NHS
Greater Glasgow and Clyde

CLINICAL GUIDELINE

Diabetes, Diabetes, inpatient prescribing FAQs

A guideline is intended to assist healthcare professionals in the choice of disease-specific treatments.

Clinical judgement should be exercised on the applicability of any guideline, influenced by individual patient characteristics. Clinicians should be mindful of the potential for harmful polypharmacy and increased susceptibility to adverse drug reactions in patients with multiple morbidities or frailty.

If, after discussion with the patient or carer, there are good reasons for not following a guideline, it is good practice to record these and communicate them to others involved in the care of the patient.

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Lead Author:	Andrea Llano
Approval Group:	Medicines Utilisation Subcommittee of ADTC

Important Note:

The Intranet version of this document is the only version that is maintained.
Any printed copies should therefore be viewed as 'Uncontrolled' and as such, may not necessarily contain the latest updates and amendments.

Inpatient Diabetes FAQs

Authors: A Llano, H Stubbs, T. Fernandes, S Cleland
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NHS
Greater Glasgow and Clyde

Contents

1. Key Insulin Safety Tips

- Always check type of insulin, dose and frequency of administration from two sources e.g patient and carer, 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'- this can lead to misreading of the dose
- Always continue basal/long acting insulin in a type 1 patient (even if fasting or NBM, dose may need adjustment)
- Twice daily mixed insulins e.g. Humulin M3 are typically prescribed before breakfast and before evening meal, not at bedtime.
- 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 + liraglutide). This can switched to Tresiba only ('dose steps' = insulin units) if unavailable or due to GI upset.

2. What CBG targets should I aim for?

- **Default target capillary blood glucose (CBG) 6 – 10 mmol/L**

- Consider **8 - 12mmol/L**
  - for elderly and frail patients
  - 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

3. 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

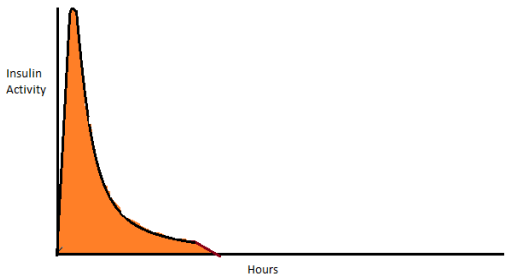
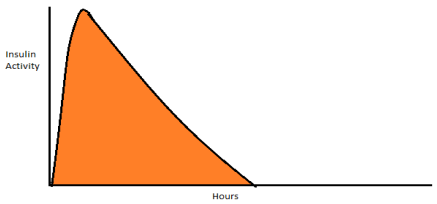
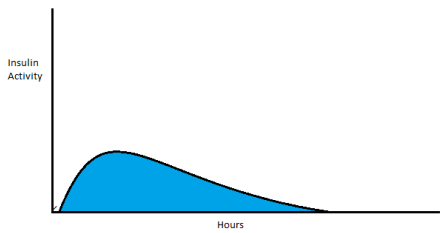
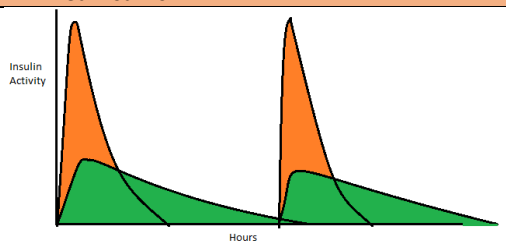
Sitagliptin
Linagliptin
Alogliptin

Combinations of oral drugs

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

Please refer to GGC Formulary for appropriate choice within each class

3.1 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	

4. 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

- **Twice daily mixed**
  Combination of intermediate and faster acting insulin, usually given before the breakfast and evening meal, **not at bedtime**. 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

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

- Aim target 6-10 mmol/L (unless specified otherwise)

- 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 9 and 12 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

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

- **Metformin**
  - AKI - Stop if eGFR <30; reduce dose to 500mg twice daily if eGFR 30-44
  - Hold if severe sepsis, especially if lactate >5
  - Hold if D&V

- **'Gliptins' (DPP-4i) & 'Glutides' (GLP-1 mimetics)**
  - withold if D&V
  - dose-adjust if AKI (as per BNF)

- **'Gliflozins' (SGLT-2i)**
  - withold if septic (especially urosepsis)
  - withold pre-op,
  - withhold if D&V, dehydrated or AKI
  - **consider euglycaemic DKA if patient is unwell (check VBG & blood ketones)**

