

Guideline for the perioperative management of diabetes for Adult patients undergoing surgery

This guidance does not override the individual responsibility of health professionals to make appropriate decision according to the circumstances of the individual patient in consultation with the patient and /or carer. Health care professionals must be prepared to justify any deviation from this guidance.

INTRODUCTION

This guideline reflects the recommendations of the NHS Diabetes document for the management of adults with diabetes undergoing surgery and elective procedures. The aim of the guideline is to improve standards of care for people with diabetes undergoing operative or investigative procedures requiring a period of starvation.

THIS GUIDELINE IS FOR USE BY THE FOLLOWING STAFF GROUPS :

All qualified healthcare professionals involved in the care of diabetic patients undergoing surgery

Lead Clinician(s)

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Consultant Anaesthetist
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Approved by Anaesthetic Clinical Governance on: 12th July 2016

This is the most current document and is to be used until a revised version is available: 12th July 2018

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Key amendments to this guideline

Date	Amendment	Approved by: (name of committee or accountable director)
2013	New guidelines – used to be part of WAHT-END-005	
July 2016	Change in renal function before metformin needs to be stopped in patients receiving contrast (GFR <60ml/min) Update to guidance for the management of oral hypoglycaemics and insulin therapy	Anaesthetic clinical governance
December 2017	Sentence added in at the request of the Coroner	

Guideline for the perioperative management of diabetes for Adult patients undergoing surgery

INTRODUCTION

This guideline summarises the recommendations of the NHS Diabetes document ⁽¹⁾ (written by the Joint British Diabetes Societies, Inpatient Care Group and representatives from the specialist societies of surgeons and anaesthetists) for the management of adults with diabetes undergoing surgery and elective procedures.

The aim of the guideline is to improve standards of care, covering all stages of the patient pathway, for people with diabetes undergoing operative or investigative procedures requiring a period of starvation.

The terminology 'sliding scale insulin' is no longer be used, instead substituted by variable rate intravenous insulin infusion (VRIII)

Day case procedure criteria

- ✓ The operation should be an elective procedure suitable for day case.
- ✓ Patient to be starved for 6 hours only (i.e.-not to miss more than one meal) as per trust guidelines.
- ✓ HbA1c < 8.5% or 69mmol/ mol in the last three months – refer back to GP if HbA1c not within this range
- ✓ Patient suitable as a day case as fit to resume self management of diabetes after surgery

Pre-operative assessment

- The patients type of diabetes must be recorded
- Ensure glycaemic control is adequate for elective surgery (HbA1c < 8.5% or 69mmol/ mol in the last three months) – refer back to GP if HbA1c not within this range.
- Identify any co-morbidities and relay these to the anaesthetic team
- Ensure that Urea and Electrolytes and ECG has been requested as a minimum for all diabetic patients

The plan for surgery should include the following:

- Location
- Time of admission and discharge
- Time of surgery – first on the list is the expectation
- Medication history (noting the usual insulin type and dose together with any other antidiabetic medication)
- Omission of high carbohydrate drink from enhanced recovery protocol in insulin treated diabetes, unless a VRIII is planned to be used in any case, in which case administer as normal
- Avoidance of support stockings in the presence of peripheral vascular disease or peripheral neuropathy.

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Anaesthetic team

- Aim for capillary blood glucose concentration of 7-11 mmol/l*
- Check serum electrolytes are satisfactory within laboratory reference range
- Ensure patient is operated on early in the list
- Avoid continuous variable rate insulin infusion (VRIII) unless more than one meal is missed or not expected to return to normal diet within 12 hours after surgery

- Check blood glucose concentration: prior to induction (if not done in the last one hour) AND hourly during procedure
- Document capillary blood glucose (CBG), insulin and substrate infusion on the anaesthetic chart as per AAGBI guidelines
- Use techniques to decrease post-operative nausea /vomiting
- Multimodal analgesia and antiemetic's recommended (NB dexamethasone may affect serum glucose concentration – consider avoiding completely in diabetic patients. If dexamethasone is used, ensure that CBG is measured at least two hourly for 8 hours after administration)
- Recommended fluid regimen for elective surgical patients (0.45% sodium chloride and 5% glucose with 0.15% potassium if a VRIII is required)
- Avoid pressure damage to feet
- Hand over to recovery staff and document any post-operative instructions

* Blood glucose of 4-12mmol/l is acceptable but if level consistently above 13 mmol/l for more than 1 hour commencement of VRIII is recommended.

