Inpatient Diabetes FAQs for Junior Doctors

GGC, version 1.0 Jan 2020

NHS
Greater Glasgow and Clyde

Contents

1. What CBG targets should I aim for?

- **Default target CBG 6 – 10 mmol/L**

- Consider **8 - 12mmol/L**
  - for elderly and frail patients
  - for patients with reduced/no hypoglycaemia awareness

- Consider **8-15mmol/L**

  for patients on an end-of-life pathway

- Consider more liberal targets if clinical circumstances indicate

  e.g. cognitive/behavioural/psychiatric issues

2. What are the pharmacological treatment options in diabetes?

INJECTABLE THERAPIES

Insulin

Long acting
Lantus
Abasaglar
Levemir
Toujeo
Tresiba

Intermediate acting
Humulin I
Insulatard

'BASAL'

Short acting
Actrapid
Humulin S

Rapid acting
Fiasp
Novorapid
Humalog
Apidra

'BOLUS'

Mix
Humulin M3
Novomix 30
Humalog Mix25
Humalog Mix50

GLP-1 Mimetics

Liraglutide
Dulaglutide
Semaglutide
Exenatide

Xultophy
(Liraglutide + Tresiba)

ORAL THERAPIES

Metformin

Gliclazide

Pioglitazone

SGLT-2 inhibitors

Dapagliflozin
Empagliflozin
Canagliflozin
Ertugliflozin

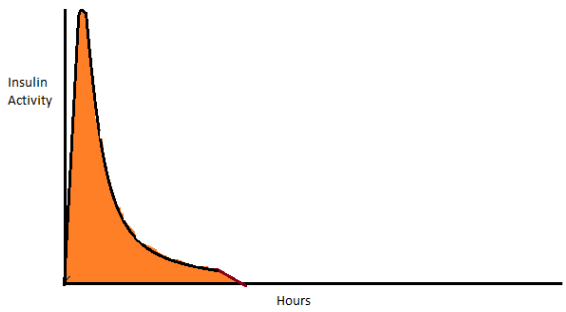
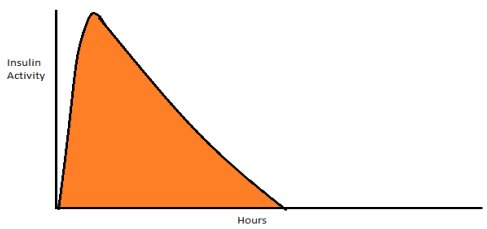
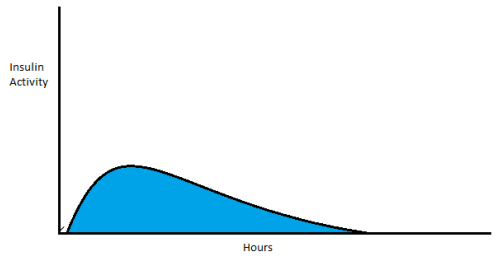
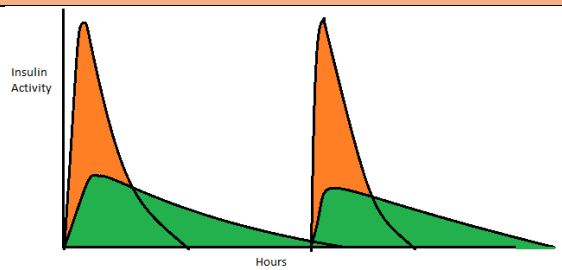
DPP-4 inhibitors

Sitagliptin
Linagliptin
Alogliptin

Combinations of oral drugs

(always check which generic drugs are included in branded combinations and clarify doses)

2.1 Insulin Profiles

Insulin Type	Taken	Onset	Peak	Duration	Activity Profile
Rapid acting Insulin Analogues					
Novorapid Humalog Aprida Fiasp	10-15 mins before food	15-20 mins	1-2 hours	3-6 hours	
Short Acting Insulin					
Actrapid Humulin S Insuman rapid	15-30 mins before food	30-60 mins	1-5 hours	5-9 hours	
Intermediate Acting Insulin					
Insulatard Humulin I	Morning or bedtime	60-90 mins	2-12 hours	12-24 hours	
Long Acting Insulin					
Levemir	Twice daily	1-2 hours	6-14 hours	16-20 hours	
Lantus	Once daily	1-2 hours	No peak	20-24 hours	
Abasaglar	Once daily	1-2 hours	No peak	Up to 24 hours	
Tresiba	Once daily	1-4 hours	No peak	>42 hours	
Mixed Insulins					
Novomix 30 Humalog mix 25 Humalog mix 50 Humulin M3	10-15 mins or Just before meals	10-20 mins	1-4 hours	Up to 24 hours	

3. What are the commonly used insulin regimens?

- **Basal Bolus**
  Long acting/intermediate insulin given once or twice daily to provide background insulin with faster acting insulin to cover meals

- **Mixed BD**
  Combination of intermediate and faster acting insulin, usually given before the breakfast and evening meal.
  The number (25, 50) refers to the percentage of rapid acting insulin
  e.g. Humulin M3 = 30% short acting insulin and 70% intermediate acting)

- **Basal**
  Long acting/intermediate acting insulin, usually given once daily

4. How do I adjust insulin in an **acutely unwell** patient with **diabetes on insulin?**

- Aim target 6-10 mmol/L

- Check **HbA1c** to provide a context for CBG patterns during acute illness.

