



# Management of adults with diabetes undergoing surgery and elective procedures: improving standards

Summary



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# Foreword

These guidelines have been commissioned by NHS Diabetes and written by the Joint British Diabetes Societies Inpatient Care Group and representatives from the specialist societies surgeons and anaesthetists. The document has also been informed by focus groups from Diabetes UK. The aim of the guidelines is to improve standards of care for people with diabetes undergoing operative or investigative procedures requiring a period of starvation.

## Target audience

The guidelines emphasise the need for patient centred care at every stage and we hope that they will be of use to all healthcare professionals whose work brings them into contact with this vulnerable group of patients.

The target audience specifically includes:

- general practitioners, practice nurses and district nurses
- pre-operative assessment nurses
- anaesthetists
- surgeons
- trainee medical staff
- post-operative recovery and surgical ward nurses
- diabetologists
- diabetes inpatient specialist nurses, diabetes specialist nurses and educators
- hospital pharmacists
- hospital managers
- commissioners
- patients

Most importantly, this document is addressed to those writing and implementing local perioperative care policies and to medical and nursing educators. Managers have a responsibility to ensure that guidelines based on these recommendations are put in place. The guidelines aim to cover all stages of the patient pathway but are not designed to be read from cover to cover. Recommendations for each stage are intended to stand alone so that individual health care professionals can identify their role in the process.

These are the first UK national guidelines in this area of diabetes care and the first to address the whole pathway from referral to discharge. They will be a resource for those responsible at every stage of the pathway for the care of the surgical patient with diabetes.

The patient pathway is summarised in this short version which contains all the guideline protocols and recommendations. The full document, which is only available electronically at [www.diabetes.nhs.uk/our\\_work\\_areas/inpatient\\_care/](http://www.diabetes.nhs.uk/our_work_areas/inpatient_care/), provides the evidence base for the recommendations, discussion of controversial areas and references.

We wish to congratulate the authors on producing clearly written, comprehensive, practical and easy to follow documents in a complex area of diabetes care. We thoroughly recommend the guidelines to diabetes, surgical, anaesthetic and primary care colleagues.

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## Comprehensive care pathway for peri-operative management of diabetes



These guidelines cover all stages of the patient pathway from primary care referral to surgical outpatients, pre-operative assessment, hospital admission, surgery, post-operative care and discharge. The process should be seamless, with advance planning throughout.

The guidelines are primarily intended for the management of patients with diabetes referred for elective surgery. However, most of the recommendations can be applied to the patient presenting for emergency surgery with the proviso that many such patients are high risk and are likely to require an intravenous insulin infusion and level 1 care (acute ward with input from critical care team) as a minimum.

# Main recommendations

## Organisation and planning of care

1. Careful planning, taking into account the specific needs of the patient with diabetes, is required at all stages of the patient pathway from GP referral to post-operative discharge.
2. The patient should be involved in planning for all stages.
3. Hospital patient administration systems should be able to identify all patients with diabetes so they can be prioritised on the operating list.
4. High-risk patients (poor glycaemic control/complications of diabetes) should be identified in surgical outpatients or at pre-operative assessment and plans should be put in place to manage their risk.
5. Early pre-operative assessment should be arranged to determine a peri-operative diabetes management strategy and to identify and optimise other co-morbidities.
6. Routine overnight admission for pre-operative management of diabetes should not be necessary.
7. Starvation time should be minimised by prioritising patients on the operating list.
8. Surgical and anaesthetic principles of the Enhanced Recovery Partnership Programme should be implemented to promote earlier mobilisation with resumption of normal diet and return to usual diabetes management.
9. Multi-modal analgesia should be combined with appropriate anti-emetics to enable an early return to normal diet and usual diabetes regimen.
10. The patient should resume diabetes self-management as soon as possible where appropriate.
11. A policy which includes plans for diabetes management should be in place for safe discharge.
12. Outcomes should be audited regularly.

## Diabetes specialists

13. Clear guidelines should indicate when the diabetes specialist team should become involved.
14. All hospitals should implement a Diabetes Inpatient Specialist Nurse (DISN) service.

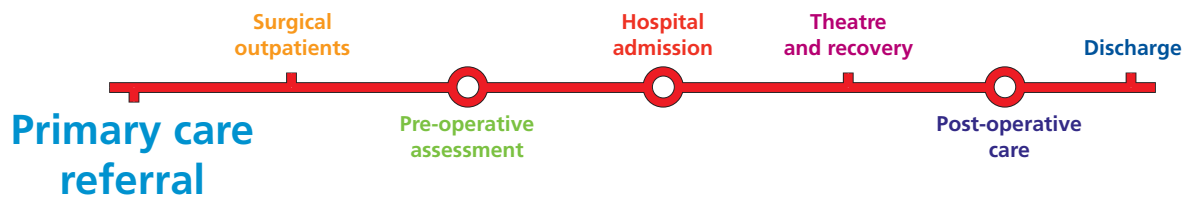
## Peri-operative use of intravenous insulin

15. The term 'variable rate intravenous insulin infusion' (VRIII) should replace the ambiguous term 'sliding scale'.
16. Patients with a planned short starvation period (no more than one missed meal in total) should be managed by modification of their usual diabetes medication, avoiding a VRIII wherever possible.
17. Patients expected to miss more than one meal should have a VRIII.
18. The recommended first choice substrate solution for a VRIII is 0.45% sodium chloride with 5% glucose and either 0.15% potassium chloride (KCl) or 0.3% KCl.
19. Insulin should be prescribed according to National Patient Safety Agency (NPSA) recommendations for safe use of insulin.

## Peri-operative blood glucose monitoring

20. Capillary blood glucose (CBG) levels should be monitored and recorded at least hourly during the procedure and in the immediate postoperative period.
21. Hospitals should have clear guidelines for the management of blood glucose when it is outside the acceptable range.
22. Training for blood glucose measurement and diabetes management should be introduced for clinical staff caring for patients with diabetes.
23. The WHO surgical safety checklist bundle should be implemented. The target blood glucose should be 6-10 mmol/L (acceptable range 4-12 mmol/L).

# Primary care



## Aims

- Ensure that the potential effects of diabetes and associated co-morbidities on the outcome of surgery are considered before referral for elective procedures.
- Ensure that the relevant medical information is communicated fully at the time of referral.
- Ensure that diabetes and co-morbidities are optimally managed before the procedure.

## Action plan

1. Provide the current HbA<sub>1c</sub>, blood pressure and weight measurements with details of relevant complications and medications in the referral letter (Appendix 12).
2. Optimise glycaemic control before referral if possible.
3. Consider referral to the diabetes specialist team for advice if HbA<sub>1c</sub> is greater than 69 mmol/mol (8.5%) (see Controversial, areas page 34 of the full document). A high HbA<sub>1c</sub> is an indication for intensive blood glucose control but it may not be realistic to delay referral until the HbA<sub>1c</sub> has been repeated.
4. Patients with hypoglycaemic unawareness should be referred to the diabetes specialist team irrespective of HbA<sub>1c</sub>.
5. Optimise other diabetes related co-morbidities.
6. Provide written advice to patients undergoing investigative procedures requiring a period of starvation (Appendices 8 and 9).

# Surgical outpatients



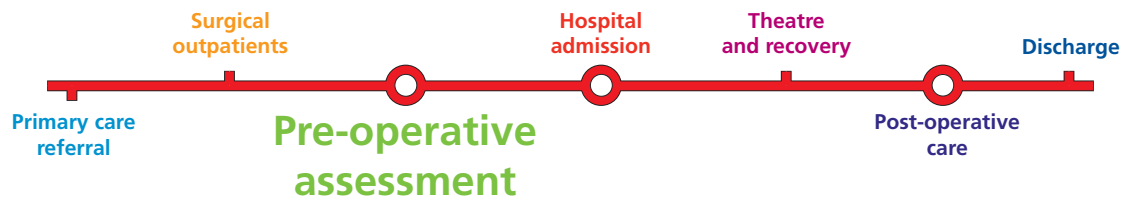
## Aims

- Arrange pre-operative assessment as soon as possible after the decision is taken to proceed with surgery to allow optimisation of care.
- Avoid overnight pre-operative admission to hospital wherever possible.

