	**Continue the long acting** (once daily) insulin dose as normal. **Omit** the **mealtime** (quick acting) insulin until eating and drinking. Check blood glucose on admission. **Restart mealtime** (quick acting) insulin **once eating and drinking** post-op

Pre-operative adjustment of non-insulin injectable therapies in adult patients

GLP-1 analogue injection	**Day before admission**	**Day of surgery**	
		AM Surgery	**PM Surgery**
Once/twice daily (e.g. Liraglutide, Lixisenatide, Exenatide, Saxenda)	**No** dose change	**Omit** on day of surgery Restart following day if eating and drinking.	**Omit** on day of surgery Restart following day if eating and drinking.
Once weekly (e.g. Dulaglutide, Bydureon, Semaglutide, ~~Saxenda~~)	**No** dose change	**Omit** on day of surgery (if once weekly dose due that day) Restart following day if eating and drinking.	**Omit** on day of surgery (if once weekly dose due that day) Restart following day if eating and drinking.

Additional notes for Adult Insulin pump users

Patients on Insulin Pumps: Should be advised to contact their diabetes specialist nurse for advice.

Usual advice is to run pump as usual prior to admission. On admission start IV insulin (VRII) then remove insulin pump.

Patients should remain on VRII until eating and drinking as normal post-op and are able to manage their pump independently.

A 30 minute overlap should be given between starting VRII and removing insulin pump (and vice-versa).

Pre-operative adjustment of diabetes tablets in adult patients:

Tablets	**Day before admission**	**Day of surgery**	
		AM Surgery	**PM Surgery**
Acarbose	Take as normal	Omit morning dose if NBM	Give morning dose if eating
Metaglinide (Repaglinide or Nateglinide)	Take as normal	Omit morning dose if NBM	Give morning dose if eating
Metformin If you are due to have contrast media, omit on the day of the procedure and the following 48 hours	Take as normal	Once a day no omission Twice a day no omission Three times a day **omit lunchtime dose**	Once a day no omission Twice a day no omission Three times a day **omit lunchtime dose**
Sulphonylurea (e.g. glibenclamide, gliclazide, glipizide, glimeperide)	Take as normal	If taken **once daily** ~~in the morning –~~ omit the dose that day If taken **twice daily** – omit the morning dose that day	If taken **once daily** ~~in the morning –~~ omit the dose that day If taken **twice daily** – **omit both** doses that day
Thiazolidinediones Pioglitazone	Take as normal	Take as normal	Take as normal
DPP-4 Inhibitor (e.g. sitagliptin, vildagliptin, saxagliptin, alogliptin, linagliptin)	Take as normal	Take as normal	Take as normal
SGLT-2 inhibitors (e.g. dapagliflozin, canagliflozin, empagliflozin)	Take as normal	**Omit on day of surgery**	**Omit on day of surgery**
Oral GLP-1 analogue (Rybelsus)	Take as normal	**Omit on day of surgery**	**Omit on day of surgery**

The Diabetes Specialist Nurses can be contacted for advice on 01902 695310- Mon-Fri 9am-4.30pm.
(Please ensure you have all the patients' diabetes medication/doses to hand as well as the latest HbA1c).

Guidelines for pre-operative management of diabetes – Version 3

Additional Guidance

Management of hyperglycaemia in adults on admission on day of surgery

Blood glucose >12mmol/L either pre or post-surgery:

- Check for ketones (If blood ketones >3mmol/L or urine ketones greater than +++ cancel surgery and follow DKA guidelines and contact either the Diabetes Outreach Team or on call Medical team for advice on management. (http://intranet.xrwh.nhs.uk/pdf/departments/diabetes/Mgmt_of_DKA_and_HHS.pdf)

Pre-operative hyperglycaemia with low/no ketones:

- **Type 1 diabetes:** Give sub cutaneous rapid acting insulin (Novorapid/Humalog/Apidra/Actrapid) and assume that 1unit will drop blood glucose by 3mmol/L. Recheck blood glucose after an hour to ensure falling. If not falling and surgery cannot be cancelled, start VRII and continue peri-operatively until eating and drinking. Follow RWT protocols for VRII
- **Type 2 diabetes:** Give 0.1u/kg of rapid acting insulin (Novorapid/Humalog/Apidra/Actrapid) and recheck blood glucose level in 1 hour to ensure falling. If not falling and surgery cannot be delayed, consider VRII.

Post-operative hyperglycaemia with no/low ketones:

- **Type 1 diabetes:** give subcutaneous rapid acting analogue insulin (Novorapid/Humalog/Apidra/Actrapid), assume that 1 unit will drop blood glucose by 3mmol/L BUT wherever possible take advice from the patient about the amount of insulin normally required to correct a high blood glucose. Recheck the blood glucose 1 hour later to ensure it is falling. If after 2 hours the blood glucose level is not falling, consider repeating the dose of rapid acting insulin but note the response to the previous dose to help decide on further treatment. Seek advice from either the Diabetes Outreach Team, on call Medical team and/or start VRII.
- **Type 2 diabetes:** Give 0.1u/kg of rapid acting insulin (Novorapid/Humalog/Apidra/Actrapid) and recheck blood glucose level in 1 hour to ensure falling. Recheck the blood glucose 1 hour later to ensure it is falling. If after 2 hours the blood glucose level is not falling, consider repeating the dose of rapid acting insulin but note the response to the previous dose to help decide on further treatment. Seek advice from either the Diabetes Outreach Team, on call Medical team and/or start VRII.