HbA1c (mmol/mol)	Mean CBG (mmol/L) (over 6-8 weeks)
40-55	7.0-8.5
56-70	8.5-11.0
71-90	11-14
91-120	14-18

- **Sepsis, trauma, major surgery, steroid therapy**
  - CBG usually rises: ↑ insulin doses (see sections 8 and 11 for guidance)
  - Consider checking ketones if CBG>14 (Type 1DM) or >20 (Type 2DM)

- **Fasting, recent weight loss, end-of-life, severe AKI**
  - CBG usually falls: ↓ insulin doses (especially short/rapid acting insulin)
  - In a Type 1 patient, never completely stop long acting insulin

5. How do I manage non-insulin therapy in an **acutely unwell** patient with **T2DM**?

- Metformin
  - AKI - Stop if eGFR <30; reduce dose to 500mg BD if eGFR 30-44
  - Hold if severe sepsis, especially if lactate >5
  - Hold if D&V
- 'Gliptins' (DPP-4i) & 'Glutides' (GLP-1 mimetics)
  - Hold if D&V
  - Dose-adjust if AKI (as per BNF)
- 'Gliflozins' (SGLT-2i)
  - Hold if septic (especially urosepsis)
  - hold pre-op,
  - hold if D&V, dehydrated or AKI
  - **Consider euglycaemic DKA if patient is unwell (check VBG & blood ketones)**
- Pioglitazone
  - Hold if acute fluid overload (e.g. heart failure)
- Gliclazide
  - Hold or reduce dose if AKI, HbA1c <53, reduced oral carbohydrate intake
  - Consider increasing dose if hyperglycaemic (e.g. steroids [see section 18]), review dose prior to discharge

6. How do I manage a hypo?

MILD

Patient conscious, orientated, able to swallow

- Give 15-20g of quick acting carbohydrate such as
  - 5-7 Dextrose tabs
  - 4-5 Glucotablets
  - 60ml Glucojuice
  - 170ml Lucozade
  - 150-200ml fruit juice
- Test blood glucose after 10-15 minutes. If CBG still less than 4, repeat treatment up to 3 cycles.
- If still <4 after 30-45 minutes or deteriorating call doctor and consider IV glucose or 1mg IM Glucacon (once only)

MODERATE

Patient conscious, and able to swallow but confused, disorientated or aggressive

- If co-operative, treat as for mild
- Of not capable or cooperative, but can swallow, give 1.5-2 tubes of glucose gel (squeezed into mouth between gums)
- If ineffective, give 1mg Glucagon IM (once only)
- Test CBG after 10-15 mins – if less than 4 repeat above up to 3 cycles
- If CBG <4 after 30-45 mins or deteriorating, call doctor and consider IV glucose

SEVERE

Patient unconscious, very aggressive or nil by mouth (NBM)

- Check ABC
- Stop IV Insulin
- Contact doctor urgently
- Give IV Glucose over 10-15 mins as:
  - 100ml 20% Glucose
  - or 150-200ml 10% Glucose
  - or 30-40ml 50% glucose (avoid unless 10-20% unavailable)
- Or give 1mg IM Glucagon (once only)
- Recheck glucose after 10 minutes

- Once CBG >4 and patient recovered, treatment as on left
- If NBM – once glucose >4 mmol/L give 10% glucose at 100mls/hr until no longer NBM or reviewed by a doctor.

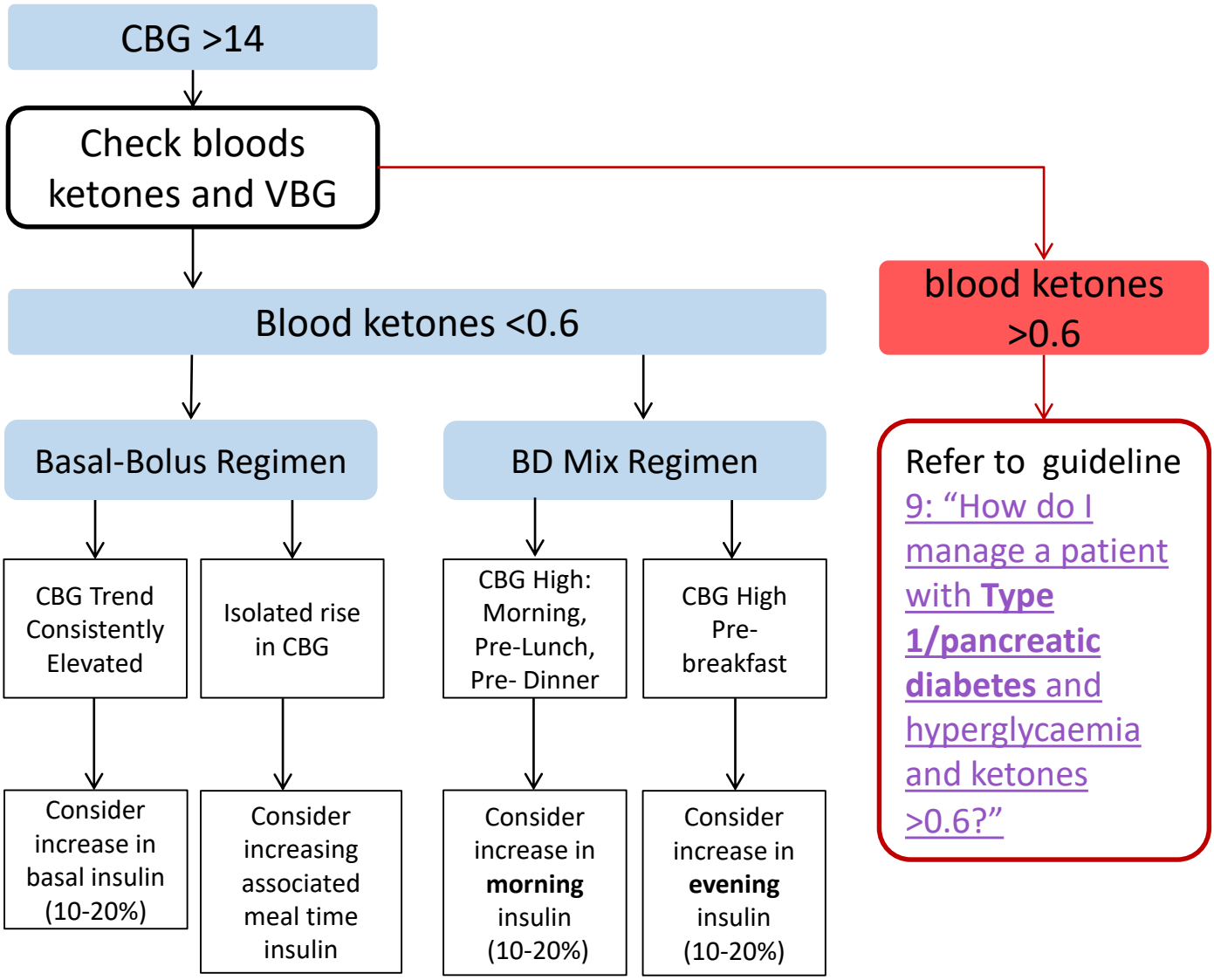
- Give 20g of long acting carbohydrate such as two biscuits or a slice of bread.
- Continue regular CBG monitoring
- For patients with an entral feeding tube, give 20g of long acting via this such as 50-70ml Ensure Plus Guide or 170ml Lucozade then flush. Recheck CBG after 10-15 minutes. Repeat up to 3 times if CBG not above 4. If still not above 4 after 30-45 mins consider IV glucose.

