t·r·e·n·d™ DIABETES

For healthcare professionals and carers working in primary care and the community:

MANAGING DIABETES DURING INTERCURRENT ILLNESS

CONTENTS

WELCOME AND STATEMENT

Diabetes management in intercurrent illness can be complex depending on the type of diabetes identified and treatment required. People with diabetes who are not skilled in managing their diabetes during illness are more likely to require hospital admission due to Diabetic Ketoacidosis (DKA) and Hyperglycaemic Hyperosmolar State (HHS)[1]. These recommendations aim to support healthcare professionals to manage and teach self-management of intercurrent illness. This includes how to manage their diabetes medication/insulin therapy, nutrition, fluid intake and when to seek medical assistance.

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This third edition was updated by Erica Richardson (Associate Committee Member) and Debbie Hicks.

RATIONALE AND REMIT

This document was originally developed in 2012 to provide information and guidance on the community management of diabetes in adults during episodes of illness. It is intended to serve as a helpful resource for a range of people who support individuals with diabetes, including medical professionals (e.g. nurses, GPs) and non-medical professionals (e.g. those working in residential care, in community nursing teams, prisons, young offender institutes).

The recommendations have been reviewed and updated to produce this Forth edition by Training, Research and Education for Nurses in Diabetes (Trend Diabetes).

When implementing any advice in the document, full account should be taken of the local context and any action taken should be in line with statutory obligations required of the organisation and individual. No part of the publication should be interpreted in a way that would knowingly put anybody at risk.

INTRODUCTION: THE CHALLENGE OF MANAGING DIABETES DURING INTERCURRENT ILLNESS

Although people with diabetes do not necessarily become ill more often than individuals without diabetes, However, there risks are the more pronounced for conditions such as; kidney infection, osteomyelitis and foot infection. There are also increased risks associated with pneumonia, influenza, tuberculosis, skin infection and general sepsis[2].

Depending on the type of diabetes they have, the type of illness and the diabetes treatment they are using, the glucose levels of individuals may respond differently to illness. For example, an episode of vomiting and diarrhoea disrupts normal eating, appetite and digestion so glucose levels may drop and lead to hypoglycaemia. However, the stress hormones produced by the body to fight an infection (adrenaline and cortisol) reduces the body's sensitivity to the effects of insulin (insulin resistance). The relative lack of insulin leads to a decrease in glycogen synthesis, glycolysis and inactivation of the paracrine regulation of glucagon. This in turn contributes to the development of hyperglucagonemia and an increase in gluconeogenesis and leads to hyperglycaemia (high glucose levels) even if the individual is not eating[3,4].

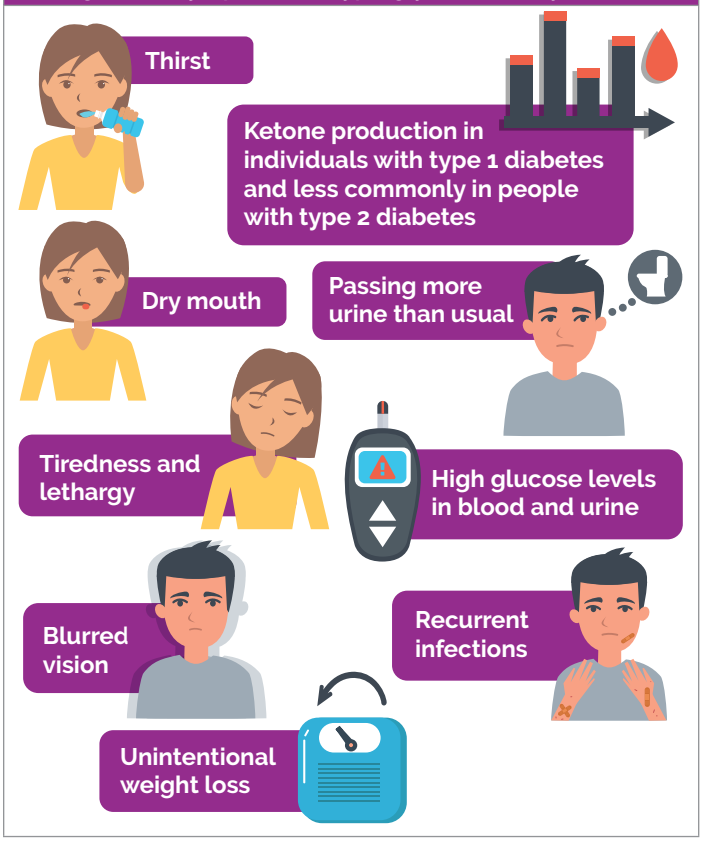
In an individual without diabetes, insulin production is increased by the pancreas to utilise this glucose. Someone with diabetes may be unable to do this effectively, resulting in hyperglycaemia (high glucose).

Examples of illnesses which may cause hyperglycaemia include:

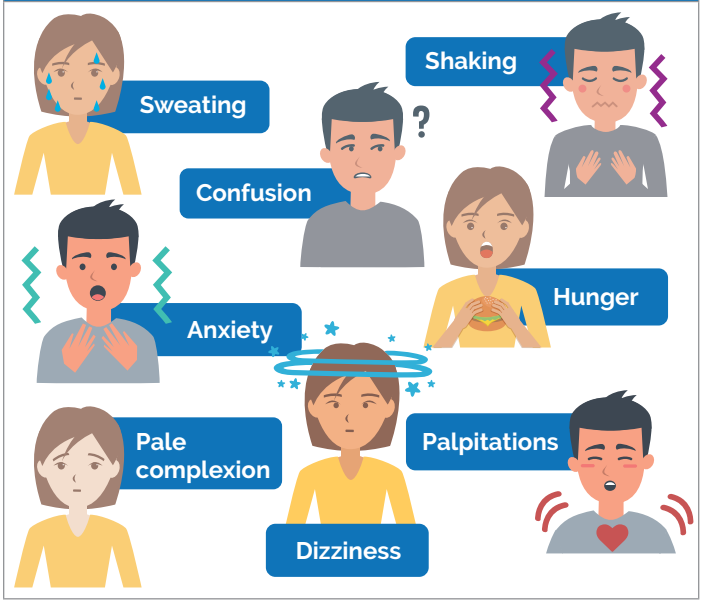
- **The common cold**
- **COVID-19**
- **Influenza**
- **Urinary tract infection**
- **Chest infection**
- **Abscess**
- **Injury such as a fracture**

Mismanagement of diabetes during periods of illness can lead to other problems such as dehydration or the development of serious acute diabetes complications[5,6]. Implementation of the correct advice can reduce the risk of this occurring. Guidance suggests all people with diabetes should receive structured education on how to self-manage the condition, including what to do during episodes of intercurrent illness.