## Action plan

1. Systems should be in place to allow early pre-operative assessment to identify people with suboptimal diabetes control.
2. Clear institutional plans based on British Association of Day Surgery Directory of Procedures should be in place to facilitate day of surgery admission and prevent unnecessary overnight pre-operative admission.
3. Hospital patient administration systems should be able to identify all patients with diabetes so they can be prioritised on the operating list.
4. Patients undergoing investigative procedures requiring a period of starvation should be identified and provided with written information about diabetes management (Appendices 8 and 9).
5. The surgeon in the outpatient clinic should ensure that patients with diabetes are not scheduled for an evening list. This avoids prolonged starvation times, the use of a VR8 and an unnecessary overnight stay (see Controversial areas, page 36 of the full document).

# Pre-operative assessment



## Aims

- Ensure that glycaemic control is optimised prior to surgery.
- Establish an individualised diabetes management plan, agreed with the patient, for the pre-admission and peri-operative period.
- Ensure that co-morbidities are recognised and optimised prior to admission.
- Ensure plans are in place to modify other treatments during the pre-admission and peri-operative period e.g. bridging therapy for warfarin, renal replacement therapy.
- Identify high-risk patients requiring critical care management (see page 8 in the full document).

## Action plan

1. All patients with diabetes scheduled to undergo an elective procedure necessitating a period of starvation should attend a pre-operative assessment clinic as soon as possible.
2. Pre-operative assessment clinic staff should:
  - a. Assess adequacy of glycaemic control. The risks of proceeding when control is suboptimal should be balanced against the urgency of the procedure.
  - b. Consider referral to the diabetes specialist team according to local policy. This should include all patients with hypoglycaemia unawareness and may include those with HbA<sub>1c</sub> greater than 69 mmol/mol (8.5%) (see Controversial areas, page 34 of the full document).
  - c. Identify other co-morbidities with referral to the appropriate team for optimisation where necessary.
  - d. Plan in-patient admission including:
    - i. timing of admission
    - ii. location
    - iii. timing of surgery
    - iv. pre-admission management of medications (Appendices 1, 2, 8 & 9)
    - v. availability of usual insulin (patient may need to bring if non formulary)
    - vi. plans for Enhanced Recovery Partnership Programme in the context of diabetes (see Enhanced recovery page 15, of the full document).
  - e. Ensure the patient is fully consulted and engaged in the proposed plan of management.
  - f. Give the patient written instructions with the changes they need to make to their medication prior to admission explicitly highlighted (Appendices 8 and 9).
  - g. Plan initial pre-operative management of diabetes.
  - h. Ensure that patients with diabetes are not placed on an evening list. This avoids prolonged starvation times, the use of a VRILL and potentially an unnecessary overnight stay. (see Controversial areas, page 34 of the full document).
  - i. During venous thromboembolism risk assessment ensure no contraindications to anti-embolism stockings e.g. patients with peripheral vascular disease or neuropathy.
  - j. Plan duration of stay and make preliminary discharge arrangements.
  - k. Ensure that admission ward staff are appraised of plans and able to activate them on the day of admission.
  - l. Consider the need for home support following discharge, and involve the primary care team in discharge planning.



## Order of lists

Many considerations determine the order of the operating lists. One of the most important goals in the management of surgical patient with diabetes is to minimise the starvation time to promote early resumption of normal diet and normal medication at the normal time. Therefore, it is recommended that elective surgical patients with diabetes are prioritised on the theatre list, so that they may have lunch at the correct time after a morning procedure, or evening meal at the correct time after an afternoon procedure. For this reason, elective evening operating is not recommended for patients taking blood glucose lowering medication (see Controversial areas, page 34 of the full document).

## Responsibility for optimisation of glycaemic control

Individual trusts need to formulate guidelines for the management of patients who are not under secondary care follow up for their diabetes but are found to have sub-optimally controlled diabetes. Some trusts may require these patients to be referred back to their primary care team with subsequent re-referral to secondary care. Others may allow the pre-operative assessment team ready access to the secondary care team as part of the pre-assessment process.

# Hospital admission



## Aims

- Ensure that an agreed and documented individual patient plan is communicated to all involved in the care pathway including:
  - the patient.
  - relevant specialists (including anaesthetist, surgeon, diabetologist).
  - staff in all relevant clinical areas.
- Minimise the metabolic consequences of starvation and surgical stress.
- Maintain optimal blood glucose control throughout the admission.
- Prevent hospital acquired foot pathology.

## Action plan

1. Provide written guidelines for hospital staff and patients for the modification of commonly used diabetes treatment regimens on the day prior to and day of surgery (Appendices 1, 2, 8 & 9).
2. Identify high risk patients (poor glycaemic control/complications of diabetes) and make arrangements for post-operative admission to critical care if indicated.
3. Base management on Enhanced Recovery Partnership Programme principles but omit the pre-operative high carbohydrate drink in people with insulin treated diabetes.
4. Determine the treatment pathway in advance depending on the anticipated duration of starvation. Avoid a VRlll if the starvation period is short (only one missed meal).
5. Prioritise patients with diabetes on the list. This reduces the starvation time and hence the likelihood of the patient requiring a VRlll.
6. Use 0.45% sodium chloride and 5% glucose with either 0.15% or 0.3% potassium chloride (as appropriate) as the substrate fluid of choice if a VRlll is required. It is recognised that this is not readily available at present but this guidance recommends that this becomes standard practice (see Controversial areas, page 34 of the full document).
7. Capillary blood glucose (CBG) target ranges are controversial. Aim for CBG between 6-10 mmol/L but 4-12 mmol/L is acceptable. Avoid wide swings in CBG.
8. Monitor CBG regularly when the patient is under sedation. Hypoglycaemia sometimes manifests as drowsiness, which may be wrongly attributed to sedation.
9. Consider continuation of long-acting analogues (Glargine/Lantus®, Detemir/Levemir®) alongside the VRlll during the peri-operative period. This is generally recommended but local policies should be adhered to (see Controversial areas, page 39 of the full document).
10. Prescribe and administer insulin according to NPSA guidance.
11. Involve the diabetes specialist team if blood glucose targets are not achieved.
12. Identify high risk feet and provide pressure relief where necessary. Avoid use of anti-embolism stockings where contraindicated.
13. Ensure that preparation for discharge is ongoing.

# Theatre and recovery



Teamwork and the presence of a good local guideline are crucial. If the management plan has been communicated effectively from the pre-operative assessment clinic it should only be necessary to review, agree and implement the plan and react appropriately to blood glucose measurements.

## Aims

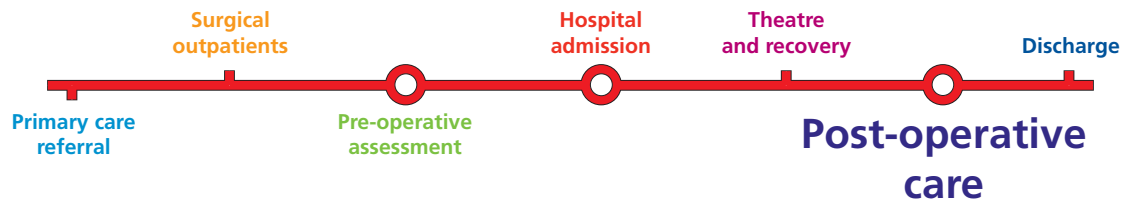
- Maintain good glycaemic control throughout.
- Maintain normal electrolyte concentrations.
- Optimise intra-operative cardiovascular and renal function.
- Provide multi-modal analgesia with appropriate anti-emetics to enable an early return to a normal diet and usual diabetes regimen.
- Avoid pressure damage to feet during surgery.

## Action plan

1. Implement the WHO surgical safety checklist bundle with target blood glucose 6-10 mmol/L (acceptable range 4-12 mmol/L).
2. Implement the agreed care plan.
3. Avoid unnecessary use of VRIII.
4. Check the CBG prior to induction of anaesthesia.