- **Pioglitazone**
  - discontinue if acute fluid overload (e.g. heart failure)

- **Gliclazide**
  - withold or reduce dose if AKI, HbA1c <53, reduced oral carbohydrate intake
  - consider increasing dose if hyperglycaemic (e.g. steroids [see section 19]), review dose prior to discharge

7. How do I manage a hypo?

See also GGC Guideline: Algorithm for treatment of hypoglycaemia in adults with diabetes in hospital

MILD

Patient conscious, orientated, able to swallow

- Give 15-20g of quick acting carbohydrate such as
  - 5-7 Dextrose tabs
  - 4-5 Glucotabs
  - 60ml Glucojuice
  - 150-200mL pure 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
- If not capable or cooperative, but can swallow, give 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 despite 3 cycles 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 15 mins as:
  - 200ml 10% glucose
  - 100ml 20% glucose
- Or give 1mg IM Glucagon (once only)
- Recheck glucose after 10 minutes, if CBG <4 repeat cycle

- Give 20g of long acting carbohydrate such as two biscuits/slice of bread/200-300ml milk/next meal.
- Continue regular CBG monitoring
- For patients with an enteral feeding tube, give 20g of long acting carbohydrate via this such as 50-70ml Ensure Plus or Fortijuice. 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.

- 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.

8. How do I prevent hypoglycaemia happening again?

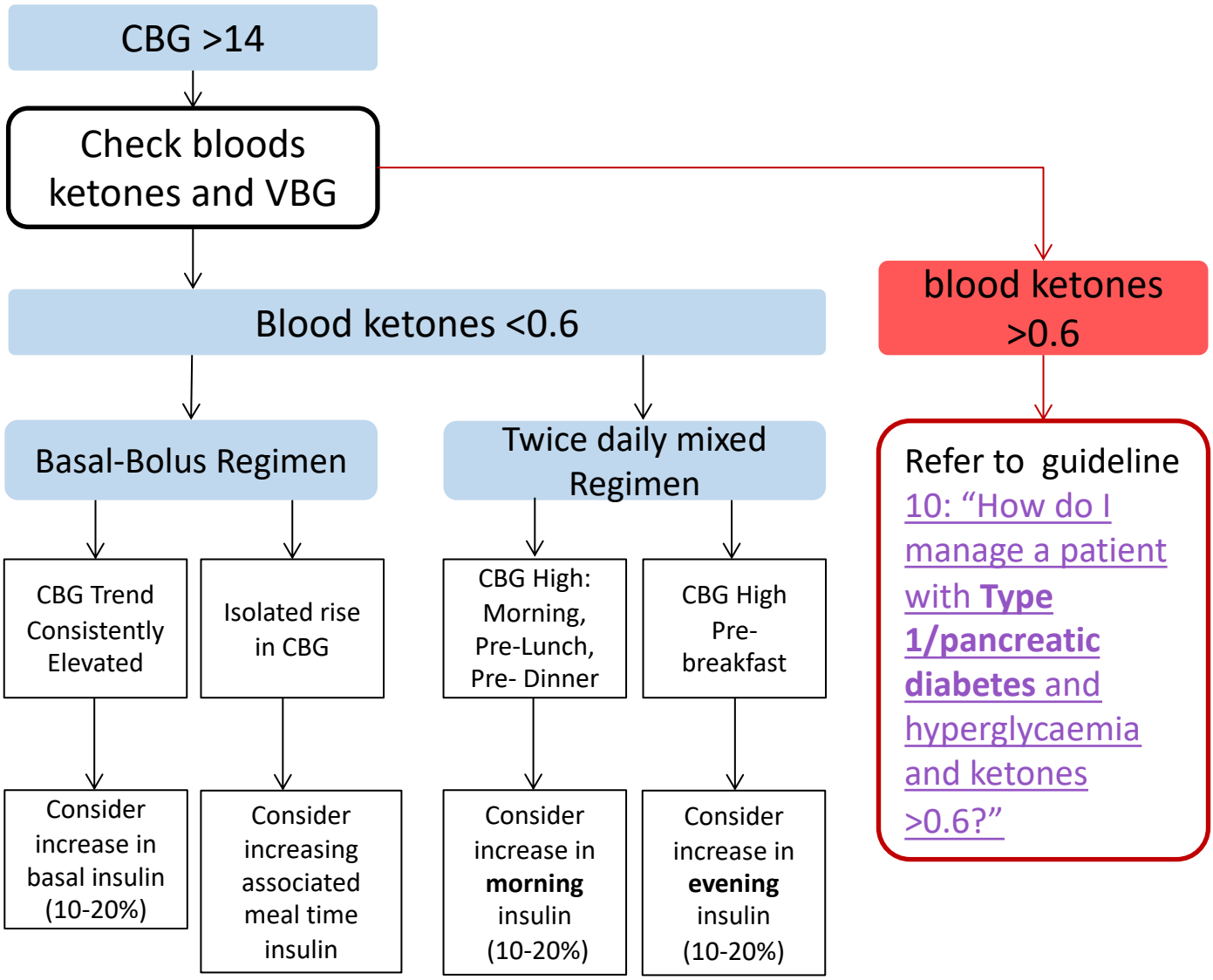
- Is the patient eating?
  - if they have a reduced appetite consider reducing insulin/gliclazide
- Look at trends in CBG and dose of insulin/gliclazide being administered
- Are they on **twice daily mixed insulin** *e.g Humulin M3?* If hypo is happening:
  - between breakfast and before dinner – consider 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%

