

Document Control

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1. Introduction

- 1.1. This document sets out Northern Devon Healthcare NHS Trust's best practice guidelines for the Peri-operative management of an Adult (over 18 years) with Diabetes Mellitus.

2. Background

- 2.1. Approximately half of people with diabetes in hospital are attending for planned procedures. The peri-operative mortality rate for people with diabetes is reported to be up to 50% higher than that of the non-diabetic population.
- 2.2. The reasons for these adverse outcomes include:
- Hypo and hyperglycaemia
 - Multiple co-morbidities including microvascular and macrovascular complications
 - Complex polypharmacy, including misuse of insulin
 - Inappropriate use of intravenous insulin infusion
 - Management errors when converting from the intravenous insulin to usual medication
 - Peri-operative infection
- 2.3. The main focus of these guidelines is elective surgery and procedures but patients with diabetes will also present with surgical emergencies. Patients undergoing emergency surgery are at particularly high risk in the post-operative period.
- 2.4. The release of high levels of catabolic hormones in response to the stress of surgery can rapidly lead to severe hyperglycaemia, keto-acidosis, electrolyte disturbance and protein catabolism. Poor peri-operative glycaemic control has a significant impact on the risk of post-operative infection. Patients with diabetes are therefore more susceptible to infection, poor wound healing, and increased venous thromboembolic risk.
- 2.5. Surgery is often accompanied by a period of starvation, which induces a catabolic state. Inappropriate insulin or drug administration can be hazardous in the peri-operative period and care should be taken to avoid hypoglycaemia. Hypoglycaemia will stimulate secretion of hormones and exacerbate the catabolic effect of surgery.
- 2.6. Each individual should expect to have a plan of safe diabetes care that ensures the shortest time in hospital. Diabetes is not necessarily a reason for a patient to be managed as an in-patient. Day of surgery admission in patients with well controlled diabetes, even for those on insulin, can safely be achieved if surgery allows.

3. Purpose

- 3.1. The purpose of this guideline is to promote best practice and ensure adherence when managing the adult patient with diabetes undergoing surgery. The primary aim of peri-operative management of the surgical patient is to decrease morbidity and hopefully reduce the duration of hospital stay.
- 3.2. Implementation of this guideline will ensure:
- Safe use of insulin
 - Optimal glycaemic control throughout the peri-operative period
 - Appropriate use of Variable Rate Intravenous Insulin Infusion (VRIII)
 - Clear direction about withdrawal of VRIII and re-introduction of pre-operative diabetes management
 - Prevention of insulin related incidents and 'Never Events' :
Overdose of insulin due to abbreviations or incorrect device
 - Safe and timely discharge
- 3.3. This guideline applies to all staff who look after patients with diabetes undergoing planned surgery and must be adhered to. Non-compliance with this guideline may be for valid clinical reasons only. The rationale for deviation from the guideline must be documented clearly in the patient's notes.

4. Role and Responsibilities

Primary Care

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

Diabetes Specialist Team

- Aim to provide expert advice and guidance to optimise glycaemic control before, during and after the planned elective procedure
- Involvement in discharge planning

Surgical Outpatients

- Aim to arrange pre-operative assessment as soon as possible after the decision is taken to proceed with surgery to allow optimisation of care
- Aim to avoid overnight pre-operative admission whenever possible

Pre-operative Assessment Clinic

- 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.
- All patients with diabetes will need an HbA1c value. Please do not reorder within 120 days (4 months) unless there is a specific reason.
- Ensure that glycaemic control is optimised prior to surgery aiming for an HbA1c of less than 69mmol/mol if safe to do so.
- Assess adequacy of glycaemic control. The risks of proceeding when control is suboptimal should be balanced against the urgency of the procedure.
- Ensure that the algorithm for peri-operative management of diabetes is followed according to the HbA1c and expected fasting period (**see appendix A** flow diagram).
- Ensure a management plan is in place to prevent peri-operative dysglycaemia including timing of admission, location, timing of surgery, preadmission management of medications, and availability of usual insulin. Involve the diabetes specialist team if necessary.
- Ensure the patient is fully consulted and engaged in the proposed plan of management. Give the patient written instructions, with the changes they need to make to their medication prior to admission explicitly highlighted (**See appendix B and C** for adjustment of insulin and non-insulin medication).
- Involve the diabetes specialist nursing team in advance of anyone with type 1 diabetes managed on an insulin pump (**See appendix F** for management of patients on an insulin pump).
- Ensure that admission ward staff are appraised of plans and able to activate them on the day of admission.
- Ensure that patients with diabetes are not placed on an evening list and prioritised to minimise starvation time where possible.
- During venous thromboembolism risk assessment ensure that no contraindications to anti embolic stockings e.g. patients with peripheral vascular disease or neuropathy. Patients with “at risk” feet should be identified through the diabetes foot assessment tool, and appropriately referred to Podiatry.
- Plan duration of stay and make preliminary discharge arrangements.