Surgeons

- Avoid listing diabetic patients on evening lists
- Make an early referral to the pre-op assessment clinic in poorly controlled patients
- Document co-morbidities
- Highlight day case/in patient (British association of day case surgery)
- Highlight if the patient has diabetes on Bluespier
- Prioritize diabetic patients for theatre list
- Refer any patients with sub optimal diabetes control to diabetes team
- Encourage primary care to use the diabetes referral sheet
- Avoid unnecessary overnight pre-op admission and extended pre-op fasting

Theatre Recovery

- Maintain blood glucose at 7-11 mmol/l
- Check CBG hourly
- Ensure VRIII is labelled, connected to the patient via a working infusion device and prescribed
- Check that antiemetics, intravenous fluids and VRIII are prescribed if required.
- Encourage early return to oral fluids
- Contact available anaesthetist for any problems
- Handover to ward staff of any specific plan

If insulin needs to be given NEVER USE INTRAVENOUS SYRINGES; insulin pen devices or insulin syringes must be used

Prescribers

- Be aware of the terminology VRIII instead of sliding scale infusion
- DO NOT use abbreviations for insulin doses (write "units" rather than "u").
- For patients with VRIII ensure suitable fluids are prescribed. Use of **0.45% sodium chloride and 5% glucose solution with 0.15% potassium is recommended.**

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Diabetes Mellitus type 2

DIET ALONE: Check CBG pre-operatively and hourly until able to eat. If glucose level rises to 13mmol/l or more for more than an hour, commence a VR88 (regimen 1) and intravenous fluid.

ORAL HYPOGLYCAEMICS +/- GLP-1 AGONIST:

Please follow guidelines as shown in the table for oral hypoglycaemics. Check capillary blood glucose pre-op and hourly until able to eat. If CBG rises to 13mmol/l or more, commence VR88 and intravenous fluids using VR88 using the dedicated prescription chart. Once able to eat, discontinue any IV treatment and recommence usual oral hypoglycaemics (ref- WHAT END-011¹). Patients taking metformin who received IV contrast during the procedure must omit Metformin for 48 hours following the procedure if GFR <60ml/min.

If any further advice needed please contact diabetic team.

Guidance on ORAL HYPOGLYCAEMICS Short starvation period (no more than one missed meal)

Oral hypoglycaemic	Day before admission	Day of surgery (AM list)	Day of surgery (PM list)
Acarbose	Take as normal	Omit Morning dose if NBM	Give morning dose if eating
Meglitinide (repaglinidine or nateglinide)	Take as normal	Omit morning dose if NBM	Give morning dose if eating
*Metformin (Procedure not requiring contrast media)	Take as normal	Take as normal	Take as normal
Sulphonylurea (e.g. Glibenclamide, Glicazide, Glipizide)	Take as normal	Omit AM dose	Omit AM and PM doses
DPP IV inhibitor (e.g. sitagliptin, Vidagliptin, Saxagliptin)	Take as normal	Take as normal	Take as normal
GLP-1 analogue (e.g. Exenatide, Liraglutide)	Take as normal	Take as normal	Take as normal
Pioglitazone	Take as normal	Take as normal	Take as normal
SGLT-2 Inhibitors (e.g. Dapagliflozin)	Take as normal	Omit on day of surgery	Omit on day of surgery

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*If patient is on three-times/day regimen omit the middle dose. For patients undergoing IV contrast with normal renal function (GFR >60ml/minute), there is no need to omit metformin. For patients with renal impairment with GFR <60ml/min, stop metformin on the day of surgery and for 48 hours following the procedure. Restart metformin when renal function is satisfactory.