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

- Aim target CBG 6 – 10 mmol/L (unless specified otherwise).
- Capillary Blood Ketone (CBK) to Urine Ketone conversion

  CBK >1.5 – 3 = Urine Ketones ++

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

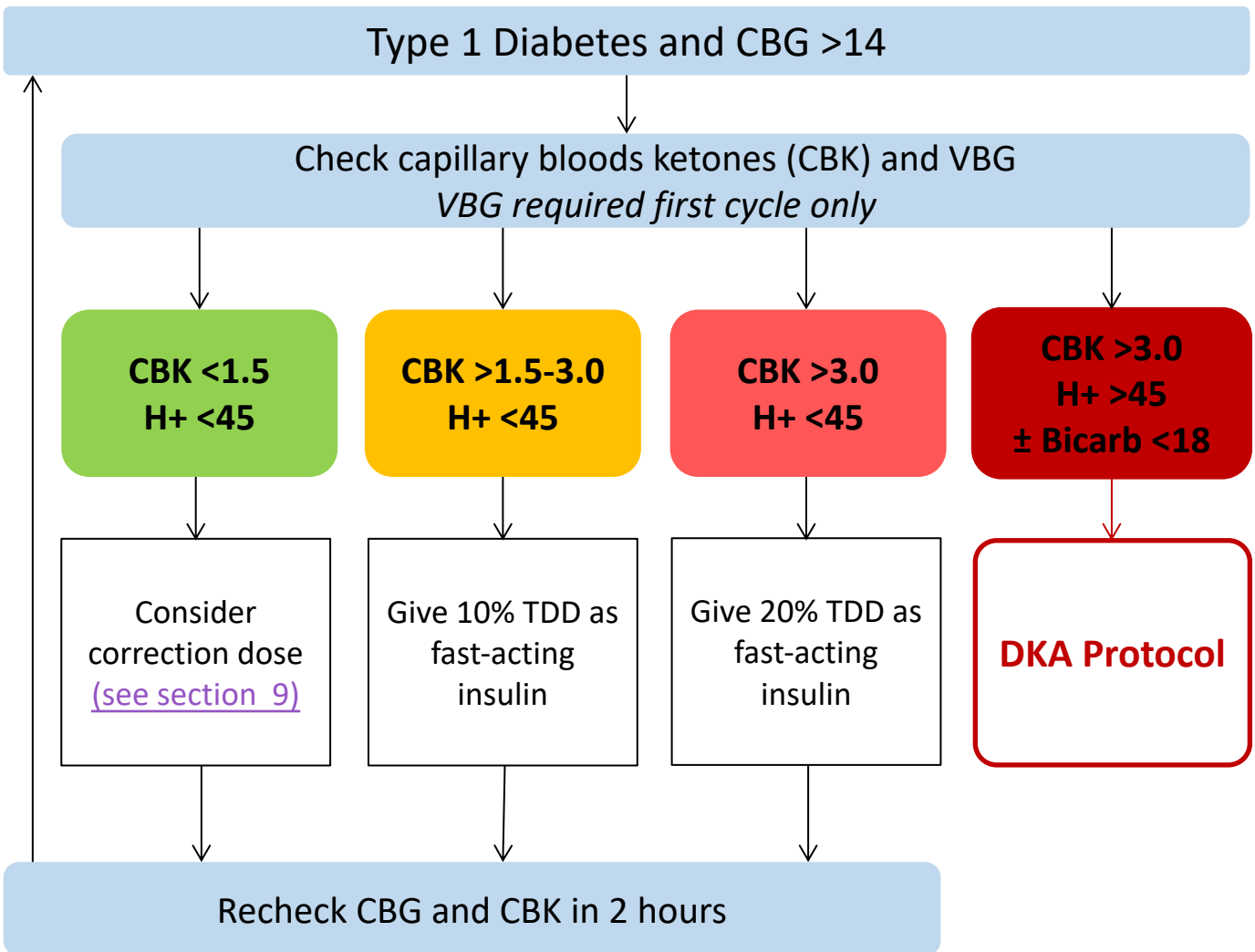


10. How do I manage a patient with **Type 1/Pancreatic diabetes** and hyperglycaemia and ketones >0.6?

- 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

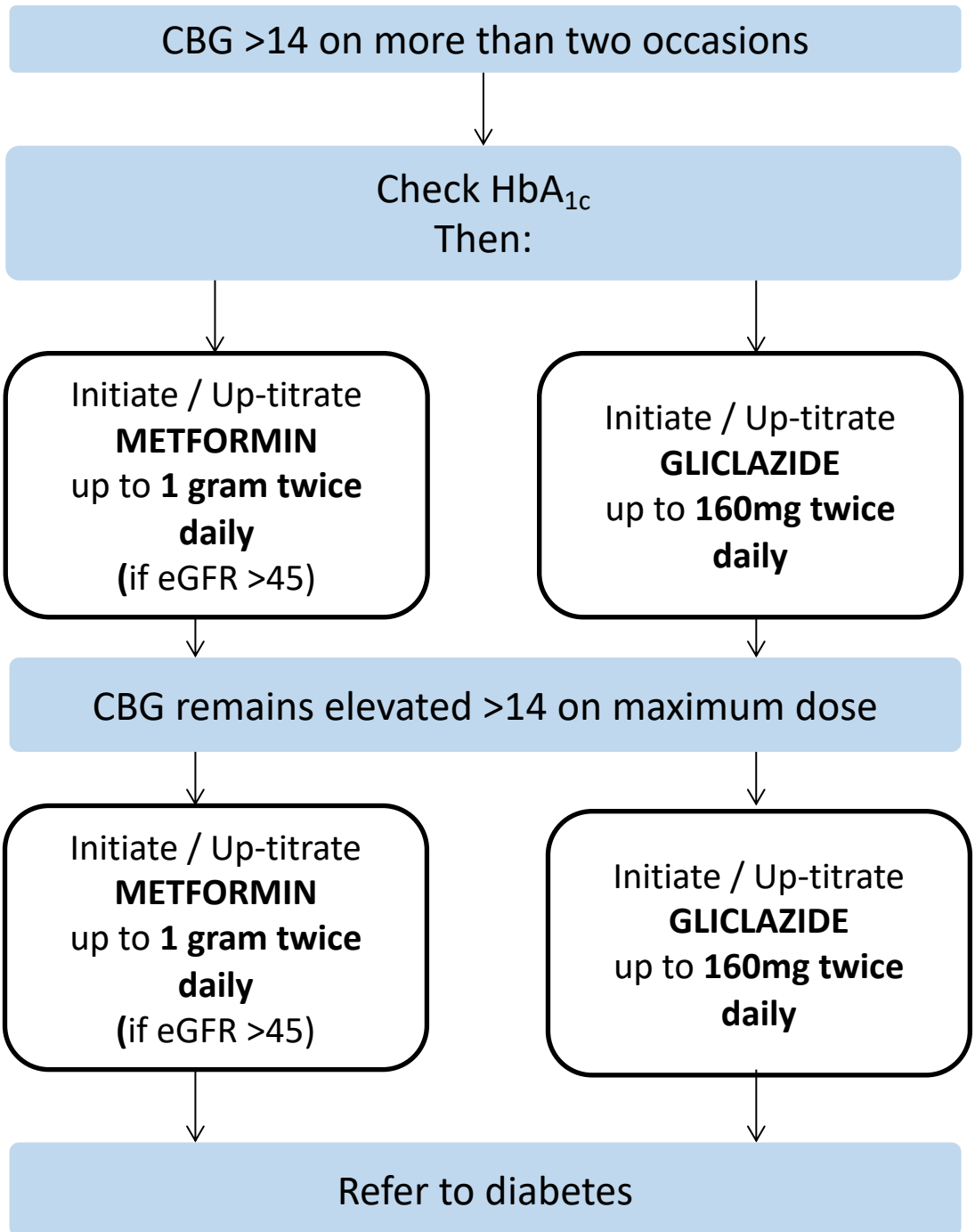
  CBK >1.5 – 3 = Urine Ketones ++

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



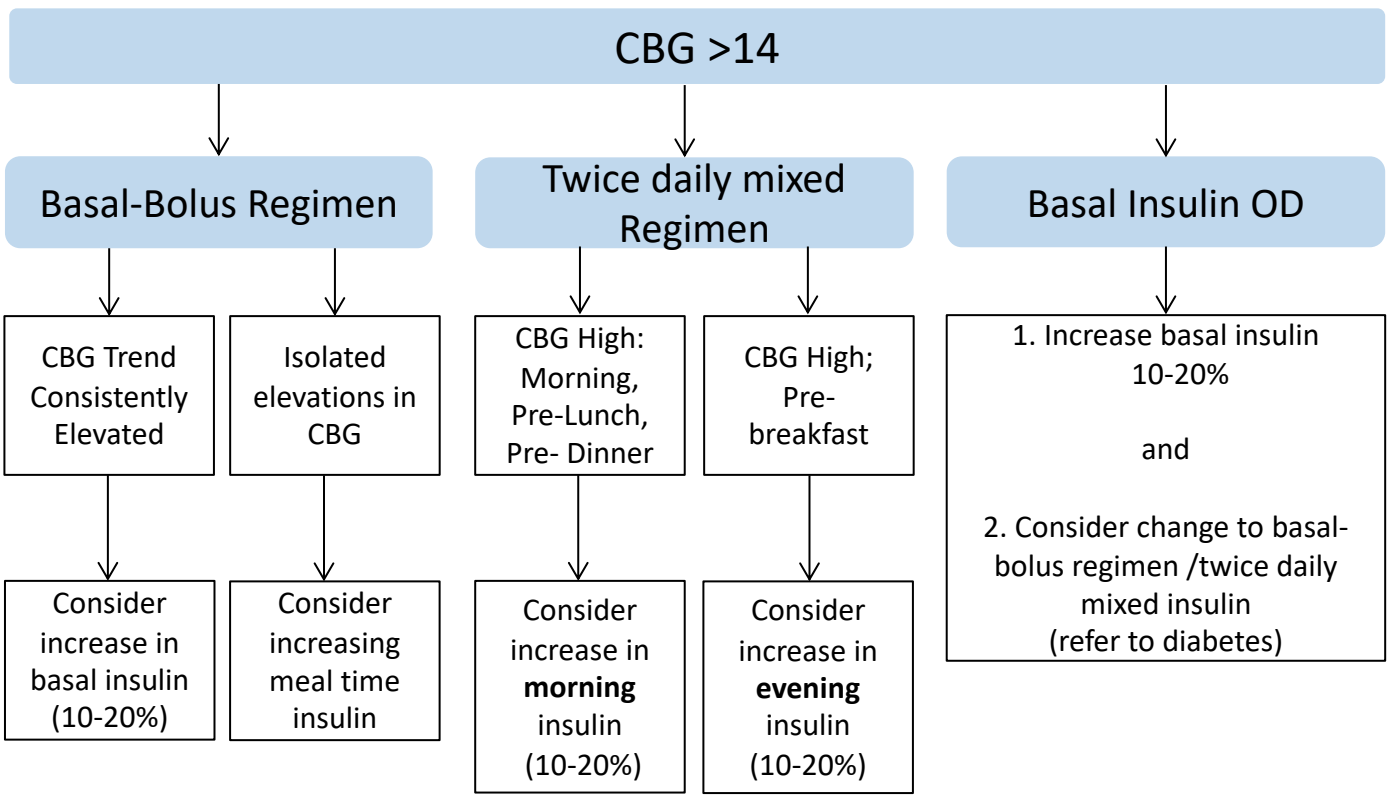
11. How do I manage hyperglycaemia in a patients with T2DM **not on insulin?**

- Aim target CBG 6 – 10 mmol/L (unless specified otherwise).



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

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



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

- Aim target CBG 6 – 10 mmol/L (unless specified otherwise).
- Avoid using correction doses where possible – review, identify causes and amend patient's regimen instead.
- 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, particularly overnight, due to risk of insulin 'stacking' and hypoglycaemia. Aim to adjust usual insulin instead.
- See section 10 for management of patients with T1DM and raised ketones

14. 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 section 10)
- Proactive insulin-dose reduction to avoid hypoglycaemia (10-20%)
- Withhold short/rapid acting insulin
- Consider changing twice daily mix insulin (e.g. humulin M3) to intermediate acting (e.g humulin I) at 50-70% total daily 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 21)

15. 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 twice daily mix insulin (e.g. humulin M3) to intermediate acting (e.g humulin I) at 50-70% total daily dose
  - if very unwell and/or erratic CBG profile, consider VRIII

16. 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 or urine ketones in?** Patients with T1DM or secondary (pancreatic) diabetes

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

- **What do the results mean? (see section 9 for conversion to urine ketones)**
  - **<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.