Pre-op Screening

4.1. All of the following patients will be screened for diabetes when they come for pre-op assessment:

- Everybody in whom we are taking a blood sample
- Patients with an increased risk of diabetes (strong family history, vascular disease, hypertension, dyslipidaemia, obstructive sleep apnoea, previous gestational diabetes).

- All patients with body mass index (BMI) >30
- All black, Afro-Caribbean patients, Chinese and South Asian patients and other black minority ethnic groups.

4.2. Screening will be done by sending a blood sample for HbA1c. (Random glucose is no longer acceptable)

All Staff

4.3. Hospital admission

- Ensure that an agreed documented individual plan is communicated to all involved in the patient pathway including: the patient, relevant specialists (including anaesthetists, surgeon, and diabetologist), staff in all relevant clinical areas.
- The patients' usual diabetes medication should also be written up on the drug chart with the appropriate adjustments made (**See appendix B and C** for adjustment of insulin and non-insulin medication. **See appendix F** for management of patients on an insulin pump).
- Aim to minimise the metabolic consequences of starvation and surgical stress.
- Aim to maintain optimal blood glucose control throughout the admission. A target of 6.0-10.0mmol/L is for those on glucose lowering agents i.e. insulin or sulphonylurea therapy, 6.0-12.0mmol/L is acceptable. In the awake patient on agents that do not produce hypoglycaemia, provided they have not been given insulin, lower blood glucose levels down to 3.5mmol/L are safe and do not require hypo treatment.
- Blood glucose levels should be measured hourly until oral intake is established and usual medication is resumed
- Base management on the Enhanced Recovery Partnership Programme but omit the pre-operative high carbohydrate drink in patients with insulin treated diabetes, and/ or HbA1c >69mmol/mol.
- Aim to prevent hospital acquired foot pathology using the Diabetes Foot Assessment Tool and follow the Diabetes Footcare Pathway for North Devon (see BOB).
- Allow the patient to self-manage if they are able to do so (See SOP Administering injectable medicines V2.0).

Ward/Department Managers

- Ensure all staff involved in the care of people with diabetes undergoing surgery or procedures have received training in blood glucose measurement and have been assessed as competent.
- Ensure people with diabetes undergoing surgery or procedures are referred to the diabetes specialist team.

Theatre and Recovery

- Aim to maintain good glycaemic control throughout. Monitor CBG at least hourly during the procedure or more frequently if readings are outside target range. Hypoglycaemia sometimes manifests a drowsiness, which may be wrongly attributed to sedation. The target blood glucose in the pre-operative, anaesthetised or sedated patient should be 6.0-10.0mmol/L (6.0- 12.0mmol/L is acceptable).
- Aim to 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 regime.
- Aim to avoid pressure damage to feet during surgery.
- Aim to maintain normal electrolyte concentrations.

Post-operative Care

- Ensure that blood glucose levels are appropriately maintained. The acceptable post-operative range in the awake patient NOT on a VRIII is 4.0-12.0mmol/L, however if a VRIII is used, then the acceptable range remains 6.0-12.0mmol/L.
- Ensure 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.
- Avoid iatrogenic injury (drugs/diabetes management/infection/pressure damage)

5. Contact Numbers

- 5.1. The Diabetes Inpatient Specialist Nurses (DISN) team can be contacted on 01271 322726 internal extension: 2726.

