

# Diabetes and Surgery Checklist and Guideline Draft 12

This guideline is being tested and altered in collaboration with healthcare professionals involved in peri-operative management of people with diabetes.

## **Aims:**

- To optimise diabetes treatment and management before during and after surgery
- To provide guidance for intravenous insulin prescription

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Please forward any comments/improvement recommendations to:

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Or Tel ext. 36009, bleep 4872

Thank you

## PERI-OPERATIVE DIABETES MANAGEMENT GUIDELINE SBAR

### SITUATION

This guideline is for the management of diabetes in the immediate peri-operative period. Illness and hospital admission can adversely affect blood glucose levels, which can impact on recovery and length of stay. Hyperglycaemia is associated with delayed wound healing and an increased risk of infection. Hypoglycaemia is dangerous if unrecognised and untreated. People with diabetes are at increased risk of foot problems that may predispose to foot ulcers. Regular foot assessment and adequate pressure relief can reduce the risk of ulceration.

### BACKGROUND

Pre operative assessment is essential to identify the complications of diabetes i.e. cardiac, renal, neurological and foot disorders and to optimise glycaemic control. HbA1c is an indicator of glycaemic control over the previous 3 months. The optimal HbA1c is 48 mmol/mol (6.5%), but individual targets can vary depending on age and presence of comorbidities.

### ASSESSMENT (ideally at a pre assessment clinic)

- Check the most recent HbA1c result. If the last sample was taken more than three months ago, send a random venous sample (purple top) to biochemistry to repeat the blood test
- If HbA1c > 75mmol/mol (9%), involve the diabetes team to help optimise glycaemic control in all patients
- Check urea and electrolytes (U & E's) and perform a urine dipstick test (note presence of overt protein or ketones)
- Check for diabetes complications e.g. cardiovascular disease, nephropathy, neuropathy, retinopathy, foot problems
- Determine the length of fast required for the surgery; this will help to plan the appropriate management of the diabetes medication in the peri-operative period

### RECOMMENDATION

In all patients who are usually prescribed multiple daily injection regimens, **continue the subcutaneous long acting insulin** Glargine (Lantus), Detemir (Levemir), Insulatard, Humulin I) daily, in conjunction with treatment with IV insulin. This is recommended to reduce the risk of Diabetic Ketoacidosis and to aid a safe transfer to subcutaneous insulin post operatively.

#### Before surgery – All patients

- Discuss complex patients with an appropriate member of the diabetes team in good time prior to surgery if possible
- Check random venous glucose and U & E's on the day prior to surgery
- Agree target blood glucose levels (e.g. 5-9 mmol/L) and the frequency of monitoring required pre and post operatively
- Stop GLP-1 analogues and oral diabetic medication, including Metformin, on the day of surgery
- Inform the patient of what peri operative management to expect and agree an appropriate self management plan

#### Day Case /Short fast / Minor surgery

- Aim for 'first on the list'
- Omit all diabetes medication and insulin on morning of surgery and avoid glucose infusions if possible
- If a rapid recovery is expected and the patient is expected to eat by lunchtime, IV insulin is not necessary
- IV insulin will be required if patient is unable to tolerate diet, if blood glucose is elevated >14mmol/L or if ketones are present (blood or urine)
- Restart the usual diabetes medication as prescribed (except Metformin – see below) with the first meal post-operation
- If a BD insulin regimen is restarted at lunchtime, give half the usual 'breakfast' insulin dose with lunch

#### Major surgery / Long Fast

- IV insulin will be required for all insulin treated patients
- IV insulin will be required for the majority of tablet/ GLP-1 analogue treated patients
- Omit usual diabetic treatment on morning of operation (except daily long acting insulin as above)
- Ideally start IV insulin and IV fluid regimen early (06 00 – 08 00 hours) on the morning of operation
- Ensure that diabetes medication is prescribed appropriately before IV insulin is stopped
- When clinically stable and tolerating fluid and food, resume diabetes medication at a suitable mealtime
- Monitor and review glycaemic control post operatively by checking mealtime blood glucose four times daily
- Adjust medication if necessary and introduce new treatment if required to optimise glycaemic control

#### Monitoring for all surgical procedures

- Check U & E's at least daily and more frequently if necessary whilst on an insulin infusion
- Check (finger prick) blood glucose levels hourly during IV insulin infusion
- Check for ketones if blood glucose > 12mmol/L (including patients with type 2 diabetes)
- Check the feet and provide pressure relief as necessary. Contact the diabetes team if a foot problem is evident
- Check the renal function prior to restarting Metformin (see link below). If in doubt, contact the diabetes team <http://taysidedn.dundee.ac.uk/HandBook/PreparationsPriorProcedures10.aspx#25>
- Exclude a contraindication (e.g. pancreatitis) before restarting a GLP-1 analogue (Exenatide / Liraglutide)
- Review blood glucose management after 24-48 hours and refer to diabetes team for advice as necessary

