Peri-Operative Guidelines for Management of Diabetes Patients

Target blood glucose 6-10 mmol/l for all patients

Acceptable blood glucose 4-11 mmol/l for all patients

**DEFINITIONS**

Non-Insulin Glucose Lowering medications (NIHM) include all oral hypoglycaemics and injectable GLP1 analogues like Exenatide (Byetta), Lixisenatide (Lyxumia) and Liraglutide (Victoza)

**Minor surgery**: Daycase or overnight stay but likely to resume normal oral intake within 24hrs

**Major surgery**: Unlikely to resume normal intake within 24hrs

**VRII**: Variable Rate Insulin Infusion
**PRE-OPERATIVE ASSESSMENT FOR DIABETES MELLITUS:**

Check HbA1c and follow usual pre-operative protocols (see flowchart next page)

Desired pre-operative HbA1c value: Less than 69 mmol/mol (8.5%)

For patients needing referral to diabetes services pre-operatively complete Form DIAB R1

Incidental glycosuria: In non-diabetic patients if a routine urine test reveals glycosuria, check HbA1c. If HbA1c > 48 mmol/mol (6.5%), patient may have diabetes. Defer surgery if possible (discuss with anaesthetist) and refer to GP. If HbA1c ≤ 48 mmol/mol (6.5%) proceed to surgery.

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**HYPOGLYCAEMIA MANAGEMENT IN THE PERI-OPERATIVE PERIOD**

**Pre procedure Hypoglycaemia:**
- If pre-operative BM 3.1 - 3.9 mmol/L, alert Anaesthetist/Medical Staff who may commence IV Dextrose +/- VRII.
- If BM 3.0 mmol/L or less, send a sample for lab glucose and follow local hypoglycaemia management protocol; alert Anaesthetist/Medical Staff.

**Post procedure hypoglycaemia:**
- If post procedure BM 3.1 – 3.9 mmol/L, treat as per local hypoglycaemia management guideline, ensure patient is alert and able to resume normal oral intake. Once BM > 4.0, Discuss with medical staff prior to discharge
- If BM < 3.0 send sample for lab glucose, treat as per NHSL hypoglycaemia management guideline and arrange review by Anaesthetist or Senior Medical Staff.
- The NHSL hypoglycaemia management guideline can be found on firstport on the Diabetes MCN page
Pre-assessment of all diabetes patients

HbA1c > 69 mmol/mol

Consider referral to diabetes team (form DIABR1)

(For emergency admission)

If delay not possible start VR11 pre-op as per section 3 or section 4 of protocol and refer to diabetes team post-op

HbA1c < 69 mmol/mol

Delay 6 weeks

Patient ready for procedure

Elective/Non-urgent

Procedure: Minor (same day discharge) or Major (overnight stay necessary)

Minor Procedure ①

Diet/Tablets

Go to Section 1 of protocol

Insulin Treated

Go to Section 2 of protocol

Major Procedure ②

Diet/Tablets

Go to Section 3 of protocol

Insulin Treated

Go to Section 4 of protocol

For ALL PATIENTS

Post-procedure and pre-discharge check for any advice necessary for metformin.

If feet high risk check pre-discharge and alert diabetes podiatry if necessary (form DIABR1)

① Minor Procedure: Day case or overnight stay likely to resume normal oral intake within 24hrs

② Major Procedure: Overnight stay and unlikely to resume normal oral intake within 24hrs
SECTION 1:
Diet controlled & Non Insulin treated patients undergoing minor surgery or day case procedures (including radiological procedures with or without contrast administration)

Diet controlled patients:
Check BM stix on admission & 4 Hourly
If glucose between 4 and 11 mmol/l, no further action necessary
If glucose > 11 mmol/l, advise anaesthetist who may consider Variable Rate Insulin Infusion VRII (Appendix 1)

Non-insulin treated patients:
Morning list:
- Usual medications day before surgery.
- Omit breakfast and all non-insulin glucose lowering medications on morning of procedure.
  Allow water upto 2hrs preop.
- Check BM stix on admission and 2 hourly.
- If glucose between 4 and 11 mmol/l, no further action necessary
- Restart oral hypoglycaemic drugs with first meal post procedure.
- If BM > 11 mmol/l, consider VRII and monitor BM 1 hourly (during procedure) (see Appendix 1)
- Stop IV insulin when eating/drinking and restart usual medications with first meal post procedure

Afternoon list: (avoid if possible)
- Light breakfast may be allowed.
- Omit all hypoglycaemic medications and check BM stix on admission. Then follow advice as per morning list

Note for patients taking metformin: If patient needed radiological contrast during procedure, omit metformin for 48 hours post procedure and request GP to repeat UEC after 48 hours.