6. General Principles of Peri-Operatives Guidelines for Adults with Diabetes

- 6.1. These guidelines have been simplified where possible such that there is no distinction between inpatients and day case patients.
- 6.2. All patients are fasted in line with hospital surgical starving criteria i.e. no food allowed 6 hours pre-operatively and only clear fluids allowed till 2 hours pre-operatively. Clear fluids may contain sugar if necessary (to treat hypoglycaemia).
- 6.3. Factors influencing the choice of peri-operative diabetes management should include:
- Duration of starvation
 - Timing of surgery

- Usual treatment regimen (insulin, tablets, diet)
- Diabetes control prior to admission
- Other co-morbidities
- Likelihood that the patient will be capable of self-managing their diabetes during the immediate post-operative period.

6.4. Anticipated short starvation period (only one missed meal)

- Minor or Day-case surgery
- Likely to resume oral intake within 24 hours
- No more than one missed meal
- Prioritise patient on theatre list
- Encourage an early return to normal eating and drinking, facilitating return to their usual diabetes regime.

6.5. All patients with diabetes who and having MINOR or DAYCASE SURGERY and who are well controlled with **HbA1C less than or equal to 69mmol/mol** should be managed by modification of their usual diabetes medication, avoiding a VRIII where possible.

6.6. Anticipated long starvation period (more than one missed meal)

- Major or Emergency surgery
- Overnight admission
- Unlikely to resume normal oral intake within 24 hours
- Long starvation period- 2 or more missed meals
- Prioritise patient on theatre list
- Encourage an early return to normal eating and drinking, facilitating return to their usual diabetes regime.

6.7. Most patients with diabetes who are having MAJOR or EMERGENCY SURGERY or are poorly controlled with **HbA1C greater than 69mmol/mol** may require a Variable Rate Intravenous Insulin and glucose infusion (VRIII). However, patients who are diet controlled or on once daily metformin, should only start a VRIII if their capillary blood glucose levels are greater than 12.0mmol/L on 2 consecutive occasions.

6.8. All patients will have a **one hourly blood glucose monitoring** from admission until oral intake is established and usual medication is resumed.

6.9. Any patient with type 1 diabetes managed on an insulin pump should be referred to the diabetes nursing team. See **appendix F** for guidelines on pump management during elective procedures under sedation or anaesthesia.

6.10. See **Appendix B and C** for advice on perioperative adjustment of insulin and non-insulin medication before surgery.

6.11. See **Appendix D** for guidelines on the use of a variable rate intravenous insulin infusion (VRIII).

7. Principles for the patient requiring Intravenous insulin and glucose

- 7.1. The use of the Variable Rate Intravenous Insulin and glucose Infusion (VRIII) provides more stable control than a “sliding scale”.
- 7.2. The aims of diabetes management peri-operatively are to avoid hypoglycaemia, excessive hyperglycaemia, and minimise fat and protein breakdown (which may lead to ketoacidosis) by the provision of a Variable Rate Intravenous insulin and glucose infusion (VRIII).
- 7.3. If hyperglycaemia is recognized then check for urinary ketones. If the patient is unwell or has more than 2++ of ketones in their urine then seek medical advice and assess for Diabetic Ketoacidosis (DKA) or Hyperosmolar Hyperglycaemic State (HHS).
- 7.4. **See Appendix D** for guidelines on the use of a Variable Rate Intravenous Insulin Infusion

8. Education and Training

- 8.1. Responsibility for education and training lies with the Lead Clinician for diabetes. It will be provided through formal study days and informal training on the ward. Competencies will be assessed and written confirmation issued.

9. Consultation, Approval, Review and Archiving Processes

- 9.1. The author consulted with all relevant stakeholders. Please refer to the Document Control Report.
- 9.2. The guidelines will be reviewed every 3 years. The author will be responsible for ensuring the guidelines are reviewed and revisions approved by the Lead Clinician for diabetes in accordance with the Document Control Report.
- 9.3. All versions of these guidelines will be archived in electronic format by the author within the Diabetes Team policy archive.
- 9.4. Any revisions to the final document will be recorded on the Document Control Report.
- 9.5. To obtain a copy of the archived guidelines, contact should be made with the Diabetes Team.