<b>Diabetes and Surgery : Checklist &amp; Guideline for Pre-operative Assessment</b>		<b>Patient Name</b>			
<b>DRAFT 12</b>		<b>DOB CHI</b>			
		<b>Telephone contact number</b>			
Surgical procedure		Consultant			
Date of surgery		Date of admission			
Ward		Hospital			
<b>Pre operative Diabetes Assessment</b>		<b>Date:</b>			
<b>Weight (kg):</b>		<b>Eye screening</b> in past 15 months Yes / No			
<b>Check U&amp;E's and HbA1c</b> <input type="checkbox"/> <b>Urinalysis</b> <input type="checkbox"/> (random venous sample, one gold top and one purple top)		<b>Attends Eye clinic</b> Yes / No			
<b>Usual Diabetes Treatment</b> ( ✓ all appropriate)					
<b>Insulin</b> <input type="checkbox"/>	Dose in units	Frequency	<b>GLP-1 Analogue</b> <input type="checkbox"/>	Dose	Frequency
<b>Name of insulin</b>					
<i>e.g. Novorapid</i> <i>e.g. Glargine (Lantus)</i>  <i>Insulin pump therapy</i>		<i>before meals</i> <i>once daily</i>	<i>e.g. Exenatide (Byetta)</i> <i>Liraglutide (Victoza)</i>		
<b>Oral hypoglycaemic tablets</b> <input type="checkbox"/>	Dose	Frequency	<b>Metformin</b> <input type="checkbox"/>	<b>Diet alone</b> <input type="checkbox"/>	
<b>Name of tablet</b>					
<i>e.g. Gliclazide</i>	80 mg	twice daily			
<b>Referred to Diabetes Team by:</b>		<b>Date:</b>	<b>Contact No.</b>		
<b>Reason for referral:</b> ( ✓ as appropriate)					
<ul style="list-style-type: none"> <li>○ Complex diabetes i.e. significant cardiovascular disease, nephropathy, retinopathy, neuropathy, foot problems</li> <li>○ Medication advice</li> <li>○ HbA1c &gt; 75 mmol/mol (9%)</li> <li>○ Steroid treatment is required pre op</li> <li>○ Prior to pancreatectomy</li> <li>○ Other (please specify)</li> </ul>					
<b>To refer:</b> please send a copy of this form to the Diabetes Specialist Nurses or use contact details below					
<b>Diabetes Specialist Nurses:</b> (Mon – Fri 09.00 - 17.00)	Ninewells 01382 660111 / 632293 or ext 32293/36009 Bleep 4872 Perth Royal Infirmary 01738 473476 ext 13476				
<b>SpR Diabetes:</b> (Mon – Fri 09.00 - 17.00)	Tel: 01382 660111 Bleep 5416				
<b>Eye Screening Enquiries</b> (Mon – Fri 09.00 - 17.00)	Tel. 01382 740068 or ext: 40068				
<b>Out of Hours</b>	On call medical team via hospital switchboard				
An open access Drop In clinic led by the Diabetes Specialist Nurse team is held in the Strathmore Diabetes Centre, Ninewells Hospital, Dundee every Wednesday 10.30 -12.30 hours for advice about diabetes management. No appointment is required. The Diabetes Specialist Nurse Team can also arrange to review patients at other times and in other locations, including PRI and Angus sites, between Monday and Friday 09.00 – 17.00 hours <b>Diabetes Information:</b> <a href="http://www.diabetes-healthnet.ac.uk/Handbook/Handbook.aspx">http://www.diabetes-healthnet.ac.uk/Handbook/Handbook.aspx</a>					

## INTRAVENOUS INSULIN MANAGEMENT SBAR

### SITUATION

This document describes intravenous insulin management in patients with diabetes undergoing surgery. It is also suitable for patients with diabetes who are acutely unwell and unable to tolerate oral food and or fluid intake.