The signs and symptoms of hyperglycaemia may include:



The signs and symptoms of hypoglycaemia may include:



ACUTE DIABETES COMPLICATIONS

Stress and infection cause a rise in adrenaline and cortisol which leads to insulin resistance. This reduces the effectiveness of insulin in enabling the body to utilise glucose as energy. It also results in a rise in the counter-regulatory hormone glucagon which causes glycogenolysis (break down of hepatic glycogen stores) and gluconeogenesis (production of glucose from other substances) by the liver. In someone with diabetes, glucose levels may rise leading to an osmotic diuresis (excess urination) leading to dehydration[3,7]. Dehydration itself causes further insulin resistance[8].

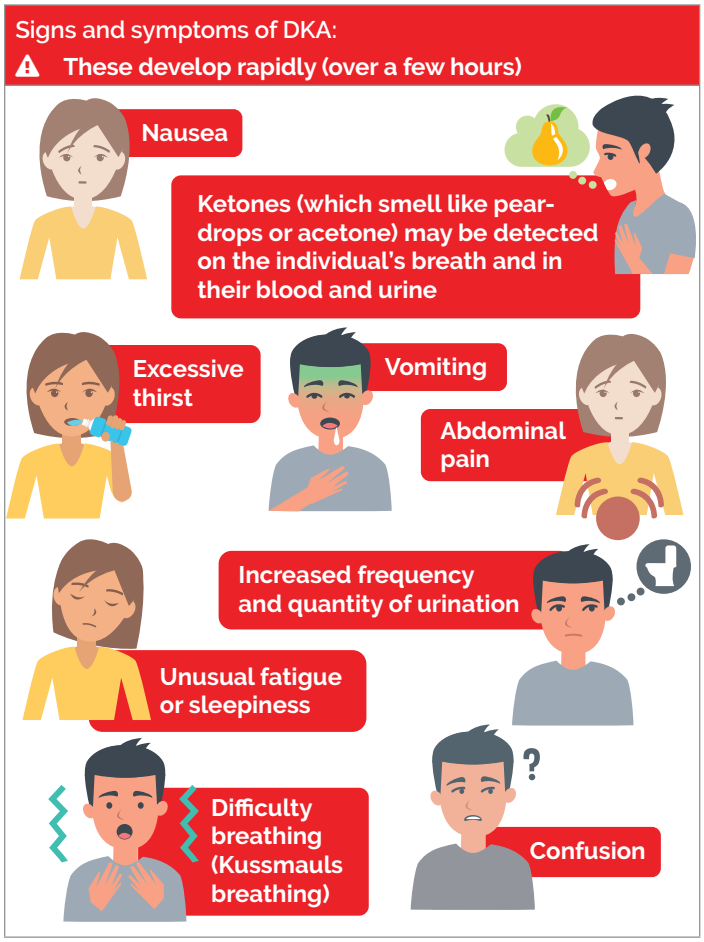
Without correct management, this situation can lead to the development of severe acute complications of Diabetic Ketoacidosis (DKA) or Hyperosmolar Hyperglycaemic State (HHS)[9,10]. These conditions are medical emergencies and require urgent hospitalisation. A brief description of both is given below to enable readers to recognise and understand the complications, **not** to suggest they can be managed in the community.

Diabetic ketoacidosis (DKA):

DKA occurs as a consequence of absolute or relative insulin deficiency resulting in insufficient glucose needed for energy to be able to enter into cells. It results in ketonaemia (ketones in the blood which are produced in response to the body being unable to use glucose for energy adequately). The production of ketones then causes the blood to become more acidic due to the rise in the ketone level[11]. Changes in the pH of the blood disrupts many processes in the body needed for life. Although commonly associated with type 1 diabetes, occasionally people with type 2 diabetes can also develop DKA.

Before the discovery of insulin DKA was a fatal condition. With improved understanding and treatment, mortality rates for DKA have fallen significantly in the last 20 years, although for very elderly people or those with several co-morbidities, this is about 5% (French et al, 2019).

Diagnosis of DKA[9]:
Blood ketones 3mmol/L or greater (or more than 2+ on urine ketone strips)
Glucose higher than 11 mmol/L
Bicarbonate less than 15 mmol/L and/or venous pH less than 7.3



Diabetic ketoacidosis can be triggered by[11]:

- Illness particularly infections like pneumonia and urinary tract infections
- Insulin omission or inadequate amounts of insulin to end of sentence
- Physical or emotional trauma
- Heart attack
- Alcohol or drug abuse
- Certain medications such as corticosteroids or SGLT2 inhibitors