5. Monitor the CBG regularly during the procedure (at least hourly – more frequently if readings outside the target range).
6. Maintain the blood glucose in the range 6–10 mmol/L where this can be safely achieved. A range of 4-12 mmol/L is acceptable.
7. Correct a high blood glucose using additional subcutaneous insulin or by introducing a VRIII (Appendix 4).
8. Prescribe fluid regimen as required (Appendix 5).
9. Document the CBG, insulin infusion rate and substrate infusion on the anaesthetic record as recommended by the Royal College of Anaesthetists and Association of Anaesthetists of Great Britain and Ireland.
10. Consider the use of individualised goal directed therapy.
11. Ensure arrangements are in place to admit high risk patients to critical care if necessary.
12. Implement surgical and anaesthetic principles of the Enhanced Recovery Partnership Programme to promote early return to normal diet and usual diabetes management.
13. Use anaesthetic techniques to reduce the incidence of postoperative nausea and vomiting (PONV) and promote early return to normal diet and usual diabetes management.

# Post-operative care



## Aims

- Ensure glycaemic control and fluid and electrolyte balance are maintained.
- Optimise pain control.
- Encourage an early return to normal eating and drinking, facilitating return to the usual diabetes regimen.
- Follow the principles of the Enhanced Recovery Partnership Programme (see page 15 in the full document).
- Avoid iatrogenic injury (drugs/diabetes management/infection/pressure damage).

## Action plan

1. Staff skilled in diabetes management should supervise surgical wards routinely and regularly.
2. Allow patients to self-manage their diabetes as soon as possible, where appropriate.
3. Provide written guidelines for the use of intravenous fluids and insulin (see Appendix 6).
4. Prescribe and administer insulin in line with NPSA guidance, in consultation with the patient wherever possible.
5. Aim for a CBG in the 6-10 mmol/L range where this can be achieved safely. A range of 4-12 mmol/L is acceptable.
6. Monitor electrolytes and fluid balance daily and prescribe appropriate fluids.
7. Treat post-operative nausea and vomiting to promote normal feeding.
8. Maintain meticulous infection control.
9. Inspect foot and pressure areas regularly.

# Safe use of insulin

Errors in insulin prescribing are very common and insulin has been identified as one of the top five high-risk medications in the in-patient environment. The wide range of preparations and devices available for insulin administration (currently more than 60) increases the potential for error. One third of all in-patient medical errors leading to death within 48 hours of the error involve insulin administration.

Between November 2003 and August 2009 15,227 insulin incidents were reported in the NHS in England and Wales. Of these 972 incidents resulted in moderate harm with severe or fatal outcomes in a further 18.

- Hand written abbreviations such as 'u' and 'iu' were a major cause of dose errors; misinterpretation led to patients being given 10 times or 100 times the intended dose.
- Hypoglycaemia is common in hospitalised patients treated with insulin and can incur significant costs. Clinical protocols and guidelines are sometimes inadequate. Nursing staff may not be authorised to administer glucose without a prescription glucose products are not always readily available in clinical areas. The recent introduction of national guidelines for the management of hypoglycaemia should address this problem.
- All staff prescribing or administering insulin should receive training in the safe use of insulin. Trusts should specify an appropriate training programme and it is recommended that this be mandatory.

As a result of increased awareness of the harm associated with insulin errors the Department of Health has added insulin maladministration to the list of 'Never Events' for 2011-12. These are listed below.

A 'never event' with respect to insulin is death or severe harm as a result of maladministration of insulin by a health professional. Maladministration in this instance refers to when a health professional:

- uses any abbreviation for the words 'unit' or 'units' when prescribing insulin in writing
- issues an unclear or misinterpreted verbal instruction to a colleague
- fails to use a specific insulin administration device e.g. an insulin syringe or insulin pen to draw up or administer insulin, or

- fails to give insulin when correctly prescribed.

In addition, the NPSA has made the following recommendations to promote safer use of insulin:

- A training programme should be put in place for all healthcare staff (including medical staff) expected to prescribe, prepare and administer insulin.
- Policies and procedures for the preparation and administration of insulin and insulin infusions in clinical areas are reviewed to ensure compliance with the above.

## Safe use of variable rate intravenous insulin infusions (VRIII)

VRIIIs are over-used in the peri-operative setting. Patients often return to surgical wards from theatre with an intravenous insulin infusion in place but no directions for its withdrawal. Written guidelines for conversion from the VRIII to the usual diabetes treatment may not be available. Doctors are often unaware of how to do this and infusions are continued or discontinued inappropriately. Continuing a VRIII while a patient is eating often results in poor glycaemic control and the VRIII should be withdrawn once the patient is able to eat and drink normally.

If the patient is normally treated with insulin the VRIII should not be discontinued until a short acting bolus has been given and background insulin is in place. Appendix 7 provides guidelines for transfer from a VRIII to subcutaneous insulin or oral therapy.

Treatment requirements may differ from usual in the immediate post-operative period where there is a risk of both hypo and hyperglycemia, and clinical staff may need to take decisions about diabetes management. Training in blood glucose management is essential for all staff dealing with patients with diabetes. **The diabetes specialist team should be consulted if there is uncertainty about treatment selection or if the blood glucose targets are not achieved and maintained.**

# Discharge



## Aims

- Ensure early discharge determined by pre-agreed clinical and social criteria.
- Ensure that factors likely to delay discharge are identified at the pre-operative assessment so that any necessary arrangements are in place when the patient is medically fit for discharge.
- Ensure that plans are in place for safe management of diabetes post discharge.

## Action plan

1. In consultation with the patient, decide the clinical criteria that the patient must meet before discharge.
2. Set a date and/or time of discharge as early as possible. This should include weekends.
3. Identify whether the patient has simple or complex discharge planning needs and plan how they will be met.
4. Involve the diabetes specialist team if diabetes related delays in discharge are anticipated.
5. Provide patient education to ensure safe management of diabetes on discharge.
6. Discharge should not be delayed solely because of poor glucose control. The patient or carer's ability to manage the diabetes should be taken into consideration. Discuss with the diabetes specialist team if necessary.
7. Systems should be in place to ensure effective communication with community teams, particularly if changes to the patients' pre-operative diabetes treatment have been made during the hospital stay.
8. Diabetes expertise should be available to support safe discharge and the team that normally looks after the patient's diabetes should be contactable by telephone.

# Audit

<b>Institutional standards:</b>	
<b>Indicator</b>	<b>Standard</b>
<b>Access:</b>	
Has the trust either adopted these national guidelines or has their own alternative, evidence based and audited internal guidelines for the perioperative care of patients with diabetes?	Yes
Does the trust collect data about the outcomes for patients with diabetes undergoing surgery or procedures?	Yes
Does the trust have the services of a dedicated Diabetes Inpatient Specialist Nurse (DISN) at staffing levels most recently recommended by the National DISN group (1.0 WTE per 300 beds)?	Yes
<b>Institutional accountability and integrity:</b>	
Does the trust have a clinical lead for peri-operative care for people with diabetes with responsibility for implementation of peri-operative guidelines?	Yes

<b>NPSA standards:</b>	
<b>Indicator</b>	<b>Standard</b>
All regular and single insulin (bolus) doses are measured and administered using an insulin syringe or commercial insulin pen device. Intravenous syringes must never be used for insulin administration.	100%
The term 'units' is used in all contexts. Abbreviations, such as 'U' or 'IU', are never used.	100%
All clinical areas and community staff treating patients with insulin have adequate supplies of insulin syringes and subcutaneous needles, which they can obtain at all times.	100%
An insulin pen is always used to measure and prepare insulin for an intravenous infusion.	100%
A training programme is in place for all healthcare staff (including medical staff) expected to prescribe, prepare and administer insulin.	100%
Policies and procedures for the preparation and administration of insulin and insulin infusions in clinical areas are reviewed to ensure compliance with the above.	100%

### Department of Health 'Never Event' standard:

Indicator	Standard
Death or severe harm as a result of maladministration of insulin by a health professional.	Never