Diabetes Mellitus type 1

Guidance on INSULIN (+/- ORAL HYPOGLYCAEMICS):

If only one meal is likely to be missed, give insulin as shown in Table. If more than one meal is likely to be missed, commence VRIII

Insulin	Day before admission	Day of surgery (am) [Morning list]	Day of surgery (pm) [Afternoon list]	Whilst VRII in place
Once daily (evening)	Decrease dose by 20%	Check blood glucose on admission	Check blood glucose on admission	Give 80% of usual dose
Once daily morning	Decrease dose by 20%	Reduce usual dose of long acting insulin by 20%. Check blood glucose on admission	Reduce usual dose of long acting insulin by 20%. Check blood glucose on admission.	Give 80% of usual dose
Twice daily fixed mixture	Give usual insulin	Halve usual morning dose. Check blood glucose on admission. Take usual evening dose	Halve usual morning dose. Check blood glucose on admission. Take usual evening dose	STOP
Basal bolus regimen	Give usual insulin	Omit the morning and lunchtime short acting insulins. Stop until eating and drinking normally If the dose of long acting basal insulin is usually taken in the morning then the dose should be reduced by 20%*	Take usual morning insulin dose(s). Omit lunchtime dose. Check blood glucose on admission	STOP
Any other regimen	Consult diabetes team	Consult diabetes team	Consult diabetes team	Consult diabetes team

Check CBG pre-operatively and hourly until the patient is able to eat. If CBG rises to 13mmol/l or more, commence VRIII and intravenous fluids using VRIII using the dedicated prescription chart. Once able to eat, recommence usual insulin and discontinue any IV treatment 1 hour after SC insulin injection.

If more than one meal is likely to be missed, commence a VRIII and intravenous fluids.

Examples of Insulin preparations: But please check product details.

Once daily- (e.g. Lantus, Levemir, Tresiba, Insulatard, Humulin I, Insuman)

Twice daily –Biphasic or long acting (e.g. Novomix 30, Humulin M3, Humalog Mix 25, Humalog Mix 50, Insuman Comb 25, Insuman Comb 50, Levemir, Lantus)

Short-acting (e.g. Novorapid, Humulin S, Apidra)

Intermediate-acting (e.g. animal isophane, Insulatard, Humulin I, Insuman)

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Conversion of VRIII back to patient's usual treatment

If a VRIII is required, it must be continued for 30 minutes after the patient has had their subcutaneous insulin injection – transition back to the usual subcutaneous insulin regimen should take place when the next meal-related subcutaneous insulin dose is due. If the patient is taking oral hypoglycaemics and requires a VRIII, stop the VRIII once the patient is able to eat. Recommence oral hypoglycaemic agents once the patient is ready to eat and drink. Withholding or reducing the dose of sulphonylureas may be required if the patient's oral intake is poor

If any doubts, consult the diabetes team

Diabetic Management in Emergency Surgery

For all diabetic patients undergoing emergency surgery, use of a VRIII should be considered the default technique, due to the difficulty in predicting starvation times pre-operatively and the timing of recommencing a normal oral diet post-operatively.

The aim should be for the patient to be taken to surgery with a CBG of 7-11mmol/l and after adequate resuscitation.

If the patient has evidence of DKA and requires emergency surgery, senior input from anaesthetic, intensive care, surgical and diabetic consultant staff should be sought to agree an optimal peri-operative plan with regards to pre-operative optimisation, timing of surgery and post-operative care. Operating on a patient with DKA carries a high mortality, and should be avoided or delayed if at all possible.

Management of Intra-operative Hyperglycaemia and Hypoglycaemia

- **Death or severe harm due to maladministration of insulin is a 'Never Event'. As such, a two person check MUST be performed and documented before administering subcutaneous insulin intra-operatively**

Hyperglycaemia (CBG >12mmol/l) in a patient with Type-1 Diabetes

- Subcutaneous rapid-acting insulin (e.g Novorapid or Humalog) should be administered to a maximum of 6 International units assuming that 1 unit will drop the CBG by an average of 3mmol/l. The aim is a CBG of 7-11mmol/l
- After administration, the CBG should be checked hourly and a second dose not administered less than 2 hours after the initial dose. If after two doses the patient remains hyperglycaemic, a VRIII should be started

Hyperglycaemia (CBG >12mmol/l) in a patient with Type-2 Diabetes

- Subcutaneous rapid-acting insulin (e.g. Novorapid or Humalog) at a dose of **0.1 units /kg** should be administered, up to a maximum of 6 units.