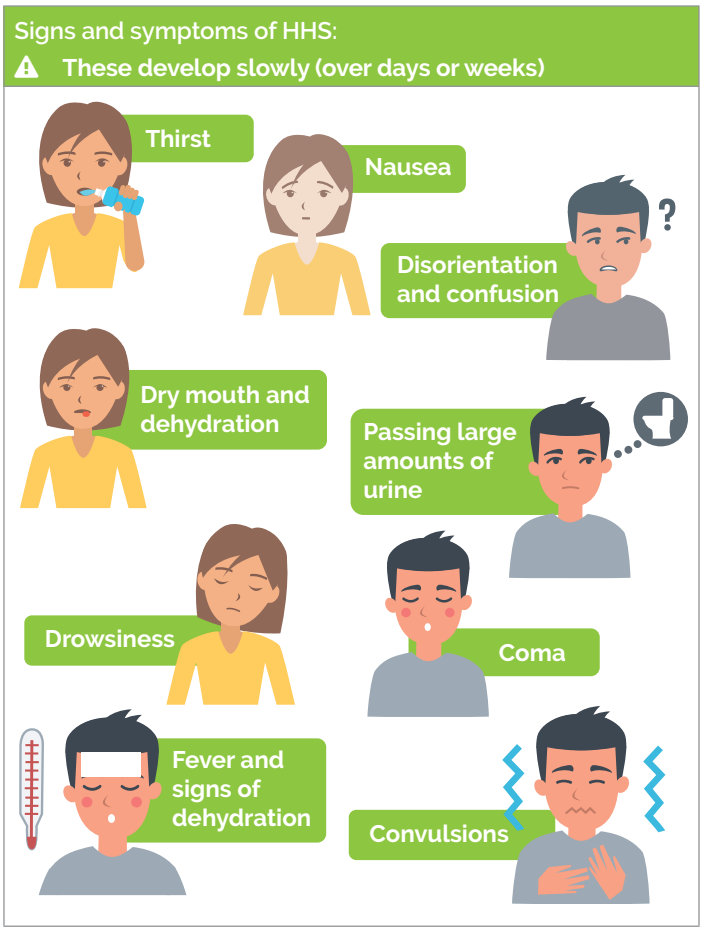
Individuals who may be at particular risk of developing DKA[12]:

- Those with suboptimal control of type 1 diabetes
- Those who frequently miss insulin injections
- Treatment with SGLT2 inhibitors or atypical antipsychotics
- Treatment with GLP-1 Receptor Agonist injections when concomitant insulin is reduced too quickly or stopped

DKA is a medical emergency. The individual needs hospitalisation for rehydration, restoration of electrolyte balance, and insulin therapy

Hyperosmolar hyperglycaemic state (HHS):

HHS differs from DKA in that it has a slow onset (developing over days or weeks) resulting in a more severe degree of dehydration and metabolic disturbances. Presenting symptoms of extremely high glucose levels (often over 30 mmol/L) and high serum osmolality are features however. there is often a lack of blood ketones (less than 3 mmol/L)[10].



Like DKA, the most common precipitating factors are infection and inadequate insulin therapy. Certain drugs like steroids and excess diuretics can also predispose the individual to develop severe hyperglycemia and HHS hyperglycaemia and HHS. The mortality rate for HHS is higher than DKA (about 10 - 50%) as it tends to affect older people with type 2 diabetes and multiple underlying co-morbidities[13]. It is complicated by vascular complications such as heart attacks, strokes and peripheral arterial thrombosis, and seizures and cerebral oedema (swelling of the brain)[10].

HHS is a medical emergency. The individual needs hospitalisation for rehydration, anti-coagulation therapy and restoration of electrolyte balance. Despite the very high glucose level on admission, the individual may not require insulin therapy[10].

GENERAL PRINCIPLES OF MANAGING DIABETES DURING INTERCURRENT ILLNESS

The aim of management is to maintain reasonable glucose levels (avoiding both hypoglycaemia and hyperglycaemia) and prevent severe dehydration and progression to DKA or HHS. The management of glucose levels during a period of intercurrent illness will depend on the type of diabetes, the type of illness and the the type of anti-hyperglycaemic treatment the person is currently using.

Guidance recommends:

Rest: avoid strenuous exercise.

Fluids: to avoid dehydration, the individual should drink plenty of sugar-free fluids. These should be sipped gently throughout the day, especially if nauseated (at least 100 ml per hour), aiming for at least 2 ½ to 3 ½ litres (4 to 6 pints) over 24 hours.

⚠ **Please Note: guidance should be sought from specialist teams for individuals with known renal or heart failure due to risks associated with fluid overload.**

Meal replacements: Being ill, especially if febrile with an infection, consumes calories. If the individual is unable to eat usual meals, calories should be replaced by easily digested carbohydrate (starchy or sugary) foods and drinks. The table below gives some suggestions. Each item is equivalent to about 10 gram of carbohydrate (e.g. equivalent to an egg-sized potato, thin slice of bread, or a tablespoon of cooked rice or pasta).

Food or drink		Quantity
	Fruit juice	100 ml
	Milk	200 ml
	Ice-cream	1 large scoop
	Tomato soup	½ large tin (200 gram)
	Yoghurt	Small 150 gram pot
	Rich tea or malted milk biscuits	2

Treat the illness/symptoms: Over-the-counter painkillers and cough syrups can be used to relieve high temperature, sore throat and cough. These medications may not have sugar-free alternatives; however, they are usually taken in small quantities and may have little impact on the individuals CBG levels. The individual should be advised to monitor their glucose frequently and correct high/ low readings accordingly. They should also be advised to seek medical assistance / review if an infection is suspected as antibiotics may be required.

Monitoring glucose levels: As mentioned in the introduction to this document, glucose levels vary in response to illness depending on the type of illness, the type of diabetes the individual has, and the type of glucose-lowering treatment they use to manage their diabetes. Regular monitoring, ideally using glucose testing equipment rather than urine testing strips, is essential to guide the appropriate management of diabetes, especially if adjusting therapies particularly insulin dose. People using insulin should test their glucose levels at least every 4 to 6 hours including during the night when unwell. Individuals with type 1 diabetes with blood ketone levels of 1.5 mmol/L or greater should test every 2 hours including during the night and give additional doses of rapid acting insulin until ketone levels reduce (see insulin adjustment section).

Some individuals monitor their glycaemic trends with Continuous Glucose Monitors (CGM) or intermittently scanned glucose monitors (isCGM). In acute illness (Particularly with associated dehydration or low B/P or when glucose levels are changing rapidly - these devices many not be reliable[14]. Before administering extra insulin, a capillary finger-prick glucose reading should be taken to confirm hyperglycaemia.