Please give Form A to patient who should take it to his/her GP.
SECTION 2: INSULIN TREATED PATIENTS & MINOR SURGERY

Insulin treated patients undergoing minor surgery or day case procedures (including radiological procedures with or without contrast administration)

- Usual insulin and oral hypoglycaemic tablets (if any) day before including long acting (basal) insulin
- Check BM stix at admission and 1-2 hourly.

Morning list:

- Omit breakfast short acting or pre-mixed insulin (like Novorapid, Humalog, Apidra, Humulin S, Novomix 30, Humulin M3, Humalog Mix 25, Humalog Mix 50, Mixtard 30) and tablets (if any) on morning of surgery
- If patient takes a long acting insulin (like Lantus, Levemir, Humulin Insulatard) in the morning, half of usual dose may be given in the morning
- Monitor BMs 1-2 hourly
- If BM 4-11 and patient is anticipated to make a quick recovery and is not expected to miss more than one meal, IV insulin is not necessary.
- If BM>11 pre-procedure, advise anaesthetist who may consider starting VRli (see appendix 1-VRlii).
- Restart short acting insulin and tablets with next meal; if on twice daily pre-mixed insulin (like Humulin M3, Novomix 30, Humalog Mix25 or Mix 50), give half of usual morning dose with lunch.
- If the patient is likely to miss more than one meal and likely to remain fasted till evening, IV insulin infusion should be started in the morning prior to procedure (see pre-op assessment or discuss with anaesthetist) and continue till patient able to eat/drink, when usual insulin should be restarted.

Afternoon list:
(Avoid if possible but do not transfer to another site if specialty access is only afternoon list)

- Usual medications and insulin day prior to surgery including long acting insulin
- Omit all non-insulin glucose lowering medications on day of surgery; however patients with type 1 diabetes should take their usual long acting insulin if they take it in the morning.
- If patient allowed light breakfast, to take half dose of morning short acting/pre-mixed insulin.
- Check BM 2 hourly pre-procedure and hourly during and after procedure.
- If BM>11 pre-procedure advise anaesthetist who may consider starting VRlii (appendix 1).
- Restart usual medications and insulin with next meal.
- If unable to eat/drink post procedure, will need VRli until able to do so.

Note for patients taking metformin:

If patient needed radiological contrast during procedure, omit metformin for 48 hours post procedure and request GP to repeat UEC after 48 hours.

Please give Form A to patient who should take it to his/her GP.
SECTION 3: MAJOR SURGERY (NEEDING OVERNIGHT ADMISSION)

Diet controlled patients undergoing major surgery:

- Target blood glucose is 6-10 mmol/l for all patients although (4-11) is acceptable.
- Random venous glucose and UEC to be checked prior to surgery.
- If Blood glucose level is 4-11 mmol/l no further action required but monitor blood glucose 2 hourly.
- If random glucose is > 11 mmol/l, patient will need VRII (Appendix 1) and blood glucose should be monitored 1 hourly.
- BM to be checked pre-procedure and hourly during procedure.
- Use VRII (Appendix 1) if BM>11 until eating/drinking. If BMs persist above 12 when on oral diet, request input from diabetes team for most appropriate treatment.

Non-insulin treated diabetes patients undergoing major surgery:

- Target blood glucose is 6-10 for all patients although (4-11) is acceptable.
- Random venous glucose and UEC to be checked prior to procedure.
- Usual medications day before surgery.
- Omit all non-insulin glucose lowering medications on day of surgery.
- Check BM in morning and then 1 hourly during procedure and 2 hourly during recovery phase in first 24 hours. (This may be done 4 hourly if patient is stable and all BMs <10).
- If random glucose or BM>11 commence VRIII. (see Appendix 1)

Note that serum potassium and renal function must be monitored at 12 hours and thereafter at least every 24 hours or more frequently (if abnormal) for patients on intravenous insulin.

