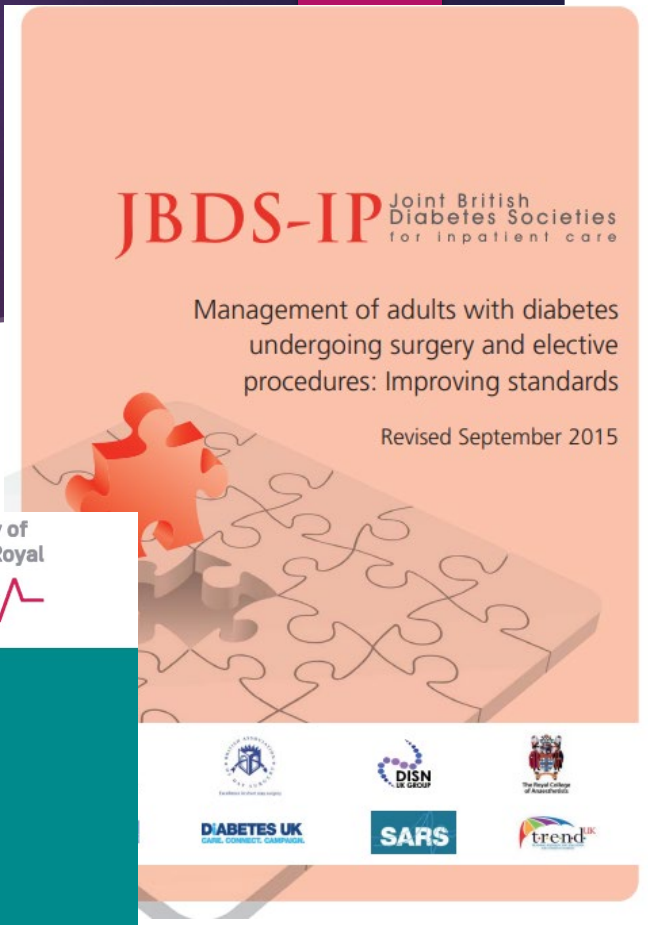
Perioperative Management of Diabetes

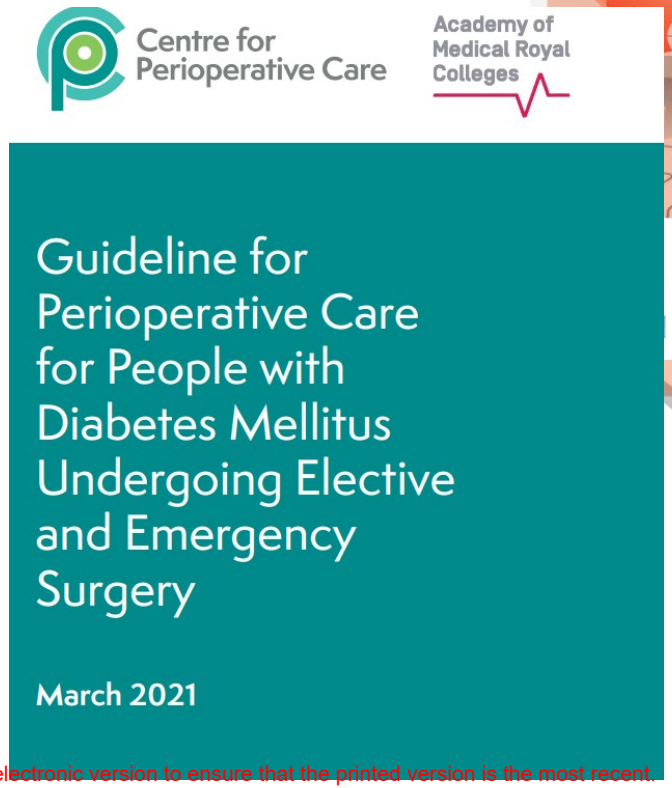
GUIDELINE UPDATE OCT 2023

[redacted]
Dr Anthony Murphy
Dr Cat Cromey
Prof Jeff Stevens
[redacted]
Dr Richard Chudleigh

Review 2022

- Joint British Diabetes Societies guidelines[1]
- Update to CPOC guidelines 2021[2]
- Adapted for local use in conjunction with other diabetes guidelines
- No one size fits all – apply clinical judgement





Contents

General Considerations

Avoid prolonged starvation

Target **6.0-10.0** mmol/L

(6.0-12.0 mmol/L acceptable)