7. How do I prevent hypoglycaemia happening again?

- Is the patient eating?
  - if they have a reduced appetite consider reducing insulin/gliclazide
- Look at trends in CBG and dose of insulin/gliclazide being administered
- Are they on **BD mixed insulin** *e.g Humulin M3?* If hypo is happening:
  - between breakfast and before dinner – consider reducing breakfast dose by 10-20%
  - after dinner/overnight - consider reducing evening dose by 10-20% and/or taking snack before bed
- Are they are on **a basal bolus regimen** e.g. Levemir/lantus/Tresiba **and** novorapid/fiasp?
  - consider reducing the fast acting insulin preceding hypo if happening at same time
  - if trend is for CBGs to consistently run close to the lower end target, consider reduction in basal insulin
- Are they are on **basal only** e.g. Levemir/ lantus/Tresiba?
  - reduce insulin by 10-20%

8. How do I manage hyperglycaemia in **Type 1/Pancreatic Diabetes?**

- Aim target CBG 6 – 10 mmol/L

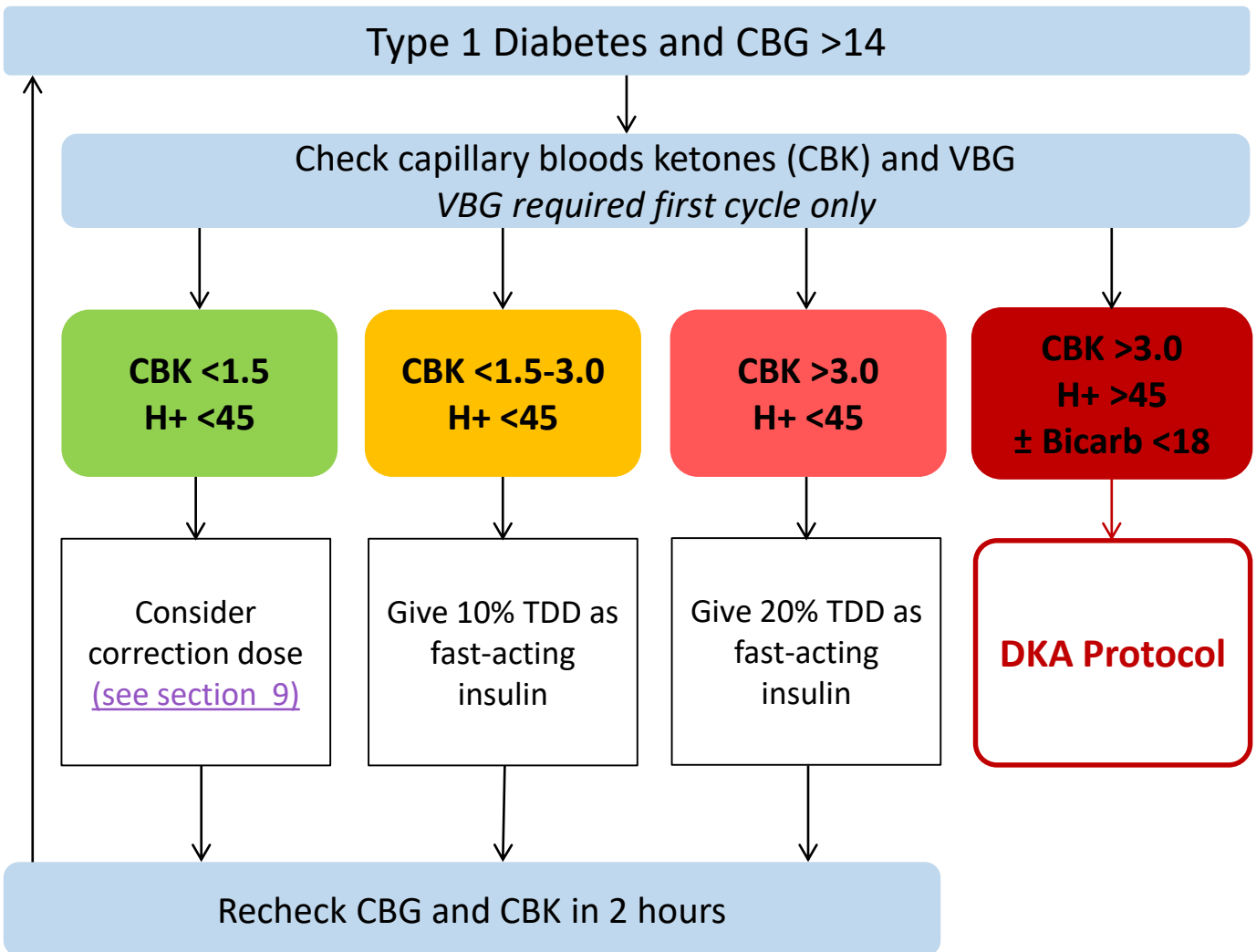


9. How do I manage a patient with **Type 1/Pancreatic diabetes** and hyperglycaemia and ketones >0.6?

- TDD = Total Daily Dose – the sum of all long-acting and fast-acting insulin taken in 24 hours
- Capillary Blood Ketone (CBK) to Urine Ketone conversion