10. Monitoring Compliance and Effectiveness

- 10.1. Monitoring of implementation, effectiveness and compliance with these guidelines will be the responsibility of the lead clinician for diabetes. Where non-compliance is found, it must have been documented in the patient's medical notes.

11. References

- 11.1. Management of adults with diabetes undergoing surgery and elective procedures: improving standards (2015)
www.diabetes.nhs.uk/our_work_areas/inpatient_care/
- 11.2. Self-management of diabetes in hospital (2012) http://www.diabetologists-abcd.org.uk/JBDS/JBDS_IP_SelfManagement.pdf

12. Associated Documentation

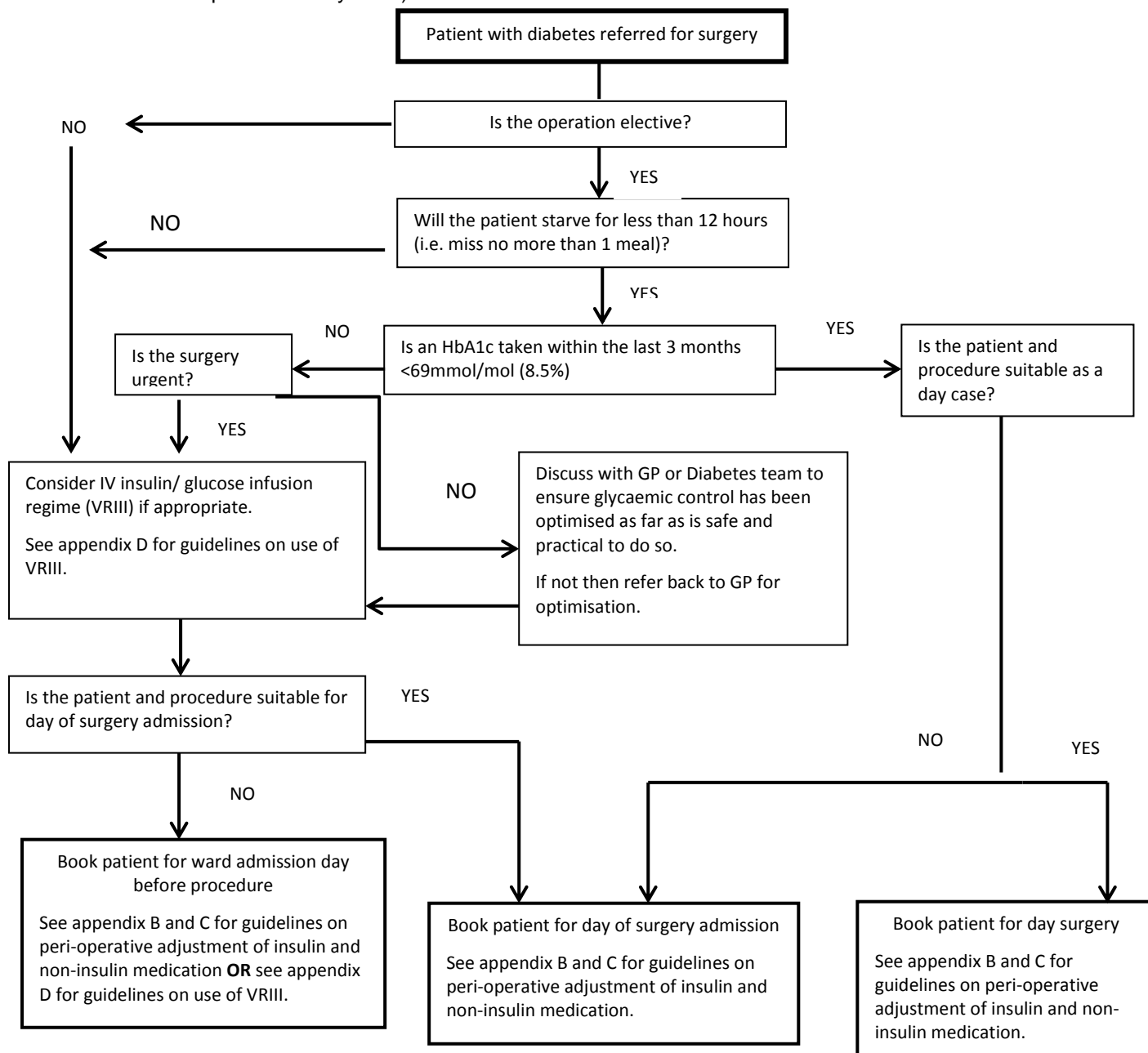
- Trust Medicine policy and associated Standard operating Procedures
- Trust Intravascular Device Policy
- Hypoglycaemia inpatient guidelines
- Trust Injectable Medicines Policy
- Standard Operating Procedure for prescribing injectable medicines in clinical areas
- Standard Operating Procedure for administering injectable medicines