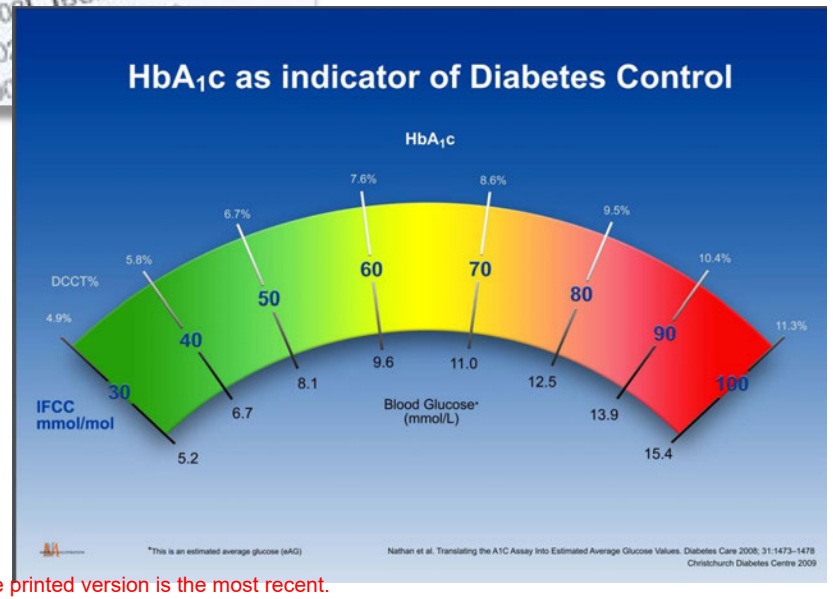
Pre-op CBG **must** be measured & recorded before induction

Anaesthetist prescribes **fluids** for **VRIII** for the immediate post-op period only - needs ongoing review by the surgical team

Contents

HbA1c < 69 mmol/L

- No clear data demonstrating that actively reducing HbA1c before surgery improves outcome
- High preop HbA1c predictive of poor perioperative glycaemic control – consider VRIII in perioperative period
- Elective patients with HbA1c >69 mmol/mol - refer for preoperative review of their glycaemic control by their GP/Diabetes team if not been reviewed in the past 12 months



Monitoring

Target: 6.0 – 10.0 mmol/L

- **>12.0**: active treatment
- **>14.0** or unwell: check ketones & active treatment
- **< 4.0**: treat hypo
- **4.1 – 5.9**: recheck in 30 mins. Pause insulin*

*BG likely to fall further if taking insulin or a Sulphonylurea such as Gliclazide

Monitoring

Fasted Patients

VRIII / subcut insulin / sedated / anaesthetised	**Hourly**
Diet controlled / oral Rx	**2 hourly**

Non-Fasted Patients

Subcut insulin / sulphonylurea	**3-4 x day**
Oral Rx / diet controlled & BG < 10.0 mmol/L	**Twice daily**

Contents

Perioperative Medication Management

MORE than
1 missed meal

ONLY
1 missed meal

One missed meal predicted

Day before surgery:

Patients on non-insulin diabetes medication

- Take meds except SGLT2i

Patients on insulin

- Continue basal insulin & adjust as per table 2 (risk of DKA)

On day of surgery:

BG & ketones checked & recorded on admission

Consult Table 1 or 2* for medication alterations

N.B. Patients with **Type 1 DM should never be without insulin.**

*adapted from JBDS-IP guidelines

Table 1: Oral diabetes therapies adjustment for day & elective surgery

Tablets	Day before surgery	Patient for a.m. surgery	Patient for p.m. surgery
Acarbose	Take as normal	Omit	Take morning dose if eating
Meglitinide s (e.g. repaglinide or nateglinide)	Take as normal	Omit	Take morning dose if eating
Metformin (eGFR >60 & procedure not requiring use of contrast media)	Take as normal	If taken once or twice a day - take as normal If taken three times a day, omit lunch time dose	If taken once or twice a day - take as normal If taken three times per day, omit lunch time dose
Sulphonylurea s (e.g. glibenclamide, gliclazide, glipizide, glimepi ride)	Take as normal	Once daily - Omit Twice daily - Omit morning dose	Omit
Pioglitazone	Take as normal		
DPP IV inhibitor (e.g. alogliptin, linagliptin sitagliptin, vildagliptin, sax agliptin,)	Take as normal		
GLP -1 analogue (e.g. semaglutide, liraglutide, lixisenatide, dulaglutide, exenatide, rybelsus)	Take as normal		
SGLT -2 inhibitors (e.g. dapagliflozin, canagliflozin, empagliflozin)	Stop 3 days pre-op. Ertugliflozin should stop 4 days pre-op	Omit Monitor capillary ketones daily until normal eating and drinking pattern restored. N.B. risk of euglycaemic DKA	