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- CBG should be checked at least hourly (aiming for 6-10mmol/l) and a second dose not administered less than 2 hours after the initial dose
- Consider starting a VRIII if the patient remains hyperglycaemic after the second dose

Management of Intra-operative Hypoglycaemia

- If the CBG is 4-6mmol/l, 50ml of 20% glucose should be administered intravenously
- If the CBG is <4mmol/l, 100ml of 20% glucose should be administered intravenously

Fluid Management in the Peri-operative period

When a VRIII is in use

If a VRIII is in use, it is recommended that the fluid that should accompany this is **0.45% sodium chloride with 5% glucose and 0.15% potassium chloride** (0.3% potassium chloride should be used instead if the patient's serum potassium is less than 3.5mmol/l). A CBG must be checked at least hourly when a VRIII is in use.

0.45% sodium chloride with 5% glucose should be administered at a rate that meets the patient's *maintenance* fluid requirements. This will be 25-50ml/kg/day (which is approximately 83ml/hr for a 70kg patient)

Any additional fluid that is required to optimise the patient's intravascular volume status should be given as Hartmann's Solution, at a rate appropriate to correct the intravascular deficit.

When a VRIII is not in use

If a VRIII is not in use, intravenous solutions containing glucose should be avoided, unless the blood glucose is low.

To avoid the hyperchloraemic metabolic acidosis associated with excess administration of 0.9% sodium chloride, **Hartmann's Solution should be used as the default fluid for all patients in the peri-operative period.**

If a prolonged period of post-operative fluid replacement (>24 hours) is likely to be required because of the surgical procedure performed, then use of a VRIII peri-operatively should be considered.

Diabetic Management in Enhanced Recovery Protocols

Enhanced Recovery protocols often utilise carbohydrate drinks pre-operatively to both reduce the absolute fasting time before surgery and to improve recovery post-operatively. However, **in insulin-dependent diabetics who are likely to have a short period of fasting, carbohydrate drinks should be omitted on the morning of surgery.**

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If use of a VRIII is planned (due to the length of the planned procedure, or a predicted prolonged fasting period post-operatively), then carbohydrate drinks should be administered as per the standard enhanced recovery protocol.

In general, use of enhanced recovery protocols should be encouraged in all diabetic patients, as they promote shortened fasting periods, and may negate the need for a VRIII where one may otherwise be required.

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MONITORING TOOL

STANDARDS	%	CLINICAL EXCEPTIONS
Continuous variable rate insulin infusion (CVRIII) will be avoided unless more than one meal is missed	>75%	blood glucose concentration >13 mmol /l for more than 1 hour
Blood glucose concentration should be checked prior to procedure then hourly during procedure	>80%	
Percentage of elective patients with DM undergoing pre-op assessment from surgical out patients	>80%	
Percentage of people with DM that are listed on the first third of the operating list	>80%	

REFERENCES

1. Dhatariya K NHS Management of adults with diabetes undergoing surgery and elective procedures: improving standards. Summary. Revised 2015 (amended March 2016). https://www.diabetes.org.uk/About_us/What-we-say/Specialist-care-for-children-and-adults-and-complications/Management-of-adults-with-diabetes-undergoing-surgery-and-elective-procedures-improving-standards/ accessed 8.7.2016.
2. Surgery in patients with diabetes mellitus. G. Gill in Textbook of Diabetes. Eds. Pickup JC, Williams G. 2nd edition 1997 Blackwell Science.
3. Peri-operative management of the surgical patient with diabetes 2015: Association of Anaesthetists of Great Britain and Ireland. P. Barker, P. E. Creasey, K. Dhatariya,1 N. Levy, A. Lipp,2 M. H. Nathanson (Chair), N. Penfold,3 B. Watson and T. Woodcock.