Appendix A: How to identify which patients with diabetes are suitable for day 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.

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

- They fulfill all day case criteria
- They can be **early** on a morning or afternoon list (Ideally first on the list as this ensures adequate recovery time.)



Appendix B: Guideline for peri-operative adjustment of non-insulin medication

This advice should be used for patients with diabetes who are

- Well controlled; HbA1c less than or equal to 69mmol/mol.
- Attending for minor or day case surgery.
- Expected to have no more than **1 missed meal** and expected to eat and drink within 2-3 hours after surgery.
- Are diet controlled or with oral diabetes medication.

Tablets	Day prior to admission	Patient for AM surgery	Patient for PM surgery	If a VRIII is being used
Acarbose	Take as normal	Omit morning dose If NBM	Give morning dose if eating	Stop once VRIII commenced, do not recommence until eating and drinking normally
Meglitinide (repaglinide or nateglinide)	Take as normal	Omit morning dose if NBM	Give morning dose if eating	Stop once VRIII commenced, do not recommence until eating and drinking normally
Metformin (eGFR is greater than 60ml/min/1.73m and procedure not requiring use of contrast media**)	Take as normal	If taken once or twice a day- take as normal. If taken three times per day, omit lunchtime dose.	If taken once or twice a day- take as normal. If taken three times per day, omit lunchtime dose.	Stop once VRIII commenced, do not recommence until eating and drinking normally
Sulphonylurea (eg. Glibenclamide, gliclazide, glipizide, glimereide)	Take as normal	If taken once daily in the morning- omit the dose that day. If taken twice daily- omit the morning dose that day.	If taken once daily in the morning- omit the dose that day. If taken twice daily- omit both doses that day.	Stop once VRIII commenced, do not recommence until eating and drinking normally

Pioglitazone	Take as normal	Take as normal	Take as normal	Stop once VRIII commenced, do not recommence until eating and drinking normally
DPP IV inhibitor (e.g. Sitagliptin, vildagliptin, saxagliptin, alogliptin, linagliptin)	Take as normal	Take as normal	Take as normal	Stop once VRIII commenced, do not recommence until eating and drinking normally
GLP 1 analogue (eg. Exenatide, Liraglutide, lixisenatide, dulaglutide)	Take as normal	Take as normal	Take as normal	Take as normal
SGLT-2 Inhibitors (e.g. Dapagliflozin, Canagliflozin, Empagliflozin)	Take as normal	Omit on day of surgery	Omit on day of surgery	Omit on day of surgery

**If contrast media is to be used and eGFR less than 60ml/min/1.73m, metformin should be omitted on the day of the procedure and for the following 48 hours.

Appendix C: Guideline for peri-operative adjustment of insulin

This advice should be used for patients with diabetes who are

- Well controlled; HbA1c less than or equal to 69mmol/mol.
- Attending for minor or day case surgery
- Expected to have no more than **1 missed meal** and expected to eat and drink within 2-3 hours after surgery.