Monitoring blood ketone levels: People with type 1 diabetes should have access to blood ketone testing equipment and be taught how to interpret and respond appropriately to the results[15,16]. Generally, people who have type 2 diabetes are not routinely prescribed ketone-testing equipment as the risk of DKA is lower in this type of diabetes (with the exception of individuals prescribed and taking SGLT2 inhibitors). Any individual (type 1 or 2 diabetes) acutely unwell with CBG levels >12mmol/l should have their blood ketone levels checked, especially if they are vomiting[17].

Although urine ketone testing strips are less costly and simpler to use, they are not recommended. They do not detect B-hydroxybutyrate which is the predominant metabolite in DKA. If they are only able to urine ketone test, a result of 2+ means they may be at risk of developing DKA.

However, it is important to remember that these results may underestimate the severity of ketonemia in the early stages and may over-estimate stages of ketonemia in the latter stages and some medications (such as Sulfhydryl's or Valproate) can give false high results[18].

⚠ **Any person with diabetes (either type 1 or type 2 diabetes) who is acutely unwell should have their blood ketone levels checked, especially if they are vomiting.**

Interpreting blood ketone levels:

Less than 0.6 mmol/L	• Normal - check again in 2 hours
0.6 to 1.5 mmol/L	• Risk of developing DKA. • Correct glucose levels (follow advice on insulin adjustment pages 9 and 10), increase fluid intake and retest in 2 hours
1.6 to 2.9 mmol/L	• High risk of developing DKA. • Increase in insulin / or correction dose is required (follow advice on insulin adjustment pages 9 and 10), increase fluid intake and contact your diabetes team for advice and guidance
3 mmol/L or higher	• Very high risk of DKA. • Needs urgent medical attention and may need admission to Accident and Emergency department

Adapted from NHSE[19] and JDRF[20].

ADJUSTMENT OF GLUCOSE-LOWERING MEDICATIONS

Increasing the frequency of monitoring glucose levels will support the appropriate adjustment of glucose-lowering medications. In most cases, these medications should be continued (but see the next section) even if appetite is poor. Sulphonylureas and insulin doses may need to be reduced temporarily if glucose levels are dropping lower than the agreed target. Typically however, adults with acute intercurrent illness are at risk of worsening hyperglycaemia and so treatments will need to be increased if levels are consistently above target. Insulin may be required temporarily in people with type 2 diabetes until the intercurrent illness has resolved[15,21].

Type 1 diabetes - Adjusting insulin during intercurrent illness:

If glucose levels are lower than the agreed target, insulin doses may need to be reduced by 10 to 20% and mealtime insulin doses may be omitted if little or no carbohydrate is consumed. **However, basal insulin must never be stopped completely in someone with type 1 diabetes.**

If glucose levels are above the agreed target, insulin doses will need to be increased. The presence of blood ketones reduces the body's sensitivity to the action of insulin so injected insulin requirements significantly increase even if the individual is not eating. The degree of ketonaemia determines the frequency of monitoring and additional insulin boluses, and the amount of insulin required. The algorithms shown opposite suggest the process for someone with type 1 diabetes to follow if they have hyperglycaemia with less than 1.5 mmol/L of ketones, and the process to follow if they have ketones 1.5 mmol/L or greater.

Managing your insulin dose when your blood ketones are less than 1.5 mmol/L[22]

Glucose more than 11 mmol/L and either no ketones or blood ketones less than 1.5 mmol/L (negative or trace of urine ketones)

↓

Sip sugar-free fluids, at least 100 ml/hr. Eat as normal if possible. If not, replace with easily digested meal substitutes. **You need food containing carbohydrate (carbs), insulin and fluids to avoid dehydration and prevent diabetic ketoacidosis**

↓

Test glucose and blood ketones **every 4 to 6 hours** including during the night

↓

Aim to take your usual insulin dose. However, if your glucose is above 11 mmol/L, take additional insulin as below

↓

Glucose	Insulin dose
11 – 17 mmol/L	Add 2 extra units to each dose
17 – 22 mmol/L	Add 4 extra units to each dose
More than 22 mmol/L	Add 6 extra units to each dose

Call your GP or nurse if your glucose still remains higher than normal

⚠ **If you start vomiting, are unable to keep fluids down, or are unable to control your glucose or ketone levels, you must seek urgent medical advice. DON'T STOP TAKING YOUR INSULIN EVEN IF YOU ARE UNABLE TO EAT**

Managing your insulin dose when your blood ketones are 1.5 mmol/L or higher[22]

Glucose more than 11 mmol/L and blood ketones 1.5 mmol/L or higher (+ or more of urine ketones)

↓

Sip sugar-free fluids, at least 100 ml/hr. Eat as normal if possible. If not, replace with easily digested meal substitutes. **You need food containing carbohydrate (carbs), insulin and fluids to avoid dehydration and prevent diabetic ketoacidosis**

↓

1.5 to 3 mmol/L on blood ketone meter (+ to ++ urine ketones) / More than 3 mmol/L on blood ketone meter (+++ to ++++ urine ketones)

↓

Give an additional 10% of your TDD as rapid-acting or mixed insulin every 2 hours	Total daily insulin dose: TDD	Give an additional 20% of your TDD as rapid-acting or mixed insulin every 2 hours
1 unit	Up to 14 units	2 units
2 units	15 to 24 units	4 units
3 units	25 to 34 units	6 units
4 units	35 to 44 units	8 units
5 units	45 to 54 units	10 units

If you take more than 54 units or if you are unsure how to alter your dose, contact your specialist team or GP

↓

Test glucose and blood ketones **every 2 hours** including during the night

↓

Glucose **more than 11 mmol/L and ketones present?**

YES - REPEAT PROCESS (↑ back to 1.5 to 3 mmol/L on blood ketone meter) / **NO** (↓)

As your illness resolves, adjust your insulin dose back to normal)

⚠ **If you start vomiting, are unable to keep fluids down, or are unable to control your glucose or ketone levels, you must seek urgent medical advice. DON'T STOP TAKING YOUR INSULIN EVEN IF YOU ARE UNABLE TO EAT**

Insulin pump devices:

Insulin pumps use quick-acting insulin to provide a continuous background of insulin delivery, with additional boluses of insulin given when carbohydrate is consumed. As insulin pump users do not use any long-acting basal insulin, they can rapidly develop DKA if the pump has a malfunction, or the insulin delivery is interrupted (e.g. the tubing has become kinked or the cannula is dislodged). Due to the updated NICE guidance[23] and NHSE 5-year implementation plan[24] it is expected that many more individuals will be using these therapies, in-particular close hybrid close loop (HCL) insulin pump systems (insulin pump with linked glucose sensing devices and AI systems to assist with insulin delivery automation).