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Supporting Document 1 – Checklist for review and approval of key documents

This checklist is designed to be completed whilst a key document is being developed / reviewed.

A completed checklist will need to be returned with the document before it can be published on the intranet.

For documents that are being reviewed and reissued without change, this checklist will still need to be completed, to ensure that the document is in the correct format, has any new documentation included.

1	Type of document	Guideline
2	Title of document	Guideline for the perioperative management of diabetes for Adult patients undergoing surgery
3	Is this a new document?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If no, what is the reference number _____
4	For existing documents, have you included and completed the key amendments box?	Yes <input type="checkbox"/> No <input type="checkbox"/>
5	Owning department	Anaesthetics
6	Clinical lead/s	Dr Alag Raajkumar
7	Pharmacist name (required if medication is involved)	Keith Hinton
8	Has all mandatory content been included (see relevant document template)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
9	If this is a new document have properly completed Equality Impact and Financial Assessments been included?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
10	Please describe the consultation that has been carried out for this document	See circulation list
11	Please state how you want the title of this document to appear on the intranet, for search purposes and which specialty this document relates to.	Guideline for the perioperative management of diabetes for Adult patients undergoing surgery
Once the document has been developed and is ready for approval, send to the Clinical Governance Department, along with this partially completed checklist, for them to check format, mandatory content etc. Once checked, the document and checklist will be submitted to relevant committee for approval.		

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Implementation

Briefly describe the steps that will be taken to ensure that this key document is implemented

Action	Person responsible	Timescale
Pilot of new prescription charts in the wards	Rachael Leese	April 2013
Perioperative medicines use guidelines updated in line with this document	Keith Hinton	July 2016

Plan for dissemination

Disseminated to	Date

1	Step 1 To be completed by Clinical Governance Department Is the document in the correct format? Yes <input type="checkbox"/> No <input type="checkbox"/> Has all mandatory content been included? Yes <input type="checkbox"/> No <input type="checkbox"/> Date form returned ____ / ____ / ____	
2	Name of the approving body (person or committee/s)	Anaesthetic Clinical Governance
	Step 2 To be completed by Committee Chair/ Accountable Director	
3	Approved by (Name of Chair/ Accountable Director):	Dr David Whitelock
4	Approval date	12/07/2016

Please return an electronic version of the approved document and completed checklist to the Clinical Governance Department, and ensure that a copy of the committee minutes is also provided (or approval email from accountable director in the case of minor amendments).

Office use only	Reference Number	Date form received	Date document published	Version No.

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Supporting Document 2 - Equality Impact Assessment Tool

To be completed by the key document author and attached to key document when submitted to the appropriate committee for consideration and approval.

		Yes/No	Comments
1.	Does the policy/guidance affect one group less or more favourably than another on the basis of:		
	• Race	No	
	• Ethnic origins (including gypsies and travellers)	No	
	• Nationality	No	
	• Gender	No	
	• Culture	No	
	• Religion or belief	No	
	• Sexual orientation including lesbian, gay and bisexual people	No	
	• Age	No	
2.	Is there any evidence that some groups are affected differently?	No	
3.	If you have identified potential discrimination, are any exceptions valid, legal and/or justifiable?		
4.	Is the impact of the policy/guidance likely to be negative?	No	
5.	If so can the impact be avoided?		
6.	What alternatives are there to achieving the policy/guidance without the impact?		
7.	Can we reduce the impact by taking different action?		

If you have identified a potential discriminatory impact of this key document, please refer it to Human Resources, together with any suggestions as to the action required to avoid/reduce this impact.

For advice in respect of answering the above questions, please contact Human Resources.

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Supporting Document 3 – Financial Impact Assessment

To be completed by the key document author and attached to key document when submitted to the appropriate committee for consideration and approval.

	Title of document:	Yes/No
1.	Does the implementation of this document require any additional Capital resources	No
2.	Does the implementation of this document require additional revenue	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 programmes or allocated training times for staff	No
	Other comments:	

If the response to any of the above is yes, please complete a business case and which is signed by your Finance Manager and Directorate Manager for consideration by the Accountable Director before progressing to the relevant committee for approval

ⁱ Guideline for use of insulin