Diabetes: The Highs and Lows of blood glucose – guidance for Primary Care teams

HYPERGLYCAEMIA

SYMPTOMS include:
Thirsty
Toilet (polyuria & nocturia)
Tired
Thinner
Blurred vision
Delayed wound healing recurrent skin/urine/foot infections
Nausea
Headaches
Drowsiness

OTHER Common CAUSES OF RAISED HbA1c (>58mmol/mol) to consider:
Iron and/or B12 deficiency
Alcohol excess
CKD
Splenectomy
Haemoglobinopathies
ca pancreas *(especially if associated with unplanned weight loss)*
Steroids

Common causes of daily raised BGLs (≥12-14mol/L) to consider:

Psychological

- Stress/mental illness

Drug related

- Glucose lowering medication omitted (*sensitive enquiry needed*), taken at wrong time or dosing suboptimal
- Therapies inappropriate/not working
- Incorrect insulin given (e.g., long-acting insulin given with meals)
- Recent or concurrent **steroid (**oral/IM/IV) based treatment
- Antipsychotic, retroviral medications or thiazide diuretics

Reduced physical activity

- Prolonged bedrest/recovery from illness or surgery
- End of life

Acute catabolic state

- Stress of Acute/subclinical illness (e.g., sepsis, urinary, foot or dental disease)
- Diabetes Emergency State: Diabetic KetoAcidosis (DKA) or Hyperglycaemic Hyperosmolar State (HHS)
- Alternative pancreatic disease (e.g., pancreatitis)
- Trauma & Burns

Mechanical

- Insulin delivery device failure (e.g., damaged insulin pen, faulty personal insulin pump (e.g., blocked cannula, inappropriately low insulin infusion rate)
- Insulin expired or stored in warm/sun-exposed environment
- Incorrect insulin injection technique or site (lipohypertrophy)
- Mixed insulin not agitated properly prior to administration

Gastrointestinal

- Dehydration and/or constipation (excess caffeine intake)
- Indiscretions between meals (e.g., high carbohydrate content snacks, high sugar **supplements**), increased portion sizes
- Mismatch between meal choices and medications
- Vomiting
- Use of home enteral/parenteral feeding
- Exocrine pancreatic issues (steatorrhea,? pancreatic enzyme replacement doses)

Endocrine

- Menstruation
- Pregnancy
- Thyroid disease

Actions to take if indicated:

- Address precipitant where possible
- Seek advice on diabetes treatment regimen/dose changes if indicated
- W**ith acute illness +/- dehydration risk:**
  - Exclude DKA or HHS
  - Suspend Metformin and/or SGLT2-I (increased acidosis risk in illness)
  - Ensure well hydrated, bowels regular
  - Offer insulin dose adjustment guidance

HYPOGLYCAEMIA

Other COMMON causes of LOW HbA1c (<48mmol/mol) to consider:
Use of erythropoietin
Iron and/or B12 replacement
CLD
Recent transfusion
Haemoglobinopathies

SYMPTOMS include:
Sweating
Dizziness
Shakiness
Tingling lips or tongue
Hunger
Anxiety
Palpitations
Headache
Poor concentration
Confusion/odd behaviour
Seizures or loss of consciousness

Actions to take if indicated:
- Review and address possible CAUSES
- Review diet, treatment +/- doses?
- Reduce risk of recurrence? (seek advice if 'hypo unaware')
- Re-educate (formal course, leaflet etc)
- Renal or Liver problem to assess?
- Driving advice? (DVLA update)
- Review again soon

Causes of daily low BGLs (<3mmol/L) to consider:

Medication related
- Insulin injection site problem (lipohypertrophy) or intramuscular injection
- Acute reduction or discontinuation of steroid based treatment without reducing insulin dose
- Alcohol or Quinine use
- Sulphonylurea related (likely to occur 4-8 hours post dose)
- Polypharmacy (drug interactions? - review ALL drugs)

Consequence of reduced carbohydrate intake (ALL need *at least* 50g carbohydrates/day)
- Nausea and vomiting, gastroenteritis
- Reduced appetite, smaller, delayed, irregular or missed meals
- Interruption or discontinued parenteral or enteral nutrition
- Change in timing of usual largest meal of the day or feed regimen
- Lack of access to usual between meal or pre-bedtime snacks, e.g., reliance on third party (carer, care home etc)
- Terminal illness/end of Life
- Inadequate treatment of previous hypoglycaemia
- **Cognitive dysfunction/dementia/frailty**/learning difficulty

Result of relative insulin excess or sensitivity
- Strict glycaemic control (**Hba1c under 48mmol/mol**)
- Rapid or fast-acting insulin administered without food
- Incorrect insulin or oral hypoglycaemic therapy, timing, doses (especially sulphonylureas) prescribed and/or administered, (e.g., sulphonylurea taken without food)
- Increased environmental temperature (more rapid insulin absorption) – warmer weather, bath or shower
- Inadequate agitation of intermediate acting or mixed insulins
- Patient with known or suspected malabsorption (e.g., coeliac, exocrine pancreatic insufficiency not on enzyme replacement
- Diarrhoeal illness (food malabsorption)
- AKI/CKD (reduced insulin or sulphonylurea clearance if egfr < 30ml/min)
- Severe hepatic dysfunction (reduced glucose stores)
- Major limb amputation or severe cachexia (reduced muscle mass, weight loss = increased insulin sensitivity)
- Post bariatric or colonic resection surgery
- Increased mobilisation and increased physical activity after acute illness or exercise
- Undiagnosed endocrine disease (thyroid, pituitary disease, hypoadrenalism)

Patient factors
- Low BMI -anorexia/poor appetite/interruption of enteral feeding/disordered eating
- History of severe hypoglycaemia +/- inadequate glucose monitoring +/- impaired hypo awareness
- Long duration of type 1 diabetes
- Increasing age
- Early pregnancy/breastfeeding

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