### Local standards:

Indicator	Standards
<b>Access:</b>	
Percentage of staff involved in the care of people with diabetes undergoing surgery or procedures who have received training in blood glucose measurement.	100%
Percentage of staff involved in the care of people with diabetes undergoing surgery or procedures receiving appropriate education from the Diabetes Inpatient Specialist Team.	75%
<b>Safety, quality, and effectiveness during the patient journey:</b>	
Percentage of primary care referrals containing all suggested information (Appendix 12).	80%. Where necessary, education programmes should be instituted to engage with primary care colleagues to raise the standard of referral letters.
Percentage of patients with diabetes referred from surgical outpatients for pre-operative assessment.	100%
Percentage of patients for whom a perioperative diabetes management plan is created at the pre-operative assessment clinic.	100%
Percentage of people with diabetes who are listed for elective surgery who are admitted on the day of the procedure.	90%. An exclusion for this is where other significant co-morbidity needs pre-operative optimisation.
Percentage of people with diabetes that are listed on the first third of the operating list (morning or afternoon lists).	95%
Percentage of people in whom a VRILL is established with correct configuration of the one-way and anti-siphon valves.	100%
Length of stay for patients with diabetes undergoing surgery or procedures.	No longer than 10% greater than for people without diabetes.
Percentage of people with diabetes and a condition not usually requiring a post-operative overnight stay that are operated on electively during an evening list.	0%
Percentage of patients with diabetes who receive hourly monitoring of blood glucose during their procedure, and in recovery.	100%



Percentage of time that people with diabetes have their blood glucose levels kept between 6 and 10 mmol/L (although 4 to 12 is acceptable) during their admission.	100%
Percentage of patients with evidence of poor peri-operative glycaemic control: <ul style="list-style-type: none"> <li>- diabetic ketoacidosis</li> <li>- hyperosmolar hyperglycaemic state</li> <li>- hypoglycaemia requiring 3rd party assistance</li> </ul>	0%
Percentage of patients where their discharge is delayed because of diabetes related problems.	0%
<b>Institutional accountability and integrity:</b>	
Percentage of patients with diabetes identified as such on hospital patient administration system.	95%
Percentage of clinical coding that identifies people with diabetes correctly.	100%
<b>Patient and staff satisfaction:</b>	
Percentage of staff who feel that they have sufficient levels of appropriate and timely support from the Diabetes Inpatient Specialist Team.	100%
Percentage of patients who express satisfaction with their patient journey, using validated tools such as the Diabetes Treatment Satisfaction Questionnaire (DTSQ) and the Diabetes Treatment Satisfaction Questionnaire for Inpatients (DTSQ-IP).	80%

# Appendix 1:

Guideline for peri-operative adjustment of insulin (short starvation period – no more than ONE missed meal)

Insulins	Day prior to admission	Day of surgery	
		Patient for AM surgery	Patient for PM surgery
<b>Once daily (evening)</b> (e.g. Lantus® or Levemir®. Insulatard®, Humulin I®, Insuman®)	No dose change*	Check blood glucose on admission	Check blood glucose on admission
<b>Once daily (morning)</b> (Lantus® or Levemir® Insulatard®, Humulin I®, Insuman®)	No dose change	No dose change*. Check blood glucose on admission	No dose change*. Check blood glucose on admission
<b>Twice daily</b> (e.g. Novomix 30®, Humulin M3®, Humalog Mix 25®, Humalog Mix 50®, Insuman® Comb 25, Insuman® Comb 50 twice daily Levemir® or Lantus®)	No dose change	Halve the usual morning dose. Check blood glucose on admission Leave the evening meal dose unchanged	Halve the usual morning dose. Check blood glucose on admission Leave the evening meal dose unchanged
<b>Twice daily - separate injections of short acting and intermediate acting</b> (e.g. animal neutral, Novorapid® Humulin S®) Apidra® (e.g. animal isophane Insulatard® HumulinI® Insuman®)	No dose change	Calculate the total dose of both morning insulins and give half as intermediate acting only in the morning. Check blood glucose on admission Leave the evening meal dose unchanged	Calculate the total dose of both morning insulins and give half as intermediate acting only in the morning. Check blood glucose on admission Leave the evening meal dose unchanged
<b>3, 4, or 5 injections daily</b>	No dose change	<b>Basal bolus regimens:</b> omit the morning and lunchtime short acting insulins. Keep the basal unchanged.* <b>Premixed AM insulin:</b> halve the morning dose and omit lunchtime dose Check blood glucose on admission	Take usual morning insulin dose(s). Omit lunchtime dose. Check blood glucose on admission

\*Some units would advocate reduction of usual dose of long acting analogue by one third. This reduction should be considered for any patient who 'grazes' during the day (see full guidance Controversial areas page 39).

**Perioperative hyperglycaemia and hypoglycaemia: follow guidelines in Appendix 4.**

**Warn the patient that their blood glucose control may be erratic for a few days after the procedure.**

## Appendix 2:

Guideline for peri-operative adjustment of non-insulin medication  
(short starvation period – no more than ONE missed meal)

Tablets	Day prior to admission	Day of surgery	
		Patient for AM surgery	Patient for PM surgery
<b>Acarbose</b>	Take as normal	Omit morning dose if NBM	Give morning dose if eating
<b>Meglitinide</b> (repaglinide or nateglinide)	Take as normal	Omit morning dose if NBM	Give morning dose if eating
<b>Metformin</b> (procedure not requiring use of contrast media*)	Take as normal	Take as normal	Take as normal
<b>Sulphonylurea</b> (e.g. Glibenclamide, Gliclazide, Glipizide, etc.)	Take as normal	Once daily AM omit Twice daily omit AM	Once daily AM omit Twice daily omit AM and PM
<b>Pioglitazone</b>	Take as normal	Take as normal	Take as normal
<b>DPP IV inhibitor</b> (e.g. Sitagliptin, Vildagliptin, Saxagliptin)	Take as normal	Omit on day of surgery	Omit on day of surgery
<b>GLP-1 analogue</b> (e.g. Exenatide, Liraglutide)	Take as normal	Omit on day of surgery	Omit on day of surgery

NB – nil by mouth, OD – once daily, BD – twice daily, TDS – three times daily, AM – morning, PM – afternoon

\* If contrast medium is to be used and eGFR less than 50 ml/min/1.73m<sup>2</sup>, metformin should be omitted on the day of the procedure and for the following 48 hours.

# Appendix 3:

## Guidelines for suitability of patients with diabetes for day case surgery

Patients with diet controlled diabetes are all suitable for day case surgery if the procedure itself is suitable for day surgery and all other criteria are fulfilled.