- Restart usual medications when able to take normal oral diet.
SECTION 4: MAJOR SURGERY & INSULIN TREATED PATIENTS

- Target blood glucose is 6-10 mmol/l in all patients—change regime as outlined below*
- 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)
- Random venous glucose and UEC to be checked prior to procedure.
- Usual insulin day before surgery.
- Commence VRII on morning of surgery. (Appendix 1)
- Continue longacting insulins alongside IV insulin peri and post operatively. - So for patients receiving Insulin Glargine (Lantus), Humulin I, Insulin Detemir (Levemir) or any other basal insulin, such should be continued alongside IV insulin on a daily basis. This would enhance quick switching to sc insulin when patient is able to eat/drink and also prevent DKA if IV inadvertently discontinued.
- Serum potassium must be monitored postoperatively at 12 hours and then every 12 or 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 40-60mmol 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
- Switch to subcutaneous insulin** when eating meals – discontinue VRII only after sc insulin has been administered. Introduce oral and other glucose lowering medications once eating/drinking normally.

*Note: If BM > 20 persistently, lab glucose and blood ketones (or serum bicarbonate) must be checked. If there is evidence of diabetic ketoacidosis, please revert to DKA protocol. Hospital Diabetes team must be contacted in this scenario.

**Note: Patients who need TPN or parenteral feeding post operatively will need to be prescribed a suitable sc insulin regime – contact Hospital Diabetes Team

References:
1. Management of adults undergoing surgery and elective procedures: NHS Diabetes, April 2011 (Joint working party report)
3. NHSL Planned Care Clinical Protocols 2007-2012
Dear Dr

Your patient was discharged on ……/…../20

The patient’s pre-assessment / admission eGFR was ..........ml/min.

Note metformin was stopped as patient received iodine containing contrast medium which may affect kidney function.

Please check patient’s renal function in 48 hours and restart metformin if there has been no deterioration in eGFR.

Thanking you
This protocol is not suitable for intensive care or obstetric patients.
This protocol is not suitable for DKA / HONK patients.

Preparation & Connection:

- VRIII must be prescribed on both the main prescription chart (‘drug Kardex’) and the form overleaf. Fluids should be prescribed separately on fluid prescription chart.
- An insulin syringe must always be used to measure and prepare insulin for IV infusion. Intravenous syringes (calibrated in mls) must never be used for insulin administration or preparation. The term “Units” should be used in all contexts. Other abbreviations such as “U” or “IU” should never be used to avoid prescription errors.
- Prepare 50 units of Human soluble Insulin (Actrapid or Humalog) in 49.5 mls 0.9% Sodium chloride, i.e. 1 unit/ml and use a syringe pump for infusion as per scale below.
- Intravenous fluids will be necessary for all patients with type 1 diabetes and those type 2 diabetes patients who will remain on IV insulin longer than 6 hours.
- Initially use infusion of 500mls of (0.45% saline & Glucose 5%) +/- 0.15% potassium chloride, i.e. 10mmol/500mls (If Potassium <5.0 mmol/l) to run through volumetric pump at a rate of 100mls/hr.
- Subsequently 0.45% saline & Glucose 5% + 0.3% KCL can be used based on serum potassium level which should be checked postoperatively at 12 hours and then regularly, at least once every 24 hours.
- The above fluid regimen may need alteration in certain patients (eg. type 1 diabetes) given their fluid status and other co-morbidities; always discuss with Anaesthetist if in doubt
- Omit Potassium in IV fluids if potassium >5.0 or in dialysis dependent patients.
- Insulin and glucose infusions should both be given through the same IV cannula, to prevent accidental administration of insulin without glucose. Connect the insulin line to the glucose line using a suitable Y-Connector which must contain anti-reflux and anti-syphon( one way) valves to prevent retrograde flow of insulin should the cannula become blocked.

Recommended set for use is Vygon Protect-a-line 2 (Version 0832.04R)

- Do not use a 3-way-tap for connection of the above lines.
- Do not give IV drug or IV infusions through the insulin cannula.
- Fluid choice and volume should be adjusted to patient's need. Patients at a risk of fluid overload (e.g. Cardiac failure, renal failure) may get 10% glucose at 50mls/hour.
- The patient may require extra fluids during the peri-operative period to meet their total fluid requirement. This should be assessed and replaced appropriately and infused through a separate IV cannula.
- To reduce the risks of Hyperchloraemic acidosis in surgical patients, Hartmans solution can be used as infusion of 1 litre Hartmans increase blood glucose by no more than 1 mmol/L.