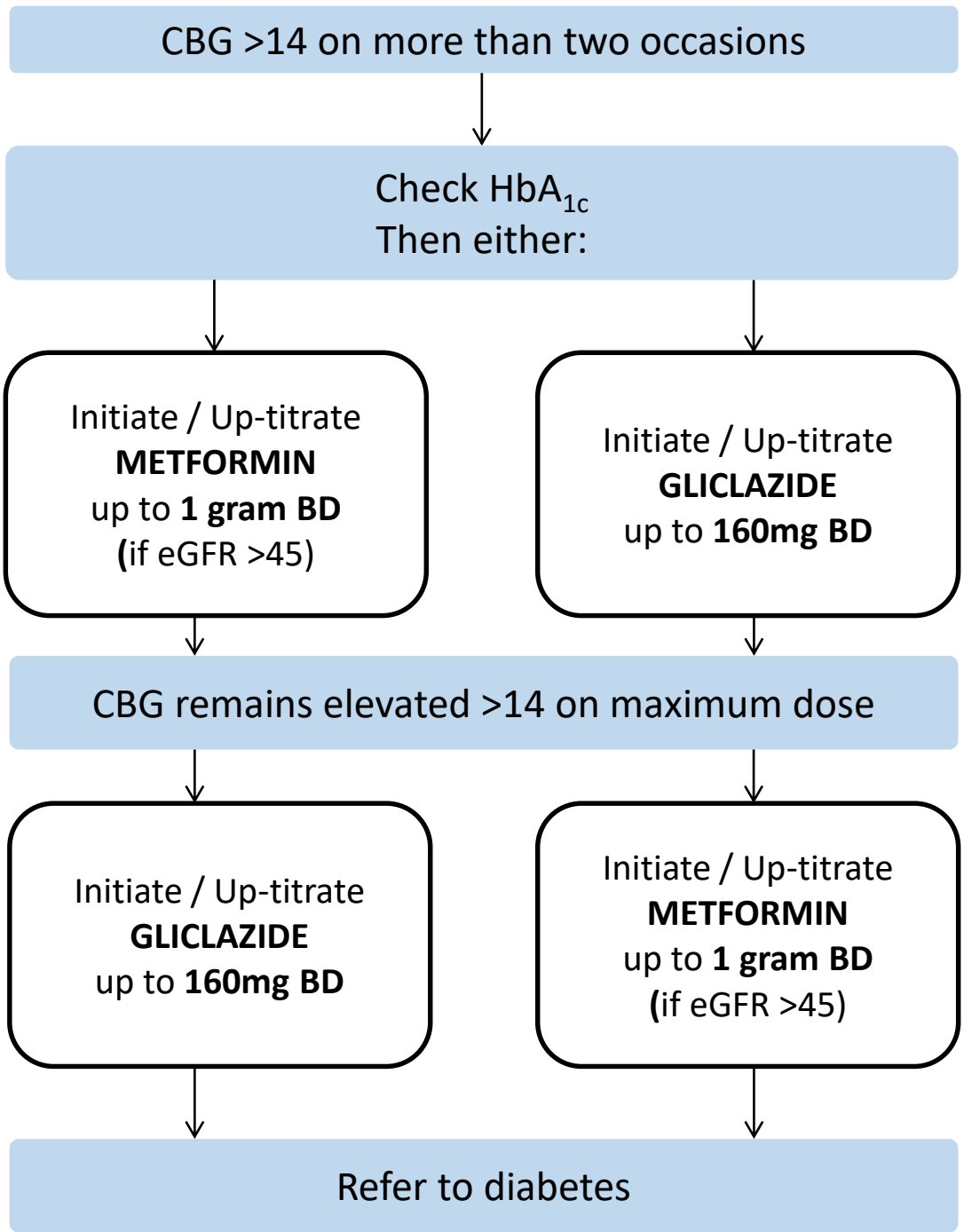
  CBK >1.5 – 3 = Urine Ketones ++

  CBK >3 = Urine Ketones +++ or ++++



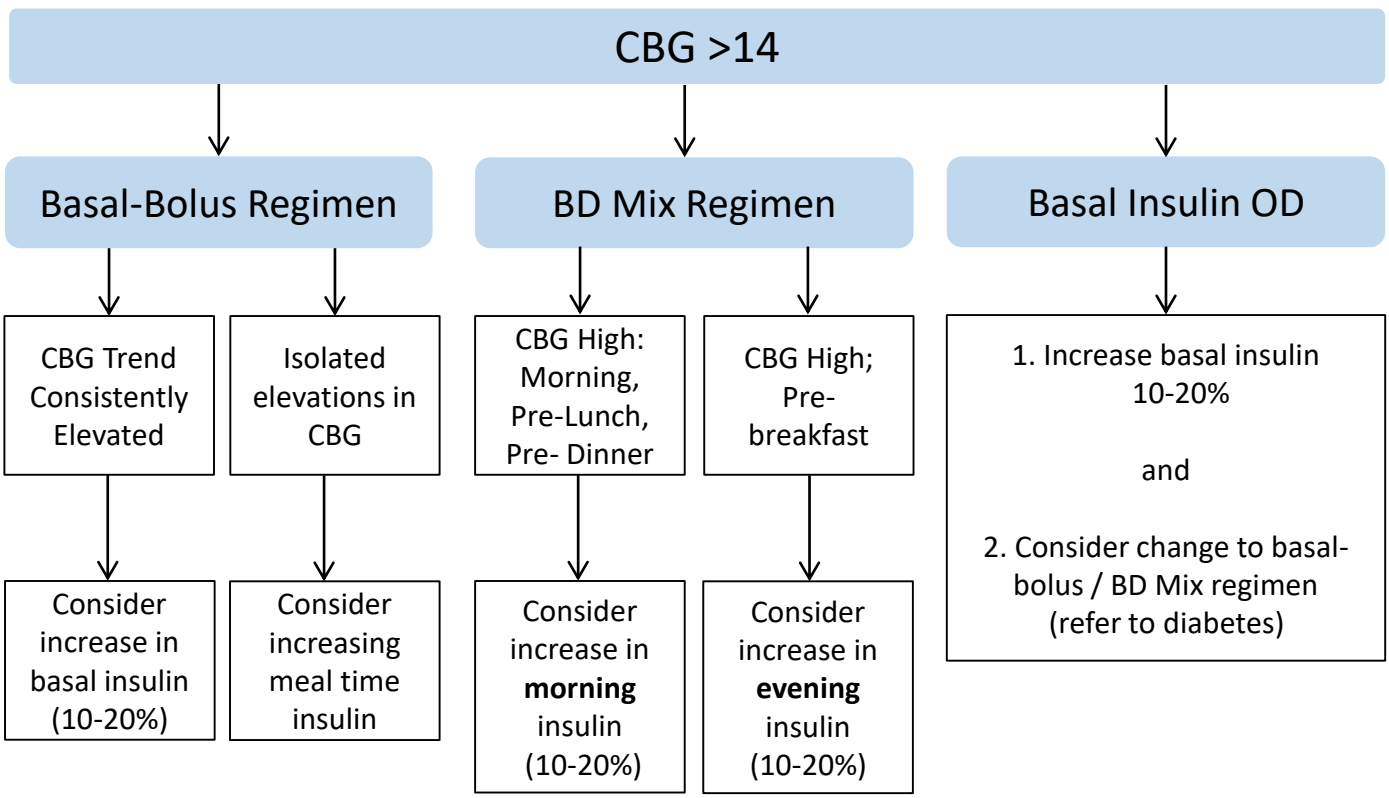
10. How do I manage hyperglycaemia in a patient with T2DM **not on insulin?**