Pump users are trained to use a fast, aggressive, and methodical approach to manage raised glucose levels to prevent the development of significant ketone levels. In most situations where DKA is suspected, the user would be advised to take a correction dose of rapid acting insulin using insulin pen, to change the cannula and giving set (or pod) and either set an increased temporary basal rate (if pump used in open loop / manual mode) or switch back to closed loop and monitor regularly to assess need for additional correction bolus's[25]. The rationale for using a pen device relates to the insulin on board feature within the pump (how much insulin the pump has calculated is in the individuals circulation) this safety feature with in the insulin pump settings to reduce over bolusing of insulin. It will restrict the amount of insulin given through the bolus calculators as the pump will not be aware that the individual is unwell. In addition to manual correction of BG levels (with an insulin pen). Details of pump use is beyond the scope of this document as individuals using insulin pumps should be supported by a diabetes specialist team.

Type 2 diabetes - Adjusting insulin during intercurrent illness:

If the glucose level is persistently greater than 11 mmol/L, the insulin dose needs to be increased as follows:

11.1 to 17 mmol/L	Add 2 extra units to each dose
17.1 to 22 mmol/L	Add 4 extra units to each dose
Over 22 mmol/L	Add 6 extra units to each dose

If the individual usually takes more than 50 units in total daily, these adjustments should be doubled. All adjustments are incremental and should be reduced gradually as the illness resolves.

If the glucose levels are dropping down to 4 mmol/L or less, the usual insulin dose should be reduced by 10% (e.g. if the dose is usually 20 units, reduce by 2 units to 18 units. If it is usually 40 units, reduce by 4 units to 36 units). Ensure the individual or their carer knows how to recognise and treat hypoglycaemia and has "hypo" treatments available.

SPECIFIC ADVICE ABOUT COMMONLY USED DIABETES MEDICATIONS

The following section outlines the advice provided in the Product Specific Characteristics information and other sources for a number of medications commonly taken by people with diabetes during periods of intercurrent illness.

Metformin:

Metformin, if used in the presence of dehydration and acute reduction in renal function, accumulates and increases the risk of developing a very rare condition called lactic acidosis. In cases of dehydration (severe diarrhoea or vomiting, fever or reduced fluid intake), Metformin should be temporarily discontinued and contact with a health care professional is recommended.

Metformin is contraindicated in people with eGFR <30 mL/min and it should be temporarily discontinued in the presence of conditions that alter renal function. These include severe infection, shock and conditions which cause tissue hypoxia such as recent myocardial infarction. There are additional considerations relating to alteration of doses according to eGFR - please review linked SMPC for more information: www.medicines.org.uk/emc/product/987/smpc (accessed 26th Januamry 2025)

Sulphonylureas:

Gliclazide, Glimepiride, Glipizide, Tolbutamide

Tablets in this class work by stimulating the beta cells in the pancreas to make more insulin, helping it to work more effectively[26,27].

These tablets can cause hypoglycaemia if taken without food so may need to be reduced if appetite is poor. However, they can be increased if the intercurrent illness is causing hyperglycaemia unless the individual is already taking the maximum dose.

Pioglitazone:

This medication reduces insulin resistance and improves sensitivity, allowing the insulin that the pancreas produces to work more effectively[26,27].

Pioglitazone can cause fluid retention, which may exacerbate or precipitate heart failure. It should be discontinued if any deterioration in cardiac status occurs[28].

DPP4-inhibitors (gliptins):

Alogliptin, Linagliptin, Saxagliptin, Sitagliptin, Vildagliptin

DPP-4 inhibitors work by blocking the action of DPP-4, an enzyme that destroys the hormone incretin. Incretin hormones help the body to produce more insulin when needed and reduce the amount of glucose production when it's not needed[26,27].

The use of DPP-4 inhibitors has been associated with a risk of developing acute pancreatitis. Individuals should be informed of the characteristic symptom of acute pancreatitis: persistent, severe abdominal pain. DPP4-inhibitors and other potentially suspect medicinal products should be discontinued[29].

SGLT2 inhibitors:

Canagliflozin, Dapagliflozin, Empagliflozin, Ertugliflozin

Sodium-glucose co-transporter-2 (SGLT2) inhibitors work by inhibiting the reabsorption of glucose from the proximal tubule in the kidney and thus allowing the loss of glucose (and calories) in the urine. They can lower glucose levels and may also produce weight loss[26,30].

However, DKA has been reported in 0.6 and 6.3 per 1000 person-years (33% higher than those not taking SGLT2i therapies)[31] of people with diabetes taking an SGLT2 inhibitor in certain circumstances. The Association of British Clinical Diabetologists recommends the SGLT2 inhibitor should be discontinued in the following situations, to reduce the risk of developing DKA[32]:

The SGLT2 inhibitor should be paused in:

- ⊘ **if the individual is acutely ill**
- ⊘ **unable to eat**
- ⊘ **has nausea and vomiting and abdominal discomfort**
- ⊘ **dehydration**
- ⊘ **concern regarding accuracy of diagnosis**

People are especially at risk if[32]:

- ⚠ **following a low carbohydrate diet**
- ⚠ **during an episode of illness**
- ⚠ **are vomiting**
- ⚠ **have sustained an injury**
- ⚠ **experiencing starvation**
- ⚠ **have excessive alcohol consumption**
- ⚠ **have a significant reduction in insulin administration**

All people taking this medication should be given advice about the signs and symptoms of DKA. Interestingly, the glucose levels may not be significantly high in DKA associated with SGLT2 inhibitor (14 mmol/L or less), known as euglycaemic DKA, despite the individual being very unwell[9].