17. 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

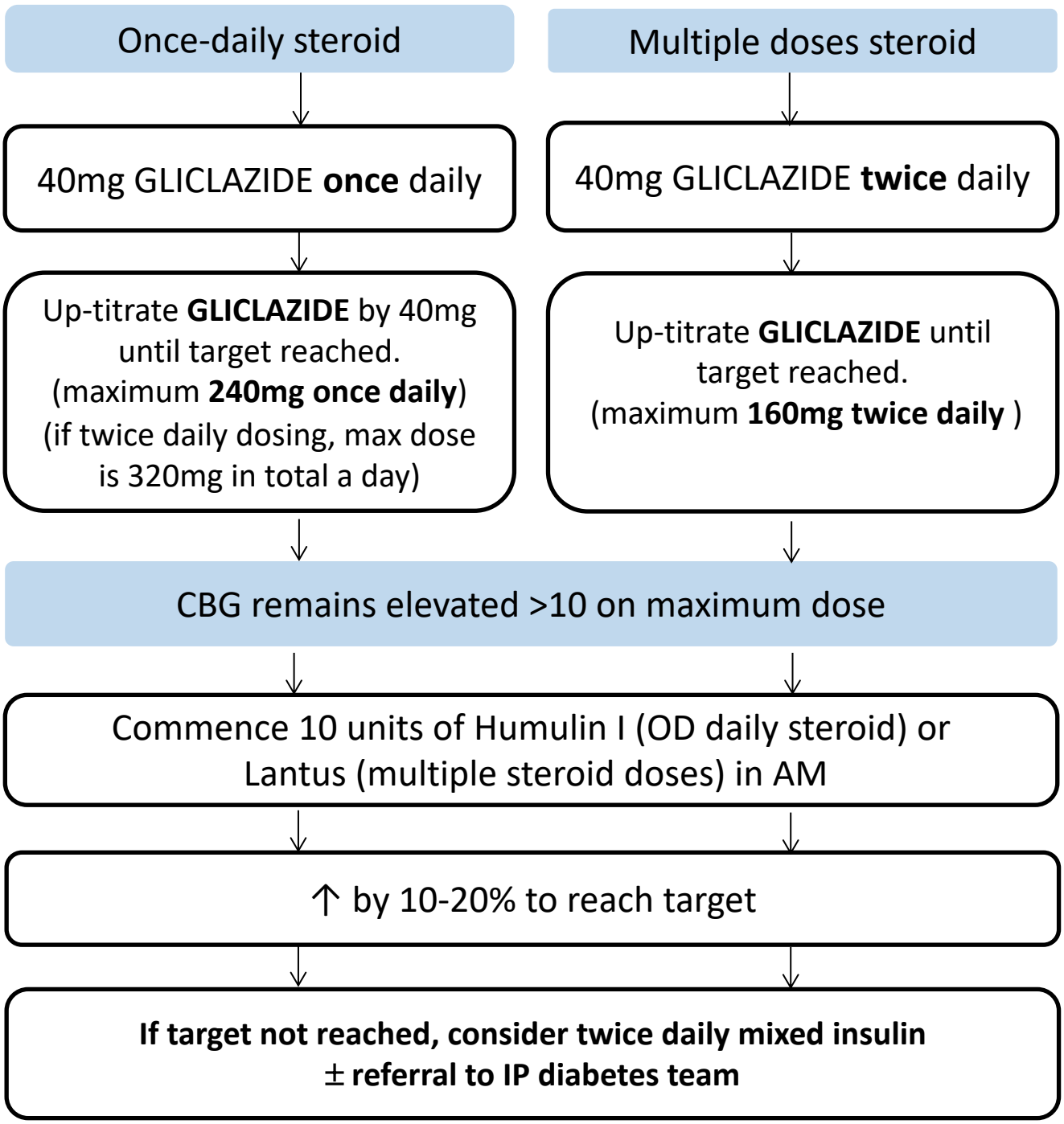
- **When should I treat hyperglycaemia in patients on steroids?**
  - **no diabetes:** if CBG >10mmol/L on 2 or more occasions in 24 hours (see section 17)
  - **known diabetes**: If CBG >10mmol/L on 2 or more occasions in 24 hours (see section 18)
  - if CBG ≥ 18 mmol/L on 2 or more occasions in 24 hours start VRIII and refer to section 21