- Aim target CBG 6 – 10 mmol/L



11. How do I manage hyperglycaemia in patients with **T2DM on insulin?**

- Aim target CBG 6 – 10 mmol/L
- Why is CBG high? Causes are sepsis, steroids, nutritional supplements.
- Usually no need for correction dose – aim to increase usual doses of insulin
- if CBG >20 on 2 or more measurements, check VBG (& blood ketones if acidotic), consider VRII/DKA/HHS and senior help



12. How and when should I use insulin correction doses? (PRN insulin)

- Aim target CBG 6 – 10 mmol/L
- Avoid using correction doses where possible – review, identify causes and amend patient's regimen instead (see 7 or 8)
- Use Novorapid for PRN correction doses. **Actrapid should not be used.**
- As a guide, 1 unit of Novorapid will reduce the CBG by 3 mmol/L

CBG (mmol/L)	PRN Novorapid dose
18-20	2 units
20-24	4 units
>24	6 units

- Re-check CBG after 2 hours. If >18 repeat PRN dose
- Avoid repeat PRN doses due to risk of insulin 'stacking' and hypoglycaemia, particularly overnight.
- See section 9 for management of patients with T1DM and raised ketones

13. How do I manage a patient with **Type 1/Pancreatic Diabetes** who isn't eating?

- Increase the frequency of blood glucose monitoring to QID
- Check blood ketones (see 13)
- Proactive insulin-dose reduction to avoid hypoglycaemia (10-20%)
- Withhold short/rapid acting insulin
- Consider changing BD mix insulin (e.g. humulin M3) to intermediate acting (e.g humulin I) at 50-70% lower total dose

If a patient with T1DM:
is NBM or
has no oral intake or
has persistent nausea and vomiting
→ **start a VRIII**
(don't forget to continue their long acting insulin with the VRII e.g. Lantus, Levemir, Abasaglar, Tresiba, see section 20)

14. How do I manage a patient with **T2DM** who isn't eating?

- Increase the frequency of blood glucose monitoring
- Withhold all oral diabetes drugs and GLP-1 agonists

- Also consider the following:
  - If using insulin consider dose-reduction to avoid hypoglycaemia (10-20%)
  - Withhold short/rapid acting insulin
  - Consider changing BD mix insulin (e.g. humulin M3) to intermediate acting (e.g humulin I) at 50-70% total lower dose
  - if very unwell and/or erratic CBG profile, consider VRIII

15. When should I test for **capillary blood ketones** (CBK) and what do the results mean?

- At present CBK testing is only available;
  - GRI - AAU, HDU and diabetes wards
  - QEUH - A&E, IAU, ARU2, HDU and diabetes wards
  - It should not be used out-with these areas.

- **Who do I check blood ketones in?**
  Patients with T1DM or secondary (pancreatic) diabetes

- **When do I check blood ketones**
  CBG > 14 or unwell

- **What do the results mean?**
  - **<0.6 – normal**
  - **0.6 – 3.0 – requires additional insulin: check VBG to exclude DKA and ongoing CBG and CBK monitoring**
  - **>3.0 – significant risk of DKA: check VBG to exclude DKA and ongoing CBG and CBK monitoring.**
    Refer to protocol for DKA/hyperglycaemia for details on further management for elevated ketones.

16. What is steroid-induced diabetes/hyperglycaemia?

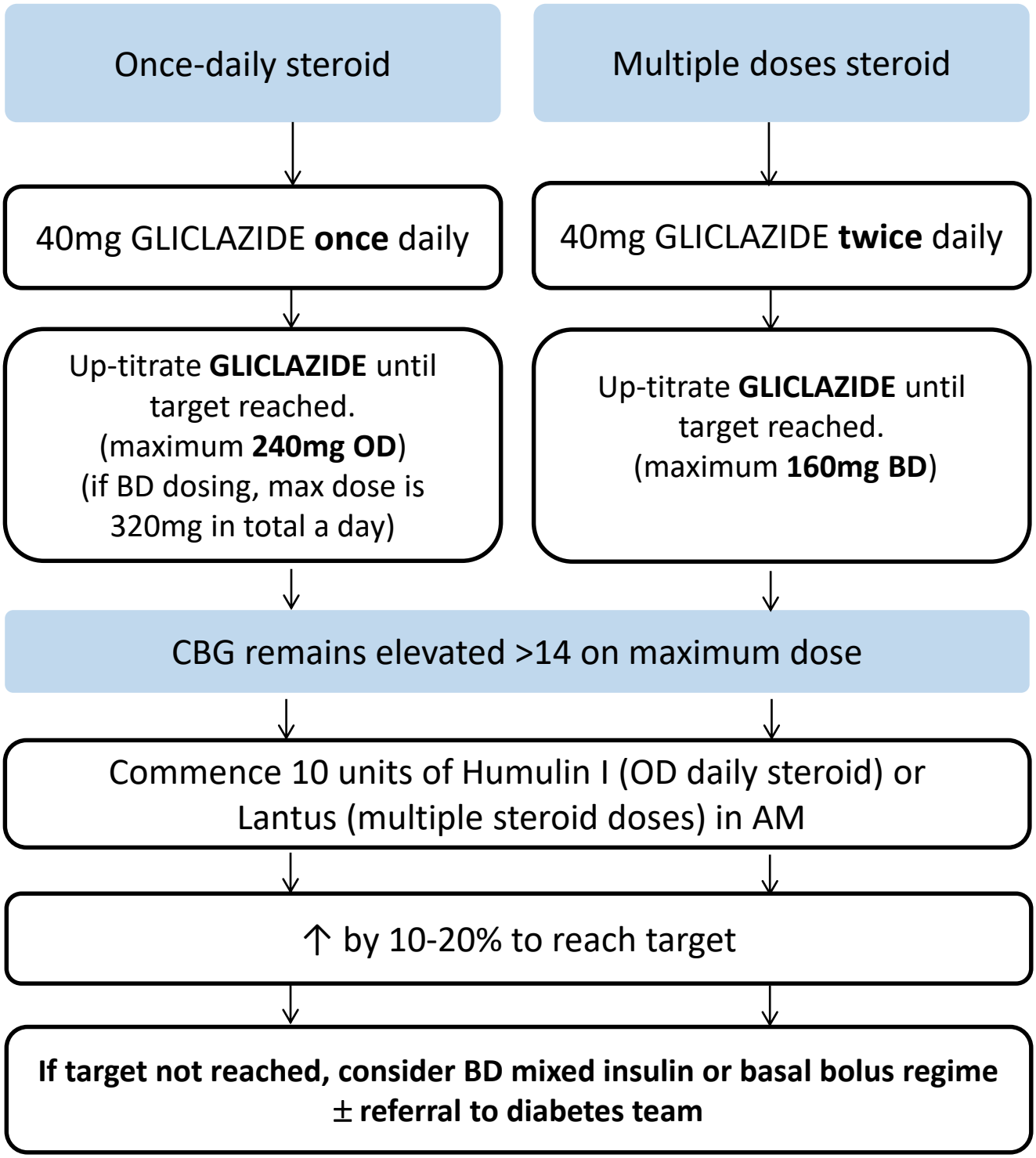
- **Steroid-induced diabetes**
  Hyperglycaemia caused by steroid therapy in patients without a previous diagnosis of diabetes