An increase in Fournier's gangrene (necrotising fasciitis of the perineum) has also been noted in men and women using SGLT2 inhibitors. This is a rare but serious life-threatening condition requiring antibiotics and urgent surgical intervention. Individuals should be advised to seek medical attention if they experience a combination of symptoms of pain, tenderness, erythema, or swelling in the genital or perineal area, with fever or malaise. The SGLT2 inhibitor should be discontinued. As uro-genital infection or perineal abscess may precede necrotizing fasciitis, these should be investigated promptly[33].

GLP-1 receptor agonists:

Dulaglutide, Exenatide, Liraglutide, Lixisenatide, Semaglutide, Tirzepatide (combination therapy containing GLP-1 and GIP)

These non-insulin glucose-lowering injections for overweight people with type 2 diabetes mimic the action of a gut hormone and can lower glucose levels and induce weight loss. There have been reports of individuals developing DKA whilst taking these therapies however it is thought that these cases relate to either the inappropriate discontinuation of insulin or inappropriate rapid reduction in dose administered. Nausea and vomiting are common side effects of GLP-1 receptor agonists but they are also well-known symptoms of DKA. The development of DKA should be considered in people who have recently begun using GLP-1 receptor agonist and whose insulin dose has been significantly reduced[34].

Acute pancreatitis has been observed with the use of GLP-1 receptor agonists. Individuals should be informed of the characteristic symptoms of acute pancreatitis (acute abdominal pain, nausea and vomiting). If pancreatitis is suspected, the GLP-1 receptor agonist should be discontinued and seek urgent medical attention[29].

Other medications:

Dehydration can be a significant risk to people taking certain medicines. These should be temporarily stopped if this occurs. https://trenddiabetes.online/portfolio/type-2-diabetes-what-to-do-when-you-are-ill/

- ⚠ **Diuretics: (e.g. furosemide or bendroflumethiazide) can cause dehydration or make dehydration more likely in an ill person.**
- ⚠ **ACE Inhibitors (medicines ending in 'pril'), ARBs (medicines ending in 'sartan') and NSAIDs (e.g. ibuprofen or naproxen) may impair kidney function in people who are dehydrated which could lead to kidney failure**

Corticosteroids:

Corticosteroids (also known as steroids) are hormones that occur naturally in the body. They can be artificially manufactured for a range of medicinal uses, such as reducing inflammation and management of acute respiratory conditions.. They are available as tablets, injections, creams, ointments and inhalers. There are a number of different types of steroids and they vary in how long a single dose lasts (from approximately 8 hours to over 2 days). Steroids may be required either as a short course (5 days), a course that gradually reduces over a period of time or a continuous course for many years.

Steroids taken orally or by injection will cause a significant rise in glucose. This will require starting diabetes treatment, increasing the dose of existing glucose-lowering treatments, or changing from tablets to insulin to prevent the symptoms of hyperglycaemia, dehydration and the risk of HHS. Generally, the steroids should be continued and the hyperglycaemia addressed with treatment rather than discontinuing the steroids.

See Appendix 1 for more details on the management of diabetes and steroid treatment.. The Trend Diabetes patient leaflet on steroids can be accessed at: www.trenddiabetes.online/resources

BEING PREPARED AND REDUCING RISK OF ACUTE COMPLICATIONS

Medications should be taken regularly as prescribed to maintain glycaemic targets. Elevated glycaemic control reduces resistance to infection and slows healing rates.

- Encourage individuals to be prepared when going on holiday or as winter time approaches when illnesses like influenza are more common: advise to keep a sufficient supply of medication and insulin supplies and glucose monitoring strips, over-the-counter medications such as simple painkillers and cough syrup, and ketone strips if Type 1 diabetes (ketone prone diabetes or considered if high risk and prescribed SGLT2 therapy). They should take advantage of recommended COVID 19/Flu/Pneumovax etc vaccinations.
- Take the opportunity to revise information and check knowledge about what to do when ill (sick day rules) with the individual during the annual diabetes review. Give appropriate written information (www.trenddiabetes.online)
- Inform individuals at risk of DKA (particularly those with type 1 diabetes, and those taking SGLT2 inhibitors) about the signs and symptoms of diabetic ketoacidosis (nausea, vomiting, abdominal pain, excessive thirst, increased frequency of urination, difficulty breathing, confusion, unusual fatigue, or sleepiness) and the need for urgent medical attention if they occur.

When initiating an SGLT2 inhibitor or GLP-1 receptor agonist in those with type 2 diabetes, reduce concomitant insulin in a stepwise manner, and not too rapidly or drastically.

WHEN TO SEEK URGENT MEDICAL HELP

Seek urgent medical advice in the following situations:

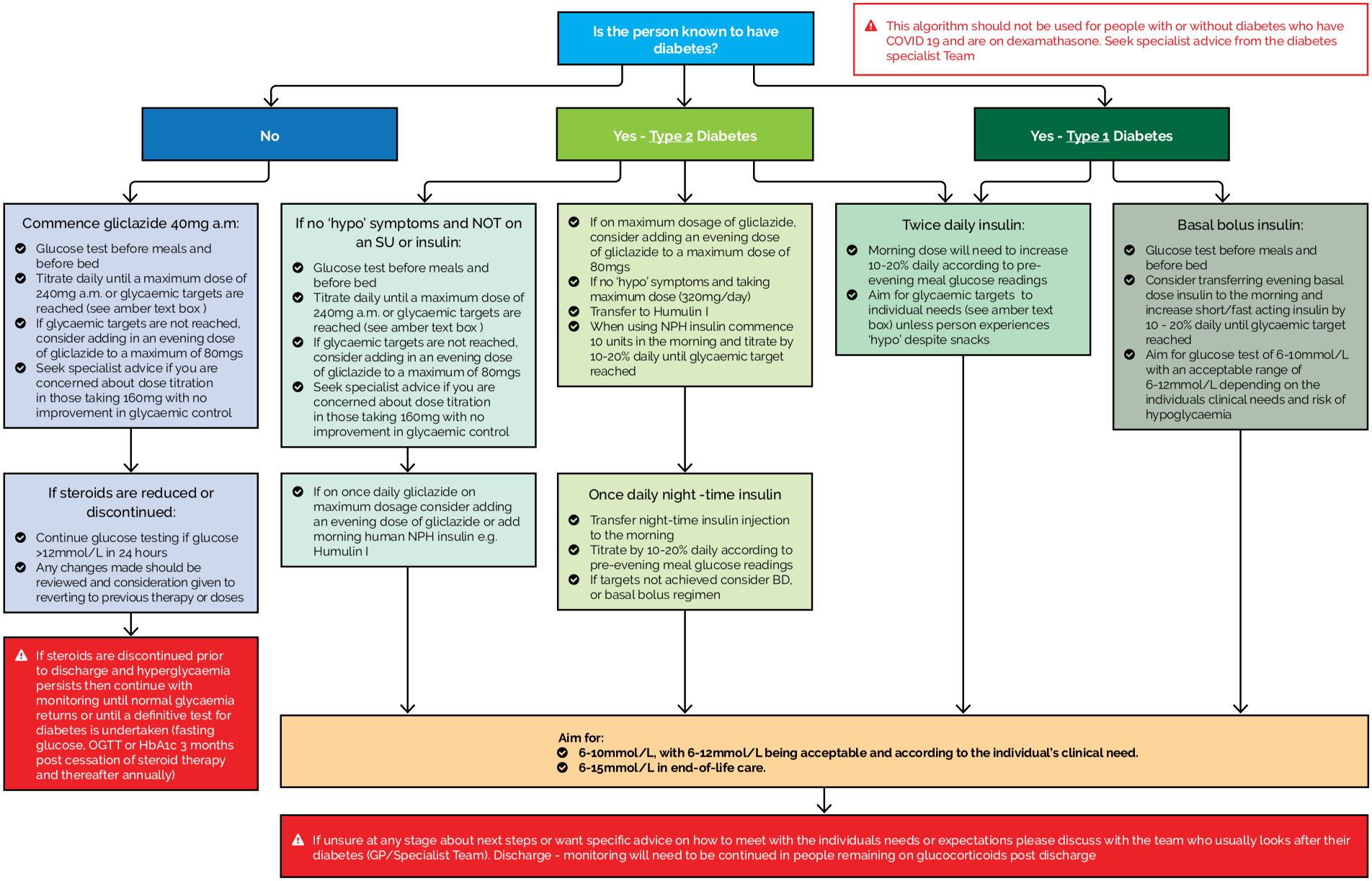
- **In someone who is pregnant (DKA can be fatal to the unborn baby)**
- **Someone taking SGLT2 inhibitor who has the signs and symptoms of DKA even if the glucose level is normal or only slightly raised**
- **If persistent vomiting and unable to keep fluids down**
- **If blood ketones are 1.6 mmol/L or higher and the individual is unable to self manage**
- **If unable to keep glucose levels above 3.5 mmol/L**
- **If not improving or getting worse, despite following the advice described in this document**

SUMMARY

Intercurrent illness in people with diabetes should be taken seriously because it may cause hyperglycaemia and lead to dehydration and subsequent risks of developing DKA or HHS. It is important that individuals receive structured education and are regularly reminded about what to do when they are unwell and how to manage their diabetes. Such precautions may avoid the development of acute complications and an unplanned hospital admission.