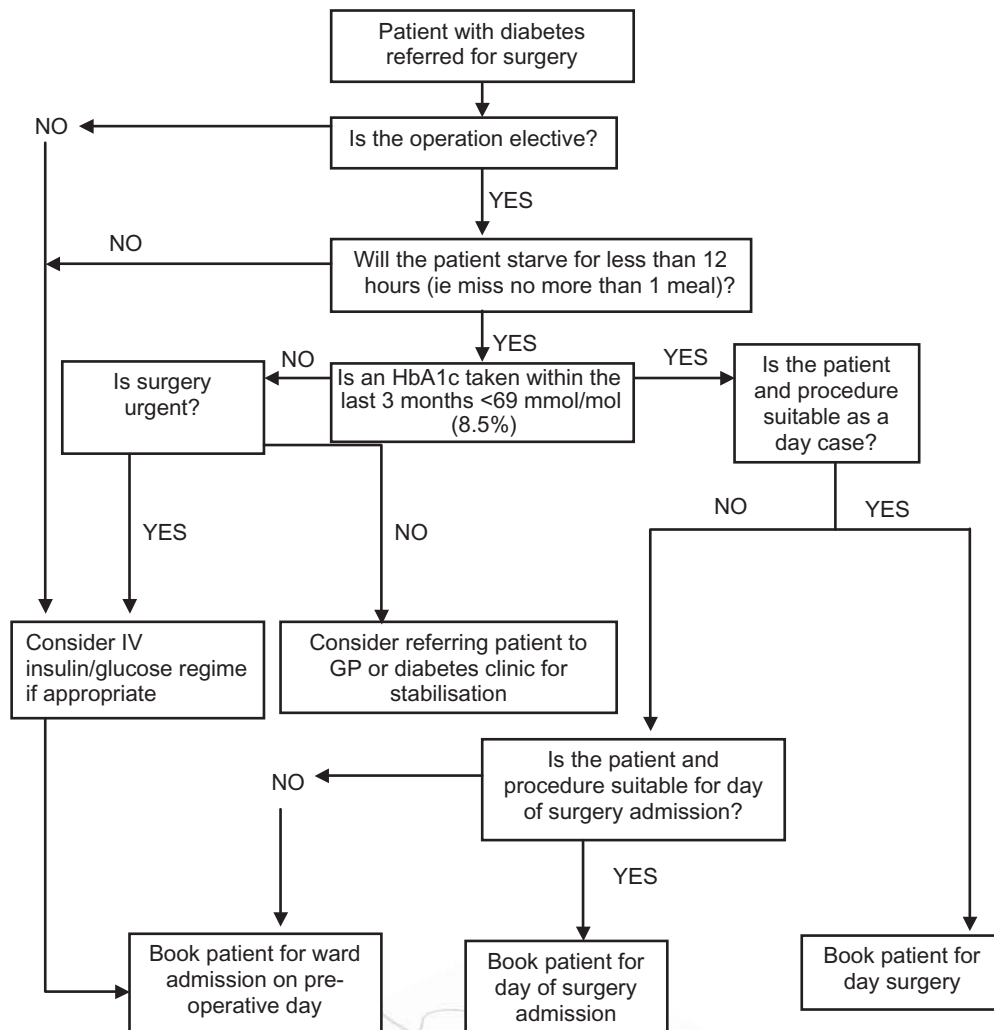
See the algorithm below for guidance.

Give patients instructions for adjusting their dose of tablets or insulin (patient instruction leaflet).

People with diabetes controlled by oral or injected medication are suitable for day case surgery if:

- they fulfill all day case criteria
- they can be first / early on a morning or afternoon list.

### Suitability of patients with diabetes for day surgery



# Appendix 4:

## Guideline for peri-operative monitoring of diabetes and management of hyperglycaemia and hypoglycaemia in patients undergoing surgery with a short starvation period (one missed meal)

- These guidelines are for the management of well-controlled patients (HbA<sub>1c</sub> <69 mmol/mol or 8.5%) undergoing surgery with a short starvation period.
- Medication should be managed as in Appendix 1 or 2, depending on usual treatment.
- Patients who are not well controlled but in whom surgery cannot be postponed should have a VRIII.
- Monitor capillary blood glucose on admission and hourly during the day of surgery. Aim for blood glucose level 6-10 mmol/L; 4-12 mmol/L is acceptable.

### Management of hyperglycaemia

#### • **Blood glucose greater than 12 mmol/L either pre or post surgery**

- Check capillary ketone levels using an appropriate bedside monitor if available.
- If capillary blood ketones are greater than 3 mmol/L or urinary ketones greater than +++ cancel surgery, follow DKA guidelines and contact the diabetes specialist team or the on call medical team for advice.

- **Pre-operative hyperglycaemia:** (blood glucose greater than 12 mmol/L with blood ketones less than 3 mmol/L or urine ketones less than +++)

- **Type 1 diabetes:** give subcutaneous rapid acting analogue insulin (i.e. Novorapid®, Humalog® or Apidra®). Assume that 1 unit will drop blood glucose by 3 mmol/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 surgery cannot be delayed commence VRIII.

- **Type 2 diabetes:** give 0.1 units/kg of subcutaneous rapid acting analogue insulin, and recheck blood glucose 1 hour later to ensure it is falling. If surgery cannot be delayed or the response is inadequate, commence VRIII.

- **Post-operative hyperglycaemia** (blood glucose greater than 12 mmol/L with blood ketones less than 3 mmol/L or urine ketones less than +++)

- **Type 1 diabetes:** give subcutaneous rapid acting analogue insulin. Assume that 1 unit will drop blood glucose by 3 mmol/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. Repeat the subcutaneous insulin dose after 2 hours if the blood glucose is still above 12 mmol/L. In this situation the insulin dose selected should take into account the response to the initial dose – consider increasing the dose if the response is inadequate. Recheck the blood glucose after 1 hour. If it is not falling consider introducing VRIII.

- **Type 2 diabetes:** give 0.1 units/kg of subcutaneous rapid acting analogue insulin, and recheck blood glucose 1 hour later to ensure it is falling. Repeat the subcutaneous insulin after 2 hours if the blood glucose is still above 12 mmol/L. In this situation the insulin dose selected should take into account the response to the initial dose – consider doubling the dose if the response is inadequate. Repeat the blood glucose after another hour. If it is not falling consider introducing VRIII.

## Management of hypoglycaemia and hypoglycaemia risk

- To avoid peri-operative hypoglycaemia consider the potential for hypoglycaemia if the admission capillary blood glucose is less than 6 mmol/L and respond as below. NB patients on diet alone are not at risk of hypoglycaemia and are excluded from the guideline below:
  - If CBG is 4-6 mmol/L and the patient has symptoms of hypoglycaemia: Consider giving 50-100mls of 10% dextrose as a stat iv bolus and repeat the CBG after 15minutes.
  - If CBG is less than 4 mmol/L; give 80-100 mls of 20% glucose and repeat the blood glucose after 15 minutes.
  - Try to avoid stopping the VRIII in patients with type 1 diabetes. If it is stopped recommence as soon as the blood glucose rises above 5 mmol/L.

- Persistent hypoglycaemia should be referred urgently to the diabetic specialist team or the on-call medical team.
- Increase frequency of blood glucose monitoring until normoglycaemia achieved and then revert to monitoring blood glucose hourly until the patient is eating and drinking.

These recommendations are at slight variance with the National Hypoglycaemia Guidelines, but are designed to promote individualised care during the highly monitored peri-operative period.

# Appendix 5:

## Guideline for the use of a variable rate intravenous insulin infusion (VRIII)

### Aim

The aim of the VRIII is to achieve and maintain normoglycaemia (ideally, blood glucose levels between 6-10 mmol/L, although 4 to 12 mmol/L is acceptable).

### Principles

- There is no one fit for all.
- **If the patient is already on a long acting insulin analogue (e.g. Levemir® or Lantus®) these should be continued (see Controversial areas, page 39 of the full document).**
- Heavier patients often require more insulin per hour.
- Initial insulin infusion rate should be determined by the bedside capillary blood glucose (CBG) measurement.
- Hourly bedside CBG measurement should be taken initially to ensure that the intravenous insulin infusion rate is correct.
- If the blood glucose remains over 12 mmol/L for 3 consecutive readings and is not dropping by 3 mmol/L/hr or more the rate of insulin infusion should be increased.
- If the blood glucose is less than 4 mmol/L, the insulin infusion rate should be reduced to 0.5 units per hour, and the low blood glucose should be treated as per the National Guideline for the Management of Hypoglycaemia in Adults with Diabetes irrespective of whether the patient has symptoms. However, if the patient has continued on their long acting background insulin, then their VRIII can be switched off, but the regular CBG measurements need to continue.

### Indication for VRIII

- Patients anticipated to have a long starvation period (i.e. 2 or more missed meals).
- Decompensated diabetes.

### Administration

- Make up a 50 ml syringe with 49.5mls of 0.9% sodium chloride solution.
- The initial crystalloid solution to be co-administered with the VRIII is 0.45% saline with 5% glucose and 0.15% KCl. This should be given via an infusion pump.
- Subsequently, the substrate solution to be used alongside the VRIII should be selected from:
  - 0.45% saline with 5% glucose and 0.15% KCl, or
  - 0.45% saline with 5% glucose and 0.3% KCl.
- Selection should be based on serum electrolytes which must be measured daily
- Very occasionally, the patient may develop hyponatraemia without overt signs of fluid or salt overload. In these rare circumstances it is acceptable to prescribe one of the following solutions as the substrate solution
  - 0.9% saline with 5% glucose and 0.15% KCl
  - 0.9% saline with 5% glucose and 0.3% KCl.
- The rate of fluid replacement must be set to deliver the hourly fluid requirements of the individual patient and should not be altered thereafter without senior advice.
- Some patients will require additional concurrent crystalloid (via a second infusion line).