Variable rate insulin infusion

- Start IV insulin at 0800 hours or one hour pre-operatively as per guidelines
- The standard infusion rate is prescribed overleaf to achieve target blood glucose of 6-10mmol/L in all patients. However the latter may be adjusted depending on patient’s insulin resistance and sensitivity.
- Continue substrate infusion and VRIII until the patient is eating and drinking and back to normal glucose lowering medications. (see guidelines)
- Insulin should not be administered without fluids except in HDU/ITU setting.

Laboratory Investigations

- Check urea & electrolytes daily whilst patient on infusion.

Ideally prescription and infusion of IV insulin & IV fluids should be started preoperatively. However this should not cause any delays in starting surgical lists.
If blood glucose < 4 mmol/L, stop insulin infusion and contact medical staff immediately. Give 100-200 mls of 10% glucose over 5-10 minutes to treat hypoglycemia and check blood glucose / 15 min until stable.

<table>
<thead>
<tr>
<th>Blood glucose (mmol/L)</th>
<th>Rate (ml/hr)</th>
<th>Adjusted rate</th>
<th>Comments</th>
</tr>
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<tbody>
<tr>
<td>&lt; 4</td>
<td>None*</td>
<td></td>
<td>Alert doctor</td>
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<tr>
<td>4.0 – 7.9</td>
<td>1</td>
<td>2</td>
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<tr>
<td>8.0 – 10.9</td>
<td>2</td>
<td>3</td>
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<td>11 – 13.9</td>
<td>3</td>
<td>4</td>
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<tr>
<td>14-16.9</td>
<td>5</td>
<td>6**</td>
<td>Alert doctor</td>
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<tr>
<td>&gt;20</td>
<td>6**</td>
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*Caution in Type 1 diabetes. Do not stop insulin infusion for longer than 1 hour, may need to infuse extra 10% dextrose to allow insulin.

**Check lab glucose, serum bicarbonate and finger stix ketones, if ketoacidosis confirmed consider 6 units soluble insulin and revert to DKA protocol.

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>BM Reading mmol/L</th>
<th>Insulin pump infusion rate ml/hour</th>
<th>Signature (1)</th>
<th>Signature (2)</th>
<th>Comments/remaining volume</th>
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*Appendix 2:  Form DIABR1

REFERRAL TO DIABETES SERVICE

<table>
<thead>
<tr>
<th>Patient label</th>
<th>Type of surgery:  Minor/Daycase or major</th>
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<tbody>
<tr>
<td></td>
<td>Date of Surgery: ..........................</td>
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<tr>
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<td>Date of Referral:..........................</td>
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</tbody>
</table>

Why is input needed (pl tick)?

☐ HbA1c >69 mmol/mol
☐ High risk feet
☐ Other (specify)..........................................................

HbA1c: .............................................

Check U & Es (yellow top)

Check urinalysis: if ketones 4+ or large, consider referral to diabetes team urgently; if protein present please send sample for albumin creatinine ratio (ACR)

Document diabetes treatment:

- Diet only  ☐
- Tablet treated  ☐  Is patient taking metformin?  ☐Yes ☐No
- Insulin treated  ☐Yes ☐No
- Byetta / Victoza  ☐Yes ☐No
- Insulin pump  ☐Yes ☐No

Is administration of radiological contrast necessary?  ☐Yes ☐No

Check feet:

Is there active ulceration of feet/heels?  ☐Yes ☐No

Contact details: (a copy of this sheet must be sent for all referrals)

Hairmyres:  Diab Nurses ext 5230;  Podiatry ext 5235
Monklands:  David Matthews Centre ext 3337
Wishaw:  Diab Nurses ext 6066;  Podiatry ext 6359
This is a quick pre-anaesthetic checklist and does NOT replace the NHS Lanarkshire peri-operative diabetes guideline.

This Checklist MUST ALWAYS be used in conjunction with the full guideline.