Insulins	Day prior to admission	Patient for AM surgery	Patient for PM surgery	If a VRILL is being used*
Once daily (evening) e.g. Lantus or levemir, Abasaglar, Insulatard, Humulin I or Insuman Basal	Reduce dose by 20%	Check blood glucose on admission	Check blood glucose on admission	Continue at 80% of the usual dose
Once daily (morning) lantus or levemir, Abasaglar, Insulatard, Humulin I, Insuman Basal.	Reduce dose by 20%	Reduce dose by 20%. Check blood glucose on admission	Reduce dose by 20%. Check blood glucose on admission	Continue at 80% of usual dose
Twice daily e.g. Novomix 30, Humulin M3, Humalog Mix 25, Humalog Mix 50, Insuman comb 25, Insuman comb 50, Twice daily Levemir	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.	Stop until eating and drinking normally
Twice daily – separate injections of short acting (e.g. animal neutral, Novorapid, Humulin S, Apidra) and intermediate acting (e.g animal isophane, insulatard, humulin I,	No dose change	Calculate the total dose of both morning insulin's. Give half this total as intermediate acting only in the morning. Check blood glucose on	Calculate the total dose of both morning insulin's. Give half this total as intermediate acting only in the morning. Check blood glucose on	Stop until eating and drinking normally

insuman)		admission. Leave the evening meal dose unchanged.	admission. Leave the evening meal dose unchanged.	
3,4, or 5 injections daily e.g. 3 meal time injections of short acting insulin (e.g. Novorapid/ Humalog/ Aprida/ Actrapid/ Humulin S) PLUS Once daily or twice daily background insulin (e.g. Abasaglar/ Lantus/ levemir)	No dose change	Basal Bolus regimens: Omit the morning and lunchtime short acting insulins. Keep the basal (long acting) unchanged*	Take usual morning short acting insulin dose if eating breakfast. Omit lunchtime short acting insulin dose Check blood glucose on admission	Stop until eating and drinking normally*
3,4 or 5 injections daily e.g. an injection of mixed insulin 3 times a day (Humulin M3/ Novomix 30/ Humalog mix 25, Humalog mix 50, Insuman Comb 25, Insuman Comb 50)	No dose change	Premixed AM insulin: Halve the morning dose and omit lunchtime dose. Check blood glucose on admission	Take usual morning insulin dose. Omit lunchtime dose. Check blood glucose on admission.	Stop until eating and drinking normally*

***If the patient requires an ongoing VRIII then the long acting insulin should be continued but at 80% of the dose the patient usually takes when they are well. Normal insulin doses should be recommenced when the patient is eating and drinking normally.**

Please Note: A number of concentrated, **HIGHER STRENGTH** insulins have recently been introduced and are now available as **200 units/mL and 300 units/mL**.

Please seek the Diabetes specialist team advice where appropriate for those patients undergoing periods of starvation in preparation for surgery.

Appendix D: Guideline for the use of a variable rate intravenous insulin infusion (VRIII)

Please note: The Intravenous Insulin Prescription for the Surgical Patient must be used if a VRIII is required.

Aims

- To achieve and maintain stable glycaemic control (aiming for blood glucose between 6.0-10.0mmol/L, although up to 12.0mmol/L may be acceptable) This is done by infusing a constant rate of glucose-containing fluid as substrate while infusing insulin at a variable rate.
- In particular it should be used in those patients who **cannot be safely managed by the manipulation of their usual diabetes medications as outlined in appendices A and B.**

Principles:

- There is no one fit all
- The VRIII is the preferred method of controlling the surgical patients serum glucose in the following circumstances:
 - Patient with Type 1 diabetes undergoing surgery with starvation period greater than 1 missed meal.
 - Patient with type 1 diabetes undergoing surgery who has not yet received background insulin.
 - Patient with Type 2 diabetes undergoing surgery with a starvation period greater than 1 missed meal and develops hyperglycaemia (CBG>12.0mmol/L)
 - Patients with poorly controlled diabetes as defined as an HbA1c >69mmol/mol.
 - Most patients with diabetes requiring emergency surgery.
- If the patient is already on long acting insulin analogue (Abasaglar, Lantus, Levemir) these should be continued at 80% of the usual dose. This is particularly important in type 1 diabetes, where continuing the basal insulin can prevent rebound hyperglycaemia and even ketoacidosis when the VRIII is withdrawn.
- Initial insulin infusion rate should be determined by the bedside capillary blood glucose (CBG) measurement.
- Hourly bedside CBG measurement should be taken to ensure that the intravenous insulin infusion rate is correct
- Insulin should be adjusted as per the Intravenous Insulin Prescription for the Surgical Patient (purple prescription form)

Indication for VRIII

- Patients anticipated having a long starvation period (i.e. 2 or more missed meals).
- Decompensated diabetes i.e. Patients with HbA1c >69mmol/mol who cannot be managed by the manipulation of their usual diabetes medications as outlined in appendices A and B.