### BACKGROUND

Infusion of IV insulin by an adjustable (sliding) scale or of glucose, potassium and insulin (GKI) is indicated in very ill patients as the absorption of IV insulin is rapid and reliable. Adjustable scale insulin refers to insulin doses administered based on blood glucose monitoring. A standard scale does not fit all patients therefore the insulin dose in the prescription should be adjusted if blood glucose levels are out with target. Specific intravenous insulin guidelines are available for the management of Diabetic Ketoacidosis (DKA) <http://taysidedn.dundee.ac.uk/Documents/Uploaded/DKAProtocolMarch2008.pdf>

### ASSESSMENT

Each patient should be assessed to:

- Identify their type of diabetes, their usual diabetes treatment and their current weight if feasible
- Check for the presence of co-existing conditions e.g. cardiac, renal, neurological and foot disorders
- Check U & E's and HbA1c (venous sample, purple top) if the latter has not been done in the previous three months
- HbA1c is an indicator of glycaemic control; the optimal HbA1c is 48-53 mmol/mol (6.5 – 7%)

### RECOMMENDATION

#### Monitoring

- Agree an appropriate target blood glucose range e.g. 6 - 9 mmol/L peri-operatively
- Check finger prick blood glucose hourly during IV insulin infusion
- Check for ketones if blood glucose rises > 12mmol/L (including in patients with type 2 diabetes)
- Check U & E's at least daily during the infusion and more often if necessary
- If the baseline **potassium > 5mmol/L - omit potassium replacement but continue to monitor U&E's and replace as necessary thereafter depending on the results**

#### In Significant Renal impairment (CKD 4&5)

- Seek advice from the diabetes or renal team. A reduced insulin scale and a reduced fluid volume may be necessary and **potassium replacement should be omitted in most if not all cases.**

#### IV insulin management

- In patients who are prescribed multiple daily injection regimens **continue their 'usual' long acting subcutaneous insulin** daily e.g. Glargine (Lantus), Detemir (Levemir), Insulatard or Humulin I in conjunction with IV insulin treatment
- IV insulin using an adjustable (sliding) scale is preferable to GKI infusion
- Use soluble insulin (e.g. Actrapid) via a syringe driver for intravenous infusion
- All IV fluid must be infused via controlled infusion pumps
- All solutions should be discarded after 24 hours
- Review hourly (finger prick) blood glucose monitoring and adjust the IV insulin scale according to the results
- Patients who have continued sc insulin may need less IV insulin (scale 3)
- If the patient is obese or on steroid therapy, they are likely to require more insulin (scale 2)
- **NB** IV insulin has a short half life therefore an **insulin pump should not be disconnected** without first giving subcutaneous insulin.
- Insulin omission can lead to Diabetic Ketoacidosis in type 1 diabetes, in some type 2 patients and post pancreatectomy

#### Transfer from IV insulin

- Transfer to subcutaneous insulin or oral medication when the patient is tolerating food and fluid orally
- Prescribe the appropriate diabetes treatment to coincide with the next suitable mealtime
- Stop the IV insulin one hour following transfer to subcutaneous insulin or diabetes medication
- Exclude any contraindication (e.g. pancreatitis) before restarting a GLP-1 analogue (Exenatide/Liraglutide)
- Adjust the medication if necessary and introduce additional new treatment if required after 24-48 hours to optimise the glycaemic control
- Patients requiring TPN or Enteral feeding or who may be 'nil by mouth' for a longer period (e.g. > 48 hours) should be transferred to a more suitable subcutaneous insulin regimen, as prolonged IV therapy will predispose to hyponatraemia. Discuss with the diabetes team.

#### THINK SAFETY!

- When patients are transferred from one department to another check IV infusion sets and cannulas with receiving staff.
- Always restart subcutaneous insulin before stopping IV insulin to reduce risk of hyperglycaemia / Diabetes Ketoacidosis
- Check U & E's prior to restarting Metformin  
<http://taysidedn.dundee.ac.uk/HandBook/PreparationsPriorProcedures10.aspx#25>

Specialist Registrar for Diabetes Bleep 5416 Diabetes Specialist Nurse bleep 4872 ext 36009

Diabetes Information: <http://www.diabetes-healthnet.ac.uk/Handbook/Handbook.aspx>





## INTRAVENOUS INSULIN THERAPY TROUBLESHOOTING GUIDELINE

### SITUATION

Hourly blood glucose monitoring is essential during IV insulin therapy. Ideally blood glucose should be maintained between 4 – 12mmol/L. **Hyperglycaemia is undesirable** as it will increase the risk of dehydration, delayed healing, and life threatening Diabetic Ketoacidosis (DKA). **Hypoglycaemia is undesirable and dangerous** if undetected and/or untreated. IV insulin has a very short half-life and so when an IV insulin infusion is stopped or inadvertently interrupted, blood glucose can rise very rapidly. Therefore, for patients who are normally prescribed insulin, an IV insulin infusion should not be disconnected before a dose of subcutaneous insulin has been administered.