See also GGC Guideline - Monitoring of capillary glucose in patients on steroids and initial management of steroid induced hyperglycaemia

18. How do I manage steroid-induced diabetes?

- Aim target CBG 6 – 10 mmol/L (unless specified otherwise).
- Check CBG QID - if CBG ≥ 18 mmol/L on 2 or more occasions in 24 hours start VRIII and refer to section 21

See also GGC Guideline - Monitoring of capillary glucose in patients on steroids and initial management of steroid induced hyperglycaemia



19. How do I manage steroid-induced hyperglycaemia?

- Target CBG 6 – 10 mmol/L (unless specified otherwise).
- Check HbA1c
- Check CBG 4 times a day, if CBG ≥ 18 mmol/L on 2 or more occasions in 24 hours start VRIII and refer to section 21

See also GGC Guideline - Monitoring of capillary glucose in patients on steroids and initial management of steroid induced hyperglycaemia

T2DM not on gliclazide or insulin

40mg GLICLAZIDE
once daily (if once daily steroid)
twice daily (if multiple doses steroid)

T2DM on gliclazide, not on insulin

Up-titrate **GLICLAZIDE** until CBG target reached.
Maximum dose **240mg OD**
(if twice daily dosing, max dose is 320mg in total a day)

CBG remains elevated >10 on maximum dose

Commence 10 units of Humulin I or Insulatard once daily
↑ by 10-20% to reach target