- **Steroid-induced hyperglycaemia**
  Worsening glucose control following the use of steroids in patients with diabetes

- **How often should CBG be tested if steroids in use?**
  - Once daily if no diabetes (before lunch/evening meal)
  - Four times a day in patients with known diabetes if CBG >12 on 2 or more occasions in 24 hours from start of steroids

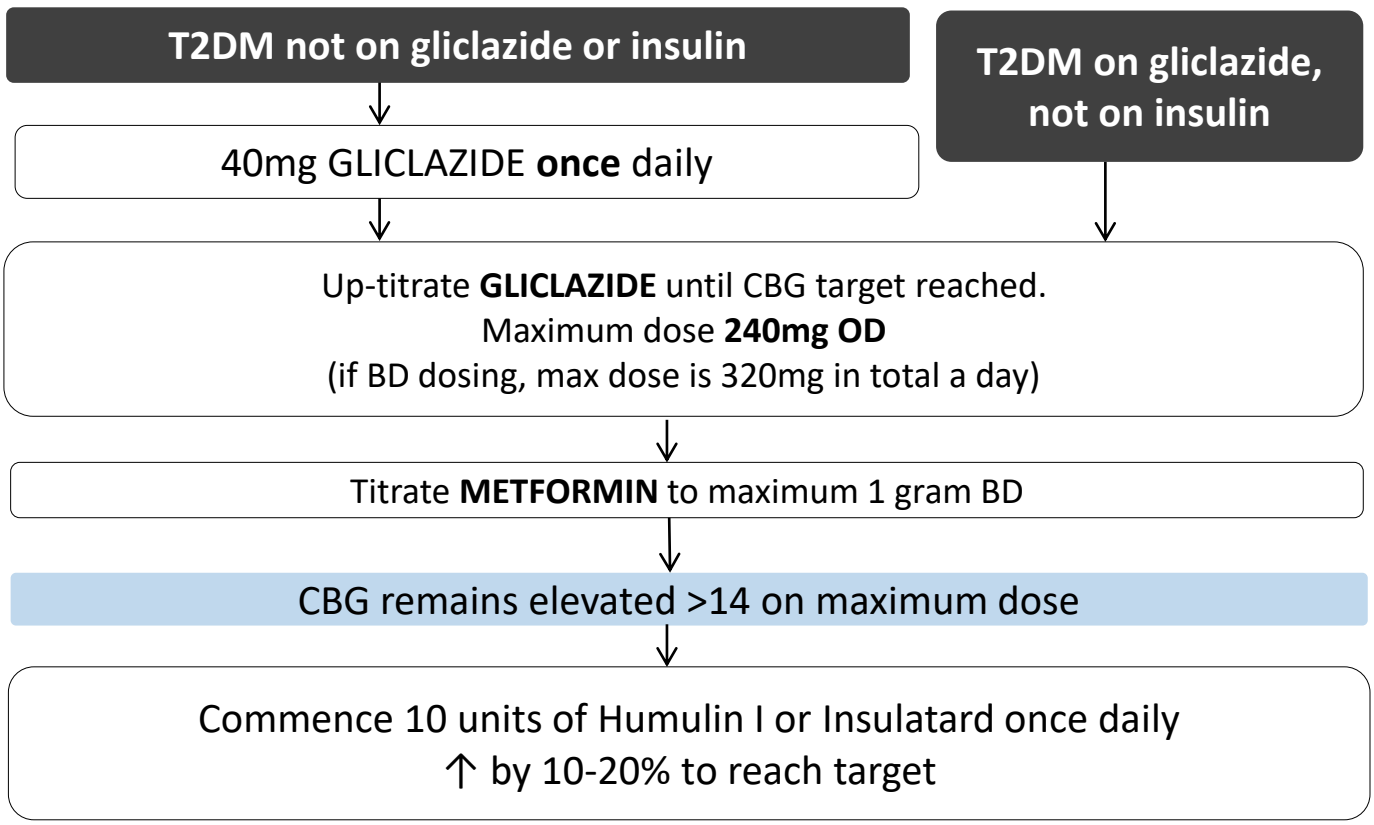
17. How do I manage steroid-induced diabetes?