Administration

- Make up a 50ml syringe with 50 units of soluble Human Insulin (e.g. Human Actrapid) with 49.5mls of 0.9% sodium chloride solution.
- Insulin must be administered via a syringe pump alongside the substrate infusion.

- The patient with a VRIII needs at least 2 cannulae- one dedicated for insulin and glucose, and the others for anaesthetic drugs and additional fluids.
- The insulin infusion and glucose solution must be infused, through the same cannula, using a single lumen. This provides a safe delivery and is best clinical practice.

Fluids

- Use 500ml 10% glucose with 10mmol KCl at 50ml/hr through an infusion pump.
- Consider 250ml 20% glucose with 20 mmol KCl at 25ml/hr if there are concerns about fluid overload.
- Consider lower concentrations of KCl (potassium) in patients with renal impairment.
- Extra fluids may be prescribed if the patient is fluid deplete, but it must be infused through a separate cannula. (Fluids MUST be prescribed & batch no. MUST be recorded on fluid chart)
- A reduction in the infusion rate to 25mls/hr may be considered if there are concerns with fluid overload
- To prevent hypoglycaemia, the substrate solution containing glucose must never be discontinued inadvertently, especially during transfers.

Suggested initial regime:

- Start at 4 units per hr if blood glucose greater than 14.0mmol/l and change subsequent rates by 2 units/hr
- Start at 2 units per hr if blood glucose less than or equal to 14.0mmol/l and change subsequent rates by 1 unit/hr

Achieving blood glucose target (6.0-10.0mmol/l):

- If blood glucose stays the same and is in target range of 6.0 -10.0mmols/L continue insulin at present rate.
- If blood glucose is above target range of 6.0 – 10.0mmols/L increase the insulin infusion by 1 or 2 units depending on the starting rate.
- If blood glucose above target range but falling, continue current infusion rate until in target range.
- If blood glucose is below target range of 6.0 – 10.0mmols/L decrease the insulin infusion by 1 or 2 units depending on the starting rate (0.5 mls/hr changes may be an option).
- If blood glucose is in target range but has risen by more than 2.0mmols/L in 2 consecutive readings increase the insulin infusion by 1 or 2 units depending on the starting rate.

Treatment of CBG < 4.0mmol/L whilst on VRIII

- If blood glucose falls below 4.0mmols/L STOP the insulin infusion immediately for 30 minutes; ensure the glucose infusion is still running at 50mls/hr.
- Recheck blood glucose after 15 minutes; If the patient is symptomatic or blood glucose remains under 4.0mmols/L after 15 minutes increase the glucose to 100mls/hr.

Cautions:

1. Do not infuse insulin without substrate unless in ITU/ HDU/ CCU setting.
2. Measure CBG hourly to avoid hypoglycaemia and hyperglycaemia

3. Ensure the administration of background insulin to prevent hyperglycaemia and risk of ketosis on cessation.
4. In patients with Type 1 diabetes, the VRIII must never be taken down until alternative subcutaneous insulin has been administered in the previous 30 minutes (**See Appendix E**).
5. Intravenous insulin is **NOT** suitable for patients who are eating and drinking.
6. Check venous blood glucose, sodium and potassium at least on a daily basis.
7. Ensure that the insulin and glucose infusion pumps are in continuous use throughout transport to and from theatre, in theatre and in recovery.

Appendix E: Transferring from a VRIII to subcutaneous insulin or oral treatment

1. **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 recommenced if the eGFR is greater than 60mls/min/1.73m²

2. **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 regime. 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 nursing team if blood glucose levels are outside target range (4.0-12.0mmol/L).

NB: 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 evening meal.

- **For the patient on twice daily fixed-mix regime:**

The insulin should be re-introduced before breakfast or before evening meal. Do not change to subcutaneous insulin at any other time.

The VRIII should be maintained for 30 mins after the subcutaneous insulin has been given.

- **Restarting 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 minutes later.