APPENDICES

1. Algorithm for Managing Glucose with Once Daily Steroid Therapy [35]



REFERENCES

1. AbuHammad et al (2023) Diabetes mellitus-related hospital admissions and prescriptions of antidiabetic agents in England and Wales: an ecological study. Online: https://bmcendocrdisord.biomedcentral.com/articles/10.1186/s12902-023-01352-z
2. Holt et al, 2024. Diabetes and infection: review of the epidemiology, mechanisms and principles of treatment. Online: https://pubmed.ncbi.nlm.nih.gov/38374451/
3. Jiang, S., Young, J.L., Wang, K., Qian, Y., & Cai, L. (2020). Diabetic-induced alterations in hepatic glucose and lipid metabolism: The role of type 1 and type 2 diabetes mellitus (Review). Molecular Medicine Reports, 22, 603-611. https://doi.org/10.3892/mmr.2020.11175 https://www.spandidos-publications.com/10.3892/mmr.2020.11175
4. (Banday et al, 2020) Pathophysiology of diabetes: An overview. Online: https://pmc.ncbi.nlm.nih.gov/articles/PMC7791288/
5. NICE (2023) Type 2 diabetes in adults Quality standard [QS209] Online:https://www.nice.org.uk/guidance/qs209/chapter/Quality-statement-2-Structured-education-programme
6. NICE (2023) Type 1 diabetes in adults. Quality standard [QS208]. Online: https://www.nice.org.uk/guidance/qs208/chapter/quality-statement-1-structured-education-programmes.
7. Banday et al, 2020) Pathophysiology of diabetes: An overview. Online: https://pmc.ncbi.nlm.nih.gov/articles/PMC7791288/
8. DUK (2023) Dehydration and Diabetes. Online: https://www.diabetes.co.uk/dehydration-and-diabetes.html
9. JBDS (2023) The Management of Diabetic. Ketoacidosis in Adults. Online: https://abcd.care/sites/default/files/site_uploads/JBDS_Guidelines_Current/JBDS_02_DKA_Guideline_with_QR_code_March_2023.pdf
10. JBDS (2022) The Management of Hyperosmolar Hyperglycaemic State (HHS) in Adults. Online: https://abcd.care/sites/default/files/site_uploads/JBDS_Guidelines_Current/JBDS_06_The_Management_of_Hyperosmolar_Hyperglycaemic_State_HHS_%20in_Adults_FINAL_0.pdf
11. CDC (2024) About Diabetic Ketoacidosis. Online: https://www.cdc.gov/diabetes/about/diabetic-ketoacidosis.html
12. DUK (2024) What is DKA (diabetic ketoacidosis)? Online:https://www.diabetes.org.uk/about-diabetes/complications/diabetic-ketoacidosis
13. Shaka et al (2022) Hospitalizations and inpatient mortality for hyperosmolar hyperglycemic state over a decade. Online: https://www.sciencedirect.com/science/article/abs/pii/S0168822722000420
14. JBDS (2024) Using technology to support diabetes care in hospital: A guideline from the Joint British Diabetes Societies for Inpatient Care (JBDS-IP) Group and Diabetes Technology Network (DTN). Online: https://abcd.care/sites/default/files/resources/JBDS_20_Using_Technology_to_Support_Diabetes_Care_in_Hospital_1.pdf
15. NICE (2022) Type 1 diabetes in adults: diagnosis and management NG17 available at https://www.nice.org.uk/guidance/ng17 (accessed 20th September 2019)
16. NHSE (2024) Commissioning recommendations following the national assessment of blood glucose and ketone meters, testing strips and lancets. Online: https://www.england.nhs.uk/wp-content/uploads/2023/04/PRN00037-v3-commissioning-recommendations-following-the-national-assessment-of-blood-glucose-and-ketone-meters.pdf
17. JBDS (2023) Diabetes at the Front Door. A guideline for dealing with glucose related emergencies at the time of acute hospital admission from the Joint British Diabetes Society (JBDS) for Inpatient Care Group. Online: https://abcd.care/sites/default/files/site_uploads/JBDS_Guidelines_Current/JBDS_16_Diabetes_at_the_Front_Door_Guideline_with_QR_code_May_2023.pdf
18. Umpierrez GE, Davis GM, ElSayed NA et al (2024) Hyperglycaemic Crises in Adults With Diabetes: A Consensus Report. Online: https://diabetesjournals.org/care/article/47/8/1257/156808/Hyperglycemic-Crises-in-Adults-With-Diabetes-A
19. NHSE (2023) Diabetic ketoacidosis. Online: https://www.nhs.uk/conditions/diabetic-ketoacidosis/
20. JDRF (2024) Blood ketone monitoring. Online:https://breakthrought1d.org.uk/knowledge-support/managing-type-1-diabetes/guide-to-type-1-diabetes-technology/blood-glucose-meters/blood-ketone-monitoring/
21. Davies et al (2022) Management of Hyperglycemia in Type 2 Diabetes, 2022. A Consensus Report by the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). Online: https://diabetesjournals.org/care/article/45/11/2753/147671/Management-of-Hyperglycemia-in-Type-2-Diabetes
22. DAFNE (2020) Sick day rules for standard DAFNE Online: https://dafne.nhs.uk/wp-content/uploads/2020/03/HG-01-002-v3-Sick-day-rules-Standard-1.pdf
23. NICE (2023) Hybrid closed loop systems for managing blood glucose levels in type 1 diabetes. Technology appraisal guidance [TA943] Online: https://www.nice.org.uk/guidance/ta943
24. NHSE (2024) Hybrid closed loop technologies: 5-year implementation strategy. Online: https://www.england.nhs.uk/long-read/hybrid-closed-loop-technologies-5-year-implementation-strategy/
25. Griffin et al (2023) UK's Association of British Clinical Diabetologist's DiabetesTechnology Network (ABCD-DTN): Best practice guide forhybrid closed- loop therapy. Online: https://onlinelibrary.wiley.com/doi/epdf/10.1111/dme.15078
26. DUK (2024) Diabetes Tablets and Medication. Online:https://www.diabetes.org.uk/about-diabetes/complications/diabetic-ketoacidosis
27. ADA (2024) Oral & Injectable Medications for Type 2 Diabetes. Online: https://diabetes.org/health-wellness/medication/oral-other-injectable-diabetes-medications
28. BNF (2024) Pioglitazone. Online: https://bnf.nice.org.uk/drugs/pioglitazone/
29. BNF (2024) Type 2 diabetes. Online: https://bnf.nice.org.uk/treatment-summaries/type-2-diabetes/
30. ADA (2024)Oral & Injectable Medications for Type 2 Diabetes. Online: https://diabetes.org/health-wellness/medication/oral-other-injectable-diabetes-medications
31. Ali-Hindi et al (2024)diabetic ketoacidosis in real-world data: A systematic review and meta-analysis. Online: https://www.sciencedirect.com/science/article/pii/S1544319123003175
32. ABCD (2023) SGLT-2 inhibitors in type 2 diabetes. An educational resource for health professionals. Online:https://abcd.care/sites/default/files/resources/SGLT2-inhibitors-ABCD.pdf
33. GOV.UK (2019) SGLT2 inhibitors: reports of Fournier's gangrene (necrotising fasciitis of the genitalia or perineum) available at https://www.gov.uk/drug-safety-update/sglt2-inhibitors-reports-of-fournier-s-gangrene-necrotising-fasciitis-of-the-genitalia-or-perineum
34. GOV.UK (2019) GLP-1 receptor agonists: reports of diabetic ketoacidosis when concomitant insulin was rapidly reduced or discontinued available at https://www.gov.uk/drug-safety-update/glp-1-receptor-agonists-reports-of-diabetic-ketoacidosis-when-concomitant-insulin-was-rapidly-reduced-or-discontinued
35. JBDS (2023) Management of Hyperglycaemia and Steroid (Glucocorticoid) Therapy. Online: https://abcd.care/sites/default/files/site_uploads/JBDS_Guidelines_Current/JBDS_08_Management_of_Hyperglycaemia_and_Steroid_%28Glucocorticoid%29_Therapy_with_QR_code_January_2023.pdf

USEFUL RESOURCES

- Diabetes UK: www.diabetes.org.uk
- Trend Diabetes: www.trenddiabetes.online
  A range of useful leaflets for people with diabetes is available on the Trend Diabetes website
- Down S (2018) How to advise on sick day rules. Diabetes and Primary Care 20(1): 15-16
- ihub Medicines and Dehydration Patient Information: https://ihub.scot/media/1398/20180424-medicine-sick-day-rules-patient-leaflet-print-v20.pdf

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