Day before:

- Take all day before except SGLT2i "**flozins**". **Stop these 3 days pre-surgery or 4 days pre-surgery for Ertugliflzoin**

Day of:

- Omit SGLT2i (until normal diet)
- Sulphonylurea (**glicazide**): omit
- **Metformin**: if taken TDS, omit lunchtime dose
- **Acarbose** / **Meglitinides**: omit am dose only if am op.

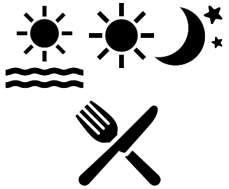
Table 2: Insulin adjustment for day & elective surgery

Basal evening: reduce dose by 20% day before only

Basal morning: reduce dose by 20% day before & day of, until diet resumed PM

BD Mixed (long & short): Reduce AM dose by 50% day of surgery, resume with evening meal

TDS Mixed: reduce AM dose by 50% only if AM surgery, omit lunchtime dose, resume with evening meal



TDS bolus + basal: reduce basal by 20%, omit fast acting dose as per meals missed,

Insulin	Day prior to admission	Patient for a.m. surgery	Patient for p.m. surgery
Once daily Basal/Background (evening) (e.g. Lantus , Levemir , Tresiba , Insulatard , Humulin I, Semglee, Toujeo, Abasaglar)	Reduce dose by 20%	No dose adjustment necessary	No dose adjustment necessary
Once daily (morning) (Lantus , Levemir , Tresiba , Insulatard , Humulin I, Semglee, Toujeo, Abasaglar, Xultophy)	Reduce dose by 20%	Reduce dose by 20%	Reduce dose by 20%
Twice daily mixed (Novomix 30, Humulin M3, Humalog Mix 25, Humalog Mix 50)	No dose change	Reduce am dose by 50% ** Resume usual dose with evening meal	Reduce am dose by 50% **. Resume usual dose with evening meal
Daily multiple injections (3, 4, 5 injections) (e.g. an injection of mixed insulin (Humulin M3, Humalog Mix 25, Humalog Mix 50, Novomix 30) 3 times a day **or** 3 meal time (bolus) injections of rapid/fast acting Insulin (Novorapid, Humalog, Apidra) **with** once/twice daily basal /background insulin (e.g. Lantus , Levemir , Tresiba , Insulatard , Humulin I, Semglee, Toujeo, Abasaglar)	No dose change	**Rapid/fast & long - acting insulins** • Omit morning dose of fast acting insulin if no breakfast. • If taking a basal insulin in the morning reduce dose by 20%. **Premixed insulin three times/day ** ** • If taking a premixed insulin, reduce dose by 50%. • Omit lunchtime dose. • Resume usual insulin dose with evening meal.	Take usual morning insulin dose(s). Omit lunchtime dose. Resume usual insulin dose with evening meal
Ensure that the patient takes their usual insulin dose the morning after surgery. However, advise that their blood glucose may be higher than usual for a day or so.			

SGLT2 inhibitors

- Dapagliflozin / Empagliflozin / Canagliflozin / Ertugliflozin
- **OMIT 3 days before surgery (stop Ertugliflozin 4 days pre-op)** or to coincide with pre-operative diet restriction / commencement of bowel preparation
- **Only Restart when usual diet resumes**
- **Association with euglycaemic ketosis**, particularly in starvation, dehydration or physiological stress.
- Need to monitor **blood ketones** daily (POC)

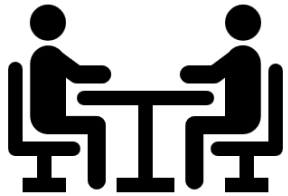
Multiple missed meals predicted

Need for VRIII likely if:

- Emergency surgery
- Sub-optimal DM management and starting HbA1c > 69 mmol/mol
- Patients with persistent blood glucose > 12.0 mmol/L
- Type 1 DM and not had background/basal insulin