If the patient was previously on long acting insulin analogue such as Abasaglar, Lantus, Tresiba, 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 the patient's usual background insulin has been given.

Contact the DSN team for advice.

3. **For the patient on a Continuous Subcutaneous Insulin Infusion (CSII, "Pump")**

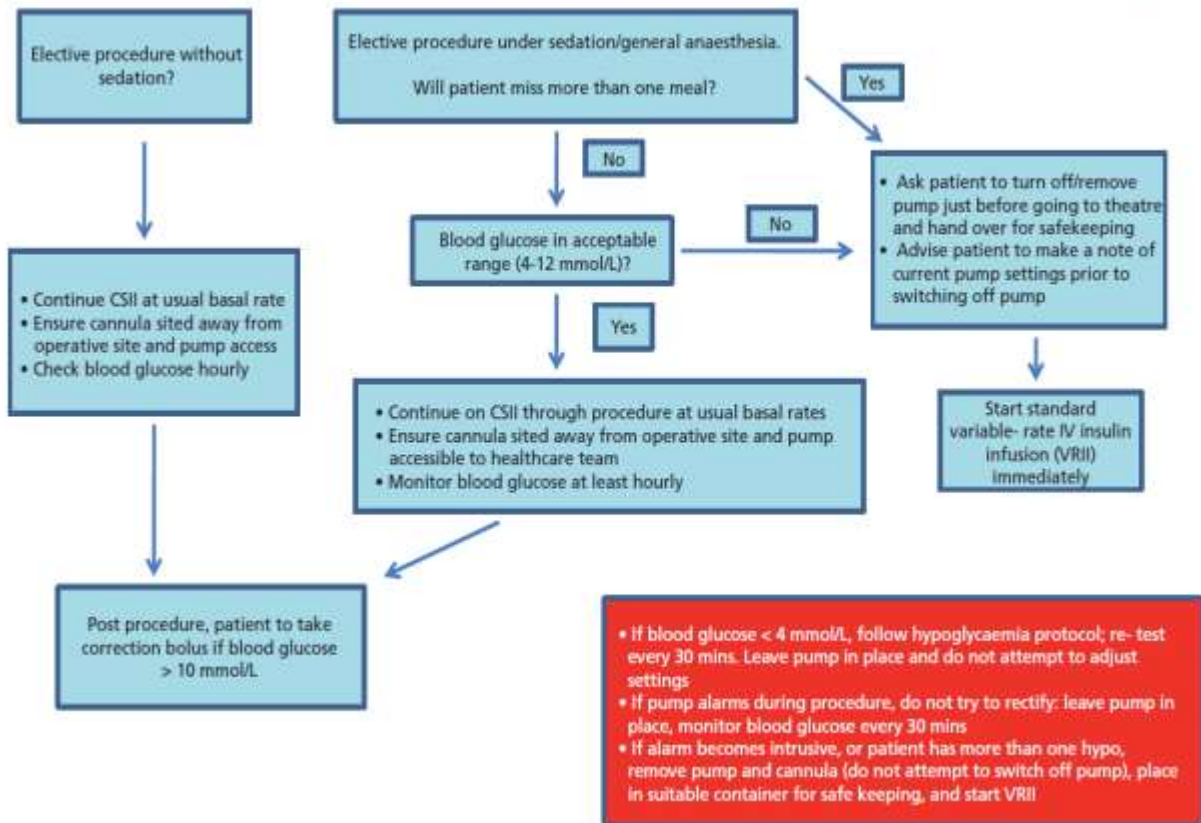
The DSN team should be informed at the time of admission or routinely referred at pre-assessment.

The subcutaneous insulin infusion should be restarted 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.

Appendix F: Pump management for elective procedures under sedation or anaesthesia.

General principles:

- Continuous infusion of subcutaneous insulin via a pump is designed to maintain stable blood glucose during the fasted state.
- Procedures requiring the patient to be nil by mouth for a limited period (no more than one missed meal) should be manageable with a pump.
- Plans for continued use of the pump during an elective procedure should be discussed and agreed with the patient before the procedure.
- Patients using a pump should not require overnight admission before the procedure.



CSII, continuous subcutaneous insulin infusion

Please discuss all pump patients with a member of the diabetes specialist team