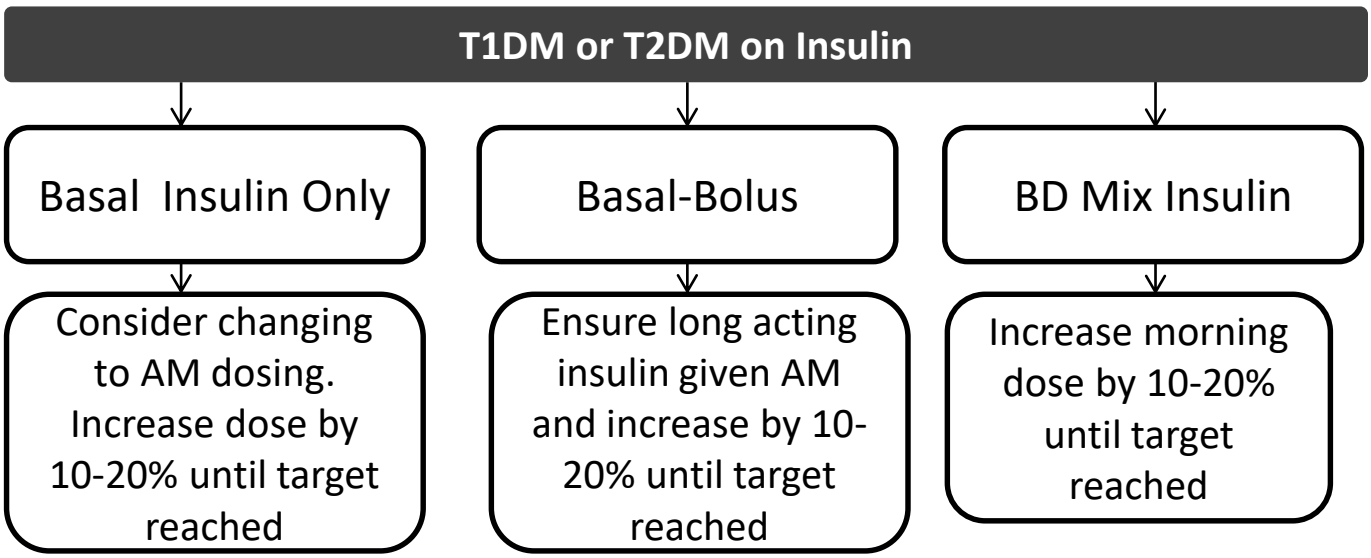
- Aim target CBG 6 – 10 mmol/L
- Check CBG QID



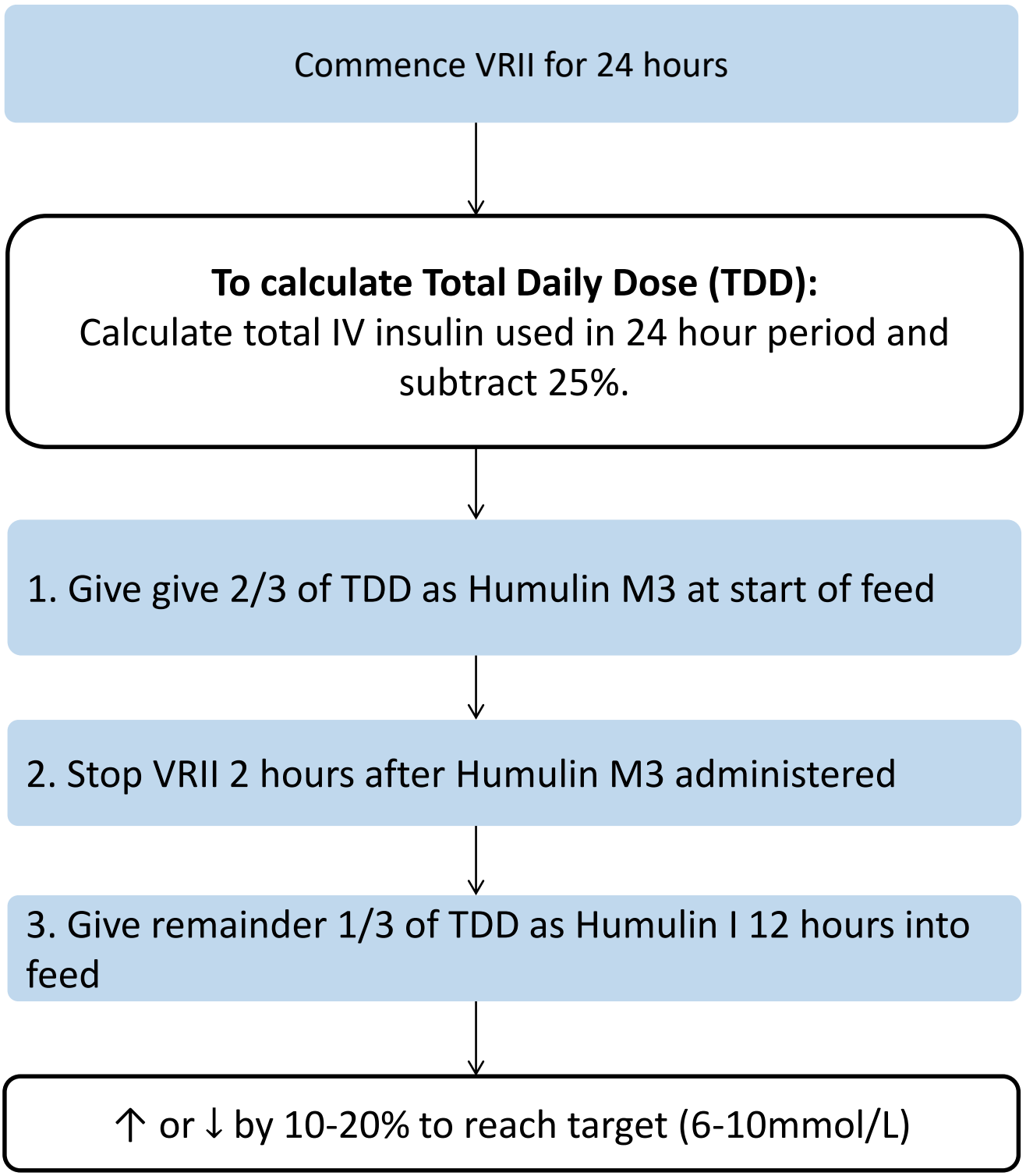
18. How do I manage steroid-induced hyperglycaemia?