**Caution: do not infuse insulin without substrate unless in ITU/HDU setting.**

## Rate of insulin infusion

Bedside capillary blood glucose (mmol/L)	Initial rate of insulin infusion (units per hour)
<4.0	0.5 (0.0 if a long acting background insulin has been continued)
4.1-7.0	1
7.1-9.0	2
9.1-11.0	3
11.1-14.0	4
14.1-17.0	5
17.1-20	6
>20	Seek diabetes team or medical advice

**If increased doses of insulin are consistently being required (blood glucose above 15 and not falling) advice should be sought from the specialist diabetes team.**

### Guidelines for setting up a variable rate intravenous insulin infusion

- Intravenous fluid must be administered using a volumetric infusion pump.
- Delivery of the substrate solution and the VRIII must be via a single cannula with appropriate one-way and anti-siphon valves.
- Set the fluid replacement rate to deliver the hourly fluid requirements of the individual patient. The rate must not be altered thereafter without senior advice.
- Insulin must be administered via a syringe pump alongside the substrate infusion.
- Insulin should not be administered without substrate except on senior advice in an ITU/HDU setting.

- Insulin must be infused at a variable rate to keep the blood glucose 6-10 mmol/L (acceptable range 4-12 mmol/L).
- Continue the substrate solution and VRIII intra-operatively and post-operatively until the patient is eating and drinking and back on their usual glucose lowering medication.
- Additional fluid therapy may be required according to the specific needs of the patient for a given surgical procedure. Hartmann's solution is acceptable. Ideally the post-operative sodium intake should not exceed 200 mmol/day.
- If the insulin and substrate solution are disconnected from the patient new solutions and new giving sets should be used to reduce the risk of nosocomial infection.

The recent British Consensus Guidelines for Intravenous Fluid Therapy for the Adult Surgical Patient (GIFTASUP) provide further excellent detailed guidance.



# Appendix 6:

## Advantages and disadvantages of intravenous solutions

	Advantages	Disadvantages
0.45% saline with 5% glucose with 0.15% potassium chloride at 83-125 ml/hr with a continuous VRIII	<ul style="list-style-type: none"> <li>• Constant supply of substrate</li> <li>• Meets daily sodium and potassium requirements</li> <li>• Safety profile of regimen demonstrated in the paediatric diabetic population</li> </ul>	<ul style="list-style-type: none"> <li>• Not widely available</li> <li>• Hypotonic solution in vivo with reference to plasma and may still predispose to hyponatraemia</li> <li>• May exceed daily requirements of sodium</li> </ul>
0.9% saline with 5% glucose with 0.15% potassium chloride at 83-125 ml/hr with a continuous VRIII	<ul style="list-style-type: none"> <li>• Constant supply of substrate</li> <li>• Meets sodium and potassium requirements</li> <li>• Safety profile of regimen demonstrated in the paediatric diabetic population</li> </ul>	<ul style="list-style-type: none"> <li>• Not widely available</li> <li>• Will exceed daily sodium chloride requirement and predispose to oedema and hyperchloraemic metabolic acidosis</li> </ul>
0.18% saline with 4% glucose with 0.15% potassium chloride at 83-125 ml/hr with a continuous VRIII	<ul style="list-style-type: none"> <li>• Constant supply of substrate</li> <li>• Meets daily sodium and potassium requirements</li> <li>• Widely available</li> </ul>	<ul style="list-style-type: none"> <li>• Associated with hyponatraemia. Use in children has been curtailed by the NPSA</li> <li>• Hypotonic solution in vivo with reference to plasma</li> </ul>
5-10% glucose with 0.15% potassium chloride at 125 ml/hr with a continuous VRIII	<ul style="list-style-type: none"> <li>• Constant supply of substrate</li> <li>• Widely available</li> </ul>	<ul style="list-style-type: none"> <li>• Does not provide any sodium</li> <li>• Associated with hyponatraemia</li> </ul>
5-10% glucose with 0.15% potassium chloride at 125 ml/hr with additional 0.9% saline at a variable rate to correct the hyponatraemia and a continuous VRIII	<ul style="list-style-type: none"> <li>• Constant supply of substrate</li> <li>• Widely available</li> </ul>	<ul style="list-style-type: none"> <li>• Requires 3 infusion pumps (1 for the glucose, 1 for the saline and 1 for the insulin)</li> <li>• May need multiple venous access</li> <li>• May lead to fluid overload</li> </ul>
10% glucose with 0.15% potassium chloride at 60 ml/hr with additional 0.9% saline at 60 ml/hr with a continuous VRIII	<ul style="list-style-type: none"> <li>• Constant supply of substrate</li> <li>• Widely available</li> </ul>	<ul style="list-style-type: none"> <li>• Needs 3 infusion pumps (1 for the glucose, 1 for the saline and 1 for the insulin)</li> <li>• May need multiple venous access</li> </ul>

	Advantages	Disadvantages
<p>10% glucose with 0.15% potassium chloride at 100ml/hr if CBG less than 15mmol/L with a continuous VRIII</p> <p>0.9% saline with 0.15% KCl at 100 ml/hr if CBG more than 15mmol/L with a continuous VRIII</p>		<ul style="list-style-type: none"> <li>• Erratic supply of substrate</li> <li>• Unpredictable administration of sodium</li> <li>• Increased nursing workload and difficulties in maintaining accurate fluid balance charts with constant changes of fluid bags according to CBG</li> </ul>
<p>500mls 10% glucose and 0.15% KCl with 5 units insulin if CBG less than 6 mmol/L</p> <p>500mls 10% glucose and 0.15% KCl with 10 units insulin if CBG 6-10 mmol/L</p> <p>500mls 10% glucose and 0.15% KCl with 15 units insulin if CBG 10-20 mmol/L</p> <p>500mls 10% glucose and 0.15% KCl with 20 units insulin if CBG more than 20 mmol/L</p> <p>All administered at 100-125 ml/hr and with additional 0.9% saline to treat established hyponatraemia</p>	<ul style="list-style-type: none"> <li>• Intrinsically safe as substrate and insulin are co-administered</li> <li>• Evidence to support its use</li> </ul>	<ul style="list-style-type: none"> <li>• Increased nursing workload and difficulties in maintaining accurate fluid balance charts with constant changes of fluid bags according to CBG</li> <li>• Hyponatraemia is a recognised complication</li> <li>• May lead to fluid overload with the co-administration of additional 0.9% saline</li> </ul>
Hartmann's Solution	<ul style="list-style-type: none"> <li>• Causes minimal metabolic and electrolyte disturbance</li> <li>• Provided the blood sugars are controlled and stable without the use of a VRIII, Hartmann's solution can be safely used as the sole fluid in all patients with diabetes</li> </ul>	<ul style="list-style-type: none"> <li>• Has insufficient calories to provide a safe substrate solution when given with a continuous infusion of insulin</li> <li>• Has insufficient potassium to run alongside a continuous insulin infusion</li> <li>• Continuous use over several days will lead to salt retention as well as hypokalaemia</li> </ul>

# Appendix 7:

## Transferring from a VRIII to subcutaneous insulin or oral treatment

### Restarting oral hypoglycaemic medication

- Recommence oral hypoglycaemic agents at pre-operative doses once the patient is ready to eat and drink.
- Be prepared to withhold or reduce sulphonylureas if the food intake is likely to be reduced.
- Metformin should only be recommended if the eGFR is greater than 50 ml/min/1.73m<sup>2</sup>.