Additional Guidance

Management of hypoglycaemia in adults pre-operatively:

- Pre-op hypoglycaemia (blood glucose level <4mmol/l) give either 1 to 2 tubes of glucogel or (if IV access available) 75-100mls of 20% dextrose (at 300-400mls/hr via infusion pump) and repeat the capillary blood glucose level after 10 minutes. Repeat treatment at 10 minute intervals until blood glucose >4mmol/l.
- Ensure regular blood glucose monitoring if patients have experienced pre-op hypoglycaemia or if blood glucose level on admission is 4-6mmol/l. (Remember patients on diet treatment, Metformin alone or DPP4 inhibitors are unlikely to experience hypoglycaemia).
- Ensure that the anaesthetist is aware if patients experience hypoglycaemia pre-op.

Discharging patients with diabetes after surgery:

- Warn the patient that their blood glucose control may be erratic for a few days after the procedure, and if possible, they should check their blood glucose more frequently.
- Blood glucose levels between 5 and 12mmol/L for a few days after surgery is the expected normal range, if either hypoglycaemia or hyperglycaemia becomes frequent, patients should be advised to contact their diabetes healthcare provider.

Guidelines for pre-operative management of diabetes – Version 3

Patient Instruction Leaflet for patients with diabetes controlled with insulin or tablets undergoing surgery or a procedure requiring a period of starvation

Before your operation or procedure:

Please follow the instructions below marked "What to do with your insulin or tablets before surgery/procedure".

If your operation or procedure is in the morning:

- Do not eat any food after…….
- Drink clear fluids such as water up until ……

If your procedure is in the afternoon:

- Eat breakfast before ……. and eat nothing else after this time.
- Drink clear fluids such as water up until ……

When you travel to/from the hospital for your operation always carry some glucose tablets or a sugary drink with you in case your blood sugar drops.

If you have any symptoms of a low blood sugar (shaky, sweaty, dizzy, blurred vision) please check your blood sugar (glucose) level. If it is below 6mmol/l take either 6 dextrose tablets or 150mls of the sugary drink (half a normal sized can of fizzy pop or a whole fun size can). Please tell the hospital staff on admission that you have treated a hypo event and at what time the event occurred.

After your procedure your blood sugar levels will be checked by the ward staff, and you will be given insulin if your blood sugar levels rise too much.

Once you can eat and drink you should restart your normal diabetes medications.
Expect your blood sugars to be a little bit different for a few days after your surgery but if they are persistently above 15mmol/l or below 5mmol/l please see your usual diabetes provider (your GP/local diabetes specialist nurse or 111 if outside opening hours).

What to do with your insulin or tablets before surgery/procedure:

……

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References:

JBDS (2016). *Management of adults with diabetes undergoing surgery and elective procedures: improving standards*. [ebook] London. Available at: http://www.diabetologists-abcd.org.uk/JBDS/Surgical_guidelines_2015_full_FINAL_amended_Mar_2016.pdf.

JBDS (2013). *The management of diabetic ketoacidosis in adults.*[ebook] London. Available at: https://abcd.care/sites/abcd.care/files/resources/2013_09_JBDS_IP_DKA_Adults_Revised.pdf.

JBDS (2018). *The hospital management of hypoglycaemia in hospital in adults with diabetes mellitus.*[ebook] London. Available at: https://abcd.care/sites/abcd.care/files/resources/20180508_JBDS_HypoGuideline_Revised_v2.pdf

Pre-Operative and Diabetes Management – in adult patients.

Pre-Op Clinic Stage.

Patient with Diabetes attends pre-op.

HbA1c below 64mmol/mol (8.5%)

- List patient for surgery.

Remind patient of the need to maintain good glycaemic control pre and post-surgery.

If HbA1c is >64mmol/mol and surgery is going ahead regardless please refer to GP for ongoing diabetes management.

HbA1c above 64mmol/mol (8.5%)

- Inform patient that surgery will be postponed until they achieve better glycaemic control.
- Ensure compliance with current medication (Check against GP records via Portal).
- Encourage blood glucose monitoring regularly (see below). If not blood glucose monitoring give patient a meter and encourage regular monitoring (see below).
- Encourage sensible diet.
- Gain consent for referral to Wolverhampton DSN team – patient may already be under a specialist team and prefer to be seen by them.

Blood Glucose Monitoring

Patients should be blood glucose testing at least twice a day in the following pattern: One day test BEFORE breakfast and BEFORE Evening meal, the next day test BEFORE lunch and BEFORE bedtime, then repeat this pattern.

Ensure they have a working blood glucose meter (if not replace) and a diary to record the results.

Pre-Operative and Diabetes Management – in adult patients.

Diabetes Nursing Team Stage.