- Target CBG 6 – 10 mmol/L
- Check HbA1c, check CBG 4 times a day





19. How do I manage hyperglycaemia during intermittent NG feeding? (12-20 hours)



20. When do I use a VRIII? What do I do with the usual insulin?

Consider a VRIII in:

- A patient with T1DM who is:
  - NBM
  - has prolonged vomiting
  - reduced consciousness
- Any diabetes patient with:
  - uncontrolled hyperglycaemia
  - who is peri-operative & unlikely to be eating

Continue long-acting insulin alongside VRIII

e.g. Humulin I, Insulatard, Lantus, Levemir, Abasaglar or Tresiba

Pre-mixed or fast acting insulin should <u>not</u> be administered whilst on VRIII

e.g. Humulin M3, Novomix 30, HumalogMix 25, HumalogMix 50

Training video (9 minutes)
https://www.youtube.com/watch?v=7OWRkZmb6D4

21. How do I stop a VRIII?

- If long-acting insulin already on board, VRIII can by stopped any time
- If no long-acting insulin already on board, give usual long-acting insulin and stop VRIII after 2 hours
- If switching back to mixed insulin (e.g. Humulin M3), must be done either at breakfast or dinner, and stop VRIII after 2 hours
- If new insulin start, calculate total dose over past 24 hours and give 70% in appropriate subcutaneous regime (e.g. basal bolus, BD mix etc, refer to diabetes)

22. When and how do I refer to the inpatient diabetes team?

Indications for referral to diabetes inpatient team:

- New diagnosis of Type 1 Diabetes
- Diabetic Ketoacidosis (DKA)
- Recurrent or severe hypoglycaemia, where attempts at Insulin or Gliclazide titration are unsuccessful
- Hyperglycaemia (when recent HbA1c <70mmol/mol), where attempts at Insulin or Gliclazide titration are unsuccessful
- Hyperglycaemic Hyperosmolar State (HHS)
- Patients who require insulin initiation
- Intravenous insulin (VRIII) > 48 hours
- Patients using continuous subcutaneous insulin infusion (CSII) pumps
- Active foot ulceration (refer also to Podiatrist via Trakcare)
- Diabetes in pregnancy
- NBM or parenteral or enteral feeding, with problematic glycaemic control
- Problematic glycaemic control in the context of changing renal function
- Patient education – sick day rules, hypoglycaemia, driving advice, insulin administration, glucose testing

Refer via Trakcare

Select patient → new request→ other→ diabetes inpatient referral

23. Admission Checklist for patients with diabetes

- Clarify type of diabetes
- Check HbA1c (if no result in last 3 months)
- Consider checking blood ketones/VBG if hyperglycaemic
- Check at least 2 sources for diabetes drugs, especially insulin – clarify type, frequency, doses
- Prescribe insulin by brand name (e.g. Novorapid), not generic name (e.g. Insulin Aspart)
- Prescribe/document insulin delivery method on insulin chart (if self-administers) i.e. penfill cartridges or type of disposable pen (e.g. Novomix 30 flexpen)
- Be aware of concentrated insulin and combination pens e.g. Toujeo, Xultophy
- Always prescribe on both Kardex and Insulin Prescription Chart with 'units' pre-typed. Never write U or IU after the number
- Consider holding non-insulin therapy depending on presentation [see section 5]
- Consider proactively altering insulin doses depending on the acute presentation and initial CBG measurements
- Never stop intermediate/long acting insulin in T1 or pancreatic diabetes
- If patient is on an insulin pump, seek early senior/specialist advice, especially if drowsy or confused.

24. Discharge checklist for patients with diabetes

- review any withheld diabetes drugs and consider restarting if appropriate
- review any inpatient dose titrations (especially insulin and gliclazide) and communicate with patient and GP about any ongoing titration advice (e.g. proactive down titration if reducing course of steroids)
- **include insulin doses on IDL** (use brand names, not generic)
- if patient able to self-manage new insulin regime, ensure that the Community Nursing Team & Community DSN Team are aware (ward nurses can refer)
- if community nurse to administer insulin, vials and syringes must be prescribed on the IDL
- ensure patient has follow up with local diabetes outpatient team or DSN and copy to relevant consultant
- if DSN follow-up is arranged prior to discharge, check that the patient knows where and when.

25. Key Insulin Safety Tips

- Always check type of insulin, dose and frequency of administration, particularly when importing information from ECS to Clinical portal
- If a patient uses pen insulin – prescribe pen insulin and administer using a pen
- Never draw insulin from a pen with a syringe
- Use pen safety needles
- Always prescribe on Insulin Prescription Chart with ‘units’ pretyped. Never write ‘U’ or ‘IU’.
- Always continue basal/long acting insulin in a type 1 patient (even if fasting or NBM, dose may need adjustment)
- Ensure basal insulin administered before stopping VRIII
- If patients on insulin pumps are admitted and unable to self manage, remove pump and commence VRIII
- Be aware of concentrated pen insulins (Tresiba 200 units/mL, Toujeo 300 units/mL, Humalog 200 units/mL).
- Xultophy (=Tresiba 100units/ml + liragltuide). Can switch to Tresiba only as inpatient (‘dose steps’ =units)

26. Further Reading

- Management of Hyperglycaemia and Steroid (Glucocorticoid) Therapy, October 2014 https://www.diabetes.org.uk/resources-s3/2017-09/JBDS%20management%20of%20hyperglycaemia%20and%20steriod%20therapy_0.pdf

- The Hospital Management of Hypoglycaemia in Adults with Diabetes Mellitus, February 2018 http://www.diabetologists-abcd.org.uk/JBDS/JBDS_HypoGuideline_FINAL_280218.pdf

- The management of the hyperosmolar hyperglycaemic state (HHS) in adults with diabetes, August 2012 http://www.diabetologists-abcd.org.uk/JBDS/JBDS_IP_HHS_Adults.pdf

- Managing diabetes at end of life, 2018 Diabetes UK https://www.diabetes.org.uk/professionals/position-statements-reports/diagnosis-ongoing-management-monitoring/end-of-life-care