### Restarting subcutaneous insulin for patients already established on insulin

- Conversion to subcutaneous insulin should be delayed until the patient is able to eat and drink without nausea or vomiting.
- Restart the normal pre-surgical regimen. Be prepared to adjust the doses because the insulin requirement may change as a result of post-operative stress, infection or altered food intake.
- Consult the diabetes specialist team if the blood glucose levels are outside the acceptable range (4-12 mmol/L) or if a change in diabetes management is required.

**The transition from intravenous to subcutaneous insulin should take place when the next meal-related subcutaneous insulin dose is due e.g. with breakfast or lunch.**

### For the patient on basal bolus insulin

There should be an overlap between the VRIII and the first injection of fast acting insulin. The fast acting insulin should be injected subcutaneously with the meal and the intravenous insulin and fluids discontinued 30 to 60 minutes later.

If the patient was previously on a long acting insulin analogue such as Lantus® or Levemir®, this should have been continued and thus the only action should be to restart their normal short acting insulin at the next meal as outlined above.

**If the basal insulin was stopped in error, the insulin infusion should be continued until some form of background insulin has been given.** If the basal insulin is normally taken once daily in the evening and the intention is to convert to subcutaneous insulin in the morning, give half the usual daily dose of basal insulin as isophane (e.g. Insulatard®, Humulin I®) in the morning; this will provide essential background insulin until the long acting analogue can be recommenced. Check for blood or urine ketones and glucose levels regularly (e.g. every 4 to 6 hours) during this transition phase.

Contact the diabetes team for advice.

### For the patient on a twice daily fixed-mix regimen

The insulin should be re-introduced before breakfast or before the evening meal. Do not change to subcutaneous insulin at any other time. The VRIII should be maintained for 30 to 60 minutes after the subcutaneous insulin has been given.

### For the patient on a continuous subcutaneous insulin infusion (CSII, 'pump')

The subcutaneous insulin infusion should be recommenced at their normal basal rate. The VRIII should be continued until the next meal bolus has been given. Do not recommence the CSII at bedtime.

### Calculating subcutaneous insulin dose in insulin-naïve patients

(NB these are guidelines only and advice should be sought from the diabetes specialist team).

**Estimated total daily dose (TDD) of insulin** - this estimate is based on several factors, including the patient's sensitivity to insulin, degree of glycaemic control, insulin resistance, weight, and age.

Calculate the average hourly insulin dose by totalling the last 6 hours doses on the chart and dividing by 6 e.g. 12 units divide by 6 = 2 units/hour.

This should then be multiplied by a factor of 20 (not 24 because of the risk of hypoglycaemia with the first dose) to get the total daily dose (TDD) insulin e.g. ~40 units.

### Calculating a basal bolus (QDS) regimen

Give approximately 50% of the TDD with the evening meal in the form of long acting insulin and divide the remaining dose to be given as rapid

acting equally between pre-breakfast, pre-lunch and pre-evening meal.

The 1st dose of fast acting subcutaneous insulin should preferably be administered prior to breakfast or lunch. It should only be administered before the evening meal if monitoring can be guaranteed. Do not convert to a subcutaneous regimen at bed time.

**It is important that basal insulin is given before the insulin infusion is taken down. See guidance on previous page for transfer from the VRIII to basal bolus insulin.**

	Pre-breakfast	Pre-lunch	Pre-evening meal	Bedtime
Rapid acting insulin, e.g. Apidra® / Humalog®/ NovoRapid®	6 units	6 units	6 units	
Long acting insulin, e.g. Lantus®/Levemir®				18 units

### Calculating a twice daily (BD) regimen

If a twice daily pre-mixed insulin regimen is to be used, two thirds of the total daily dose should be given at breakfast, with the remaining third given with the evening meal.

# Appendix 8:

## Examples of patient information leaflets for patients undergoing surgery or procedures requiring a period of starvation

### Patient instruction leaflet for people with diabetes controlled with tablets or by injections of GLP-1 agonists - Byetta® (exenatide) or Victoza® (liraglutide)

Before your operation or procedure.

#### Please follow the instruction in the table below marked "What to do with your medication before surgery"

If your operation is in the morning:

- do not eat any food after midnight
- drink clear fluids such as black tea or coffee, sugar-free squash or water up to 5 am.

If your operation is in the afternoon:

- eat breakfast before 7 am and take no food after this time
- drink clear fluids such as black tea or coffee, sugar-free squash or water up to 10 am
- when you travel to and from the hospital for your operation carry some glucose tablets or a sugary drink.

If you have any symptoms of a low blood sugar such as sweating, dizziness, blurred vision or shaking please test your blood sugar if you are able to do so. If it is less than 4 mmol/L take 4 glucose tablets or 150 mls of the sugary drink (this is the same as half a standard sized can of non-diet cola). Please tell staff at the hospital that you have done this because it is possible that your surgery may have to be rearranged for another day.

- After your operation you will be offered food and drink when you feel able to eat. If you are eating and drinking normally you should resume taking your normal tablets the morning after surgery. However, your blood glucose levels may be higher than usual for a day or so.
- When you get home, if you feel nauseated or vomit and are unable to eat, please refer to the sick day rules leaflet.
- If you do not improve quickly and usually attend the hospital for diabetes care please telephone the Diabetes Team on [insert telephone number] during office hours Monday – Friday. Outside these hours please contact your GP practice or out of hours service. If you usually see your GP about your diabetes please phone your GP practice.

#### Remember to bring with you to hospital

- glucose tablets or a sugary drink
- blood glucose testing equipment (if you usually monitor your blood glucose)
- the tablets you usually take for your diabetes.

Instructions for taking your diabetes medication before your operation [to be completed by assessing nurse].

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## What to do with your medication before the surgery

Tablets	Day before going into hospital	Day of surgery	
		If your surgery is in the morning	If your surgery is in the afternoon
<b>Acarbose</b>	Take as normal	Omit morning dose if you have been told to fast from midnight.	Take your morning dose if eating breakfast. Do not take your lunchtime dose.
<b>Meglitinide</b> (repaglinide or nateglinide)	Take as normal	Omit morning dose if you have been told to fast from midnight.	Take your morning dose if eating breakfast. Do not take your lunchtime dose.
<b>Metformin</b> If you are due to have contrast media this <b>may</b> need to be stopped on the day of the procedure and not taken for a further 48 hours (your doctor should tell you this in advance)	Take as normal	If taken once a day – do not stop. If taken twice a day – do not stop. If taken three times a day omit your lunchtime dose only.	If taken once a day – do not stop. If taken twice a day – do not stop. If taken three times a day omit your lunchtime dose only.
<b>Sulphonylureas</b> (glibenclamide, glipizide, gliclazide/gliclazide MR, glimepiride, gliquidone)	Take as normal	If taken once a day in the morning – omit this dose. If taken twice a day, omit the morning dose.	If taken once a day in the morning – omit this dose. If taken twice a day, omit both doses.
<b>Thiazolidinediones</b> (Pioglitazone)	Take as normal	Take as normal.	Take as normal.
<b>DPP-IV inhibitors</b> (Sitagliptin, saxagliptin, vildagliptin)	Take as normal	Omit your morning dose.	Omit your morning dose.

**You should restart taking your normal tablets the morning after surgery. However, your blood glucose may be higher than usual for a day or so.**

**If you are taking Byetta® (exenatide) or Victoza® (liraglutide) by injection these medications should not be taken the day of surgery and restarted once you start eating and drinking normally.**

## Patient instruction leaflet for people with insulin (or insulin and tablet) controlled diabetes undergoing surgery or a procedure requiring a period of starvation

[To be adapted depending on the procedure]

### Before your operation (or procedure)

**Please follow the instruction in the table below marked "What to do with your insulin before surgery (or procedure)."**

If your operation (procedure) is in the morning:

- do not eat any food after midnight
- drink clear fluids such as black tea or coffee, sugar-free squash or water up to 5 am.

If your operation (procedure) is in the afternoon:

- eat breakfast before 7 am and take no more food after this time
- drink clear fluids such as black tea or coffee, sugar-free squash or water up to 10 am
- when you travel to and from the hospital for your operation carry some glucose tablets or a sugary drink.