T1DM or T2DM on Insulin

Basal Insulin Only

Consider changing to AM dosing. Increase dose by 10-20% until target reached

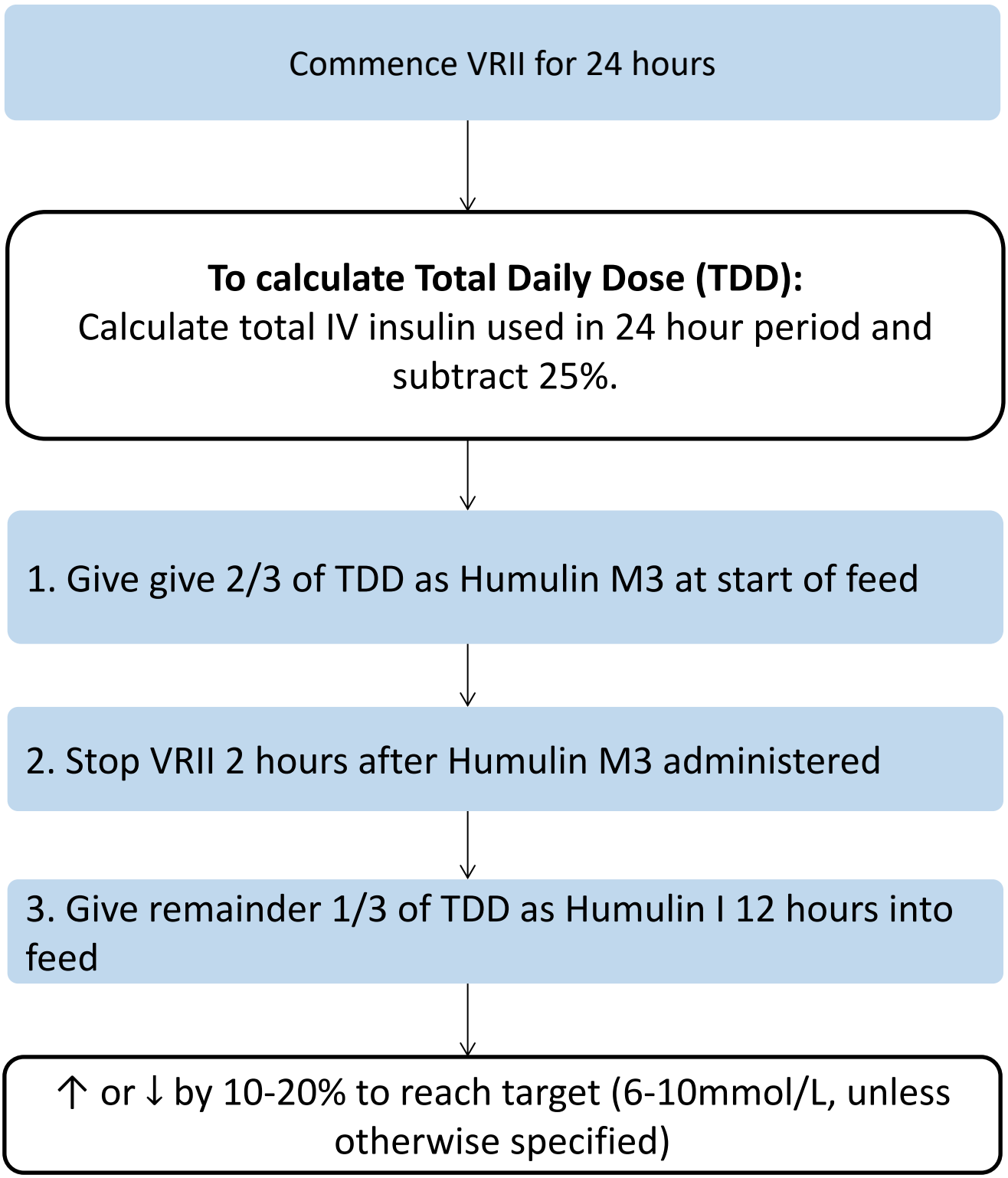
Basal-Bolus

Ensure long acting insulin given AM and increase by 10-20% until target reached

twice daily mixed Insulin

Increase morning dose by 10-20% until target reached

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



21. 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 (significantly outwith specified targets)
  - 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

Do not convert mixed insulin to long acting component only with a VRIII

e.g. Humulin M3 should not be given as Humulin I

In patients with T2DM, usual diabetes medications can be continued with a VRIII unless other contraindications e.g. AKI

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

See also GGC Guideline: Variable Rate Intravenous Insulin Infusion

22. How do I stop a VRIII?

- If clinically indicated to stop VRIII, then it can be stopped if long-acting insulin is on board.
- 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), it 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 75% in appropriate subcutaneous regime (e.g. basal bolus, twice daily mixed etc, refer to inpatient diabetes team)

23. What happens if a dose of insulin is missed?

These are suggestions only – exact management will depend on individual circumstances.

- **Once daily long acting insulin** (e.g. lantus, abasaglar)
  Give as soon as missed dose noted. Time of subsequent doses will need to be changed. Aim to adjust back to usual administration time.

- **Twice daily levemir**
  Give missed dose as soon as noted, give next dose 12 hrs later. Aim to adjust back to usual administration time.

- **Tresiba**
  Has administration window of approx. 8 hrs. Give as soon as missed dose noted. If outwith 8 hr window give usual dose and aim to adjust back to usual time of administration.

- **Meal time insulin** (e.g. novorapid, humalog)
  If within an hour of eating, give usual dose. If >1hr, consider correction dose if CBG high (see section 13).

- **BD mixed insulin** (e.g. humulin M3)
  Give 50-70% of dose as soon as missed dose noted if <4hrs. Ensure patient has a snack to avoid hypo. If >4 hours consider correction dose according to CBGs (see section 13). Do not change time of next dose.

Remember to check ketones in patients with T1DM with missed doses and hyperglycaemia

24. 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

25. 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.

26. 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/carer 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 unable 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.

27. GGC Guidelines

- Diabetes during Practical Procedures (including colonoscopy)
  http://www.staffnet.ggc.scot.nhs.uk/Info%20Centre/PoliciesProcedures/GGCClinicalGuidelines/GGC%20Clinical%20Guidelines%20Electronic%20Resource%20Direct/Diabetes%20during%20Practical%20Procedures%20(including%20Colonoscopy).pdf

- Alogrithm for treatment of Hypoglycaemia in Adults
  http://www.staffnet.ggc.scot.nhs.uk/Info%20Centre/PoliciesProcedures/GGCClinicalGuidelines/GGC%20Clinical%20Guidelines%20Electronic%20Resource%20Direct/Diabetes,%20Algorithm%20for%20treatment%20of%20Hypoglycaemia%20in%20Adults.pdf

- Variable Rate Intravenous Insulin Infusion
  http://www.staffnet.ggc.scot.nhs.uk/Info%20Centre/PoliciesProcedures/GGCClinicalGuidelines/GGC%20Clinical%20Guidelines%20Electronic%20Resource%20Direct/Diabetes,%20Variable%20Rate%20Intravenous%20Insulin%20Infusion.pdf
-
- Monitoring of capillary glucose in patients on steroids and initial management of steroid induced hyperglycaemia *in progress*

28. 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