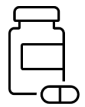
Mrs A

missed meals…
meds…



POA:
TKR
Type 2 DM
HbA1C 65 mmol/mol

DH:
Metformin BD
Gliclazide BD
Dapagliflozin



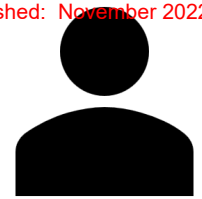
Metformin – as normal
Gliclazide – omit AM dose
Dapagliflozin – stop 3 days prior & on the day

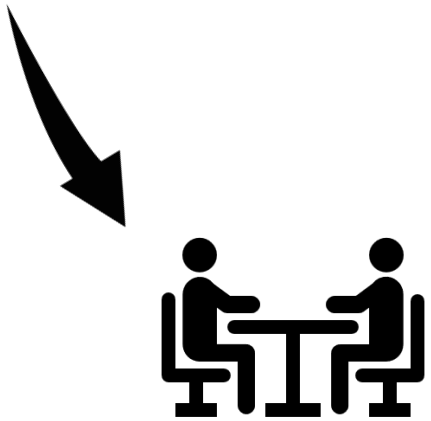
On admission:
First on list
BG = 11
BG check 2 hrly

In theatre:
BG hourly (GA)

Post op:
Oral meds resume
Dapagliflozin restart when normal diet resumes

Mr B





missed meals…
VRIII?

On admission:
PM list
BG = 13
BG check hrly

VRIII commenced
BG hourly

In theatre:
BG hourly (GA)

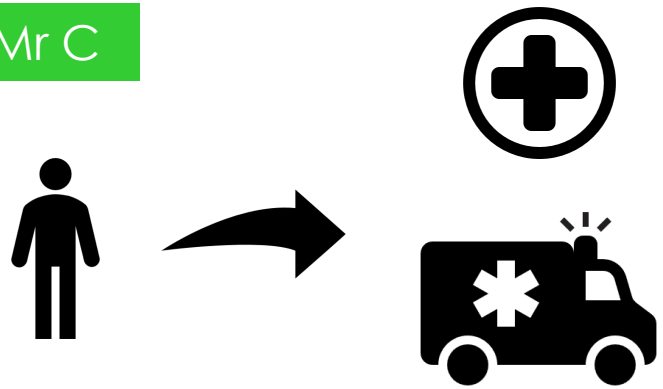
POA:
Subtotal colectomy
Type 2 DM
HbA1C 85 mmol/mol

DH:
Lantus 80iu AM
Novarapid TDS

Lantus
- reduce dose by 20% day before and day of op

Novarapid
- omit with each meal missed

Mr C



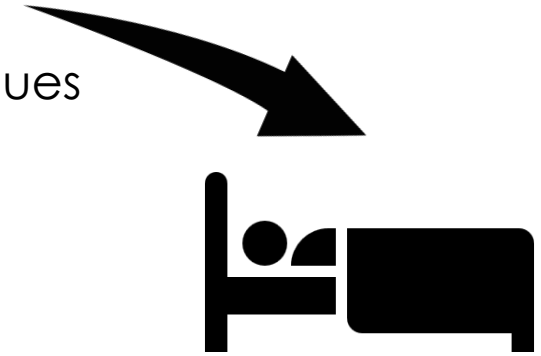
Type 1 DM
Acute abdomen

On admission:
BG 16
Ketones 1.8
Lactate 4
Urea 9
Creat 130
HbA1c 70 (8m ago)

IV fluid
VRIII

Basal insulin continues at 80% of dose

Hourly BG



Hourly BG
VRIII
80% basal SC insulin

? Discuss with Diabetes Team

Contents

Post-operative care

- **BG 6-10**
- **U&E**
- **N&V**
- **E&D**

- Refer to surgical VRIII chart when transferring back to SC insulin
- Seek support from the **diabetes team**
- Aim to convert from IV insulin to SC insulin at a **meal time**.
- SC insulin to be given **prior** to stopping IV infusion
- Never stop insulin infusion in patients with T1DM unless
  - SC basal (background) insulin (or mixed insulin) administered, and
  - ketones are < 0.6 mmol/L for two consecutive readings and for at least 2 hours

Contents

Rescue Treatment

- **Hypoglycaemia**

  BG < 4 = urgent treatment → follow hospital guidelines

- **Hyperglycaemia**
  - Data supports target BG < 10.0 mmol/L
  - Excess insulin treatment also associated with harm
  - Therefore treatment should occur once BG >12.0 mmol/l