If you have any symptoms of a low blood sugar such as sweating, dizziness, blurred vision or shaking please test your blood sugar if you are able to do so. If it is less than 4 mmol/L take 4 glucose tablets or 150 mls of the sugary drink (this is the same as half a standard sized can of non-diet cola). Please tell staff at the hospital that you have done this because it is possible that your surgery may have to be rearranged for another day.

- After your operation (procedure) your blood sugar will be checked and additional insulin given if necessary.
- After your operation (procedure) you will be offered food and drink when you feel able to eat.

If you are eating and drinking normally you should restart taking your normal insulin (and tablets) the next morning. However, your blood glucose levels may be higher than usual for a day or so.

- When you get home, if you feel sick or are sick and are unable to eat, please refer to the sick day rules leaflet.
- If you do not improve quickly and usually attend the hospital for diabetes care please telephone the Diabetes Team on [telephone number] during office hours Monday – Friday. Outside these hours please contact your GP practice or out of hours service. If you usually see your GP about your diabetes please phone your GP practice.

### Remember to bring with you to hospital

- glucose tablets or sugary drink
- blood glucose testing equipment you usually use
- insulin (and tablets) you usually take for your diabetes.

Instructions for taking insulin before your operation [to be completed by assessing nurse].

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## What to do with your insulin before surgery (procedure)

Insulins	Day before going into hospital	Day of surgery	
		If your surgery is in the morning	If your surgery is in the afternoon
<b>Once daily (evening)</b> (Lantus®/Glargine or Levemir/Detemir®) Insulatard® or Humulin I®	No dose change	No dose change necessary*.	No dose adjustment necessary*.
<b>Once daily (morning)</b> (Lantus®/Glargine or Levemir/Detemir®) Insulatard® or Humulin I®	No dose change	Take your normal dose*. Your blood glucose will be checked on admission.	Take your normal dose*. Your blood glucose will be checked on admission.
<b>Twice daily</b> (Novomix 30®, Humulin M3®, Humalog Mix 25®, Humalog Mix 50®)	No dose change	Halve the usual dose. Your blood glucose will be checked on admission. Resume your normal insulin with your evening meal.	Halve the usual dose. Your blood glucose will be checked on admission. Resume your normal insulin with your evening meal.
<b>3, 4, or 5 injections daily</b>	No dose change	Do not take your morning dose of short acting insulin if no breakfast is eaten. If you normally take a long acting basal insulin in the morning you should take your normal dose*. If you normally take a pre-mixed insulin the dose should be halved. Do not take your lunchtime dose. Resume your normal insulin with your evening meal.	Take usual morning insulin dose(s). Do not take lunchtime dose. Your blood glucose will be checked on admission. Resume your normal insulin with your evening meal.

**You should restart taking your normal insulin the morning after surgery (procedure).  
However, your blood glucose may be higher than usual for a day or so.**

\*Some units would recommend reduction of usual dose of long acting analogue by one third, particularly if you take regular snacks during the day.



# Appendix 9:

Example of instructions for non-operative procedures requiring a period of starvation (no more than one missed meal)

## Gastroscopy / Bronchoscopy

- Follow guidelines for surgery as in leaflets above.

## Colonoscopy

### Day before procedure: insulin-treated patients

- Follow the advice provided about low residue food.
- Take the bowel preparation as instructed.
- Take additional clear fluid, and sugary drinks such as Lucozade® or clear fruit juice to maintain the blood glucose levels.
- Test your blood glucose levels before administering insulin.
- Take half the usual dose of short acting (Novorapid®/Humalog®/Actrapid®/Humulin S®) or mixed insulin (Novomix 30®/Humulin M3®/Humalog Mix 25®).
- Take the usual dose of long-acting insulin (Lantus®/Levemir®).

### Day before procedure: non insulin treated patients

- Do not take any diabetes tablets.

### Day of procedure: insulin treated or non insulin treated patients

Please refer to the guidelines for the day of surgery (procedure) (Appendix 8). However, if the colonoscopy is due for the afternoon, then halve the morning dose of insulin(s).

# Appendix 10:

## Sick day rules for people with diabetes

These are a guide only, local practice may vary.

### What should I do if I am unwell?

- **NEVER** stop taking your insulin or tablets – illness usually increases your body's need for insulin.
- **TEST** your blood glucose level every 2 hours, day and night.
- **TEST** your urine for ketones every time you go to the toilet or your blood ketones every 2 hours if have the equipment to do this.
- **DRINK** at least 100 mls water/sugar free fluid every hour – you must drink at least 2.5 litres per day during illness (approximately 5 pints).
- **REST** and avoid strenuous exercise as this may increase your blood glucose level during illness.
- **EAT** as normally as you can. If you cannot eat or if you have a smaller appetite than normal, replace solid food during illness, with one of the following:
  - 400 mls milk
  - 200 mls carton fruit juice
  - 150-200 mls non-diet fizzy drink
  - 1 scoop ice cream.

### When should I call the Diabetes Specialist Nurses or my GP?

- **CONTINUOUS** diarrhoea and vomiting, and/or high fever.
- **UNABLE** to keep down food for 4 hours or more.
- **HIGH** blood glucose levels with symptoms of illness (above 15 mmol/L - you may need more insulin).
- **KETONES** at ++2 or +++3 in your urine or 1.5 mmol/L blood ketones or more. (You may need more insulin). In this case, contact the person who normally looks after your diabetes immediately.

**OUTSIDE NORMAL WORKING HOURS consult the local out of hours service or go to your local hospital A&E department.**

# Appendix 11:

## Discharge letter: Advice for patients with diabetes who are discharged following a surgical procedure

- Take your insulin or other medication as advised in the information leaflet.
- Monitor your blood glucose if you have the equipment to do so – 4 times per day if possible. You should test more frequently if you are unwell, feeling or being sick.
- Your blood glucose may be higher than usual. This is not a concern if you are feeling well.
- If you are feeling unwell (particularly if you are being sick and unable to take food or medication) contact your usual diabetes team/GP surgery.  
Tel: .....
- If outside normal working hours contact the out of hours service.  
Tel: .....

# Appendix 12:

## GP letter with recommendations for referral of patients for surgery

Dear Local GP

Poor glycaemia control is associated with greater post-operative morbidity and mortality. By optimising pre-operative diabetes control you can help reduce the risk of post-operative mortality by 50%.

You may be aware of the recent publication from NHS Diabetes, '**Management of adults with diabetes undergoing surgery and elective procedures: improving standards**'. The recommendations contained within this document aim to streamline the management of the surgical patient with diabetes. There is emphasis on optimising the patient's condition before referral for surgery, promoting day surgery where possible, avoiding the unnecessary use of intravenous insulin, and encouraging a rapid return to the patient's usual diet and diabetes management.

**We are writing to ask for your help in implementing these recommendations at a local level.**

Please could you provide the following information when referring a patient with diabetes for a surgical opinion:

### Up-to-date current diabetes care

- Duration and type of diabetes
- Place of usual diabetes care (primary or secondary care)
- Other co-morbidities
- Treatment
  - For diabetes - oral agents/ insulin doses and frequency
  - For other co-morbidities

### Specific complications of diabetes

- At risk foot
- Renal impairment
- Cardiac disease

### Recent values for

- BMI
- BP
- HbA<sub>1c</sub>
- eGFR

### Importance of good glycaemia control prior to surgery

There is evidence that poor pre-operative glycaemic control is associated with greater post-operative mortality and morbidity after elective surgery **In view of this we recommend that every effort be made to achieve an HbA<sub>1c</sub> below 69 mmol/mol (8.5%) prior to surgery.** To avoid the risk of postponement or cancellation, please review the treatment of any patient with an HbA<sub>1c</sub> above this target to improve diabetes control. You may wish to consider referral to the local diabetes team. If there is a reason why control cannot be improved, please make this clear so that the risks and benefits of surgery can be assessed.

We will start to use this approach to assess patients pre-operatively from .....(date).

For further information please contact the Diabetes Specialist Nurse Team on .....(tel no.).

We look forward to working together with you to improve surgical outcomes for patients with diabetes.

Yours sincerely

Medical Director







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