**PRE-OPERATIVE ASSESSMENT FOR DIABETES MELLITUS:**

Check HbA1c and follow usual pre-operative protocols (see flowchart next page)

Desired pre-operative HbA1c value: Less than 69 mmol/mol (8.5%) 

For patients needing referral to diabetes services pre-operatively complete Form DIAB R1

Incidental glycosuria: In non-diabetic patients if a routine urine test reveals glycosuria, check HbA1c. If HbA1c > 48 mmol/mol (6.5%), patient may have diabetes. Defer surgery if possible (discuss with anaesthetist) and refer to GP. If HbA1c ≤ 48 mmol/mol (6.5%) proceed to surgery.
Pre-assessment of all diabetes patients

HbA1c > 69 mmol/mol

Consider referral to diabetes team (form DIABR1)

Delay 6 weeks

Elective/Non-urgent

HbA1c < 69 mmol/mol

Patient ready for procedure

For emergency admission

If delay not possible start VR II pre-op as per section 3 or section 4 of protocol and refer to diabetes team post-op

Minor Procedure

Diet/Tablets

Go to Section 1 of protocol

Insulin Treated

Go to Section 2 of protocol

Major Procedure

Diet/Tablets

Go to Section 3 of protocol

Insulin Treated

Go to Section 4 of protocol

FOR ALL PATIENTS

Post-procedure and pre-discharge check for any advice necessary for metformin.
If feet high risk check pre-discharge and alert diabetes podiatry if necessary (form DIABR1)

① Minor Procedure: Day case or overnight stay likely to resume normal oral intake within 24hrs

② Major Procedure: Overnight stay and unlikely to resume normal oral intake within 24hrs
SECTION 1:
Diet controlled & Non Insulin treated patients undergoing minor surgery or day case procedures (including radiological procedures with or without contrast administration)

Non-insulin treated patients:

Morning list:
- Usual medications day before surgery.
- Omit breakfast and all non-insulin glucose lowering medications on morning of procedure.

Afternoon list: (avoid if possible)
- Light breakfast may be allowed.
- Omit all hypoglycaemic medications and check BM stix on admission. Then follow advice as per morning list

SECTION 2: INSULIN TREATED PATIENTS & MINOR SURGERY

Insulin treated patients undergoing minor surgery or day case procedures (including radiological procedures with or without contrast administration)

- Usual insulin and oral hypoglycaemic tablets (if any) day before including long acting (basal) insulin

Morning list:
- Omit breakfast short acting or pre-mixed insulin (like Novorapid, Humalog, Apidra, Humulin S, Novomix 30, Humulin M3, Humalog Mix 25, Humalog Mix 50, Mixtard 30) and tablets (if any) on morning of surgery
- If patient takes a long acting insulin (like Lantus, Levemir, Human Insulatard) in the morning, half of usual dose may be given in the morning

Afternoon list:
(Avoid if possible but do not transfer to another site if specialty access is only afternoon list)
- Usual medications and insulin day prior to surgery including long acting insulin
- Omit all non-insulin glucose lowering medications on day of surgery; however patients with type 1 diabetes should take their usual long acting insulin if they take it in the morning.

SECTION 3: MAJOR SURGERY (NEEDING OVERNIGHT ADMISSION)

Non-insulin treated diabetes patients undergoing major surgery:
- Usual medications day before surgery.
- Omit all oral diabetes medications on day of surgery.

SECTION 4: MAJOR SURGERY & INSULIN TREATED PATIENTS

- Usual insulin day before surgery.
- Commence VRII on morning of surgery. (Appendix 1)
- Continue longacting insulins alongside IV insulin peri and post operatively. - So for patients receiving Insulin Glargine (Lantus), Humulin I, Insulin Detemir (Levemir) or any other basal insulin, such should be continued alongside IV insulin on a daily basis. This would enhance quick switching to sc insulin when patient is able to eat/drink and also prevent DKA if IV inadvertently discontinued.
REFERRAL TO DIABETES SERVICE

Patient label

Type of surgery: Minor/Daycase or major

Date of Surgery: ................................
Date of Referral: ................................

Why is input needed (pl tick)?
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HbA1c: .................................................

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Check urinalysis: if ketones 4+ or large, consider referral to diabetes team urgently; if protein present please send sample for albumin creatinine ratio (ACR)

Document diabetes treatment:

Diet only  ☐

Tablet treated  ☐
Is patient taking metformin?  ☐ Yes  ☐ No

Insulin treated  ☐ Yes  ☐ No

Byetta / Victoza  ☐ Yes  ☐ No

Insulin pump  ☐ Yes  ☐ No

Is administration of radiological contrast necessary?  ☐ Yes  ☐ No

Check feet:

Is there active ulceration of feet/heels?  ☐ Yes  ☐ No

Contact details: (a copy of this sheet must be sent for all referrals)

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