If BG > 12.0 mmol/L, **recheck in 30 minutes**

If glucose remains > 12.0 mmol/L - rule out DKA and HHS and consider a corrective dose of subcutaneous rapid/fast acting insulin

Insulin Correction Doses

Type 1 DM

- **Assume 1 iu insulin will drop BG by 3.0 mmol/L (N.B. pt may have personal correction ratio)**
- Re-check in 1 hour. A 2nd dose can be repeated after 2 hours if BG not falling and remains > 12.0 mmol/L.
- Re-check after **1 hour**, if > target consider VRIII

Type 2 Diabetes

- **Give 0.1 u/kg of subcutaneous rapid/fast acting insulin**
- Re-check in 1 hour. A 2nd dose can be repeated after 2 hours if BG not falling and remains > 12.0 mmol/L.
- Re-check after **60-90 min**, if > target consider VRIII

Contents

Continuous Subcutaneous Insulin Infusion pump (CSII)

- 15% T1DM use CSII
- Continuous fast acting insulin + patient delivered bolus
- Used alongside
  - self monitored blood glucose (SMBG)
  - flash glucose monitoring (FGM)/Libre systems
  - real-time continuous (interstitial) glucose monitoring (RT-CGM)*

Use of intraoperative CSII should be agreed between anaesthetist & diabetes team in advance of surgery

* 15 min lag behind serum glucose – caution in anaesthetised pts

CSII Pros & Cons

Pros

- Avoidance of VRIII
- Less risk of hospital acquired DKA
- Risks of electrolyte disturbance eliminated
- Avoidance of changing to and from multi dose injections (MDI)
- Patient familiarity

Cons

- Pump failure
- Manufactures outside warranty
- Clinicians unfamiliar so cannot titrate
- Anaesthetist may not be familiar
- No basal insulin so rapid ketogenesis in event of pump failure

CSII considerations

- **Never stop CSII** unless replaced by alternative insulin – DKA will occur
- Prolonged procedures / >1 missed meal – replace with VRIII (remove CSII)
- Short procedure / can drink within 2-3 hrs – CSII may continue with regular BG checks
- Snackers or those with regular BG <6 should reduce their basal infusion rate by 20% perioperatively
- The CSII cannula must be Teflon (not steel) & positioned away from diathermy
- BG must be measured hourly
- Beware flash device measurements for BG monitoring as has ~15 min time lag

CSII - planning

Day before surgery

- Continue using as normal
- Only reduce dose by 20% at bed time if patient usually wakes up with a fasting glucose < 6.0

Day of surgery

- Only reduce dose by 20% if usual daytime BGs <6
- If cannot maintain target range, then one round of bolus correction via pump allowed prior to converting to VRIII

During surgery

- If BG <6.0, correct hypo & recheck in 15 mins
- Once hypo corrected, commence VRIII & stop CSII.
- If BG >12.0 convert to a VRIII & stop CSII.

Post-op

- Restart mealtime boluses with meals
- Consider using a correction dose if BG >10.0 mmol/L.
- Consider VRIII if BG >12.0 mmol/L.
- If CSII was replaced with VRIII then CSII can re-start when E&D normally and VRII stopped 30 mins after mealtime bolus dose

Take Home Messages

- Monitor and maintain BG **6.0 - 10.0** mmol/L
- **SGLT2i are omitted at least 3** days before surgery & **ketones checked daily** during the admission
- **Basal insulin should continue at 80%** of usual dose.
- The bolus/mealtime insulin is discontinued while on VRIII
- Medication for type 2 diabetes can be withheld whilst on VRIII until usual diet resumes
- Insulin (rule of thumb):
  - Long acting basal – reduce by 20%
  - Mixed – reduce by 50%
  - Short acting – omit as per meals missed

References

1. Joint British Diabetes Societies guidelines (www.diabetologists-abcd.org.uk/JBDS/JBDS_IP_Surgical_Guideline_2015_Full.pdf
2. CPOC-Guideline for Perioperative Care for People with Diabetes Mellitus Undergoing Elective and Emergency Surgery.pdf
3. Diabetic ketoacidosis with SGLT2 inhibitors. *BMJ* 2020;371:m4147 https://doi.org/10.1136/bmj.m4147