### BACKGROUND: Hyperglycaemia

Elevated BG or erratic BG can be associated with:

- Problems with infusion pump, tubing, venflons, IV site affecting insulin delivery
- Insulin omission e.g. IV pump inadvertently switched off, even for a period of minutes
- 'Insulin resistant' patients e.g. type 2 diabetes, co-existing infection or treatment with steroid
- Enteral feeding regimens / Total Parenteral Nutrition
- Patients who are eating and drinking – in most cases, IV insulin therapy is not appropriate

### BACKGROUND: Hypoglycaemia

Low BG(< 4mmol/L) can be associated with the following:

- Problems with infusion pump, tubing, venflons, IV site affecting insulin delivery
- In 'well controlled patients' during IV insulin, particularly when long acting insulin is continued daily
- When IV insulin is increased
- If blood glucose monitoring is not done hourly
- Interruption in nutritional intake e.g. 'rest' period in feeding regimens
- Pancreatic and hepatic pathology

### ASSESSMENT

Aim to identify the cause of problem if possible:

- Check infusion pump and equipment, venflons, and IV site at least hourly
- Monitor BG at least hourly during IV insulin to monitor efficacy of insulin prescription
- NB IV insulin is administered *reactively* according to the blood glucose level
- Review the pattern of blood glucose levels to pin point problematic periods e.g. patients who are receiving Enteral feeding regimens or Total Parenteral Nutrition (TPN) may have problematic hyperglycaemia during the 'feed' and hypoglycaemia during the 'rest' period
- During Enteral feeding or TPN prescribe insulin taking account of the amount and duration of feed and the 'rest' period
- Check blood or urinary ketones to identify and prevent hospital acquired Diabetic Ketoacidosis  
<http://taysidedn.dundee.ac.uk/Documents/Uploaded/DKAProtocolMarch2008.pdf>

### RECOMMENDATION for Hyperglycaemia / Erratic control

- Review glycaemic control hourly and report problems to ward medical staff/prescriber to facilitate insulin adjustment
- Check for ketones
- Refer to medical staff for immediate review of fluid and insulin management if ketones are positive due to the risk of DKA developing
- Adjust IV insulin prescription proactively as per guideline to 'insulin resistant' scale (scale 2) to increase insulin delivery
- Address the cause/s of hyperglycaemia e.g. if patient is eating and drinking, consider change to subcutaneous insulin. IV insulin will not be sufficient to maintain glycaemic control after main meals
- If hyperglycaemia is associated with enteral feeding or TPN, the adjustable IV insulin prescription may require temporary adjustment at specific times to address hyperglycaemia
- Refer to Diabetes Team for advice if necessary

### RECOMMENDATION for Hypoglycaemia

- Treatment if BG level is < 4mmol/L during IV insulin infusion
- Infuse 50ml 10% Glucose IV
  - Reduce IV insulin prescription e.g. by changing from scale 1 to the 'insulin sensitive' scale 3
  - Repeat a BG check within 15 minutes
  - If BG remains < 4mmol/L, stop IV insulin infusion for 15 minutes and recheck BG once more
  - If BG remains < 4mmol/L administer 50 ml IV Glucose 50% and restart IV insulin infusion. (NB 50% Glucose is strongly hypertonic and it is important to avoid extravasation)
  - Check BG within 15 minutes again
  - Repeat treatment with IV Glucose 50% if necessary.
  - When BG is > 4mmol/L resume treatment as per guideline and adjust insulin prescription if necessary
  - Check ketones in patients with type 1 diabetes if the IV insulin infusion has been disconnected
  - If hypoglycaemia is associated with Enteral feeding or TPN, the adjustable IV insulin prescription may require temporary adjustment at specific times to maintain BG > 4mmol/L e.g. reduce during 'rest' period
  - Refer to Diabetes Team for advice if necessary





Diabetes and Surgery Checklist and Guideline AUDIT  DRAFT 12	Patient Name  DOB CHI	
AUDIT	Yes	No N/A
1. Did this patient have elective (planned) surgery?		
2. Was the HbA1c < 75mmol/mol < 9 % before surgery?		
3. Was intravenous insulin (IV) prescription adjusted appropriately if blood glucose (BG) was out with 5-12mmol/L target during infusion?		
4. Was the patient free of hypoglycaemia during IV insulin (i.e. no record of BG < 4mmol/L)?		
5. Was the patient transferred to subcutaneous insulin before IV insulin stopped?		
6. Was urea and electrolyte (U&E) sample checked before surgery and at least once daily during IV insulin therapy?		
7. If HbA1c was > 9% was diabetes team involved?		
Audit completed by: Name: _____ Designation: _____ Date: _____		